



Sustainable and Integrated Sanitation Management in Developing Countries: The case of Kabul’s Informal Settlements

A dissertation submitted to the HafenCity University Hamburg in fulfilment of the requirements of the “Promotionsordnung der HafenCity Universität Hamburg” and for the

**Degree of
Doktor-Ingenieur (Dr.-Ing.)**

**Dissertation by
M.Sc. Hussain Etemadi
Born in Ghazni/Afghanistan**

2019

Supervisor

Prof. Dr. Ing. Wolfgang Dickhaut, HafenCity University

Second Supervisor

**Dr. Ing. Christoph Lüthi, the Swiss Federal Institute of Aquatic Science and
Technology (Eawag)**

Abstract

Kabul City as the capital and largest Afghan city mostly relies on on-site sanitation. There are some decentralized sanitation systems in suburbs of Kabul constructed mostly by the private sector without any proper monitoring by the government authorities. There is also a major semi-centralized sewerage system in central Kabul constructed during the Soviet Era providing services to the apartment blocks in the area. Other parts of the city usually use raised-vault dry latrines or flush toilets connected to soak wells or septic tanks.

Lack of proper faecal sludge management is a growing concern in main cities of Afghanistan including Kabul. Any sanitation intervention, especially in Kabul City should develop a proper faecal sludge management, and expand its scope from the household level to the whole sanitation chain.

The major part of Kabul City is unplanned and informal areas. There are various efforts undertaken by different national and international organizations to improve the poor sanitation situation in Kabul City. This dissertation focused on Kabul's informal areas to define and conceptualize a sustainable and integrated sanitation approach linked to the city-wide sanitation. Considering Kabul's typology, household surveys in two different informal settlements were conducted.

This research put SuSanA's sustainability criteria at the center of technology identification & suggestions for its study sites, and later for all of Kabul's informal settlements. To do so, primary sanitation systems were selected in accordance with indicators & measures developed based on the sustainability criteria. As a conclusion, three prioritized sanitation systems including vermi-digester, pour-flush pit and dry toilet were suggested as the most suitable sanitation systems for Kabul's informal areas.

Based on geo-physical, social and urban services data Kabul City was divided into four sanitation zones including formal and informal areas. As the next step, integration of Kabul's sanitation zones to the city-wide sanitation was evaluated. Furthermore, interlinkages of the different components of environmental sanitation to the proposed sustainable and integrated sanitation system was discussed.

The last part of the dissertation is a comparison of Kabul's findings with the results of the studies on Beirut and Erbil Cities. The comparison helped us to make a generalization for low-income countries with similar context. Governments of low-income countries need to address poverty alleviation and provision of basic services, including sanitation, in their societies. Such efforts by the governments should be prioritized and focused on the most vulnerable groups.

Acknowledgement

Foremost, I would like to express my sincere gratitude to my doctoral supervisor, Prof. Dr. Wolfgang Dickhaut, for his valuable knowledge and the continuous support of my Ph.D study and research.

I would also like to thank my supervisor, Dr. Christoph Lüthi, for his motivation and enthusiasm. His guidance helped me a lot in all the time of research and writing of this dissertation. I feel myself so blessed meeting him at the early stages of this long inner and outer journey.

Furthermore, I would like to thank BORDA¹, especially BORDA WesCa, for their consistent support. Without their cooperation & help this research wouldn't be started and continued.

I would also like to extend thanks to the many people either in Afghanistan or other countries who so generously contributed to the work presented in this dissertation.

1. <http://www.borda-net.org/>

Dedicated to my son & his colorful imaginary world!

Contents

1. Introduction	1
1.1. Research Rationale & Hypothesis.....	1
1.2. Scope of Work.....	3
1.2.1. Conceptualize a Strategic Sanitation Approach for Kabul’s Informal Settlements.....	3
1.2.2. Derive Generalization Based on the Proposed Approach.....	3
2. Methodology Description	4
2.1. Site Selection; in Kabul and its Reference Cities.....	4
2.2. Data Collection and Analysis.....	7
2.3. Developing a Sanitation Solution for Kabul’s Targeted Study Areas.....	7
2.4. Developing a Sanitation Approach for Kabul’s Informal Areas.....	8
2.5. Comparison of Kabul City with its Two-reference-cities (Erbil and Beirut).....	9
2.6. Generalization.....	9
2.7. Conclusion.....	10
3. Theoretical Framework: Sustainable Sanitation Management in Kabul and Similar Contexts	11
3.1. Sustainable Development.....	12
3.2. Sustainable Cities.....	16
3.3. Sustainable Sanitation (SuSanA’s Sustainability Criteria).....	17
3.4. Comprehensive Planning for Sanitation Provision.....	18
3.5. Sanitation Chain: from the Point of Produce to the Point of Reuse / Disposal.....	23
3.6. Enabling Environment for Sustainable Sanitation Provision.....	24
3.6.1. Government Support.....	25
3.6.2. Legal and Regulatory Framework.....	27
3.6.3. Institutional Arrangements.....	30
3.6.4. Skills and Capacities.....	32
3.6.5. Financial.....	34
3.6.6. Social and Cultural Acceptance.....	36
3.7. Complexities of Sanitation Provision in Kabul’s Informal Settlements.....	38
3.8. Basic Urban Service Provision in Afghanistan as a Post-conflict Country.....	41
3.9. Faecal Sludge Management in Kabul City.....	43
4. Case Study Investigation: Kabul’s Informal Settlements	47
4.1. Findings in Site One.....	51
4.2. Findings in Site Two.....	59
4.3. Suitability Analysis for Kabul’s Targeted Study Areas.....	64
4.4. Sanitation Planning in the Study Sites.....	72
4.4.1. Service Priorities in the Study Sites.....	77
4.4.2. Sanitation System Comparison and Selection.....	95
4.4.3. SWOT Analysis.....	105
4.4.4. Development of the Community Upgrading Plan (CUP).....	108
4.5. Greywater Management in the Sites.....	109
4.6. Rainwater Management.....	111
4.7. Solid Waste Management.....	112
4.8. Water Supply.....	112
4.9. Financial Sustainability: Willingness to Pay and Affordability.....	117
4.10. Operation and Maintenance in the Study Sites.....	118
4.10.1. Operation and Maintenance by Kabul Municipality.....	119

4.10.2. Owned by the Government and Run by Private Sector.....	119
4.11. Land Regularization in the Study Sites	121
4.12. Sanitation Integration in the Study Sites	123
5. Sanitation Approach for Kabul’s Informal Settlements	126
5.1. Kabul City	126
5.2. Sanitation Zoning in Kabul	133
5.2.1. Priority Intervention Areas	134
5.2.2. Creation of Sanitation Zoning	137
5.3. Sanitation Provision at Zone Level	144
5.4. City-wide Sanitation Provision	149
6. Reference Cities: Erbil and Beirut	152
6.1. Methodology	152
6.2. Sanitation Management in Iraq	153
6.3. Environmental Sanitation in KRI.....	154
6.4. Erbil City.....	155
6.4.1. Urbanization in Erbil	157
6.4.2. Institutional Framework	157
6.4.3. Water Supply	158
6.4.4. Wastewater Management.....	161
6.4.5. Solid Waste Management	162
6.4.6. Stormwater Management.....	163
6.5. Beirut City.....	163
6.5.1. Urbanization	164
6.5.2. Legal / Institutional Framework	165
6.5.3. Water Supply	166
6.5.4. Wastewater Management.....	166
6.5.5. Solid Waste Management	167
6.5.6. Stormwater Management.....	168
7. Comparative Analysis between Kabul and its Reference Cities	169
7.1. General Situation.....	169
7.2. Informal Areas.....	170
7.3. Environmental Sanitation Management.....	172
7.4 Generalization	178
8. Conclusion	182
8.1 Kabul’s Findings and Comparison to the Reference Cities.....	182
8.2 Answers to the research questions.....	183
Bibliography	188
Annexes	199
Annex 1. List of experts interviewed in Kabul, Erbil and Beirut.....	200
Annex 2. Questionnaire conducted in Beirut and Erbil	201
Annex 3. Assessment of Enabling Environment in Erbil and Beirut	202
Annex 4. Household Survey in Kabul.....	203

List of Figures

Figure 1: <i>Dissertation research design</i>	6
Figure 2: <i>Sustainable development goals (SDGs)</i>	14
Figure 3: <i>Overviews of the CLUES planning approach</i>	20
Figure 4: <i>Sanitation ladder</i>	24
Figure 5: <i>Sanitation chain</i>	24
Figure 6: <i>The “Enabling Environment” framework</i>	25
Figure 7: <i>Schematic of key institutions linked to Integrated Wastewater Management</i>	32
Figure 8: <i>SFD Kabul, Afghanistan</i>	46
Figure 9: <i>Site selection in Kabul City</i>	48
Figure 10: <i>Site one, Kabul’s informal flat area</i>	49
Figure 11: <i>Site two, Kabul’s informal hilly area</i>	50
Figure 12: <i>Public wells in the study areas</i>	52
Figure 13: <i>Dry toilet in Kabul’s informal area</i>	53
Figure 14: <i>Conversion of dry toilets to water-based technologies</i>	54
Figure 15: <i>Greywater management in Kabul</i>	55
Figure 16: <i>Solid waste management in site one</i>	55
Figure 17: <i>SFD developed for site one</i>	58
Figure 18: <i>Sanitation management in site two</i>	61
Figure 19: <i>Solid waste management in site two</i>	61
Figure 20: <i>SFD developed for site two</i>	63
Figure 21: <i>Kabul land use</i>	67
Figure 22: <i>Suitability analysis using vector data</i>	68
Figure 23: <i>Kabul suitability analysis using raster data</i>	69
Figure 24: <i>Study sites slope map</i>	70
Figure 25: <i>Kabul’s old city</i>	71
Figure 26: <i>Stakeholder analysis</i>	76
Figure 27: <i>Selection of the best possible sanitation system</i>	78
Figure 28: <i>Selection of primary sanitation system</i>	83
Figure 29: <i>Simplified dehydration vault</i>	85
Figure 30: <i>Pour flush pit system without sludge production</i>	86
Figure 31: <i>Tiger worm toilet</i>	88
Figure 32: <i>Worm-based toilet</i>	89
Figure 33: <i>TWTs installed in the Maina IDPs camp in Myanmar</i>	90
Figure 34: <i>Urine-diverting dry system</i>	92
Figure 35: <i>Pour flush pit system</i>	93
Figure 36: <i>Vermi-digester system</i>	94
Figure 37: <i>SWOT matrix analysis</i>	105
Figure 38: <i>Courtyard versus detached housing</i>	109
Figure 39: <i>Potential water resources for Kabul City</i>	114
Figure 40: <i>Extension of water supply system of Kabul</i>	116
Figure 41: <i>Kabul urban master Plan</i>	124
Figure 42: <i>Map of Afghanistan</i>	128
Figure 43: <i>Comparative population estimates by ICT for Kabul City</i>	129
Figure 44: <i>Segregation of Kabul River Basin</i>	131
Figure 45: <i>Priority intervention areas in Kabul City</i>	136
Figure 46: <i>Sewage development plan</i>	140
Figure 47: <i>Creation of sanitation zones for Kabul City</i>	142
Figure 48: <i>Kabul water supply master plan</i>	143
Figure 49: <i>Kabul aquifers</i>	143
Figure 50: <i>Kabul’s built up areas</i>	146
Figure 51: <i>Kabul blocks based on river basin areas</i>	148

Figure 52: <i>The republic of Iraq and its Kurdistan Region</i>	153
Figure 53: <i>Comparison of water consumption rates in KRI</i>	154
Figure 54: <i>Erbil City master plan</i>	156
Figure 55: <i>Organizational chart of Kurdistan Ministry of Municipalities and Tourism</i>	159
Figure 56: <i>Solid waste Component in Erbil City</i>	162
Figure 57: <i>Lebanon regional map</i>	163
Figure 58: <i>Solid waste management in Lebanon</i>	167

List of Tables

Table 1: <i>Summary of Open Planning, Sanitation 21 and CLUES approaches</i>	22
Table 2: <i>Overview of sector functions at different levels</i>	29
Table 3: <i>Key stakeholders in the sanitation sector</i>	30
Table 4: <i>Advantages of community upgrading methodology</i>	35
Table 5: <i>The World Bank and UNHCR have also categorized different kind of informal settlements</i>	40
Table 6: <i>The overriding policies under the U-NPP</i>	43
Table 7: <i>Stakeholders identification adapted from KURP</i>	74
Table 8: <i>KURP planning versus common planning steps</i>	75
Table 9: <i>Technology assessment indicators</i>	80
Table 10: <i>Ranking list for the indicators</i>	81
Table 11: <i>Criteria one: Health and Hygiene</i>	97
Table 12: <i>Criteria two: Environment & Natural Resources</i>	98
Table 13: <i>Criteria three: Technology & Operation</i>	99
Table 14: <i>Criteria four: Financial & Economic</i>	100
Table 15: <i>Criteria five: Socio-cultural</i>	101
Table 16: <i>Sanitation system comparison for the study sites</i>	103
Table 17: <i>Selection of the best sanitation system</i>	104
Table 18: <i>SWOT analysis: internal factors</i>	106
Table 19: <i>SWOT analysis: external factors</i>	106
Table 20: <i>SWOT matrix strategies</i>	107
Table 21: <i>Kabul's population by Nahias in 2008</i>	147
Table 22: <i>Kabul city-wide sanitation master plan</i>	151
Table 23: <i>Main water problem issues in KRI</i>	160
Table 24: <i>Regulatory framework</i>	173
Table 25: <i>Water resources</i>	173
Table 26: <i>Technologies applied in the sector</i>	175
Table 27: <i>Financial mechanisms</i>	176
Table 28: <i>Comparison of Enabling Environment in Kabul with Erbil and Beirut</i>	181

Acronyms

ACCI	Afghanistan Chamber of Commerce and Industries
ACWUA	Arab Countries Water Utility Association
Afghani (Afs)	The Unit of Afghanistan Currency
AIEG	Afghanistan Independent Evaluation Group
AISA	Afghanistan Investment Support Agency
ANDS	Afghanistan National Development Strategy
ANSA	Afghanistan National Standards Authority
AREU	Afghanistan Research and Evaluation Unit
AUWSSC	Afghanistan Urban Water Supply and Sewerage Corporation
BOD	Biological Oxygen Demand
BORDA	Bremen Overseas Research and Development Association
CAWSS	Central Authority for Water Supply and Sewerage
CCAP	Citizens' Charter Afghanistan Project
CDCs	Community Development Councils
CDR	Council for Development and Reconstruction
CFC	The Civil-Military Fusion Centre
CHMP	Cultural Heritage Management Plan
CLUES	Community-led Urban Environmental Sanitation
CSO	Afghanistan Central Statistics Organization
CSTEP	Center for Study of Science, Technology and Policy
CUP	Community Upgrading Plan
EAWAG	ETH Domain -The Swiss Federal Institute of Aquatic Science and Technology
ESIA	ESIA Environmental and Social Impact Assessment
FGDs	Focus Group Discussions
FSM	Faecal Sludge Management
GCM	Gozar Council Members
GDMA	General Directorate of Municipal Affairs
GDP	Gross Domestic Product
GIZ	German Society for International Cooperation
GIS	Geographic Information System
HQ	Head Quarter
ICT	International Consultants and Technocrats Pvt. Ltd
IDLG-GDMA	Independent Directorate for Local Governance – General Directorate of Municipal Administration
IDP	Internal displaced people
IWRM	Integrated Water Resources Management
IOM	International Organization for Migration
IWWM	Integrated Wastewater Management
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Program

KAP	Knowledge, Attitude and Practice
KFW	Germany Development Bank
KIIs	Key Informant Interviews
KM	Kabul Municipality
KMDP	Kabul Municipal Development program
KRG	Kurdistan Regional Government
KRI	Kurdistan Region of Iraq
KURP	Kabul Urban Reconstruction Project
LARA	Land Reform in Afghanistan
MAIL	Ministry of Agriculture, Irrigation and Livestock
MDGs	Millennium Development Goals
MEW/MoEW	Ministry of Energy and Water
MoE/DoE	Ministry of Education/ Department of Education
MoE	Ministry of Environment
MoEc	Ministry of Economy
MoF	Ministry of Finance
MoFA	Ministry of Foreign Affairs
MoI	Ministry of Interior
MoM	Ministry of Mines
MoPH/DoPH	Ministry of Public Health/ Department of Public Health
MRRD/DRRD	Ministry of Rural Rehabilitation and Development/ Department of Rural Rehabilitation and Development
MoT	Ministry of Transport
MUDA	Ministry of Urban Development Affairs
MUDH/DUDA	Ministry of Urban Development Affairs/ Department of Urban Development Affairs
MUDH	Ministry of Urban Development and Housing
NEPA	National Environmental Protection Agency
NGO	Non-Governmental Organization
NPP	National Priority Program
NRVA	National Risk and Vulnerability Assessment
NSP	National Solidarity Program
NWMP	National Water Master Plan
ODK	Open Data Kit
PMU	Project Management Unit
PPP	Public Private Partnership
PWC	Price Waterhouse Coopers
RBA/RBC	River Basin Agency/ River Basin Council
SACOSAN	South Asian Conference on Sanitation
SBU	Strategic Business Unit
SCoW-TS	Supreme Council of Water – Technical Secretariat
SDC	Swiss Agency for Development and Cooperation

SDGs	Sustainable Development Goals
SDP	Strategic Development Plan
SEI	Stockholm Environment Institute
SESP	Sustainable Environmental Sanitation Planning
SFD	Shit Flow Diagram
SN	Supernatant
SuSanA	Sustainable Sanitation Alliance
SWOT	Strengths, Weaknesses, Opportunities and Threats
TWT	Tiger Worm Toilet
UNAMA	United Nations Assistance Mission in Afghanistan
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development
USGS	U.S. Geological Survey
UWSWW	Urban Water Supply and Waste Water
U-NPP	Urban National Priority Programme
UNOPS	United Nations Office for Project Services
UWSS	Urban Water Supply and Sewerage
WASH	Water, Sanitation and Hygiene
WCED	World Commission on Environment and Development
WWTP	Wastewater Treatment Plant

1. Introduction

Afghanistan is a landlocked country located in Asia. It is surrounded by Central Asia in the north, East Asia in the east, South Asia in the south and Middle East in the west. Its total surface area is 652,860 KM² and most of the country especially in the center and north-east is occupied by highlands and mountains¹. Several decades of war has put the country among the world's least-developed countries, still facing with instability and poverty.

The Afghan capital city is Kabul. After the fall of the Taliban in 2001, several sanitation projects were implemented by national and international organizations in the city. But the overall impact is still less than satisfactory.

Lack of enough urban infrastructure including sanitation services, destruction of available facilities during the civil war as well as rapid population growth due to the immigration of people to Kabul City following the collapse of Taliban regime converted the city to a huge urban agglomeration with a big part of informal area and minimal urban infrastructure.

The exponential post-conflict development of the city, especially in Kabul's unplanned informal areas poses a great challenge for the city development. Only centrally located apartment complexes belonged to the soviet era is equipped with a semi-centralized sewerage system, although it is not properly functional and the level of treatment is not satisfactory. In general, most of the households in the city have their own individual sanitation facilities in many case traditional raised-vault latrines or pour flush toilets linked to soak wells or holding tanks (Etemadi et al., 2012).

There is currently a global focus on sustainability in sanitation. Kabul with minimal existing infrastructure and substantial investments for infrastructure rehabilitation provides opportunities for development of integrated sanitation management systems in novel ways. It also holds the opportunity for focusing on sustainability from the early stages of strategic planning and integrating sustainability aspects in all stages of implementation and management of improved sanitation systems and services.

Following primary and secondary data collection and analysis, this dissertation is proposing a strategic sanitation approach for Kabul's informal settlements linked to city-wide sanitation. The approach will be focusing on Sustainability and also integration of different components of environmental sanitation as the cornerstones of this research.

Furthermore, creating an enabling environment for sanitation improvements and also providing basic services as a prerequisite for sustainable economic development, satisfaction and stability will be discussed.

The results of the investigation will be compared to similar contexts in developing countries, including Erbil in Iraqi Kurdistan and also Beirut City in Lebanon.

1.1. Research Rationale & Hypothesis

The world missed to meet the 2015 MDG sanitation target (WHO & UNICEF, 2015a). Despite many efforts and investment Afghanistan and its capital, Kabul City, was not able to achieve an acceptable level of sanitation provision. Up to 80% of Kabul's population currently lives in informal settlements occupying about 70% of the urban area (Palau, 2013). Lack of sanitation strategic

¹ <https://www.indexmundi.com/facts/Afghanistan/surface-area>

approach and focus on isolated projects in different neighborhoods brought no improvement in overall sanitation situation in the city.

Sustainable and integrated sanitation management can be the solution for problems of inefficiency in the sanitation sector. This PhD's overall objective is to develop a more sustainable and integrated sanitation approach for Kabul's unplanned informal settlements.

The hypothesis of this research study states that "An integrated and sustainable sanitation approach for Kabul's unplanned informal areas can improve the impact and efficiency of sanitation provision".

Furthermore, based on the sub-hypothesis that

- i) Improving the overall enabling environment is crucial for supporting of sustainable and integrated sanitation delivery in Kabul, and
- ii) Sustainable and integrated service provision increases public trust and stability in Kabul's informal settlements, this PhD research tries to conduct a more comprehensive study that includes urban governance issues.

Sustainable and integrated sanitation in this context is defined as inclusive sanitation provision with a focus on the main types of household wastewater¹ produced in Kabul's unplanned informal settlements, its sustainable management, and the linkages to other sub-sectors including water supply and solid waste management.

The main research questions discussed in this PhD study are as follows:

- 1) What are the main limiting factors affecting the adoption of more sustainable sanitation management practices in Kabul?
- 2) What kinds of sanitation systems are sustainable for Kabul's informal areas?
- 3) How would these systems lead to long-term sustainability in terms of technology, economics, institutional, environmental and health/hygiene?
- 4) What are the specificities of Kabul's informal settlements regarding the provision of improved sanitation services?
- 5) Can the provision of sanitation services bring about greater stability and satisfaction for Kabul's urban poor?
- 6) Considering the results of comparative analysis and generalization, what would be the core part of sustainable environmental sanitation provision in Afghanistan and similar contexts?

To answer the above-mentioned questions, a detailed analysis of the sanitation situation in Kabul City was done. Two study sites in Kabul's informal areas were selected and comprehensive household surveys were conducted. Furthermore, several key informants interviews were arranged and the required information was collected. Finally, the elaborated questions in chapters six, seven and eight were discussed and answered.

¹ The types of wastewater in this research will be limited to: excreta, blackwater, greywater and stormwater generated from targeted informal areas.

1.2. Scope of Work

Following a comprehensive data collection, field surveys and data analyses, define a contextualized and sustainable sanitation approach for the targeted areas was the first step of sanitation planning. Household surveys and field investigation were conducted in Kabul's informal areas because:

- i. Such locations are underserved regarding urban infrastructure services and present the worst sanitation conditions.
- ii. The majority of Kabul's population resides in such informal areas. Also, the lack of sanitation services threatens the public health and the environment, not only in informal areas but for the entire city. Above all, access to proper sanitation is a human right (UN Water, 2010), while people living in informal areas are usually neglected.

The aim of this part is to define and conceptualize a sanitation action plan for the targeted study areas which covers technical options and its long-term operations. The proposed integrated and sustainable sanitation plan for each neighborhood considers the intersection with other sub-sectors which affects the sanitation flow chain such as water supply, solid waste management, impact of proposed sanitation management system and exploring the interlinkages with other sectors such as agriculture (for reuse).

1.2.1. Conceptualize a Strategic Sanitation Approach for Kabul's Informal Settlements

Community-level sanitation planners should incorporate their local plans into the higher level city-wide sanitation plans. Furthermore, community sanitation plans need to be integrated into urban master plans through city-wide sanitation plans. In fact, integration of a local plan to the higher level of urban planning has a mutual benefit: it links a community-level plan to the city-wide sanitation plan and at the same time the urban sanitation plan will be more comprehensive by contribution of local sanitation plans (Tayler et al., 2003).

Development of a community sanitation plan for each Kabul's informal neighborhood should be based on its local context including physical and social characteristics, but at the same time it needs to consider the possibility of joining up with the planned or existing sanitation infrastructure at the higher level within Kabul City. Furthermore, city-wide sanitation plan in Kabul should be integrated into Kabul's urban master plan. The urban master plan is officially approved and can act as a facilitator for the upcoming upgrading projects in the informal areas.

Considering the results of developing a sanitation approach at the neighborhood level, this dissertation tries to propose a strategic sanitation approach for all Kabul's informal areas linked to city-wide sanitation. Integration and sustainability are the main concepts behind the proposed sanitation approach. This holistic approach considers sanitation technologies and management aspects from the point of produce to the point of reuse or disposal.

1.2.2. Derive Generalization Based on the Proposed Approach

Integration of informal settlements into the formal city with the provision of public infrastructure, and improving the quality of life of poor families increases public trust and stability in Kabul as a post-conflict city (Hogrewe et al., 1993).

Because of very limited knowledge and experience regarding sanitation interventions in informal areas especially for post-conflict cities in developing countries, the results and conclusions are generalized: Due to their similar contexts, Erbil and Beirut were selected as reference cities for Kabul. Literature review, situation analysis and key informant interviews were conducted for both of them and the output were compared to Kabul City.

Comparing the stability situation before and after infrastructure provision in Kabul's selected areas with Erbil and Beirut, this dissertation will analyze the relationship between sanitation provision and infrastructure integration and its contribution to peace building and stability.

Due to lack of required data and difficulty of measuring stability, this research measured "satisfaction" with provision of urban infrastructure as a suitable indicator (proxy measure) during the site studies. This dissertation research tries to assess if providing sanitation (infrastructure) brings a higher level of satisfaction and stability among Kabul's urban poor.

2. Methodology Description

Kabul City, the capital of Afghanistan, has been selected as the case study for this dissertation. This research study attempts to develop a sustainable and integrated strategy for Kabul's informal areas which accommodate most of the Kabul's population. Two study sites were selected as the focus areas for the household surveys.

Following a sanitation approach development, the reference cities were compared to the Kabul City for a generalization. They share important similarities with Kabul. More or less Kabul, Erbil and Beirut come from similar culture and history, and all of them are at post-conflict situation and their reconstruction era. And finally, possibility of access to some level of data and conducting key informant interviews was another reason to choose Erbil and Beirut as the reference cities for Kabul (Figure 1).

2.1. Site Selection; in Kabul and its Reference Cities

The unit of analysis for this research is Kabul's unplanned informal settlements. This investigation aims to collect, organize, and analyze all the information required to understand the context and the existing situation pertaining to integrated and sustainable sanitation in Kabul's unplanned informal settlements.

To choose the appropriate pilot study areas in Kabul's unplanned informal settlements, eight criteria were developed. Previously the criteria were used on consultations conducted in December 2011 by a team of USAID's Land Reform in Afghanistan (LARA) project with the Ministry of Urban Development and Housing (MUDH), the Independent Directorate of Local Governance (IDLG)/General Directorate of Municipal Affairs (GDMA), and a city officials to determine which informal settlements were deemed appropriate for upgrading and regularization:

- **Criterion 1:** Settlements with undeveloped connection to urban infrastructure networks and inadequate provision of social services
- **Criterion 2:** Low-income urban settlements with limited access to livelihoods opportunities in the city

- **Criterion 3:** Settlements safe from natural hazards and located where occupancy does not constitute an environmental threat for the surrounding communities
- **Criterion 4:** Settlements with comparatively high degree of compliance with applicable land-use regulations
- **Criterion 5:** Settlements where recognition of occupancy rights is relatively simple and more expedite
- **Criterion 6:** Settlements whose upgrading can have positive impacts on growth and development of the whole city
- **Criterion 7:** Settlements where well established community organizations and local networks are present
- **Criterion 8:** Settlements where municipal governance and urban dynamics support successful upgrading initiatives

The past experience of several years of upgrading project in informal areas shows that the suggested criteria include all the important factors in an upgrading project. There is no overall hierarchy among the criteria mentioned here. But still any prioritization should put sustainability, equitable growth, and the mobilization of all the resources at the center of its focus (Giovacchini, 2013).

To sum up, a mixed method approach using the aforementioned criteria, transect walks through possible pilot-study areas, discussions with the community members, and discussions with different informants were used to select the two study areas.

Except aforementioned general criteria for the site selection, there were also several site specific reasons behind the site selection:

- Easy access to both sites
- A knowledge, attitude and practice survey (KAP Survey) was conducted by KURP¹ (Kabul Urban Reconstruction Project), the implementing agency.
- Available upgrading reports to examine the implementation process
- Both areas were upgraded by the main Kabul's informal upgrading project (KURP)

¹ KURP was a program funded by the World Bank to provide urban basic services, including sanitation, to poor communities in Kabul City. It has also a capacity building unit to enhance the management capacity of relevant Afghan organizations.

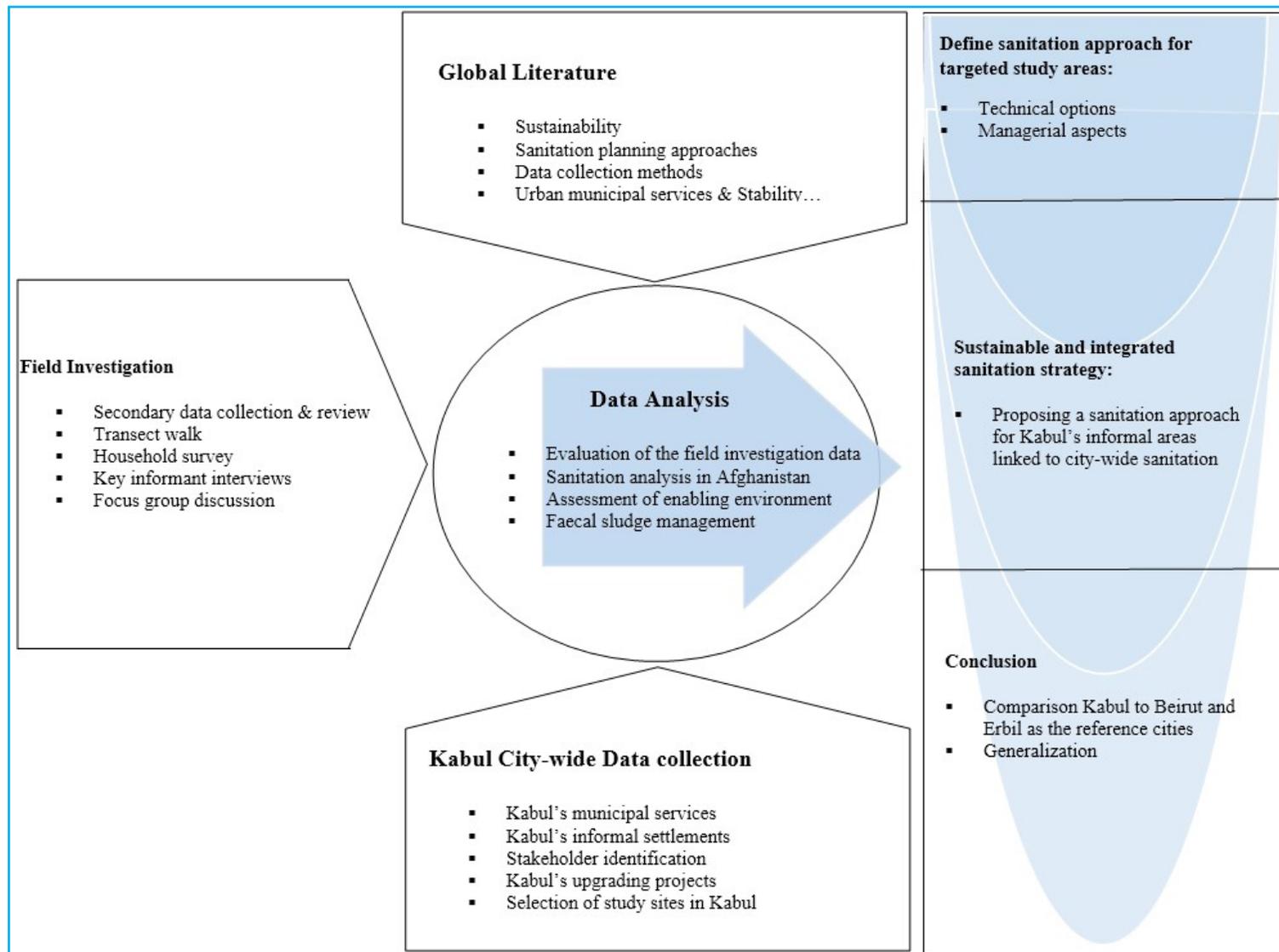


Figure 1: *Dissertation research design (for details please see the Methodology Description)*

2.2. Data Collection and Analysis

This dissertation relies on two kinds of data sets:

- i) Field study: primary data collected during transect walks, household surveys, focus group discussions and key informant interviews.
- ii) Desk study: secondary data collected from literature review.

A comprehensive literature review on Kabul City was done: The main purpose of this investigation was: i) acquiring detailed and relevant information on the city, ii) developing a plan for the primary data collection and finally iii) primary site selection of the targeted study areas in Kabul's informal settlements.

Following the desk study, a field study was planned. The field investigation had three main purposes: i) finalizing the selection of targeted study areas and following that conducting household surveys there. ii) Cross checking of the collected information during the desk studies and iii) filling the data gaps in the secondary data.

The household survey consisted of a semi-structured questionnaire divided into ten sections which covered specific topics. The questionnaire started with general questions followed by specific questions under different categories including water, food, personal hygiene, sanitation, environmental hygiene and solid waste, health, willingness to pay and financial issues and satisfaction. The questionnaire was finished by an observation checklist which was needed to be filled out by the interviewers. During the observation, sanitation and hygiene practices within the household were observed. In addition, household surveys and focus group discussions in the study areas, several key informant interviews with relevant authorities were also done¹.

Household surveys provided us the baseline data needed to identify problems and define integrated and sustainable sanitation solutions for the targeted areas. The suggested solutions paved the way for proposing an approach for the whole Kabul's informal settlements.

2.3. Developing a Sanitation Solution for Kabul's Targeted Study Areas

The study sites are located in western Kabul, and Kabul's downtown. The first step before suggesting a sanitation system was a land-use suitability analysis. Suitability analysis showed whether the site locations were suitable for residential purposes and upgrading or not.

If the site locations were suitable, developing an upgrading plan including sanitation provision by the government, in a close cooperation with the local people, would be the next step. Successful upgrading should be followed by a formalization process, and then the upgraded area can be considered a formal neighborhood. If the case study areas were not located on a suitable places, there would be a proper relocation plan.

For the suitability analysis, Landsat satellite images of Kabul City by Arc GIS Software was classified. Using Arc GIS and also QGIS, different features and layers were produced and several analysis were conducted. Finally, two site studies were overlaid on the other layers extracted from the satellite images.

If the study sites are in accordance with the criteria developed for a GIS-based site placement, a

¹ Please see annex 1.

proper upgrading plan and following that formalization process are the next steps. But if the sites are not located on proper places in technical point of view, more investigations are needed.

Before any concrete decision regarding unsuitable areas, a comprehensive assessment should be done. Technical, social and political limitations should be considered and relevant laws and regulations should be reviewed. In fact, such sensitive issues need a collective problem-solving approach.

Following suitability analysis, a sanitation technology flowchart was developed. Using this flowchart three primary suitable sanitation technologies for each site study were identified. The next step included a detailed comparison between three primary sanitation systems and following that 'selection of the best available sanitation system for each site.'

To develop the technological options and their operational aspects in the case study areas, a set of indicators was developed. The indicators and their measures were based on the SuSanA sustainability criteria, literature review and some local factors determined by the author during the field visits. This approach helped us to focus on sustainable sanitation provision as the main concept behind this dissertation.

During the household surveys, local people who were the end-users and beneficiaries of the sanitation projects stated their technological preferences and the reasons behind accepting one technology or rejecting the others.

Finally a list of indicators was developed and provided to the stakeholders for ranking based on the importance of each indicator for the system selection. The ranking was used at the later stages for indicator and also system weighting.

2.4. Developing a Sanitation Approach for Kabul's Informal Areas

The results and outcome of the proposed sanitation technologies and their operational aspects for the case studies in Kabul were used for developing a comprehensive sanitation strategy for the whole Kabul's informal areas.

The strategy should promote sustainability according to the SuSanA's criteria. It should also consider integration among different components of environmental sanitation while trying to link sanitation services in informal neighborhoods to the city-wide sanitation facilities.

Perhaps some of Kabul's informal neighborhoods cannot be subjected to upgrading. There are some areas located on specific locations which make upgrading difficult. Informal areas on high slopes, groundwater protection zones or greenery areas are examples of such areas where upgrading is costly and difficult.

About 70 percent of Kabul City is informal (Palau, 2013). It is difficult to start upgrading for all neighborhoods at the same time. The general upgrading plan should develop a mechanism of sanitation intervention to show in which kind of areas immediate intervention is needed. It also shows which kind of area could be upgraded in mid or long term.

The general plan should explain how informal areas are upgraded, and what kind of services are provided. It should discuss the engagement of local communities in the upgrading process from the early stages.

After determining the area of intervention, a community-based neighborhood upgrading plan should be developed. All details like facilities, support for poor families, local contribution, implementation and operation should be included in the neighborhood upgrading plan. A methodology for selecting poor families for financial support should be introduced, and the contribution of locals during the upgrading shall be elaborated.

Proper dealing with on-site sanitation facilities and their produced sludge should be considered as an important part of the proposed sanitation strategy for Kabul City. A sustainable sanitation strategy will not be possible without proper faecal sludge management in the city. Using collected data for this dissertation, an investigation on faecal sludge management in Kabul City was conducted. The report can be found under title “SFD Promotion Initiative Kabul Afghanistan.” This study explains sanitation management in Kabul City with special focus on faecal sludge management (Hassib & Etemadi, 2016).

A proper exit plan is another important issue to be discussed. Before leaving an upgraded area there should be a proper mechanism in place for a sustainable sanitation management. The role of the community, private sector and official authorities should be determined. It is important to have an agreed and legalized procedure of operation and maintenance for the upgraded facilities before leaving a neighborhood.

2.5. Comparison of Kabul City with its Two-reference-cities (Erbil and Beirut)

The findings of sanitation assessment in Kabul was analyzed and compared to the contexts of two reference cities, Erbil and Beirut. The basis for comparison were environmental sanitation management in each city. Required information for comparison were literature review and the data collected during household surveys in Kabul and also interviews conducted in Erbil and Beirut.

A questionnaire was developed to use for data collection in Erbil and Beirut. It comprises of two parts: The first part includes some questions about the enabling environment in terms of sanitation management within the cities, and also some questions to understand the sanitation situation on ground. In the second part, findings in Kabul’s study was shared with the interviewees in Erbil and Beirut. Through feedback the interviewees could share their comments on the Kabul’s findings and also compare it with the situation in their own cities.

To sum up, the main activities in this phase were as follows:

1. Review of existing documents on Beirut and Erbil sanitation management
2. Key stakeholder identification & Interview preparation
3. Conducting key informant interviews

2.6. Generalization

Kabul, Erbil and Beirut as post-conflict cities have many issues in common which help us for a holistic comparison and finally generalization for similar contexts in post-conflict countries.

All three cities had a period of conflicts. They have to improve the level of access to urban sanitation services for their citizens. Currently, reconstruction is an important topic especially in Erbil and Kabul. Environmental protection and lack access to enough water resources are big challenges for all of them. In addition, similar culture and social context are other common points

between these three cities which make the comparison sensible.

The generalization section suggests us the main important points regarding basic service delivery, with a particular focus on urban and peri-urban sanitation services. It also helps us to understand whether sanitation provision is an important factor to increase the satisfaction among inhabitants in a post-conflict community or not.

2.7. Conclusion

Conclusion is the last part of this dissertation. Research questions will be discussed at conclusion section. Balanced and to-the-point answers to each research question will be provided there. Furthermore, there will be referring to the in-depth discussion for each research question and readers can find the details in the other parts of the dissertation. Such kind of approach will deliver an idea whether the purpose of this dissertation is achieved or not.

At conclusion part, there will be also some recommendations for more studies and researches on sustainable and integrated sanitation management in Kabul City and other similar contexts. Such recommendations would extend the scope of work for future similar studies.

3. Theoretical Framework: Sustainable Sanitation Management in Kabul and Similar Contexts

As discussed in the previous chapters, and will be explained more in this chapter, the overall sanitation management in Kabul suffers from several deficiencies. The Afghan government and its international partners have initiated several activities to improve the sanitation services, but the value earned from the investment and efforts was poor. The low level of efficiency is the core part of the sanitation problem in the areas provided with the sanitation services. Furthermore, there are especially many informal areas in the city which lack improved sanitation services at all.

The Afghan government needs to increase its efforts for urban infrastructure provision including sanitation services to the citizens. But it needs also to change its strategy for improving sanitation provision. Concerning previous sanitation projects, the new approach should seriously consider the level of efficiency and impact of the projects.

Sustainable sanitation management would increase the efficiency and impacts of the sanitation projects. Nowadays sustainable development is a worldwide accepted idea which includes sustainable sanitation management as well.

The paradigm of sustainable development is a concept being promoted since the 1980s. It came about when the negative impacts of industrialization and economic growth was became evident, and industrialized countries faced many problems including low efficiency in the long run, pollution and over-exploitation of natural resources.

Development should not focus only on growth while ignoring other aspects of comprehensive development. If our definition of development is too narrow, the results would be increasing of inequalities among the society. Only few percentages of the community will benefit while the majority get poorer and the standards of living will decrease (Brito, 2014). Development should be inclusive. It should consider society, environment, economy and governance as a whole within a society.

To make the development sustainable, all the aspects including social, environmental and educational issues should be considered.

The third Chapter will discuss sustainable development, green cities and the sustainable development goals (SDGs). Following the above-mentioned general topics, the focus will be more on sanitation related issues: There will be more discussion on sustainable sanitation, comprehensive sanitation planning, the sanitation chain and ensuring enabling environments for sanitation provision.

In the last part of the this chapter, Kabul City as the case study of this dissertation will be explained and the complexities of sustainable sanitation management in a post-conflict context will be highlighted. Following that due to the wide spread use of on-site and individual sanitation facilities in Kabul, faecal sludge management in the city will be discussed.

3.1. Sustainable Development

The history of Industrial Revolution dates back to the 18th century. It started in England and following that spread to the other Western European countries. Before the 18th century the speed, level and impact of industrialization was not as significant as after that.

Although the Industrial Revolution brought many positive changes in the quality of human life, but it created also major problems including environmental pollutions and social dissatisfaction led in some cases to historical unrest and uprising. One of the main reasons behind these problems was lack of enough experience and knowledge among the countries to mitigate the negative impacts of rapid development.

Nowadays there is a consensus that development is a multidimensional process. It consists of different goals and specific agendas. They should be achieved through well designed policies and strategies. There is no a single way or approach toward development (Dang & Sui, 2015).

Economic development is one of the most complicated challenges which human being has ever been faced. Although increasing per capita income is important, but economic development should move beyond it; poverty reduction, equal opportunities, better health and education should be at the center of economic development while environmental protection is not neglected (World Bank, 1991).

Following more than three decades of war, Afghanistan is moving toward recovery and economic growth. According to the World Bank, Afghanistan's Gross Domestic Product (GDP) is about five times more than what it was in 2002 and we have an increase of 64% in per capita income. Although the economic situation look promising compared to the past, but still the country faces many challenges. Unemployment is a big problem while each year about 400,000 job seekers enter the small market of Afghanistan (USAID, 2017).

Furthermore, using indicators like GDP or per capita income, production and consumption as the main index development is not comprehensive enough. Socio-environmental problems that developed world faced with showed we cannot ignore the negative impacts of such kind of development. Social justice, life expectancy at birth, inclusiveness of development, equal access to educational and health systems, lack of violence, environmental protection and other indicators that increase the life quality should be the top priorities of any development plan (Brito, 2014). In fact the main beneficiaries of economic development should be ordinary people.

Economic development can contribute and help Afghanistan to move beyond the post-conflict era and reach a stable situation. But if there is no holistic approach toward development, it can escalate the conflict and add new aspects to the problem. Massive discrimination, lack of social justice and widening the gap between poor and rich are other issues to be considered. During the last 17 years inequalities have been growing so fast in the country which has been already led to other kinds of tensions as well. Increasing standards of living, quality of life, fighting against corruption and sustainable development should be an important part of development. Too much focus on growth and ignoring other aspects of development can make the country more vulnerable.

Above that sacrificing environment and natural resources in favor of economic growth can jeopardize the durability of economic development itself on a long run. There should be a balance between economic growth and environmental protection to avoid making irreversible changes to the Afghanistan's environment.

“Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” (WCED, 1987). This is the first globally accepted definition for sustainable development suggested by World Commission on Environment and Development (WCED) in 1978. Although the definition was very general, it paved the way for later detailed and precise discussion on the issue.

Sustainable development has three pillars: Economic, social and environmental. These three aspects have overlap and interaction with each other. To be sustainable a system should be equitable which means a proper interaction between the economic and social dimension, it should also be livable which insist on the higher quality of life (correspondence of the environment to social needs), and finally sustainable development should consider the carrying capacity of the environment which means the development should be viable (Tanguay et al., 2010).

The overall goal of sustainable development is improving the quality of life in a comprehensive manner. Sustainable development should bring economic welfare for all and keep the environmental quality. Economic, social and environmental aspects should be approached in an integrated manner (World Bank, 2003).

Nowadays sustainability is at the center of development efforts by most countries. Sustainable development is considered a path now more than a goal, and being on the track toward it, is a specific agenda for each country or region in the world. Achieving sustainable development does not mean following the same steps taken by the developed world. Each country should find and define its own sustainability pathway. Despite some disadvantages, late-comer countries have the chance of avoiding some mistakes made by the front runners.

A sustainable development approach in each country should be comprehensive and inclusive. The approach should be based on the people’s capacity, available resources and local conditions.

A sustainable development model should start from a country’s potential to solve both local and global challenges. It should try to create an atmosphere of promoting ingenuity and using science and technology to deal with the problems. Development models should consider the complexity of our challenges and also the dynamics of our surrounding environment. That means we need to change our lifestyles according to a sustainable approach

Following the goals of MDGs and also integrating new aspects of sustainability to it, the United Nations (UN) developed a new agenda for sustainable development called the Sustainable Development Goals (SDGs) (Figure 2).



Figure 2: Sustainable development goals (SDGs)

The first Sustainable Development Goal aims to “End poverty in all its forms everywhere” (United Nations, 2015b). Poorest of the poor should be the focus of poverty alleviation. They should be supported by different pro-poor policies to narrow the gap between rich and poor between and among the countries across the globe.

Despite all the efforts and recommendations, inclusive growth remains mainly a discussion topic in scientific atmospheres rather than an action agenda (The World Economic Forum, 2017). Everybody should have a chance to get free from poverty. Governments are responsible to facilitate this process if not with a positive discrimination for poor people but at least providing same opportunities to all the citizens. Social inclusion should be an important principle of sustainable development, and economic growth should benefit everyone.

Afghanistan as a low-income country enjoying the support of international community should make tremendous efforts to reduce the level of poverty among its citizens especially for the most vulnerable groups.

SDG1 consists of a target insisting on universal access to basic service with particular focus on poor people. Private sector is hardly invest on SDGs in poor areas of developing countries. It is responsibility of governments in the least-developed countries to invest on SDGs according to a pro-poor developed strategy. They can finance such kind of projects through public money, public private partnership (PPP) or aid which is provided by the international community. It is also the responsibility of the international community to make sure if the aid reaches the most needy and vulnerable people in each society.

Although in the developed world access to safe drinking water and adequate sanitation is granted, many people in developing countries simply lack it. Access to sustainable water and sanitation for all is the goal six of SDGs (United Nations, 2018).

Safe drinking water and adequate sanitation are keys to poverty alleviation and sustainable development. On 28 July 2010 the United Nations General Assembly through Resolution A/RES/64/292 declared safe and clean drinking water and adequate sanitation a basic right which is

essential to the full enjoyment of life and all other human rights (United Nations, 2010).

Monitoring the human right aspects of sustainable development should be used as a tool to make sure that development is inclusive. Integration of human right and development can be pursued by developing segregated monitoring criteria based on important issues like gender, ethnicity, income, geographic locations, etc.

There should be a link between economic and financial development with the concept of human rights in order to promote both human rights and economic development (Tomasevski, 1992). Afghanistan as a low-income country faces more challenges toward sustainable development. We need to understand that how different aspects of sustainable development are linked to each other and what is the best way they can work together.

Concerning development it seems there are two main approaches in today Afghanistan:

Economic Growth: this approach originates from the World Bank where current Afghan President Ashraf Ghani was also working. Economic growth is at the center of this approach, and experts promoting this concept believe that economic growth is the key to stability in Afghanistan and even can gradually decrease problems like corruption and poverty.

Sustainable Development: Insisting on more comprehensive and inclusive development approach is the idea has more supporters in the United Nations. MDGs and following that SDGs were also developed there. According to this approach economic growth should not be over-played too much and it should be a part of sustainable development. Economic growth without considering poverty alleviation and providing basic services to the most vulnerable communities could lead to negative impacts in the long term.

Economic growth should increase social justice and help to distribute the wealth among the society. It should provide society-wide education and healthcare. The environmental quality should be improved and the standards of living for everybody should be increased. Economic growth without sustainable development could lead to widening the gap between poor and rich, dissatisfaction, corruption, class distinction and even uprising within a society.

Good governance is an essential element to build a synergy between economic growth and more broadly-based progress in life quality (The World Economic Forum, 2017). A wealthy, inclusive and environmentally sustainable society will not be achievable without proper agenda and policies enforced by a good governance.

As a conclusion, international organizations working to meet globally SDGs' goals and targets should focus on least developed like Afghanistan to make sure that these societies are also on the track: This kind of approach will help us to reach the most vulnerable communities within each society. Equality should be increased not only between poor and rich countries but also among different communities within a society.

To sum up, in a context like Afghanistan SDG indicators should be disaggregated by income, sex, age, race, ethnicity, migratory status, disability and geographic location, or other characteristics, in accordance with the Fundamental Principles of Official Statistics (United Nations, 2015a). All the poverty education statistics should be based on disaggregated criteria to make sure that nobody is left behind.

3.2. Sustainable Cities

In 2008 population living in urban areas, for the first time in history, was more than those living in rural areas (UN-Habitat, 2003) and this trend is expected to continue. Nowadays cities consume the main part of the resources and therefore for a sustainable lifestyle in urban areas a significant change is necessary (Lüthi, Panesar, et al., 2011).

To have a sustainable city, the level of pollutions shouldn't be beyond the carrying capacity of local and global thresholds (Vliet, 1996).

There are three main approaches regarding sustainable urban development (Lüthi, Panesar, et al., 2011):

- ***Cities as sustainable ecosystems***: this concept was developed by the United Nations Environment Program (UNEP) and introduces a comprehensive approach for sustainable development of cities with different contexts.
- ***The transition towns***: introducing resilient cities to the effects of limited resources such fossil fuels and also the effects of climate change. The aim is to create towns resilient to the effects of limited resources such as fossil fuels and the effects of climate change.
- ***Green Cities***: this concept tries to introduce a harmony between sustainable developments and urban studies on different levels from planning and design to service provision and management. It can be at neighborhood level, the whole city or even creating totally new urban areas.

According to Afghanistan Central Statistic Organization the population of the country is about 30 million while more than 30 percent of it lives in urban areas. Kabul City population is estimated to be 4 million while it was less than one million before the fall of the Taliban in 2001 (Afghanistan CSO, 2018). Based on this trend urbanization will continue and more people will move to the cities.

Sustainable cities should have proper plans to keep the ecological footprints minimum and create resilient atmospheres to tolerate different shocks. According to the field investigation and observation conducted for this dissertation, Kabul as the capital of post-conflict Afghanistan has been faced with the most significant challenges in the country. There is no enough urban infrastructure while the population is increasing and the informal areas are expanding. Shortage of enough and affordable houses with access to the urban infrastructure services was the main reason of the informal development in Afghan cities and especially in the capital. Following that among emerging several different related problems, land tenure is one of the big challenges in this regard which needs special attention.

There is no safe and enough water supply for Kabul. Almost the whole city use groundwater which is already under threat in terms of quality and quantity. Water management system in Kabul is not efficient and despite water scarcity, there is no effective protection of the water resources.

Above that Kabul City is vulnerable to the floods in rainy seasons and to drought in summer time (A. Mohammadi, personal communication, May 17, 2015).

Improper wastewater management is a big challenge, and one of the main sources of environmental pollution. There is very low coverage of sewerage and there is only one WWTP allocated to the downtown's apartment complexes and even that does not work efficiently. Most of the city

discharge their wastewater into the ground and open channels or simply dump it without any treatment (M. Vali, personal communication, May 17, 2015).

Air pollution especially in cold seasons is an important problem in coal-burning Kabul. Lack access to cleaner source of energy and using dirty energy sources is the main challenge citizens are facing with especially in winter time. The vehicles use low quality fuels and electricity is unreliable. Energy efficiency is a neglected concept in Afghanistan including Kabul City. Many individual construction activities use the designs copied from neighboring countries especially Pakistan which are not adopted to the climate condition in Kabul (F. Jafari, personal communication, June 17, 2015).

Using more renewable energy resources especially solar power due to the climatic condition of the city and also bringing hydroelectric power from distance look promising options, but less has been done to investigate on such possibilities.

Solid waste management ends up in form of dumping in the landfill sites and leads to soil and groundwater pollution. There is no proper recycling, waste to energy or other sustainable plans (N. A. Habibi, personal communication, July 3, 2015).

Although non-autonomous electrified buses several decades ago were using in the city, today populated Kabul has no efficient public transport system. High congestion wastes citizens' time and resources every day. The city atmosphere is not suitable for bicycling or walking. Travelling without individual car is difficult and sometimes impossible (G. M. Malikyar, personal communication, July 23, 2015).

Kabul City is located on earthquake zone but there is no building codes to reinforce the buildings and no comprehensive emergency plan to protect the citizens.

Social inequalities, discrimination and corruption are another issues have sparked dissatisfaction among the citizens. During the last few years several big demonstrations against discrimination and lack of balanced development have been conducted.

Although in recent years some activities going on to mitigate the negative impacts of urbanization in Kabul, but still urban development is not the main priority for Afghan government and its international donors. Security as the main challenge still consumes most of the resources.

3.3. Sustainable Sanitation (SuSanA's Sustainability Criteria)

Despite introducing the Millennium Development Goals (MDGs) and after many efforts, progress in respect to access to the adequate sanitation was not satisfying. Many countries cannot meet the target asked by the MDGs. Many implemented projects failed and lack of sustainability in sanitation projects turned to an important issue. Conventional sanitation provision approach and too much focus on household level sanitation provision could not solve the problem of lack access to sanitation especially in least-developed countries.

Based on the experiences during MDGs, a greater emphasis on sustainability in sanitation provision is the focus of the current efforts. The global network SuSanA (the Sustainable Sanitation Alliance) in 2008 introduced five criteria of sustainability including health and hygiene, environmental and natural resources, technology and operation, financial and economic issues and social-cultural and institutional aspects. The idea was accepted worldwide as a vision for sustainable sanitation

(SuSanA, 2008). The concept is used in this dissertation for the site study evaluation and also developing a sustainable sanitation approach for Kabul's informal areas. The five criteria for sustainable sanitation are:

1. **Health and hygiene:** Public health and hygiene is the most important factor in respect to sanitation management in developing countries. Therefore safely sanitation management from point of produce to the point of reuse or disposal is an important issue. Otherwise we cannot avoid health risk within the societies.
2. **Environment and natural resources:** This criteria promotes the role of natural resources in sanitation provision. Nowadays there is an emphasis on utilizing of renewable resources while reducing the negative impacts of sanitation projects on the environment.
3. **Technology and operation:** This aspect considers issues like robustness of sanitation systems at their different chains, flexibility of a system and its ability to be adopted and upgraded according to the context. Simplicity of a system and the possibility of its construction and maintenance locally are the core issues highlighted here.
4. **Financial and economic issues:** Affordability, subsidies, capital cost, operation and maintenance cost are the main points that should be considered at this part. Above that some direct benefits from sanitation services including recycled products and also costs like health risk and hazards and negative impacts on the environment should be analyzed here.
5. **Socio-cultural and institutional aspects:** This aspect of sustainability considers socio-cultural issues. It evaluates if the sanitation system and technology is accepted within a community. What could be the social or cultural barriers or facilitators to scale up a system within a community? How the legal frame work would support or fail a system and how we are able to create an enabling environment for a sustainable sanitation system.

3.4. Comprehensive Planning for Sanitation Provision

Applying sanitation sustainability criteria would help us for a better planning and successful implementation of a system. It can be used as an important tool for a comprehensive comparison of different sanitation options (Lennartsson et al., 2009).

Sanitation planning is a complicated task and needs a holistic approach. One should deal with technical issues as well as financial, socio-cultural, logistic and institutional issues (Wright, 1997).

Sanitation provision is not only a technical solution. It also shows the capacity and social characteristics of a society in which the project is conducted. Therefore it is very important to involve a community at the early stages and get them on-board for the whole cycle of the project. Therefore proper planning is a key during sanitation provision (McConville, 2010).

To provide sanitation services, planning is the most important factor. Project implementers are using different planning tools according to their priorities. Based on sanitation projects and their objectives, the planning tools mainly focus on technical, social or both of them in order to implement a successful project (Nayono, 2014).

According to Macconville and Nayono, in general sanitation planning tools consists of five main steps including (McConville, 2010; Nayono, 2014):

Step 1: Problem Identification

This step tries to explain the existing sanitation situation. It tries to answer to the question of “Where are we now?” At this step external and internal factors affecting the existing sanitation situation including stakeholder identification & analysis and institutional arrangements should be understood. A detailed assessment is the outcome of this step.

Step 2: Define Objectives

At this step we are trying to answer “Where do we want to go?” This question will help us to have a vision. Participatory sanitation provision should be highly emphasized here, and all the stakeholders, which identified at the previous step, should be involved. Validation of the last step and also making a general road map and recognizing the priorities are the main outcomes of activities done here. In practice, steps 1-2 are often done together as the context evaluation part.

Step 3: Design Options

The next three steps try to answer to the question of “How do we get there?” To do so, the possible options should be identified. All stakeholders are involved in the process and through brainstorming all the possible sanitation solutions are covered. But finally a limited number of feasible options should be highlighted. Each option is discussed among the stakeholders and its different aspects including financial, socio-cultural and operation and maintenance issues need to be evaluated.

Step 4: Selection process

At this step the feasibility of all selected system in detail should be addressed. Following that a critical comparison will help us for selection of the best available sanitation system. The final selection is mainly based on a sort of pre-developed criteria which meet our sanitation objectives. The selection process may or may not be participatory in nature, but the recommended approach at least among research institutes and NGOs is a participatory approach with highlighting the roles of the users and main beneficiaries.

Step 5: Action plan for implementation

Although action plan has been not mentioned in all the popular planning framework directly, but it is the main outcome of the process which is an agreed upon sanitation plan with detailed information on how the decided system should be implemented.

To sum up, there are several sanitation planning approaches. They are using different tools and guidelines to plan a proper sanitation project. But the most widely cited approaches are mainly Open Planning, Community-Led Urban Environmental Sanitation (CLUES) and Sanitation 21 (Table 1).

Based on the context, in Open Planning several sanitation options are offered to the community. These options should cover all the important concerns regarding sanitation provision within the community including primary issues (hygiene/ environment) and as well as practical functions (costs/ user friendliness etc.) The users according to their preference and affordability will choose the best system that meets their needs and willingness (Kvarnström & afPetersens, 2004).

CLUES is further development of HCES and both tools were developed and recommended by Swiss Federal Institute of Aquatic Science and Technology (Eawag). While HCES puts the household at the center of sanitation provision efforts, CLUES pays more attention to the community as the cornerstone of its planning process.

Figure 3 shows CLUES approach including its seven steps which are not always in sequence. In practice they will usually overlap and some steps may need to be repeated iteratively (Lüthi, Morel, et al., 2011).

According to the CLUES guideline, there are also three cross-cutting tasks which are relevant throughout the entire sanitation planning (Lüthi, Morel, et al., 2011):

1. Increasing public awareness and holding continuous communication with the stakeholders are key to creating demand and raising people's abilities to make informed decisions for the best feasible sanitation system.
2. Capacity building to increase the skills and abilities of the locals for sanitation planning, implementation and maintenance.
3. Long term monitoring and evaluation of the sanitation system for further improvement or correct the potential mistakes.

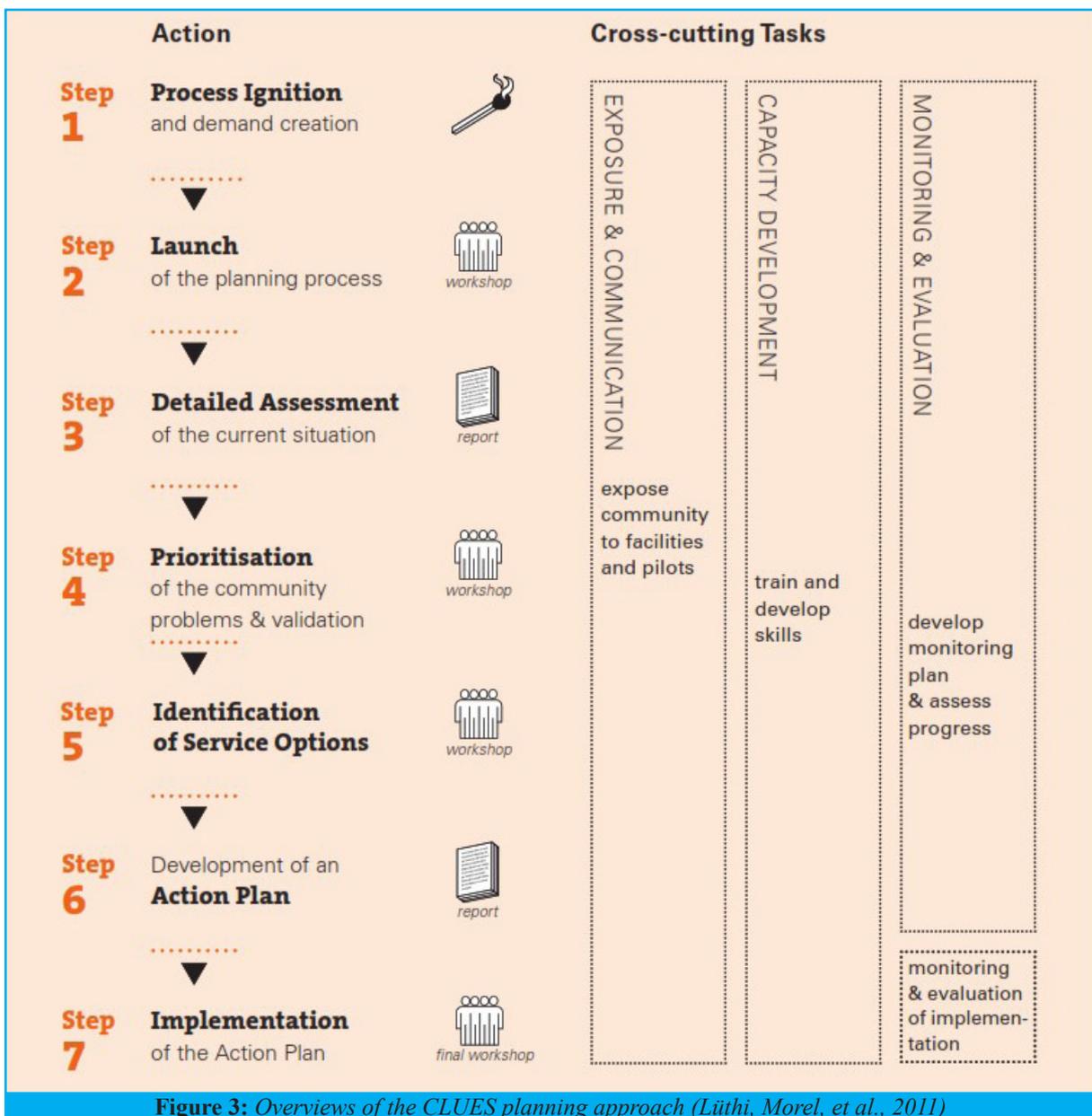


Figure 3: Overviews of the CLUES planning approach (Lüthi, Morel, et al., 2011)

Sanitation 21 is a city level sanitation planning tool. It can be used to develop a strategic sanitation plan for entire a city. This tools includes short, medium and long term steps to improve the sanitation situation at city level. Sanitation 21 tries to fill the gaps existed in a master plan approach. It consider different aspects of sanitation planning through a comprehensive approach (Parkinson et al., 2014). Sanitation 21 as a planning framework has five main steps:

- Step 1: Define institutional arrangement for service provision
- Step 2: Context analysis and evaluation of existing situation
- Step 3: Derive strategies for sanitation system improvement
- Step 4: Develop proper managerial aspects
- Step 5: Prepare for the implementation

Table 1: Summary of Open Planning, Sanitation 21 and CLUES approaches (Nayono, 2014)

Analysis	Open Planning	Sanitation 21	CLUES
Background	To create and support an open and democratic sanitation planning process through stakeholder engagement.	To address some key failings in current planning approaches which result in a mismatch between the stated investment objectives and the outcomes.	To create a more effective planning as an improvement of HCES
Focus	Not only focusing on purely technical solutions, but also focus on the functionality of a sanitation system in order to supply a sustainable sanitation system.	The tool focuses on excreta management: how could that be planned better, so that investments are more likely to generate the needed health and environmental benefits.	The seven-steps focuses on multi-actor and multi-sectoral approach
Stakeholders involvement	Opinions of stakeholders are taking into account as early on as possible in: <ul style="list-style-type: none"> - Identifying problems - Defining Terms of Requirement (TOR) of the technologies used - Analyzing possible solutions. 	There is recognition that stakeholders in each domain have their own interest. The key step in the framework is finally to select a system based on its ability to meet the objectives and management capacity defined by the stakeholders.	Stakeholders are involved almost in all planning stages. The planning framework employs both expert and community knowledge.
Technology assessment	The terms of requirement (ToR) are used for assessing sustainable sanitation alternatives. Criteria for ToR are provided in the framework. However, the framework emphasizes the need of developing a contextual ToR together with the stakeholders.	The tool highlights the importance of the compatibility of the technology across domains for sustainability. A list of criteria for technology assessment is not provided. Eight generic sanitation systems are offered for further consideration (functionality, operation, maintenance, and basic management requirement of the systems)	The selection of technology refers to an informed-choice catalogue. However, technology implications (financial, management) become the important consideration in selecting a technology

3.5. Sanitation Chain: from the Point of Produce to the Point of Reuse / Disposal

The sanitation chain includes all technological and managerial aspects used to manage excreta safely from the point of produce to the point of reuse or disposal. The idea behind sanitation chain is to have a holistic approach toward sanitation and avoid any potential health risk or pollution to the environment along the sanitation chain (Parkinson et al., 2014).

MDGs asked only about ‘using improved sanitation facilities’ which means hygienic separation of excreta from human and animal contact. But since 2011, there is consensus for going beyond only access to a basic sanitation facility. The focus changed on safely management of excreta along the sanitation chain. The new suggested indicator of ‘percentage of population using safely managed sanitation services’ should consider three below-mentioned points (WHO & UNICEF, 2015b):

- A basic sanitation facility (according to MDG’s indicator),
- It shouldn’t be a shared facility, and
- Where excreta is safely disposed in situ or treated off-site (Figure 4).

Based on the experienced achieved from MDG, SDG indicator 6.2.1 further develops the MDG indicator “proportion of the population using an improved sanitation facility.” Safe management of excreta along the sanitation chain in the SDG indicator has been considered (Figure 5). Accessibility and affordability of the sanitation services are here also focused. Above that hygiene, which was neglected in the MDGs, has been included in SDG and alongside sanitation in SDG 6.2.1 has been addressed.

SDG 6.2.1 has two components. The first one, on sanitation, monitors the percentage of population that have access to an improved sanitation facility at the household. The sanitation facility should not be shared with other households. If the facility is shared, which is the case in many house compounds in developing countries and in Afghanistan, it should be allocated to a limited and determined families.

The indicator also tracks where excreta are treated and disposed of on the site or safely transported and treated off-site. If there is no enough information on excreta management, the sanitation facilities are considered basic, because most probably lack of data means also lack of safely management.

The second component is hygiene. Existence of handwashing facilities at homes is used a proxy measure to track the population with handwashing behavior (UN Water, 2017).

Open defecation	Unimproved	Shared	Basic	Safely managed
Human faeces disposed No facility No handwashing facility open bodies of water, beaches or other open spaces or disposed of with solid waste	Pit latrines without a slab or platform, hanging latrines and bucket latrines	Sanitation facilities of an otherwise acceptable type shared between two or more households	Flush/Pour flush to piped sewer system, septic tank or pit latrine, venti- lated improved pit latrine, composting toilet or pit latrine with a slab not shared with other households	A basic sanitation facility which is not shared with other house- holds and where excreta are safely disposed in situ or treated off-site

Figure 4: Sanitation ladder adopted from (WHO & UNICEF, 2015b)

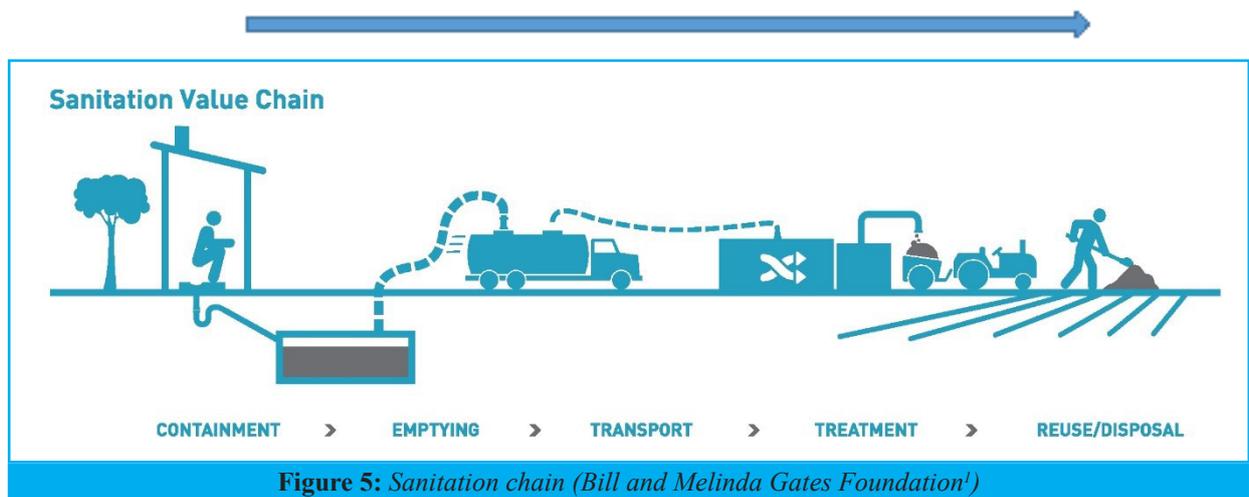


Figure 5: Sanitation chain (Bill and Melinda Gates Foundation¹)

3.6. Enabling Environment for Sustainable Sanitation Provision

To have a successful sanitation planning, the context should be fully understood. Without reliable information and data about sanitation situation, there wouldn't be a sustainable sanitation project. If a context is not supportive to implement a sustainable sanitation project, before any sanitation intervention there should be an enabling environment. Enabling environment is especially vital for innovative sanitation approaches (Müllegger & Lechner, 2008).

In many cases the main reason behind failure of sanitation project in low-and-middle-income countries is the lack of supportive environment. Institutions, policies and contexts could act as barriers to a sustainable sanitation planning and implementation. In fact supportive environment is a key to a successful sanitation intervention. The Sustainable Environmental Sanitation Planning (SESP) Group has introduced the concept of “enabling environment” as a pre-condition for a sustainable sanitation planning and implementation. As shown in Figure 6, enabling environment includes six different categories: (i) Government support, (ii) Legal and regulatory framework, (iii) Institutional arrangements, (iv) Skills and capacity, (v) Financial arrangements, and (vi) Socio-cultural acceptance (Lüthi, Morel, et al., 2011).

1. <https://www.flickr.com/photos/gtzeconsan/22340106212/in/dateposted-public/>

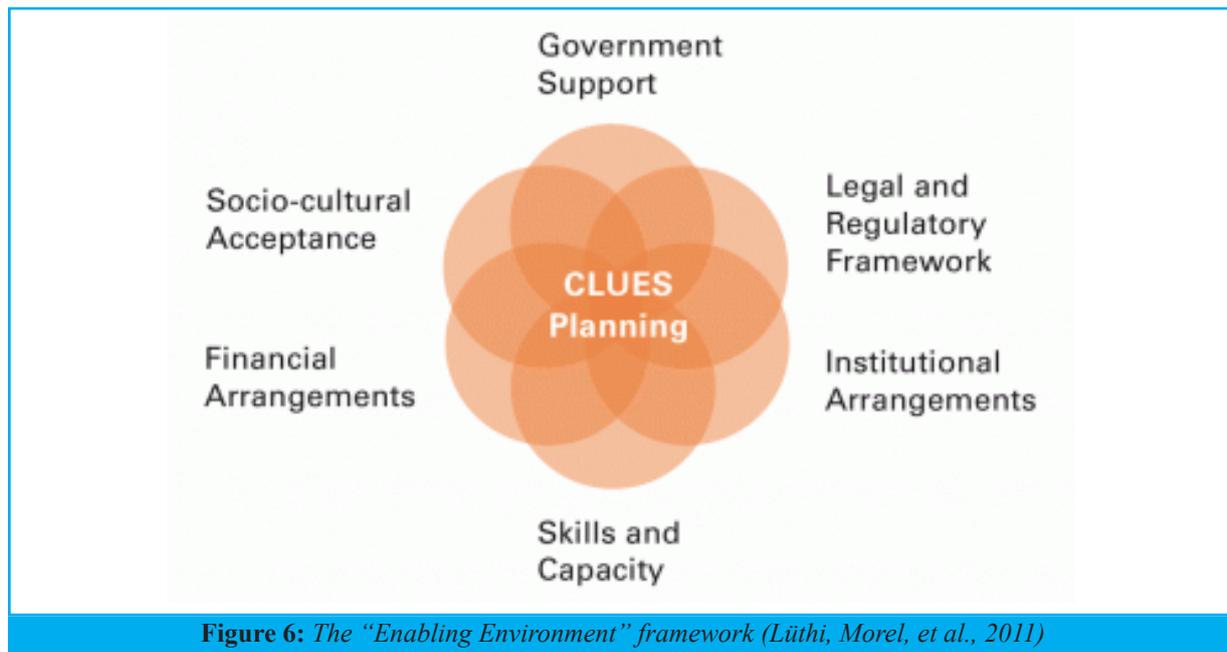


Figure 6: The “Enabling Environment” framework (Lüthi, Morel, et al., 2011)

3.6.1. Government Support

There should be a clear political support especially at municipal level for sanitation provision for all the citizens including those who live in the informal areas. Without such a precondition sanitation planning approaches like CLUES cannot succeed. Lack of clear and strong political commitment is the initial reason behind many failed stories (Lüthi, Morel, et al., 2011).

Although MUDH and AUWSSC are in charge of urban water supply and all forms of wastewater management, but current Afghanistan urban water supply and wastewater policy called “Urban Water Supply and Sewerage Sector Policy” (MUDH, 2005).

The policy’s focus is on sewerage system. This happens while even most of the urban areas have no sewerage system at all. There are two main reasons behind this kind of approach to the urban water supply and sanitation (M. Noor, personal communication, July 21, 2015):

- Some authorities still think of providing the whole urban areas with centralized sewerage system. They are not in favor of decentralized solutions or other approaches suitable for wastewater management. In fact they consider the sewerage system as the ultimate solution and golden standard.
- Some authorities are not yet ready to consider informal areas, mainly occupied by poor families, as a part of Afghan cities with a right to access to safe drinking water and adequate sanitation. In the best scenario such authorities don’t give priority or same right to those areas despite their deteriorated sanitation situation.

Thanks to the international organizations & advisors, in recent years there has been good progress in respect to the government willingness to provide sanitation services to the all citizens including inhabitants of the informal areas. There has been also positive changes in respect to legal documents, decentralization and also institutional reforms. Although there are some overlaps among the organizations involved in the sector, but it is mostly due to the lack of enough capacity. The role and support of international organizations to spread the new approach was vital and need

to be continued (Q. Salehi, personal communication, May 12, 2015).

MUDH is planning to update its water supply and sewerage policy. Although the policy updating is going on, but still it is not finalized. There are some other legal documents which are important to the sector, but the main document in this regard is the policy and the following documents out of it like its strategy. The strategy document will be developed and finalized when the policy is officially approved (Q. Salehi, personal communication, May 12, 2015).

To evaluate political willingness and support by a government in respect to inclusive sanitation provision, national policy framework can be assessed (Lüthi, Morel, et al., 2011). National documents including sanitation policy and other related laws and regulations are insisting on an inclusive approach and providing basic services to the whole citizens.

At the same time, inclusive access to basic services in some cases are not enough insisted by the international donors as a pre-condition when there is no full commitments in this regards by the national authorities (A. Mohammadi, personal communication, May 17, 2015).

Increasing access to safe drinking water and sanitation is considered by the Afghan Government as an important factor toward development. But lack of priority or emergency plan for the poor people who are the most vulnerable is a disadvantage in some development plans (F. Jafari, personal communication, June 17, 2015).

Economic development is the main goal of developing countries including Afghanistan, but simultaneously providing basic services including water supply and sanitation are recognized as human rights. In low-and-middle-income countries, there should be a plan to provide the basic services to everybody across the country. In the policies and regulations there are some level of insisting on poverty alleviation and providing basic services with focus on poor people, but the enforcement is not strong enough.

There are some projects responsible for upgrading of poor and infrastructure deficient areas in Afghan Cities including Kabul. But those projects usually focus on surface water management, road pavement and in some few cases implementing water supply projects. Even water supply projects are mainly implemented in formal planned areas. Sanitation projects, especially on-site facilities are usually neglected or considered a low priority.

Following the fall of the Taliban, new developed laws and regulations are insisting on decentralization, and engagement of the private sector. Based on the current sector policy, Water supply and Sewerage Central Authority was divided into policy, regulatory and implementation levels. Now MUDH is in charge of policy development, and independent organizations are in charge of regulatory issues and implementation. Based on this policy not only responsibilities are divided among different players in the sector, but also there is great insisting on decentralization (MUDH, 2005).

Currently there is no a pro-poor policy or strategy to promote affordability. In many case poor people have no voice to ask for their rights to access to the basic urban services. Although in the some national level documents there are emphasize on inclusive service provision, but at implementation level there are many challenges (S. N. Masoomyar, personal communication, June 23, 2015).

Usually projects supported by international organizations have a level of community participation.

Not only KURP and following that KMDP but also most of the development projects try to implement a community-based approach and engage the communities for the whole cycle of the projects (G. R. Nawabi, personal communication, July 7, 2015). The original activities planned for KURP were service delivery in the selected neighborhoods including formal and informal areas. They scope of work covered water supply, sanitation, solid waste management, road pavement, drainage construction and also street lighting (Afghanistan Independent Evaluation Group, 2011).

KMDP, which is the next phase of KURP, includes: neighborhood or community roads and drains, culverts, footpaths, street lighting, community parks, community solid waste collection points, and water supply if feasible (World Bank, 2014).

According to the field observations by the author, it seems the last approach of informal upgrading (KURP) was more comprehensive compared to its successor (KMDP). In most case sanitation provision and water supply are not involved any more in the upgrading packages. Some changes in the upgrading policy and approach is needed to make it more suitable in respect to environmental sanitation components.

To sum up, there is a level of government's support for sanitation provision for all. There are also some legal documents that support inclusive development and equality in the sector. But at the implementation level still many improvements need to be done. The government's support in many cases originates from the legal documents which have been developed by contribution of international organizations. There should be high level of efforts to adopt such approach at the implementation level where mostly local authorities are in charge.

3.6.2. Legal and Regulatory Framework

Regulations should determine service providers, the threshold level of standards for service provision, tariff structure, cost recovery as well as operation and maintenance of the facilities (Lüthi, Morel, et al., 2011). Without a clear and comprehensive regulations, overlaps and gaps in service provision could be a major risk.

The umbrella law regarding water supply and sanitation is the Water Law which was updated in 2009. This law appoints MUDH for managing water supply and waste water issues in the urban areas by developing proper legal documents and tools. According to this law MUDH and other respected organizations are responsible to develop their regulations, standards and guidelines. Although some urban sanitation sector managing documents were produced or are in the process of development, but still many documents are missing.

Before 2005, MUDH was responsible for policy development, regulatory issues, operation and maintenance. All the activities were conducting by Central Authority for Water Supply and Sewerage (CAWSS). CAWSS was working under MUDH and reported to the Ministry (MUDH, 2005).

In 2005 by developing a new policy and an Institutional Development Plan, urban water supply and wastewater activities was assigned to different organizations. Urban water supply and waste water management issues have been divided into three different levels (MUDH, 2005):

- Constitutional level: development of national plans, laws, policies and regulations are the main responsibilities at this level. MUDH is in charge for these activities.

- **Regulatory Level:** An independent regulatory body should be established in mid-term. The regulatory body will be responsible to do the role of supervisory and regulatory issues. MUDH is in charge to establish the regulatory body, but until that time should take care of the regulatory issues itself.
- **Implementation level:** Afghanistan Urban Water Supply and Sewerage Corporation (AUWSSC) as a government-owned corporation is responsible for service provision. Based on the new institutional plan, at the end the whole urban areas should be divided into six decentralized and independent zones with their own service providers. According to the current policy service delivery can be handled as public, private or co-management projects. Currently due to lack of enough capacity in AUWSSC, MRRD mostly in informal areas and municipalities in some formal areas are also in charge of service delivery (Table 2).

Under the policy developed by 2005 and also its institutional development plan later, AUWSSC was established. Statutes of AUWSSC (2007) was endorsed by the Ministerial Council on July 4th, 2007 and its activity as an independent organization for service delivery was started. As mentioned, in mid-term MUDH should follow a similar procedure to establish an independent regulatory body for the sector as well.

For a successful upgrading project CLUES suggests a set of pre-conditions (Lüthi, Morel, et al., 2011):

- Users should be involved in decision making process;
- Municipalities are allowed to collect taxes;
- local structures like community-based organizations (CBOs), user associations, etc. are allowed to manage services including operation and maintenance, and the control of funds collected from users;
- Applicable technical norms and standards to run affordable sanitation systems

Although some of these pre-conditions are mentioned in different legal documents, but still there is a long way to enforce them. For example local structure are not engaged in operation and maintenance of the facilities. Private sector active in informal areas is considered also informal and widely ignored. In respect to the norms and standards, still many documents are missing.

As mentioned MUDH has started to develop a new policy with shifting from sewerage alone to an integrated waste water management (MUDH, 2014). There are also other improvements in the new-coming policy, and of course enforcement is another important issue need to be focused after the policy approval.

Currently there are gaps and overlaps regarding responsibilities and scope of authority within the sector. The process of updating legal documents are too time-consuming and reaching a consensus sometimes is difficult. But the good news is despite the problems, “change” is possible and there is progress in respect to the development of legal documents: Afghanistan is a post-conflict country and many laws, regulations and policies need to be produced or re-considered again. This process has been started and continued during the last decade in the different sectors. The first step is usually developing the laws. Following that respected regulations, policies, strategies, guidelines and technical standards should be developed and approved. That is why in some cases still enough legal documents are not in place. Although these gaps are considered challenging but they also provide an opportunity for developing proper legislations based on the achieved experiences.

Although very slow, but it seems that water supply and waste water sector despite some missing documents is on track to create an enabling legislative environment. Some activities including conducting training sessions, workshops, pilot projects and also exposure to implemented successful projects in the other countries are done to catalyze the process.

MUDH through KURP had responsibility for formal and informal upgrading. KURP had developed their own documents and procedures. Their documents were considered as internal materials. They were not available to the public and not reflected in the other government's documents. KURP as a project was finished and its second phase called Kabul Management Development Plan (KMDP) started a different approach. It has unfortunately less attention to the sanitation components. The main focus is now on road pavement and drainage construction.

As a conclusion, a lot of efforts are doing to produce the missing legal documents in the sector. Although it is time consuming, but going on. The materials produced by KURP and KMDP cannot be considered a part of the legal and regulatory framework in the sanitation sector. A mentioned most of their materials were for internal use and not available to the public for evaluation and finally contribution to development of the legal framework in the sector.

Table 2: Overview of sector functions at different levels (MUDH, 2005)

Level	Main Roles and Responsibilities
<i>Constitutional</i>	<ul style="list-style-type: none"> • Sector Policy development • Urban Water Sector Legal Framework development • Negotiating and signing inter-governmental and donor agreements • Inter-ministerial issues and overall water sector coordination • National planning and overall sector performance, measured against national objectives such as the Millennium Development Goals • Setting tariff policy that treats water as a scarce economic good and approving regulatory recommendations on tariffs and charges • Holding shares in the sector institutions in the national interest • Ensuring that the sector follows national policies with respect to social responsibility and social equity
<i>Regulatory</i>	<ul style="list-style-type: none"> • Setting national standards for the UWSS sector, both in technical and service level areas • Reviewing and making recommendations to constitutional level on tariff applications • Proposing regulatory measures for the sector • Advising on UWSS policy development • Coordinating national UWSS objectives and planning • Monitoring the individual and collective performance of the sector against set criteria and benchmarks • Providing advice and technical/managerial support and training • Developing PPP models • Approval of private sector concession/lease/management contracts • Co-ordination and management of donor funding and other financing instruments on a national basis • Coordinating organizational development and human resource development initiatives for the sector • Appointing members of institutional boards in accordance with statutes and shareholding conditions • Approving tariff applications and water service standards • Ensuring that financial resources and investment levels are adequate nationally • Reviewing and approving major international contracts for design/supply/construction

<i>Operational</i>	<ul style="list-style-type: none"> • Putting in place the management and organization structure required to operate the systems and provide the services • Operating and maintaining the systems and infrastructure, • Ensuring that the correct procedures are followed in running and maintaining the systems • Developing the customer base, supplying service in accordance with standards, billing and collecting the revenue • Preparing operations budgets and monitoring performance against budgets • Preparing reports on performance results for the information of relevant stakeholders • Ensuring good performance and development of local employees • Identifying need for infrastructure expansion and working with partner organizations to implement the projects • Preparing annual business plans for approval by relevant board(s) • Ensuring that planning takes place for improvement and expansion of supply and that appropriate investment decisions are taken • Directly employing staff • Coordinating and maintaining a good relationship with stakeholders including municipalities and communities
--------------------	--

3.6.3. Institutional Arrangements

Although according to the general approach decentralization within the country should be promoted, but still Afghanistan has a centralized system of political and administrative governance. Beside laws and regulations the attitudes need also to change and pave the way for the new and up to date approaches. Table 3 shows the main stakeholders involved in the sanitation sector in the urban areas.

Table 3: *Key stakeholders in the sanitation sector (Hassib & Etemadi, 2016).*

Key stakeholders	Institutions/Organizations
Public Institutions	Ministry of Urban Development Affairs (MUDH), Ministry of Rural Rehabilitation and Development (MRRD), Ministry of Education (MoE), Afghanistan Urban Water Supply and Sewerage Corporation (AUWSSC), (National Environmental Protection Agency (NEPA (Municipality (district and city level
Private Sector	(Private emptier (formal and informal
Development Partners, NGOs and Donors	BORDA, GIZ
Community level	Community councils, gozar's official representative in municipality

Although MUDH and AUWSSC are the main actors in the urban water supply and wastewater management sector, but Table 3 and Figure 7 show that other related originations also have their own roles. Finally all these organizations involved in the sector regardless their importance should work under the supervision of Supreme Council of Water (SCoW) which is led by the vice president, and its technical secretariat works under the Ministry of Energy and Water (MoEW).

As mentioned regulatory framework in the water and wastewater sector is not completed yet. Different technical documents still need to be developed or are under development. This is one of the reasons which has led to the lack of proper institutional arrangement within the sector. Another reason for the current gaps and overlaps is lack of enough awareness or different interpretations

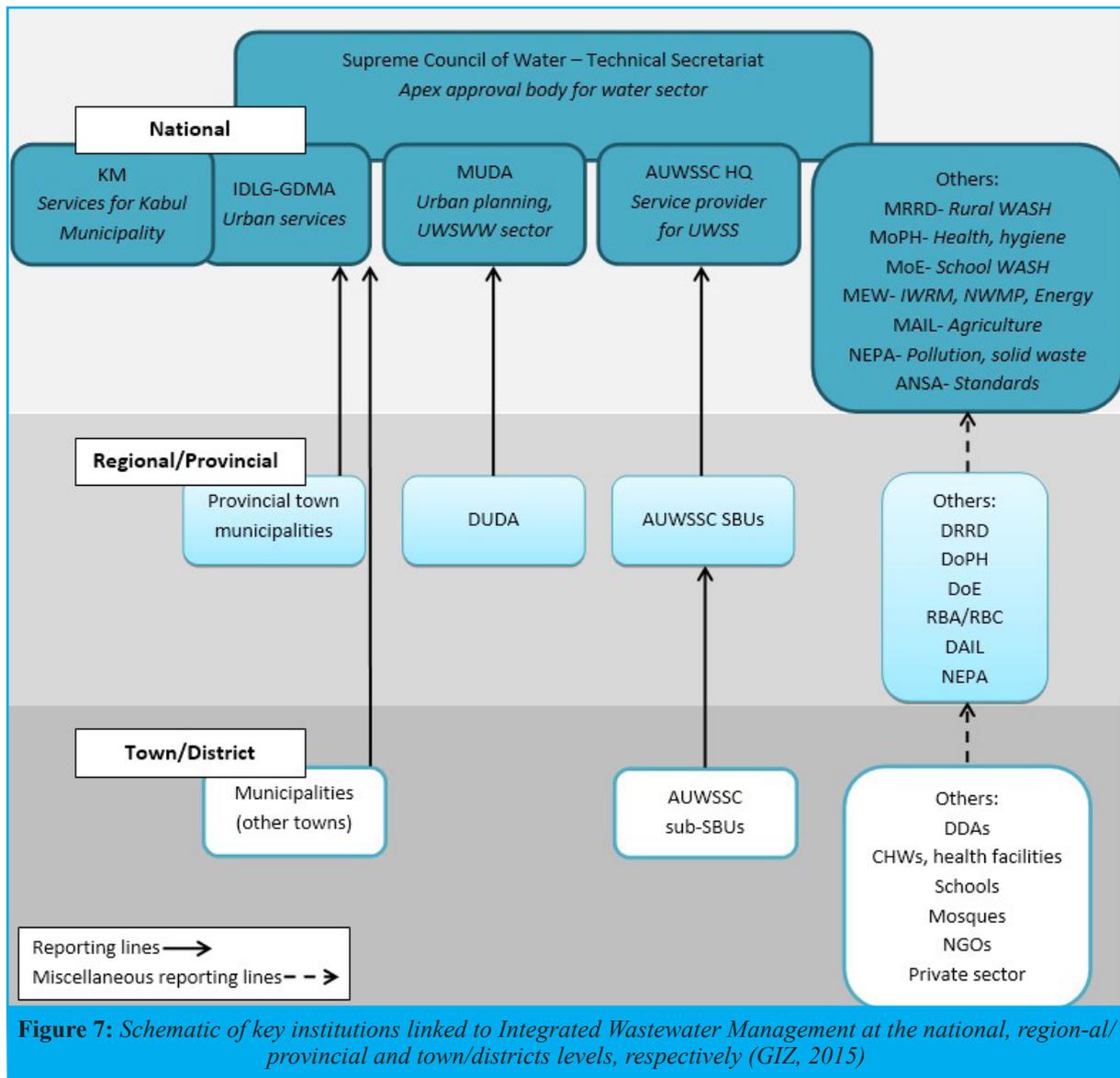
among some authorities regarding legal documents. Platforms like Supreme Council of Water provides a unique opportunity to highlight and discuss such disputing issues provided that all the members are capacitated enough to tackle the challenges in a cooperative manner.

Regarding institutional arrangement and roles of different stakeholders in the sanitation sector more details have been provided in a joint study with GIZ titled “SFD Promotion Initiative, Kabul, Afghanistan.” The investigation and data collection for the study and the dissertation was conducted simultaneously. Therefore repeating of the details are avoided here and some important points with focus on KURP and KMDP are discussed as follow:

Kabul Urban Reconstruction Project (KURP) was managed by a Program Management Unit (PMU) which was working under MUDH with cooperation of Kabul Municipality and also some technical support provided by consultants hired by the World Bank (Zar Consulting Inc., 2012). The project has established to upgrade selected planned and unplanned neighborhoods in some poor and infrastructure deficient areas (SMEC International, 2011). Investigations show that in some cases during the implementation of KURP, the different stakeholders at managerial level did not have communications with each other sufficiently to ensure smooth implementation (Zar Consulting Inc., 2012). This shows lack of proper institutional arrangement either at planning level or at implementation level among the respected authorities.

KURP was active in the framework of MUDH and communicated with other organizations through the Ministry. Following KURP’s decommission MUDH established a unit called “Upgrading of Unplanned Area Directorate.” This directorate works at the country level and mainly focuses on policy development. But it is a new established unit with lack of enough technical and financial support and still has a long way to go. Above that, due to the existence of KMDP under Kabul Municipality, MUDH’s upgrading directorate focuses more on other cities compared to Kabul, and its scope of work should be also policy issues.

KMDP arranges its activities through the Kabul Municipality with other related organizations. There are two engineering components with their own team leaders but both reporting to Kabul Mayor. Each engineering team leader is in charge for design, procurement, implementation, supervision, and project management issues, and also reporting on progress in his /her own team. Procurement, financial, social and environmental issues are conducted by a common unit responsive to the both engineering teams. There are different departments in KMDP including Social and Environment, Engineering, Procurement, Finance, Contract Management, Human Resources, Administration, and Information Technology (Sisk, 2014).



3.6.4. Skills and Capacities

To create an enabling environment and successful planning and implementation a high level of capacity for project management including administration issues, stakeholder identification and engagement, public health protection and hygiene promotion is needed (Lüthi, Morel, et al., 2011).

A big portion of Afghan Government budget especially in the development sector are paid by the international community. Different kind of capacity building including on-job training is the core part of many projects. Above that several short-term training centers have been established in Kabul City by the Afghan Government. They use different trainings tools including exhibitions, demonstration sites, field trips, workshops, etc. for capacity building.

KURP as a multi-donor project supported by the World Bank and implemented by MUDH had several components including:

1. Area upgrading in Kabul City
2. Land Tenure Regularization (later was cancelled)

3. Engineering and Project Management Support
4. Overall Capacity Building for Kabul Municipality
5. Preparation of physical development plans and focus on city-wide urban services (later was cancelled)
6. Improvements to main roads and traffic management

Among these six components only components one and two had specific focus on upgrading of poor and infrastructure deficient areas in Kabul City. During KURP implementation, all components provided some kind of on-job trainings to the local staff as well. Even in component one according to the procedure on-job training was going on, and capacity building for locals was a part of their job. Especially some parts of the project was conducted by international experts in cooperation with the locals which provided an opportunity for capacity building. Usually in different projects each international consultant has a local assistant who could be an expert in long run.

Almost all the joint projects by Afghan Government and international organizations consider capacity building as a task to do alongside the project implementation. Therefore the capacity of the local stakeholders are higher compared to the past.

Despite many efforts more capacity building for specific topics and stakeholders are still needed: it is both in technical issues and also project management aspects. To do so different training programs either by Afghan Government or international organizations have been initiated and still going on.

Despite many ongoing capacity programs, informal private sector has not been exposed to the trainings. They have been mostly neglected either by the government or by the international organizations. The informal private sector have been engaged only with the locals for their private water supply projects or wastewater/night soil collection. They have done their jobs without specific norms, monitoring or quality control.

In respect to the human resource, usually international organizations and formal private sector have better situation compared to the other stakeholders. They pay higher salary and hire more capacitated staff, and also their hiring systems are more merit-based. They are also more accurate on spending their budgets for the training of their own staffs. And finally they choose usually right staff for the trainings.

As a conclusion, the mindsets of some government staff are outmoded, especially among the older generation. Although during the last decade they had exposure to many capacity building programs but the output has not been always as expected. The main reasons for the above-mentioned points could be as follows:

- Lack of enough capacity for the level of training provided to some staff
- Lack of enough motivation or incentive for improvement among some stakeholders
- Lack of coordination between related organization to make comprehensive and inter-linked training plan
- Lack of transparency to choose the right persons for the trainings: people who can make difference

There are also some problems in training provider side like donors:

- Trainings are easy way to spend the budget
- Using training to satisfy the trainees with the field trips, site visits, etc.
- There is no follow up regarding implementation of the takeaways after the trainings

Regarding community members either community level training or other methods of training like training in schools, are needed. But first we need to make sure that trainers are enough qualified to conduct such kind of training / awareness campaigns.

3.6.5. Financial

During cost estimation for a sanitation project all aspects need to be considered. Administrative, hardware cost, capacity building, operation and maintenance costs are the main issues for evaluation (Lüthi, Morel, et al., 2011). Above that a pro-poor sanitation plan, affordability and cost recovery are vital to make a sanitation project financially sustainable.

Even poor people, who are usually live in informal areas, are willing to pay for a better environmental sanitation services if they are well-informed about its benefits (Whittington, 2010). The household survey conducted for this study also shows the willingness of the communities to pay for a better sanitation service. But as mentioned, to make a project financially sustainable except willingness to pay, users' affordability should be also considered.

Most of the upgrading projects implemented in Kabul have no comprehensive investigation about the financial situation in the areas selected for the upgrading. Although there are some micro finance organizations or banks to provide loans to the people, but such practices have not been tried or investigated yet for the sanitation projects.

According to the survey conducted for this study, the households are not able to pay for the capital cost of the environmental sanitation projects which is the case in many areas including planned and unplanned in the city. They can contribute by paying a minor percentage of the cost usually through labour work at the household level or on their community level.

It was showed that during the past 14 years of country wide National Solidarity Program (NSP) ,which conducted many projects across the country, local peoples were very important for a successful implementation. They played vital roles despite their high rates of poverty. During NSP, Afghan communities contributed approximately 13 percent on average to NSP's construction costs (30 percent on average in urban areas), and they also built some infrastructures much more cost effectively compared to the private sector (World Bank, 2016).

In a pilot project funded by USAID in the informal areas they found that community-based upgrading reduces the overall cost through active engagement of the local people. It also has advantages beyond financial issues (Table 4).

Table 4: *Advantages of community upgrading methodology (Salam, 2006)*

Community Based Upgrading Approach	Private Sector Upgrading Approach
<ul style="list-style-type: none"> • Able to implement small scale projects • Majority of works done by manpower • High community participation and contribution • Community feel ownership of the project • Employment of the local labour • Participation of women • The project leadership has community support • Community pays especial attention on the project's quality • Cause good relation among community members • Because of community contributions the project financial cost is cheaper than construction company 	<ul style="list-style-type: none"> • Able to implement large scale projects • Majority of works done by machinery • The process financially is not very transparent • Community participation is limited • Community does not feel ownership of the project • Limited opportunities for local employment • Limited community participation and support • Community does not feel any responsibility • Lack of coordination between community and Municipality • The project financial cost is higher than the community approach, for the same physical result.

To cover the capital cost for a sanitation project different options should be considered. The required budget can be provided by national or provincial funds, international donors' contributions or credit allowances through different organizations. But to make a project sustainable, running cost must be secured (Lüthi, Morel, et al., 2011). For running cost usually local people are the main contributors. And the way of contribution should be agreed during the sanitation plan.

Users' contribution should be more as a tiny part of the capital cost to give them sense of ownership and engage them in the upgrading process. But in respect to running cost and to make the project financially sustainable, the community should take active role during operation and maintenance through paying for that. Therefore the running cost of sanitation system and totally the environmental sanitation components should be affordable.

Afghanistan Government has recognized the right of inclusive access to adequate sanitation. The government is willing to develop more political support for that. Respected organizations within the government are committed to make a scheduled plan and high level of efforts for budget allocation and sanitation promotion (SACOSAN V, 2013).

In 2015, 193 governments including Afghanistan came together and developed a common framework to achieve 17 major world goals by 2030. In Goal 6 governments should ensure access to safe water and adequate sanitation for the whole citizens (PWC Network, 2016).

Almost all over the country, sanitation is an individual asset and sanitation quality directly related to the financial situation of the households. Government and donors have had investment on the other components of the environmental sanitation while they ignored widely sanitation.

In Afghanistan poverty following the withdrawal of international troops increased. Many jobs and economic activities were closed and there was a sharp decline in economic growth. Currently unemployment is particularly severe amongst low skilled and illiterate workers who are historically the most vulnerable group (World Bank, 2017b).

To promote an inclusive access to adequate sanitation a pro-poor strategy for the sector is needed. Afghanistan is a least developed country with a high percentage of poor people living under the poverty line. Without a proper strategy and financial support by the related organizations, poor people cannot afford to have an adequate sanitation services.

Direct attack on the poverty and putting the last one first should be the cornerstone of the pro-

poor strategy. Thus the strategy for water and sanitation should be established on four pillars of (Bangladesh Ministry of Local Government, 2005):

1. *Practical definition of hardcore poor households*
2. *Definition of basic minimum service level*
3. *Targeting and organizing the hardcore poor households*
4. *Mechanism for targeted subsidy plan*

KURP project paid for (i) roads, drains and culverts (83% of the total expenditure); (ii) water supply investments (11.8% of the total expenditure); (iii) sanitation or latrines (1.8% of the total expenditure); (iv) waste collection points (0.2% of the total expenditure), and (v) street lights (World Bank, 2013).

As a multi-donor project, KURP project was heavily subsidized and there was not much to do in respect of capital investment by the community. They had determined the level of budget to cover selected gozars for the upgrading. Despite their pre-planned activities, KURP had to cancel several components due to lack of fund: they had to spend more budget on physical activities. KURP authorities believed project delays, price increases, and also inaccurate estimation was to blame for the cancellation (Zar Consulting Inc., 2012).

Except capital and running cost of a project, financial impacts of an upgrading project should be also considered. In a similar approach, USAID tried to implement an upgrading project in a Kabul's informal area using the community available resources. The financial impacts of this community-based approach has been explained as follow (Salam, 2006):

- The market values of the houses increase in comparison with non-upgraded communities.
- People pay less for transportation in the upgraded community.
- Some families get economic support though local employment in the upgrading.
- Because of proper drainage and clean streets families pay less for health treatments.
- Locally employed people learn and build their capacity during implementation of the project. They are now able to work as contractor or skilled labor and support their families.
- Implementation of the upgrading project encouraged the families to invest in their neighborhood. Through investment in their houses many people got employment and income.

At the end, regarding running cost of KURP's project in the site studies, there is no big problem. According to the household survey the operation and maintenance cost is affordable for the locals. But inefficiency of the project and managerial challenges at the municipality level, lack of integration, etc. make the project dysfunctional. About these problems in the other section of the study has been discussed.

3.6.6. Social and Cultural Acceptance

Proposed environmental sanitation services should be according to the socio-cultural preferences of the local people, otherwise the project could be faced with many challenges especially at the operational phase. Furthermore the local community (Lüthi, Morel, et al., 2011) should have effective demand for the participation from the early stages of the sanitation planning, and they should be engaged actively for the whole cycle of the project.

According to the KURP's documents and reports there was a clear demand for the community upgrading among the locals. They formed neighborhood and Gozar Councils to take part in the project. Sanitation improvement at the household level and also construction of the trash collection points were responsibility of each community with a financial and technical support from KURP.

Past experiences have shown that local engagement in Afghan communities are high and they are willing to participate in the project planning and implementation. Urban Community Development Councils (CDCs) and Gozar Assemblies (GAs) are good examples of the capacity within Afghan communities to organize, find solutions for social challenges and also get engaged in the project as an important stakeholder. The engagement of Afghan communities is the best way to ensure socio-cultural acceptability as well. This potential can be used for different projects to make sure that communities are also satisfied with the project planning and implementation (Government of Islamic Republic of Afghanistan, 2016). Approximately 35,000 CDCs have been formed in all rural areas of 34 provinces. There are about 1,800 CDCs in urban and peri-urban areas of Afghan cities (World Bank, 2016).

Upgrading package in KURP was covered different constructional components including sanitation. Budget and time limitations were the main constraints for the project implementation. Due to these kind of constraints, there was always insisting on the priorities. In a poor and infrastructure deficient neighborhood, sanitation is always the last choice when the community has to prioritize its needs, leave alone when there is no enough insist on sanitation from the planner side as well.

In such atmosphere the selected communities for upgrading, first of all try to keep the project within their neighborhoods. If the community is not agreed with the general conditions provided by the officials (here KURP), the project would be implemented somewhere else. Furthermore when there is budget and time limitation, the community tries to arrange itself with the project authorities and prioritize its needs. Usually road pavement, water supply and surface drainage system are the top priorities. Following that issues like solid waste and sanitation are considered. Therefore regarding type of sanitation there wouldn't be much socio-cultural debate, because the sanitation issue itself is not the main priority within the community. The community accept any kind of sanitation intervention provided that their priority problems including road pavement and water supply are addressed.

In site one people had many problems in respect to water supply and unpaved roads. They preferred to insist on those problems. But following the upgrading many families turned to water-based sanitation technologies. The remaining still use the improved traditional latrines, but the system doesn't work properly and they are not happy with it. According to the household survey 91% of people wanted to have water-based system while KURP's intervention was only improvement of the dry latrines.

In site two located on hilly areas, where the community had access to reliable drinking water and the headquarter of Kabul Municipality is within walking distance, the community insisted on water-based sanitation and road pavement: despite rocky ground in the area, KURP planned to construct six communal septic tanks, but due to the high cost of such construction activity in a hilly area finally KURP came up with only one communal septic tank covering only 13 houses. Many of the remaining households, where ever possible, connected their toilets to the surface water drainage system.

According to a World Bank program urban infrastructure should be part of an overall municipal development plan with linkages to trunk infrastructure. Currently the Citizens' Charter as a national Programme (CCAP) and a multi-donor project funded by the World Bank has a five years project plan to cover about 1,200,000 people in four major Afghan cities including Kabul City. Each gozar composed of five Urban Community Development Councils (CDCs) has a right to prioritize their infrastructure needs including road pavement, water supply, street lightening and solid waste management, park and recreation area. All infrastructure investments at the community and Gozar levels will be confirmed by the local municipal authorities to ensure that there is possibility of later city-wide integration (World Bank, 2016). Sanitation is again neglected in this large scale national program. But this it is even worse compared to KURP. They decided to do nothing about sanitation. It seems KURP couldn't find a sustainable solution for the sanitation problem, and now authorities think just ignore dealing with the problem itself.

As a conclusion if an upgrading plan is introduced, sanitation shouldn't be the last priority among other components either by the community or by the planners. The budget for an integrated sanitation planning should be in place and allocated only to the sanitation. Following that the planners and the community can debate over social and cultural acceptance. Without planning an integrated sanitation provision, the community will accept any kind of sanitation option provided that their roads are paved and other priorities are addressed. Later they would have chance to switch to their own socio-cultural accepted sanitation system if possible. But that time there wouldn't be enough resources to develop a sustainable and integrated sanitation system.

3.7. Complexities of Sanitation Provision in Kabul's Informal Settlements

Due to lack of one or all of the following conditions, slum housing is inadequate (UN-Habitat, 2004).

- Improper site selection
- The houses are not robust enough
- Lack of urban basic services
- Lack of security

People who live in slum areas have much less access to the formal market and employment. They are facing with discrimination and sometimes geographic isolation due to the informal nature of their neighborhoods. In the other hand living conditions in slum areas are not suitable due to lack of urban basic services, natural hazards like flooding or land slide and lack of robust houses. In many case the whole informal area is subjected to demolish due to the insecurity of the tenure (UN-Habitat, 2004).

In 1990s during the civil war between Mujahedeen most of the city and especially western Kabul was destroyed. Many of the citizens were injured, killed or had to leave their homes. Following the fall of the Taliban and the presence of international community, many refugees and also internally displaced people moved to Kabul. There was an unprecedented level of demand for accommodation and urban infrastructure in the city. Afghan Government and its international allies were busy with security issues or other priorities like development projects including highway reconstruction or rural reconstruction. There was no consensus among the authorities regarding dealing with rapid expansion of the informal areas. The last Kabul master plan which was developed by 1978 was not anymore applicable to the city (Soave, 2008). It was formally

suspended by the Afghan president in 2005 in order to develop a new master plan addressing the new challenges (Calogero, 2011). The development and approval of the new master plan took a long time, almost one decade. Meanwhile due to the influx of refugees to the city and high demand of shelter, there was a huge expansion of informal areas without access to the basic services in Kabul City. Today most of the Kabul's population live in the informal areas.

Most of the people in Afghan Cities live in informal areas with little access to the basic urban services. This is the problem especially in Kabul City where 66% of the dwelling stock which is about 280,000 dwelling units is irregular. About 10% of the irregular houses locate on hilly areas (Islamic Republic of Afghanistan, 2015).

Similar to other developing countries many Afghan citizens live in informal or unplanned areas. These areas have not developed based on the master plan and therefore are not considered legal. Insecurity of the tenure is a big challenge in such areas and the whole informal area could be subjected to demolish by the authorities. The residents in informal areas are always concerned with their uncertain future and cannot plan for major improvement within their neighborhoods (UN-Habitat, 2017).

Considering the type of land acquisition different kind of informal settlements in Kabul City can be identified:

- Settlements on public land or abandoned buildings
- Settlements on privately owned land
- Settlements on grabbed land. In this case the land could be bought from a land grabbers or occupied directly by the residents
- And the last form is the lands with murky legal condition (Gebremedhin, 2005).

Table 5: *The World Bank and UNHCR have also categorized different kinds of informal settlements in Kabul City in a similar way:*

Settlement Type	Definition	Population Segments
1. Formalized Areas	Areas covered by Kabul old Master Plan from 1978.	Usually middle class areas, most national and international organizations.
2. Informal Unplanned Areas	Areas falling outside of the master plan developed by 1978 which host 80% of Kabul's population.	Different social strata including middle class, urban poor, etc. Mostly with Customary Title. Usually in different neighborhoods different ethnicities live. The reasons could be group migrations (Metcalf et al., 2012).
3. Informal Illegal Areas	Land is source of dispute, either because land is privately owned or public (govt.) property	Usually internally displaced people and nomads. Comparing to two other population groups, they are not much. Such areas can be found anywhere in Kabul City, e.g. abandoned buildings, hilly areas or urban periphery.

During last decade Afghan Government and international community were too busy with security problems and other priorities. They were also looking for short term projects to have more achievements and a better show off. But such kind of projects are not usually applicable in a complicated urban area. Furthermore, it seems there was a bias toward rural development among the authorities and international community due to the portion of the population living in the rural areas.

MUDH was a minor Ministry while Ministry of Rural Rehabilitation and Development (MRRD) has received several times more budget compared to MUDH. MRRD has implemented some ambitious national level projects.

Despite all the challenges, Kabul's informal areas have provided affordable shelters to the poor people who came from the rural areas or abroad. The informal private sector in Kabul has provided job opportunities and income to one of the most vulnerable parts of the society. The amount of investment by the people in informal areas were also considerable. According to an investigation by the World Bank in 2004, the amount of private investment in fixed capital without including the land value in informal areas of Kabul City was of US\$ 2.5 billion (World Bank, 2004a). Despite above-mentioned positive points a new approach toward informal areas in the country is needed, otherwise neglected informal neighborhoods cannot handle their challenges themselves.

In recent years national & formal approach to informal areas is changing. Nowadays there is more tolerance regarding informal areas by the authorities in developing countries. Policies like forced eviction and neglect are switching to more positive approaches like upgrading and right-based policies (UN-Habitat, 2004). Usually informal areas are occupied by the most vulnerable groups of each community and without a concrete support by the government, situation improvement is not possible.

During different relevant meetings by Afghan authorities, there was insisting on the importance of land. They have mentioned to the urban land regularization and also tenure security as one of the priority programs in the government. They have announced that Afghan Government is committed to legalize all the properties that have legal flaws, and highlighted the tenure insecurity as a big problem for the economy.

Since 2016 Afghan Government with the technical support from UN-Habitat has started a national level program called 'Cities for All.' This program as the national urban land and property, paves the way for recognizing the rights of informal settlements. The households in the informal areas receive occupancy certificate as a step toward tenure security (French et al., 2016). Furthermore approximately during the last 10 years some upgrading projects by international organizations and Afghan Government were conducted to improve the overall situation in informal areas of Afghanistan and especially Kabul City. Upgrading can be used as a tool and also precondition in the informal areas for the land tenure and regularization.

KURP as the main upgrading project had two objectives: (i) improving capacity of the MUDH and Kabul Municipality in urban management field; and (ii) supporting the integration of selected neighborhoods into the urban fabric of Kabul Municipality through the upgrading and improvement of urban services. KURP had several components including Part A: Area Upgrading in the areas under jurisdiction of Kabul Municipality with focus on poor, infrastructure-deficient, formal and informal neighborhoods by providing improved water supply provision, sanitation improvement, solid waste management, road pavements, hill-side steps and surface water management facilities (World Bank, 2013).

Due to time and budget constraints, in many cases the local communities had to choose between different services according to their needs. As mentioned using this approach, in many cases sanitation was neglected either by the project authority or by the community.

KURP project originally was planned to be implemented by Kabul Municipality. At that time

there was a debate among the Afghan officials regarding informal development of Kabul City. The authorities in Kabul Municipality were not supporting the upgrading of informal areas, so the Ministry of Finance and The World Bank asked MUDH to implement the project (Zar Consulting Inc., 2012). The second phase of KURP project called Kabul Municipality Development Program (KMDP) is implemented by Kabul Municipality which shows new approach in the municipality as well.

3.8. Basic Urban Service Provision in Afghanistan as a Post-conflict Country

Lack of urban planning and low capacity in municipal governance are the main reasons behind the failure of a proper urban service delivery. Fast growing Afghan cities have significant potential as the engine of economic growth and social welfare. It provides a unique opportunity for promotion a sustainable urban development. At the same time this rapid urbanization shows the urgent need for a proper urban planning and good governance (World Bank, 2017a).

According to ‘The 2013-2014 Afghanistan Living Conditions Survey’ about 74 percent of the urban population lives in slum areas. Informal settlements in Afghan major cities are growing while the number of poor – an estimated 29 percent of the urban population – who do not have access to urban basic service is also increasing (World Bank, 2016).

Afghanistan is now in its ‘Transformation Decade’ (2015-2024). There is much emphasis on the self-sufficiency of the government. The international aids has also been reduced. At the same time Afghan army has the main responsibility to fight against terrorism and insurgency as well. Urban population growth is much higher compared to the global average. All these put a high level of pressure on the government while poverty is a big challenge and political instability and ethnical tensions in post-conflict Afghanistan are increasing.

During the last few years and especially following the withdrawal of international troops from Afghanistan, the country’s economic growth, compared to the last decade, has been decreased. There was a marginal GDP growth 0.8 percent in 2015 to 1.2 percent in 2016, but still it is a decline in per capita term due to the population growth rate which is nearly 3 percent. About 39 % of the population live in poverty and almost 70% of working-age population are illiterate. There is a high rate of unemployment among the young people up to 28 percent. Poor nutrition and food insecurity is another challenge for the country (World Bank Group, 2016).

Low income means poverty and low growth means no hope for the future. After a decade of rapid economic growth in a post-conflict society, the risk of another war can be decreased to a manageable level (Collier, 2008). Afghanistan needs to increase its GDP and speed up the economic growth in a sustainable and continuous way to avoid another instability. Furthermore, poverty increases the chance of instability and even civil war while many poor people live in infrastructure deficient informal settlements. They are prone to being hired by the gangs or terrorist groups, or simply turn against the government.

The majority of urban population in Kabul City live in informal areas with minimal access to the urban basic services. Such a huge population with dysfunctional infrastructure makes the whole city prone to the instability. The cost of neglecting these vulnerable groups would bring another conflict. Above that poor people live in the informal areas with no access to urban infrastructure services feel subjected to the discrimination and biased. This feeling can be even higher among

the minorities and would lead them to turn against the government which can be a big challenge for a country already faced with ethnic tensions. In the best scenario those who feel neglected can start civil resistance which could be also a huge burden on the shoulder of a new established government and its incapacitated organizations.

Although during last 17 years Afghanistan has received a high amount of aid by international community, but aid alone cannot solve the problems of Afghanistan. There should be a proper range of policies and good governance. Aid could be allocated to lift out as many people as possible from poverty (Collier, 2008). Aid and support of international community can be used to promote sustainable economic growth and poverty alleviation. Without chronic poverty, citizens can make their own way toward education and a better future.

As mentioned earlier, SDG 1 insists on ending poverty in all its forms by 2030, eradicate extreme poverty for everybody across the globe (United Nations, 2015a). Aid can be used to help poverty alleviation across the country. There should be a proper plan to eradicate poverty in the country through insisting on targeted aid distribution with focus on the most vulnerable groups. Afghanistan is a diverse multi-ethnic country and proper distribution of aid is important to have a balanced and sustainable development.

In September 2015, Afghan MUDH made a commitment to prepare a comprehensive Urban National Priority Programme (U-NPP) to achieve dynamic, safe, livable urban centers (Table 6). To ensure “functional effectiveness,” government must adopt enabling environment including legal and regulatory framework. To do so, MUDH through technical supports from its international partners, outlined a comprehensive U-NPP to strengthen good urban governance and provide Adequate Housing and basic urban services (Afghanistan MoF, 2016).

Table 6: *The overriding policies under the U-NPP (Kammeier & Issa, 2017)*

Vision: By 2024, Afghanistan will have a network of dynamic, safe, liveable urban areas that are centers of economic development and arena for culture and social inclusion through decentralized planning and participatory approach.		
<i>Pillar One:</i> Strengthened Urban Governance and Institutions	<i>Pillar Two:</i> Adequate Housing and Inclusive Basic Urban Services	<i>Pillar Three:</i> Strengthened Urban Economy and Infrastructure
Focus on legislative, regulatory framework	Focus on adequate housing and infrastructure development	Focus on all means for economic development

According to the U-NPP, Afghan cities should be an important forum for economic transition and social inclusion during the transformation decade (2015-2024). With a targeted infrastructure development and sustainable and integrated upgrading in the informal areas, there should be a regionally balanced growth and sustainable development (Afghanistan MoF, 2016).

To address above-mentioned issues ‘The Citizens Charter Afghanistan Project’ or CCAP as a national Programme in 2017 by the Afghan Government was introduced. It is a replacement for the country-wide development National Solidarity Programme (NSP) which had been started in 2003.

3.9. Faecal Sludge Management in Kabul City

Although MDG water target was met, but the world has failed to meet the sanitation target. In respect to the sanitation, problem was not only meeting the target and providing adequate sanitation to unserved or under-served people, but also some ambiguities in the definition and approach.

Proper defining and monitoring safely managed sanitation provision was a big challenge. In addition, the MDG target on sanitation did not consider the whole sanitation chain from the point of produce to the point of reuse or disposal.

The sanitation needs of 2.7 billion people worldwide are provided by onsite sanitation technologies, and that number is expected to increase to 5 billion by 2030 (Strande et al., 2014). In developing countries many urban areas do not have access to sewerage system. Usually only limited areas mostly located in downtowns are covered by sewerage systems and other neighborhoods especially in urban peripheries and informal areas are served by on-site technologies.

The main objective of a sanitation system is to protect and promote public health by providing a clean environment and breaking the cycle of disease (SuSanA, 2008). The majority of the urban population living in developing countries use some form of on-site sanitation. But these on-site technologies are mostly basic and poor maintained (Lüthi, Panesar, et al., 2011). To protect public health as the main objective of sanitation provision in developing countries, there should be a proper on-site sanitation management.

Faecal sludge (FS) produced by on-site sanitation technologies is raw or partially digested. It is result of the collection, storage and partially treatment of excreta and blackwater with or without greywater (Strande et al., 2014). In fact there is essential difference between the products of on-site technologies with the wastewater transported by sewer systems.

Despite the widespread use of on-site technologies, its proper management have been neglected for a long time in many countries. Sewerage system has been considered as the golden standard and ultimate solution for urban wastewater management. Nowadays lack of a proper faecal sludge management is a major concern in many settlements of developing countries: Any sanitation improvement especially in informal areas of developing world, which mainly rely on on-site sanitation facilities, should focus more on proper management of faecal sludge (FSM).

In the last few years there has been a world level attention to on-site sanitation facilities and FSM. Introducing suitable solutions for on-site sanitation management will improve the situation widely and will help us to achieve the goals determined by SDGs.

In November 2014, a project called “the SFD Promotion Initiative” funded by the Bill and Melinda Gates Foundation was initiated. The project was managed by GIZ under the umbrella of the Sustainable Sanitation Alliance (SuSanA) together with the project team CSE, Sandec/Eawag, UoL and WEDC. The SFD Approach provides methodology and tools for the worldwide practitioners to evaluate sanitation management in their own cities.

Kabul as capital and the biggest Afghan City relies heavily on on-site sanitation technologies. Most households have their individual sanitation facilities, while others use a kind of decentralized sanitation systems at community level.

Traditional toilets have only one chamber and resting time for the human waste is also short. Although the product needs further treatment, but it is collected by local farmers to apply directly

on their farm lands. Due to the expansion of Kabul City and also less demand, in many cases Kabul Municipality should collect the products of the traditional latrines which are dumped on trash points constructed for solid waste management.

Above that Kabul Municipality, private companies and individual vacuum truck drivers collect faecal sludge produced at on-site sanitation facilities like septic tanks, holding tanks and soak wells. Faecal sludge would go either for further treatment or simply dumping in the environment.

Although there are few small scale wastewater treatment plants but Macroyan WWTP is the only semi-public facility available in Kabul. It receives wastewater produced in apartment complexes in Macroyan area and also wastewater from on-site sanitation facilities. The volume of wastewater treated in the facility is about 580,000 m³ per month, of which some 40,000 m³ are delivered by trucks. The amount of wastewater is beyond the current capacity of the WWTP and its treatment efficiency is also very low (Hassib & Etemadi, 2016).

Some private townships around and within the city have their own decentralised wastewater treatment plants. There are also government complexes including army bases with their own treatment facilities. In general there is no monitoring system in place and no data available regarding the level of treatment and efficiency of treatment facilities.

Current enforced policy on urban water supply and wastewater was developed by MUDH in 2005 and entitled “Urban Water Supply and Sewerage Sector Policy” (MUDH, 2005). According to this policy constitutional, regulatory, and operational roles are separate and the tasks are performed by different independent organizations: MUDH takes care of constitutional issues while a regulatory body and a government-owned corporation are in charge of regulatory and operational functions (Etemadi et al., 2012).

On-site sanitation is the main system used in Kabul, but it is not regulated well and the enforced policy did not address it properly. As mentioned, currently MUDH is working to update the policy reflecting the actual situation on-ground. It also has plan to establish the regulatory body according to the road map delineated in the current policy.

Following the fall of the Taliban Kabul City has been expanded to an unprecedented level. Nowadays there is less agricultural activities in and around the city, and also less demand for the products of traditional latrines. Above that many households are switching from dry technologies to water-based systems which is considered a modern and convenient technology among the citizens. Therefore use of traditional latrines are becoming more and more limited.

It is a critical time for Kabul where urban characteristics are changing fast; many investments taking place for re-establishment of infrastructure, governance and urban services. Sanitation is also getting more attention and the time is conducive to assess the sanitation requirements for Kabul with a sustainable and integrated approach. To do so, before introducing a sanitation management plan, it is important to have a precise analysis of the situation in the city. Due to the wide use of on-site sanitation facilities, FSM investigation should be an important part of sanitation study within the city.

Substantial parts of Kabul are unplanned or peri-urban areas (World Bank, 2004a). There are various efforts undertaken by different national and international organizations to improve the poor sanitation situation in Kabul City. But these interventions are fragmented and without a

holistic approach due to lack of a complete picture of sanitation situation in the city. Developing a comprehensive sanitation approach and following that a sanitation master plan based on a detailed situation assessment and data collection is key to sanitation improvement in the city.

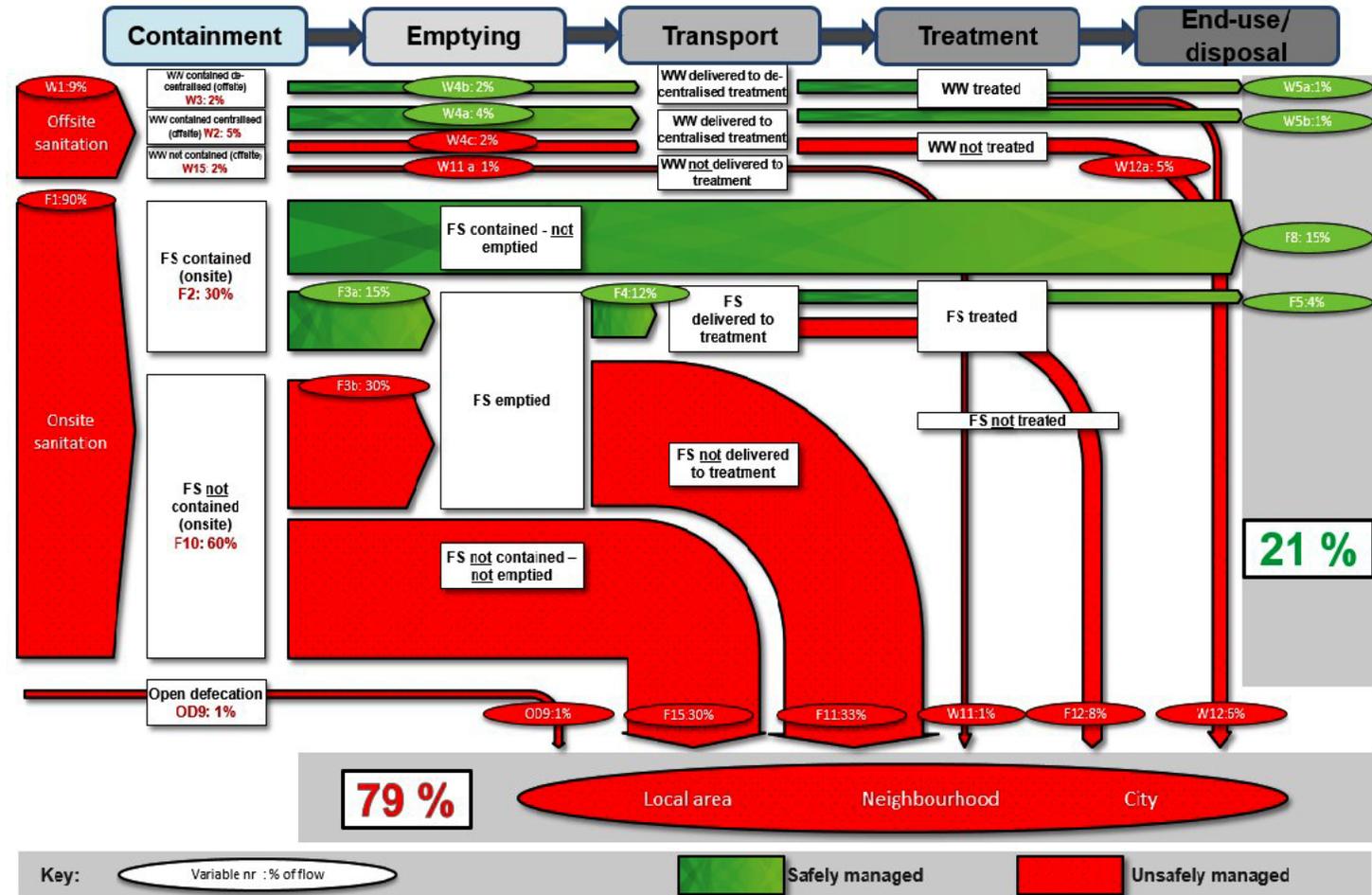
To develop a Shit Flow Diagram (SFD) for Kabul City and evaluation of the faecal sludge management, a data collection and analysis simultaneously with the data collection for this dissertation was done. The results of the study in a joint cooperation with German Society for International Cooperation (GIZ) as a report was published. Here we avoid to repeat it again, and the full investigation can be found on Internet as “SFD Report - Kabul, Afghanistan - SFD Promotion Initiative.¹”

The report goes through the sanitation chain in Kabul City and explains the existing sanitation situation. It evaluates different systems, technologies and practices in Kabul City and tries to develop a comprehensive picture showing the current sanitation condition within the city. Finally it develops a Shit Flow Diagram (SFD) showing the entire sanitation chain in the city (Figure 8). The results show only 21% of the faecal sludge in Kabul City are managed safely and the remaining part discharge in the environment without treatment.

¹ <http://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/2612>

Kabul / Afghanistan (23. June 2016)

Desk based



© University of Leeds, as part of the "SFD Promotion Initiative" project, with financial support from the Bill and Melinda Gates Foundation.

Figure 8: SFD Kabul, Afghanistan (Hassib & Etemadi, 2016)

4. Case study Investigation: Kabul's Informal Settlements

Chapter four briefly explains the sanitation situation in the study sites. It describes the current level of sanitation provision in the sites, and following that compares the implemented sanitation approach to the common steps in the popular sanitation planning. To get the details of sanitation situation in the study sites please see Annex 4.

Primary sanitation systems for the study sites are introduced and based on that the best possible solution will be suggested. A SWOT Analysis for the final selected system is conducted and different scenarios with regards to operation and maintenance will be discussed.

The findings of this chapter pave the way for later investigations on Kabul's informal area linked to the city-wide sanitation.

To evaluate the existing sanitation situation in Kabul City comprehensive household surveys in two informal neighborhoods of Kabul City were conducted. Furthermore several key informant interviews with different stakeholders including practitioners, government authorities, beneficiaries, private sectors and NGOs were done.

Considering Kabul's typology two different study sites were selected; site one in a flat informal area in Nahia 13 and site two in a hilly informal area in Nahia 2 (Figure 9). The general condition for the site selection was based on the criteria which was explained earlier in the methodology section.

Masjed Itefaq, site no. 1, is located in western Kabul, Nahia 13. It is a flat area and in few parts prone to flooding (Figure 10). Nahia 13 is considered totally informal and most of the area was expanded rapidly during the last decade. Dehghouchak area, site no. 2, is an informal hilly area located in Kabul's downtown (Figure 11). It locates just few kilometers away from several high profile government buildings including Kabul Municipality and Ministry of Education. The whole neighborhood is unplanned and not included in Kabul's master plan.

In the each study site a semi-structured household survey was launched. Following that to answer some questions raised during the primary data collection and also fill the gaps after the desk study, several focus group discussions (FGDs) for males and females in the both study sites were conducted.

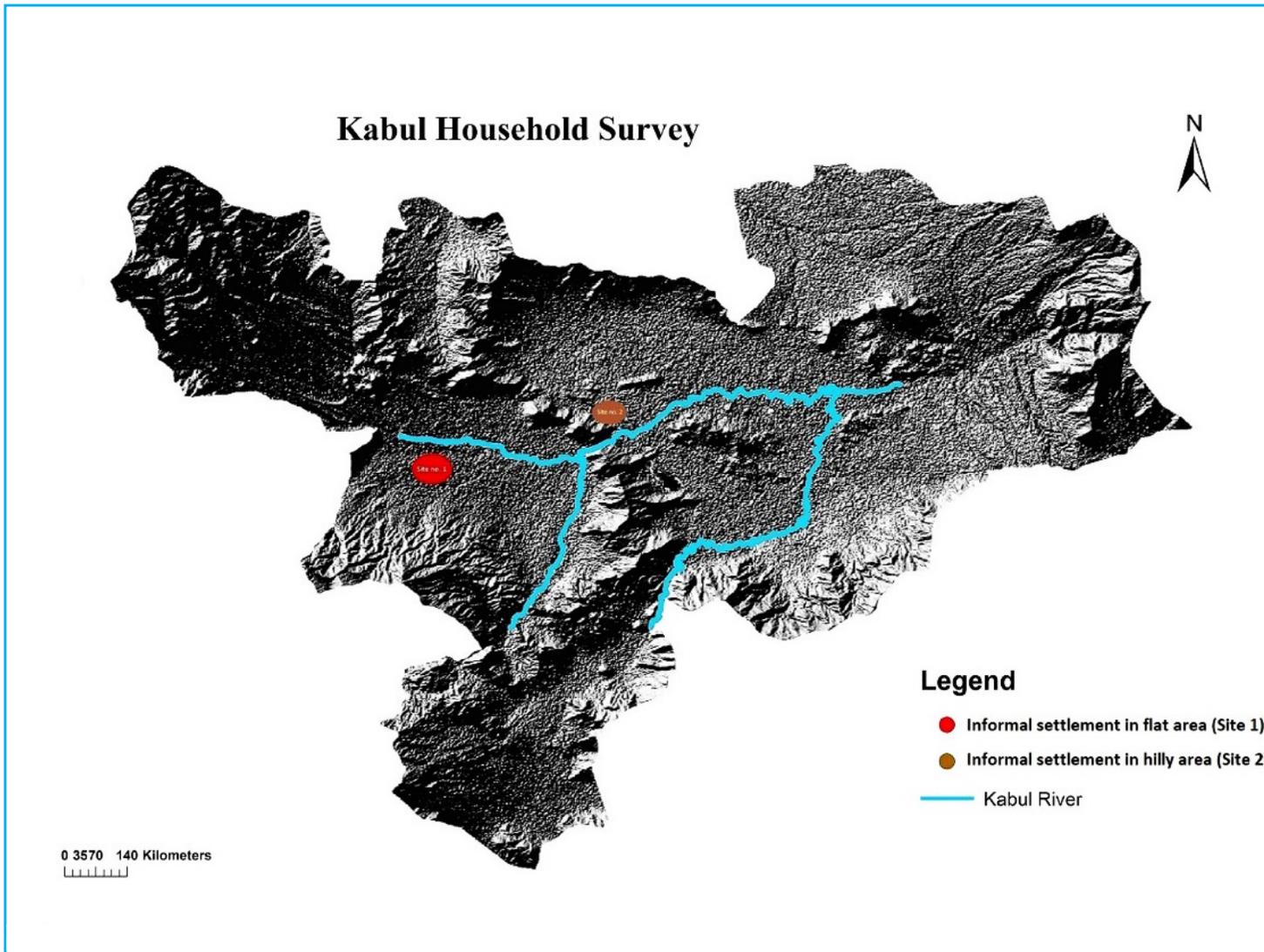


Figure 9: Site selection in Kabul City (Basemap: World Imagery. Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Author: Hussain Etemadi)

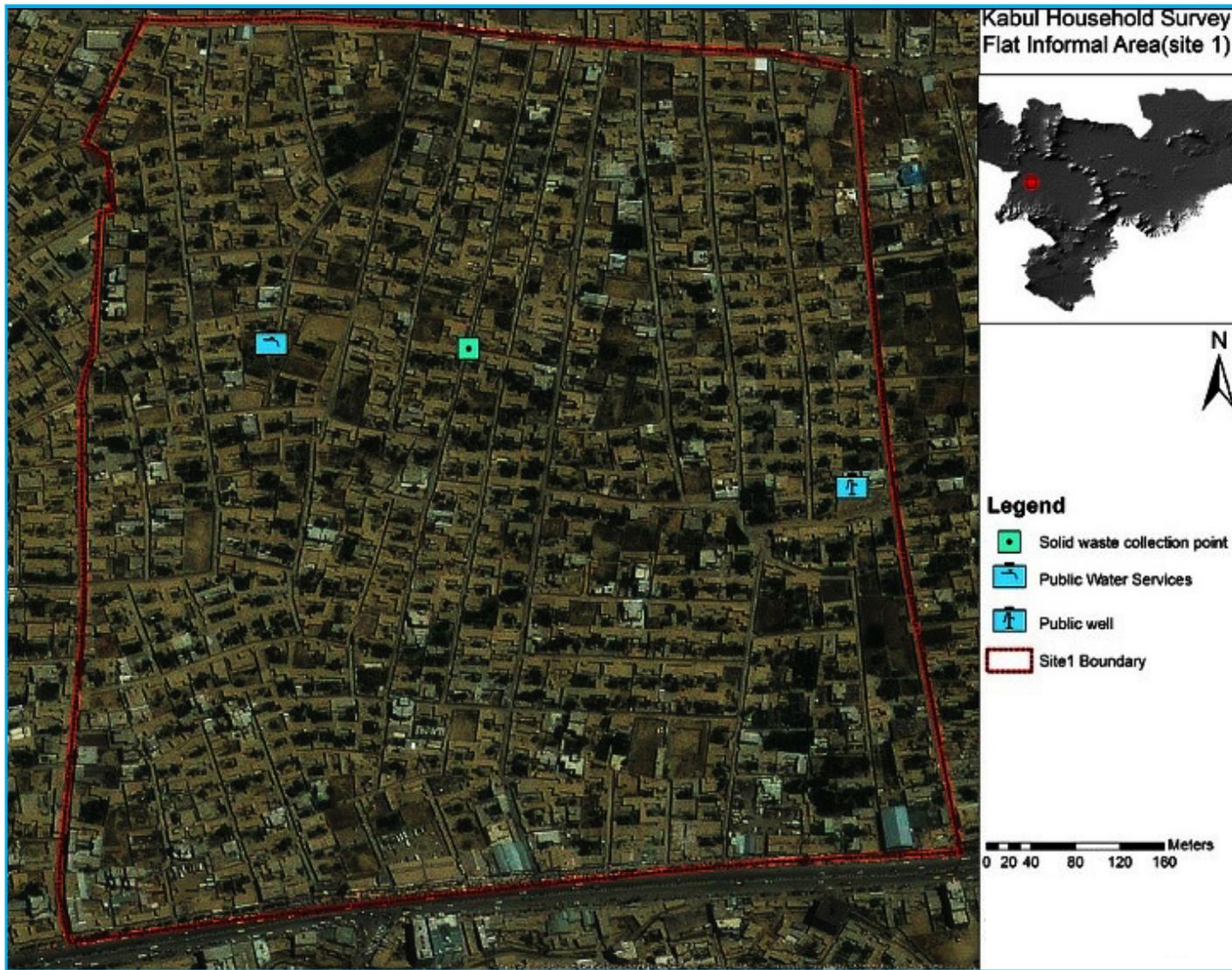


Figure 10: Site one, Kabul's informal flat area (Source: Google Earth, 2015)

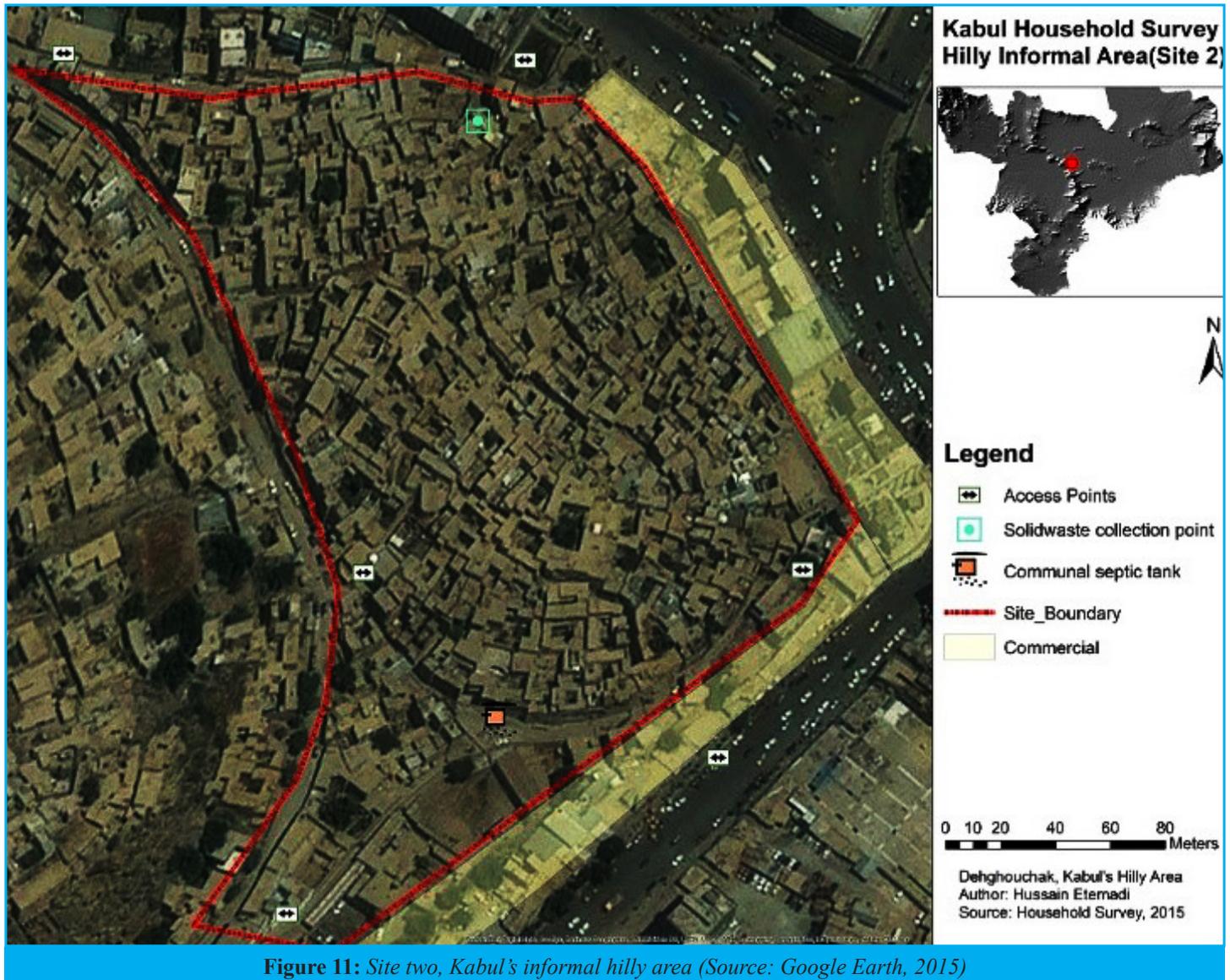


Figure 11: Site two, Kabul's informal hilly area (Source: Google Earth, 2015)

Household survey was conducted in randomly selected houses in site one. Totally 319 households out of about 1000 households were interviewed. In many house compound there were two households, and only one of them, by chance, was asked for the interview. Site two was smaller than site one. It consists of 179 house compounds, and all the households were covered.

It is noteworthy to mention that household is the unit of analysis in this study and means people who eat from same pot in a housing unit which is usually around eight persons in the study areas.

To avoid possible problems related to paper-based survey including data collection and especially data transfer, ODK Software, which runs on mobile device, was used. There was an internet account secured with a password for the interviewers. All the surveyors using their mobile device and through internet connection could submit their data directly. For more information about the tool please visit ODK website¹. The final collected data by Excel software was analyzed.

To avoid any unforeseen problems during the survey, before starting the main survey several questionnaires using ODK Software were filled out. That helped the survey team to understand potential problems during the survey and have a solution for that in advance.

During the survey, for a better coordination and covering all the interviewees including men and women, several survey teams, each team consists of one male and one female, were formed. Totally 7 surveyors including four females and three males were trained to conduct the surveys.

To go more in details, totally five focus group discussions (FGDs), two for the males and three other for the females was held. In each focus group discussion participants were the residents of the communities including Community Council Members called Gozar Council members (GCS) and also Cluster's representatives which are representatives of different parts of a community.

For cross checking and making a concrete analysis several interviews with the key informants from sanitation sector was held; the main stakeholders are MUDH, KURP authorities, Kabul Municipality and practitioners.

The main objectives to conduct the surveys were as follow:

- Collect data and get impression about the current level of sanitation provision
- Understanding household sanitation and hygiene practices
- To understand the reasons behind existing sanitation services
- To identify the relationship between hygiene and sanitation
- Recommendations for future sanitation intervention in the informal settlements

4.1. Findings in Site One

Percentage of the male interviewees was 54 percent compared to the female which was 46 percent. Half of the respondents had less than 32 years old and the average of respondents' age was almost 36 years old. The average number of each family in Afghanistan is about seven to eight which is the case here also.

Water Supply: KURP project has provided the whole community with groundwater shooting out directly to the distribution network. Each household has its own water meter and based on that pays the bills. When the upgrading project was completed, KURP handed over it to AUWSSC which has responsibility for operation and maintenance of water supply and sewerage projects in

¹ <https://opendatakit.org>

the urban areas. There are few public wells within the community, but almost all of them are either broken or dry. The public wells were used before the upgrading project and their operation and maintenance mainly was done by NGOs or MRRD (Figure 12).

Due to unreliability of water provision by AUWSSC, some households receive water from private water supply companies or use their wells as well. In many cases the households have two water meters belonged to different water supply providers.

According to the survey, 75 percent of the households have piped water extended only to their yards, following that nearly 10 percent of households use their own motorized bored-well and plumbing systems and almost seven percent have their own plumbing systems but rely on the public water supply. The remaining households use public wells or their shallow wells. In all the categories water accessibility is a challenge. The level of groundwater has been dropping down and public water supply is not reliable. Above that many shallow wells are dry.

Some areas within the neighborhood have access to water only during day and the water pressure is usually not enough. During cold season due to the shortage of electricity, water is available only for few hours per day. In one case local people had to remove a trash point in the community and dig a public well. Considering their affordability, many households try to have several options: getting connected to the public water supply, private sector connection, their own or public wells.

Regarding water quality there are many reports by national and international organizations which show Kabul groundwater has been polluted mainly due to improper management of wastewater in the city. The level of pollution in shallow wells are higher. AUWSSC and private companies in some cases use chlorine for water disinfection, but there is no proper schedule or standard for that. According to the survey, 88 percent of the population in site one use water without further treatment.

Surface Water Management: Drainage system construction and road pavement is the main component of KURP upgrading project. 87 percent of the interviewees believe that the drainage system is working well, while 22 percent complain about the stagnant water in the neighborhood and 28 percent are concerned with flood problems during the rainy seasons.

In some parts of the neighborhood there is no enough operation and maintenance either by the residents or by the municipality. Some canals are permanently blocked by the residents. There is one street in the neighborhood without any upgrading; it seems there was no house in that part during the upgrading project.

Sanitation Management: Sanitation technology divided into wet and dry options. The wet or water-based technology means it needs water to flush the excreta. The dry technology does not require water for excreta transportation (CStep, 2016). Traditional raised-vault latrine is the main dry system used in Kabul City (Figure 13).



Figure 12: Public wells in the study areas. Source: author

According to the survey, in terms of sanitation system, 57 percent of the households have traditional improved latrine which is a kind of dry technology. About eight percent of the latrines are not in a good condition. 43 percent of the households use water-based technology which is mainly pour flush toilets.

The materials which are used for the construction of toilets are bricks, concrete and in old houses mud, but usually all of them are strong enough and in a good condition in terms of robustness. Dry toilets in most cases are not lined, but constructed above the ground to prevent groundwater pollution. They have pipe that divert urine and anal cleansing water into the surface drainage channels. But in many cases due to the improper operation and maintenance, the system doesn't work well and creates many health and environmental problems. The problems are more when the users are washer, which is the case in many parts of Kabul.

Dry faeces is collected in the containment section for later use by farmers as soil conditioner. Containment has a door which opens into the street. When a dry toilet is full the collector has access to the faeces from the street.



Figure 13: Dry toilet in Kabul's informal area: internal space (l), Outside view (r).
Source: author

Before upgrading the area, about 11 percent of the households used flush toilets and KURP project only improved dry toilets (SMEC International, 2011). KURP project with installing a door and a ventilation pipe for each containment, improved the general conditions of dry toilets. But according to the current data during the household survey, the percentage of households using water-based system is increasing and 91 percent of the interviews prefer to use flush toilet, following that five percent interested in dry toilet and four percent prefer composting toilet.

There are few lined holding tanks in the area. Many households cannot afford to construct such tanks. Furthermore due to lack of outlet in this holding tanks, the operation and maintenance cost is high. Local people who have water-based system, have a flush toilet connected to soak pit. Such facilities cost around 200 \$¹ while a holding tank or a septic tank could cost 10 times more. In terms of operation and maintenance, a soak pit should be emptied each two or three years while a regular septic tank (holding tank) or traditional toilets get emptied one or twice per year depends on the population of each house. In general, dry toilets need to be emptied more than water-based toilets. Above that in some cases in water-based systems, the soak wells are made intentionally in a way to avoid emptying for a long time. That also help to decrease the operation and maintenance cost (Figure 14).

¹ Based on an interview with a service providers (Please see annex 1)

According to the survey, each toilet in average is used by 10 persons. In site one, mostly two families in each house compound live and share the toilet.

Water-based systems can be installed inside a building. In this case, it is usually used only by one family, but dry toilet is installed in yard which is shared between the whole residents.

The products of dry toilets are usually taken away by animal carts to farm lands. It is spread over the ground under the sunlight for a while and then applied on the agricultural lands. In some cases if the products are left on the solid waste collection points, it is removed by the municipality.

The sludge produced in a water-based system is usually collected by vacuum trucks and delivered to the only Kabul treatment plant. But in many cases, the sludge is also discharged somewhere illegally.



Figure 14: Many households are converting their dry toilets to water-based technology, mainly flush toilet connected to a soak well. Usually Concrete hollow rings (l) are used to construct a soak well (m & r). There is possibility of wastewater infiltration into the ground at the bottom, through the pores in the rings' walls and also the space between the rings. It usually takes several years to have a soak well full. Source: author

Greywater Management: Greywater as the largest part of household wastewater is mainly discharged into the drainage channels or on the streets without treatment. According to the survey, about 70 percent of the households discharge their greywater into the drainage channels across the neighborhood (Figure 15).

While dealing with and exposure to blackwater and fecal sludge is prohibited culturally, it is also considered a low profile practice. But in cultural point of view exposure to greywater is not a major problem and the households discharge it freely into the drainage system. Greywater is mainly wash water which is a mixture of kitchen, laundry and bath used water.



Figure 15: Greywater discharge: many households discharge their greywater into the streets.
Source: author

Solid Waste Management: There are different practices in terms of solid waste collection within the neighborhood: While 47 percent rely on collection points, 33 percent use public spaces allocated for solid waste collection and 15 percent have door to door collection in the area.

Usually alongside the main streets there are some big solid waste containers operated by Kabul Municipality. Some households take their solid waste there, if they live in walking distance.

KURP project constructed two trash points within the neighborhood for solid waste collection, but they are inside the community and not operated well by the municipality.

In case of door to door collection, the worker is paid by the community itself. In general, solid waste management condition is not good and there are many problems. 80 percent of the households do nothing in terms of recycle or reuse of their solid waste while 17 percent recycle or reuse their solid waste for different purposes. They usually sort out their solid waste to sell some useful parts, burn them to warm their houses in cold seasons or to feed their animals (Figure 16).

According to the households, the frequency of solid waste collection in average is two to three times per week. But usually solid waste collection at the higher managerial level is not effective, and in some cases for several weeks there is no collection by the municipality which creates big problems across the city.



Figure 16: Solid waste management in site one: Solid waste container alongside a street (l) and open space used for waste disposal (r). Source: author

Health and Hygiene: The main achievement of a sustainable sanitation management in developing countries should be public health and following that environmental quality. Therefore the impact of KURP project on the general public health in the area is important. Considering the level of public health before and after the project, we can say if the project was successful or not.

To understand the health condition within the neighborhood, three questions including health condition in winter, summer and also respecting of precautionary measures were asked. According to the results of the survey, especially during summer time diarrheal and water-borne disease were the major challenges. Low-quality water, lack of hygiene, lack access to enough water for cleanliness and low public awareness were the main reasons for this problem.

Handwashing practice with soap was used as the main proxy measure for hygiene. In the first question people were asked about their handwashing practices and in the second question about the materials which were used for handwashing. But there were some other hygiene-related questions like food hygiene as well.

Almost 82 percent answered using soap when it is needed, which cannot be considered as a proper hygienic behavior. And about 18 percent of the interviewees didn't use soap at all which is a big number.

According to the reported observation by the surveyors regarding general appearance of the interviewees, almost half of them had good conditions in terms of handwashing, clean clothes, finger nails, etc. and 36% had very good conditions. Regarding general hygiene including food hygiene, general situation inside the houses and kitchens more than 70% had good conditions, but only about 45 percent of the households had hand-washing facilities near their toilets.

Installing handwashing facilities inside or near the toilets is an important factor for public health protection. In regards to dry toilets, handwashing facilities inside a toilet cannot be installed. To have a well-operated system, we need to avoid introducing water into the system. In addition, due to difficulty of proper operation and maintenance of a dry toilet usually the inside atmosphere is not so pleasant to stay long. Therefore even there is a way to divert used water from the containment, many people still prefer to avoid installing handwashing facilities inside the toilet.

Above that, dry toilet is usually constructed where households do not have the affordability of a water-based system and most probably they do not have the luxury of inside or immediate outside handwashing facilities as well.

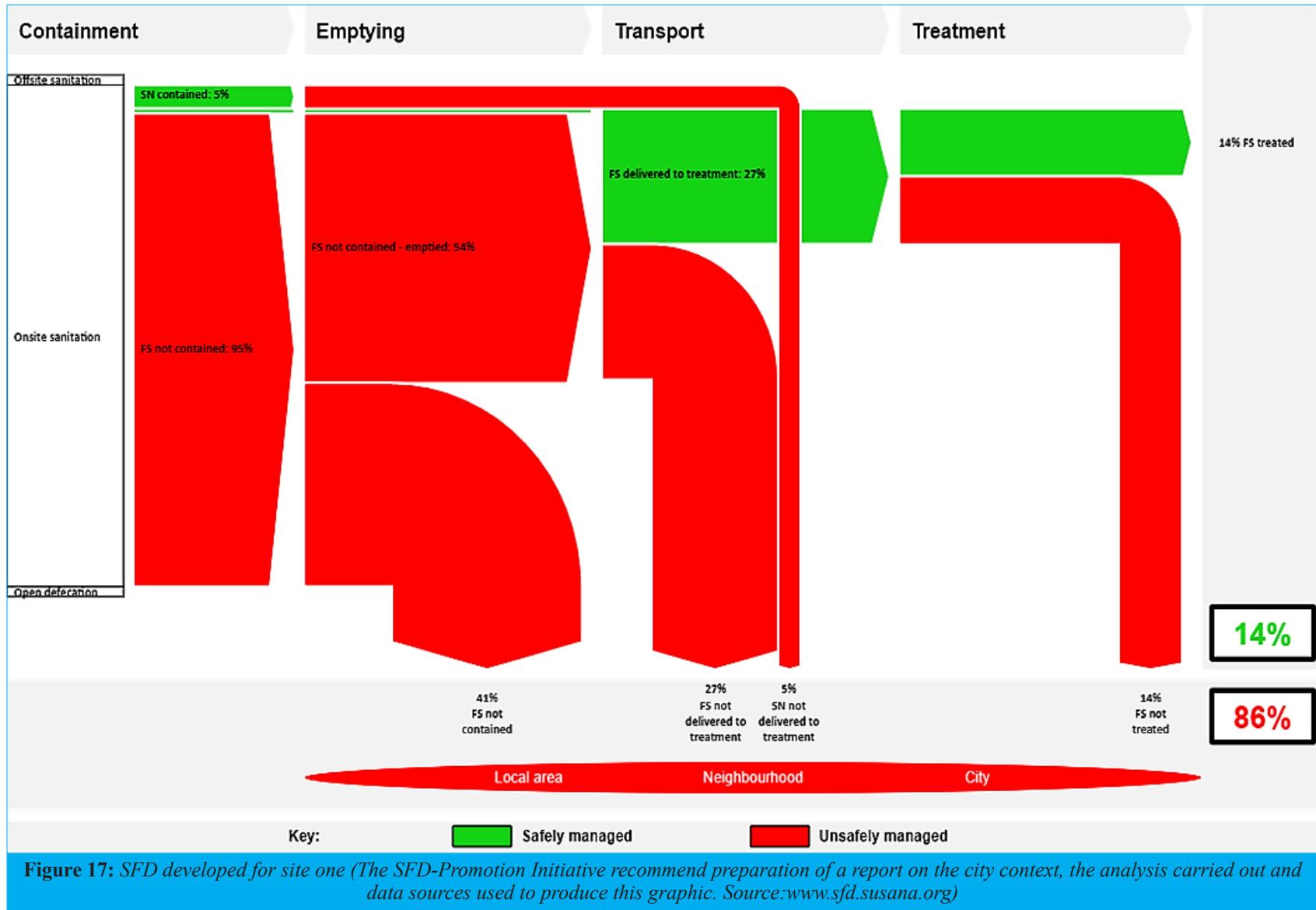
Another point is the type of water provision inside the compounds. Most of the households have a tap in their yards. They use the tap for different purposes including water collection, washing dishes, clothes or their hands. According to the observation, many houses have big yards and water tap is not close to the toilet, but still convenient to use it for handwashing after visiting the toilet.

Availability of handwashing facilities near the toilets was 45 percent which is not enough for a hygienic practice. Furthermore according to the interviewees only 42 percent of the households cited handwashing practice after visiting toilet.

As a conclusion, it is difficult to say an exact percent for the handwashing practice within the neighborhood. But it is clear that the percentage of the practice is low. It seems beside any kind of physical intervention for improvement, public awareness at neighborhood level and schools is necessary.

It is beyond the scope of this dissertation to explain the whole details of the household surveys done in the study areas. But the completed report titled “Household Survey in Kabul” is available for more investigation (please see Annx. 4). Furthermore in a master thesis titled “Sustainable Sanitation Planning for Urban Informal Settlements” at HafenCity Hamburg University the sanitation sustainability in site two was evaluated. The author of this dissertation was engaged in the master study as the data provider and also second supervisor (Parikh, 2015).

To sum up, Figure 17 shows the SFD developed for site one after the upgrading: The required data for the SFD development was collected through the household survey and field investigation in Kabul. Comparing the sanitation situation in site one to the general sanitation situation in Kabul City shows that the upgrading activities, at least in respect to sanitation improvement, was not successful. While safely managed faecal matter in Kabul City is about 21 percent (Figure 8), in site one the percentage is only 14 percent following the upgrading.



4.2. Findings in Site Two

The majority of respondents in site two, 59 percent, were female and the average age of the respondents was 36. Site two is a hilly informal area and access to enough space is not always possible. More than 70 percent of the interviewees are property owners and they do not have tenants.

Water Supply: In terms of access to water for sanitation, washing and drinking purposes 87 percent of the households have water tap in their yards or inside the dwellings provided by the government. The percentage is same in different seasons and according to the survey, there is no major water problem and the households are satisfied with the water supply.

Almost everybody has access to piped water within the neighborhood. About four percent who has no access to the piped water within their houses are still able to collect water from public taps or mosques which is free and very close to them.

Surface Water Management: In general the households are satisfied with the drainage system but 30 percent complaining about stagnant water in the neighborhood and 22 percent are affected by flooding problems in rainy seasons. It seems there are some problems with functionality of the public drain but mostly due to below reasons:

- Lack of proper solid waste management, which blocks many canals, and during rainy seasons in lower areas within the neighborhood could cause flooding. During direct observation within the area, lack of proper solid waste management was tracked clearly.
- Households in the area discharge their black water and greywater into the drainage system. It creates severe health and dysfunctionality problems.
- There is no proper operation and maintenance in place: There are many blockages due to the solid waste and high amount of wastewater in the channel.
- The public drain is connected to a main drainage system located in a congested street. The drainage system is usually blocked with solid waste. This situation also affects the functionality of the public drain in the upstream.

Sanitation Management: 63 percent of the households are using flush toilet, and 37 percent rely on dry toilet; among this 37 percent, 20 percent have no improved latrines. Site two is an old and historical site, and some houses are constructed below the street level. The number of unimproved toilets, either no improvement during the project or facing some damages after the upgrading, is high.

The survey results showed that currently 63 percent of the households in site two had flush toilets. According to a survey by the KURP project in an adjacent neighborhood which was hilly area and very similar to our case study but without upgrading, 88 percent of the households had traditional toilets (SMEC International, 2008). Above that during KURP project in site two only dry toilets were improved. Therefore almost all the houses with water-based toilets, have converted their traditional toilets to a wet system after upgrading. In the area there is only one communal septic tank constructed by KURP, which covers only 13 houses.

Depending on the technology used at each house in the area, manual and mechanical emptying is available and usually provided by the private sector. But many of the households, with wet

system, discharge their wastewater including blackwater into the drainage system (Figure 18). Above that due to difficulty of the night soil disposal many households, with dry system, dispose their night soils using the rainy weather opportunity. The rainwater wash away the night soils which creates many problems in the downhill during rainy seasons.

69 percent of the respondents mentioned to 'nobody empty their toilet facilities.' Most probably they have connected their facilities to the public drains which is neither legal nor easy to mention it. 13 houses rely on the communal septic tank. But according to the community's representative sometimes the overflow of the septic tank discharges into the public drain. In few cases there are individual septic tanks or soak wells in the area. But in general due to the rocky ground in the area, it is very rare.

In some parts of the neighborhood, it is difficult to be connected to the public drains: The street level is higher than the house levels and the households have no option except dry toilets.

In site two 76 percent of the households are satisfied with their sanitation facilities. Their reasons for the satisfaction are cleanliness and convenience while unsatisfied households have mentioned to dirty condition, fly and odor. The reasons mentioned for the lack of satisfaction show that most probably the households with dry toilets are not satisfied with it. Dirty condition, fly and odor usually is the case with improper maintenance of dry toilet.

But households who have wet system, despite their connections to the drainage channels, are satisfied. It seems the households are not enough aware of the health risk of their practices for the community and also other citizens.

Furthermore according to the survey about 90 percent of the households are interested in wet system. That can be another reason for the high popularity of the current practice despite its major health risk.

Greywater Discharge: According to the survey, almost 60 percent of households discharge their greywater without treatment into the drainage system while 22 percent use septic tank and 16 percent discharge it on the streets. Discharging greywater on streets or into public drains without treatment is a normal practice in many part of the city and if households have the possibility, they usually do it.

The percentage of the households who discharge their greywater into the public drains is more or less similar to those who discharge their black water into the drainage channels. Because wherever possible, the households have used the public drains for the wastewater discharge.



Figure 18: In hilly informal area (site 2), the majority of the households use water-based system. The public drain is mainly used for all kind of domestic wastewater disposal (l). Usually lack of proper solid waste management and drainage maintenance blocks the public drain (m). Furthermore, covered public drain makes difficult operation and maintenance of the drainage system. Finally, the public drain is connected to a road side ditch located on a congested street without a proper maintenance. That makes the situation more complicated (r). Source: author

Solid Waste Management: according to the survey in site two, 71 percent of the households use the collection point allocated for the solid waste, and 27 percent use public space available in the neighborhood while two percent have access to door to door collection.

There is no door-to-door collection by Kabul Municipality within the neighborhood, but some shops and houses located near the main street have the chance of door-to-door collection by the municipality. There are some open spaces within the neighborhood, which is used for solid waste disposal although not legally allowed. As mentioned, KURP project constructed a trash point in the neighborhood which is used by some locals, but there is not a proper operation and maintenance in place (Figure 19).



Figure 19: Solid waste management in site two: a solid waste collection point constructed by KURP (l) and an open space used for solid waste disposal (r). Source: author

Health and Hygiene: According to the survey, the percentage of diarrheal diseases in winter is six percent, but in summer time is 23 percent. Comparing to the rate of diarrheal diseases before the project implementation which was nine percent in autumn 2007, there is no significant changes at least in terms of water-borne diseases (SMEC International, 2008).

84 percent of the respondents mentioned to handwashing practice when it is needed. But at the same time only 36 percent mentioned to handwashing practice after visiting toilet. Although practice does not always correlate with the knowledge, but it seems there should be more activities in respect to public awareness. Hygiene has usually two main aspects: awareness regarding personal hygiene, and then possibility of putting the knowledge into practice. To increase the above-mentioned percentage working on both aspects are needed.

According to the surveyors, regarding general hygiene condition almost half of the respondents were in good condition and about 34 percent were in very good condition. They also mentioned that 60 percent of the households stored their foods hygienically which means clean, off-ground and covered. And in 55 percent, the kitchens were in a good condition. But 52 percent of the houses had no hand-washing facilities near the toilet despite access to a reliable source of water and high percentage of wet system.

As a conclusion, Figure 20 shows the SFD developed for site two after the upgrading: The data collection for the SFD development was done through the household survey and field investigations in Kabul. Comparing the sanitation situation in site two to the general sanitation situation in Kabul City shows that the upgrading activities, at least in respect to sanitation improvement, was not successful. While safely managed faecal matter in Kabul City is about 21 percent (Figure 8), in site two following the upgrading the percentage is only 4 percent.

This percentage of safely managed faecal matter in site two is lower even than site one. As mentioned earlier, the households simply connected their toilets into the public drains. Black waster, greywater and surface water in the area mostly discharged into the surface drainage channels without treatment. Even the overflow of the communal septic tank goes to the public drains. Even disposal of human waste from dry toilets, especially in rainy seasons, is not safe. Such kind of practices make the sanitation situation worse compared to site one which is already below the general sanitation situation in Kabul City.

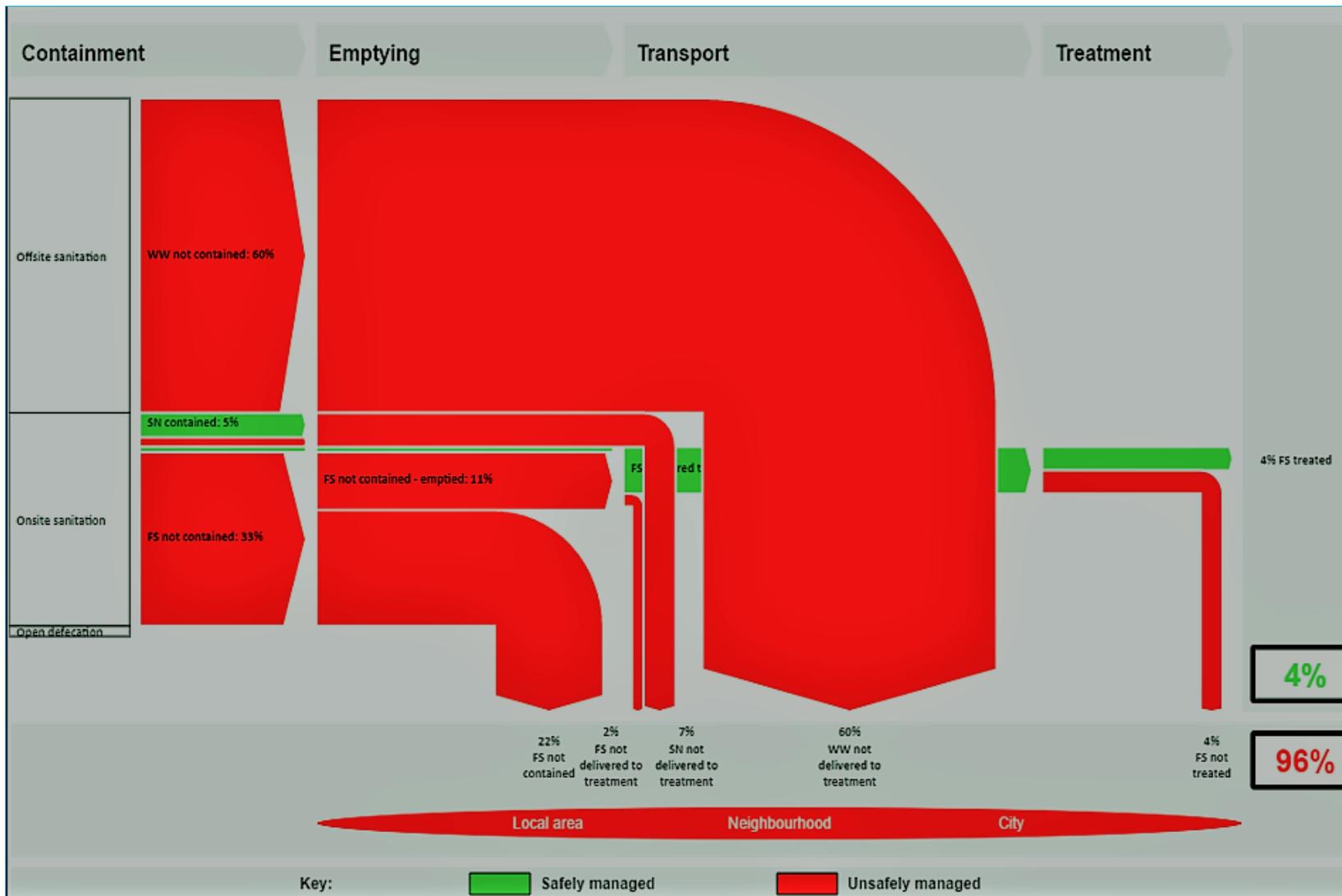


Figure 20: SFD developed for site two (The SFD-Promotion Initiative recommend preparation of a report on the city context, the analysis carried out and data sources used to produce this graphic. Source: www.sfd.susana.org)

4.3. Suitability Analysis for Kabul's Targeted Study Areas

Two study sites are located in western Kabul, and Kabul's downtown. The first step before suggesting a proper sanitation system is a suitability analysis. Suitability analysis will show us which areas in Kabul City are suitable for residential purposes. If our study sites are located within those suitable areas, for them an upgrading plan, including sanitation improvement, should be developed. Following that if the intervention is successful, the upgraded areas can be officially formalized. But if the sites are not on suitable locations for upgrading & living purposes, a short or long term relocation plan should be considered.

Most of the existing informal areas in Kabul City are suitable for upgrading. But there are some exceptions as follows (RECS International & Yachiyo Engineering Co., 2011):

- Areas prone to natural hazards and not suitable for living like steep slope and flood prone areas
- Areas that are important regarding public interest like farm lands or groundwater protection zones.

Usually the main limitation factors for upgrading or construction activities would be greenery areas, groundwater protection zone, steep areas, and water bodies. If an informal area is located on such lands, there is low possibility for upgrading.

Kabul City needs to save its agriculture and greenery as much as possible and any urban development on those areas should be based on a technical analysis which was not possible during unplanned informal development by locals. Therefore our study sites should not be located right in the middle of a big greenery or agricultural areas.

Groundwater is the only source of water in Kabul City. This source is already polluted. It is also under pressure in terms of quantity, and water scarcity is becoming a challenge. Therefore protection of the recharge zones is very important. These areas are usually alongside the main streams, agricultural and greenery areas. So these areas are also considered as unsuitable zones for living.

Many hilly areas in the city accommodate informal settlements. Mountains especially in the downtowns are the identity of Kabul City and should be protected. They also can be a better places as recreational areas to improve the environmental quality. Furthermore providing urban services to the houses located on hilly areas is expensive and sometimes impossible. So we need to know in which areas locals can have urban services and in which areas providing such facilities are not possible. The draft version of Kabul new master plan recommends '30 degree' as the threshold for the relocation (RECS International & Yachiyo Engineering Co., 2011). This study also suggests a similar approach for the informal hilly areas.

To keep the city compact, it is important to avoid any further horizontal development before any detailed and proper investigations. While informal development by locals has no such kind of consideration, therefore our case studies should be located within the current boundary of the city.

Considering above-mentioned points, Landsat satellite image of Kabul City using Arc GIS Software was classified and different features on the image were determined (Figure 21). Finally two site studies were overlaid on the restricting layers to conduct the suitability analysis: If the study sites are placed without violating the above-mentioned criteria, there should be a proper

formalization plan including sanitation provision.

GIS analysis was a minor part of this study used as a tool which helped us for sanitation approach development. Therefore a detailed explanation of the conducted GIS steps is beyond the scope of this dissertation. Here only the outcomes of the analysis and the main GIS activities are mentioned.

Figure 22 shows the result of the suitability analysis performed by vector data. As it is shown, considering the limitation factors for the development, there is no restriction to upgrade the study sites. So developing an upgrading plan and following that formalization can be done in the targeted study areas.

Furthermore, for cross checking, suitability analysis by raster data was also performed (Figure 23). The result is similar to the analysis using vector data. It shows that there is major restriction for development of a sanitation approach for the study areas. But still there are some other issues need to be considered in respect to site two.

In case of hilly areas another important criterion is slope. Residential settlements located on hilly areas face several challenges. In general they are prone to landslide and rock fall. Providing urban services to such areas are more expensive than flat areas, and in some cases even impossible.

Regarding slope analysis, Kabul's Digital Elevation Map (DEM) was used to produce the slope map of Kabul City shown in Figure 24. Following that site one and two were overlaid on the slope map to evaluate their locations.

According to the slope map, site one is located on a flat area with a slope less than 5 degree, while site two is located on a hilly area but still less than 30 degree which is considered as the threshold for the service provision. Main part of site two is less than 15 degree and only small part is higher than 15 degree but still less than 30 degree.

According to the conducted suitability analysis both sites, in general, have no problem for upgrading. But there is a site specific problem regarding site two. It is located on a hilly area at Kabul's down town that is a touristic destination in the future according to the master plan.

Kabul's downtown should have a touristic orientation development. Most of the current official buildings, ministries and also Kabul's bazar will be relocated to another parts of the city to increase the public space and develop the area for tourism industry (RECS International & Yachiyo Engineering Co., 2011). Therefore all the future plans including infrastructure provision for site two should consider this point.

Site two is not a very old neighborhood. The very first construction development in site two was about 300 years ago. There are few places which need to be protected even in case of residential relocation in future (Jaramillo, 2008). But this site, and other residential areas surrounded it, are not a part of Kabul's old City: In Figure 25 developed by Aga Khan Foundation, Kabul's Old City and also the location of site two are shown.

Even many parts of the 'Old City' of Kabul is not that old. Kabul was a small town during the late Mughol Empire; it became again important and big when Timur Shah decided to make it the capital of Afghanistan in 1776. During the Afghan-British war most part of the old city was destroyed. For example, two major historic sites which were built before Timur Shah was also destroyed by the British in 1880: the Mughol-era Chahar Chata Bazar in 1842, and the sixth-

century Bala Hesar. Following that there was also a re-development plan by the 1949-1954 that destroyed many other parts of the old Kabul (Calogero, 2011).

As mentioned, the Draft report of the master plan developed by 'RECS International Inc and Yachiyo Engineering' suggests to convert the downtown to a touristic area and relocate people living on hilly areas in a long-term. This period considers being maximum 30 years while the current locals' buildings require renovation. Renovation should not be allowed in the areas, and the locals should relocate to another place based on a government plan (RECS International & Yachiyo Engineering Co., 2011).

To sum up, In the past many people were interested to live in the downtown which is very close to the city center and main Kabul's market. Even now despite many problems, people who are seeking job opportunities in the city center, prefer to stay close to it even on the hilly areas.

But according to the new master plan, Kabul City should be a multi-center city and the main central-located market will be shifted to urban fringes alongside the main roads. Considering what was discussed above, the sanitation suggestion for site two should be some kind of mid-term facilities.

Although both study sites are suitable for the upgrading, but site two would be subject to a relocation in mid-term: Any upgrading and sanitation provision should consider this point as well. Upgrading here means not only providing environmental sanitation services to the informal neighborhoods, but also providing other required services like road pavement, lightening facilities for the streets and even some public spaces like parks and greenery. Due to the scope of this dissertation except environmental sanitation services other kind of upgrading activities are not discussed in details.

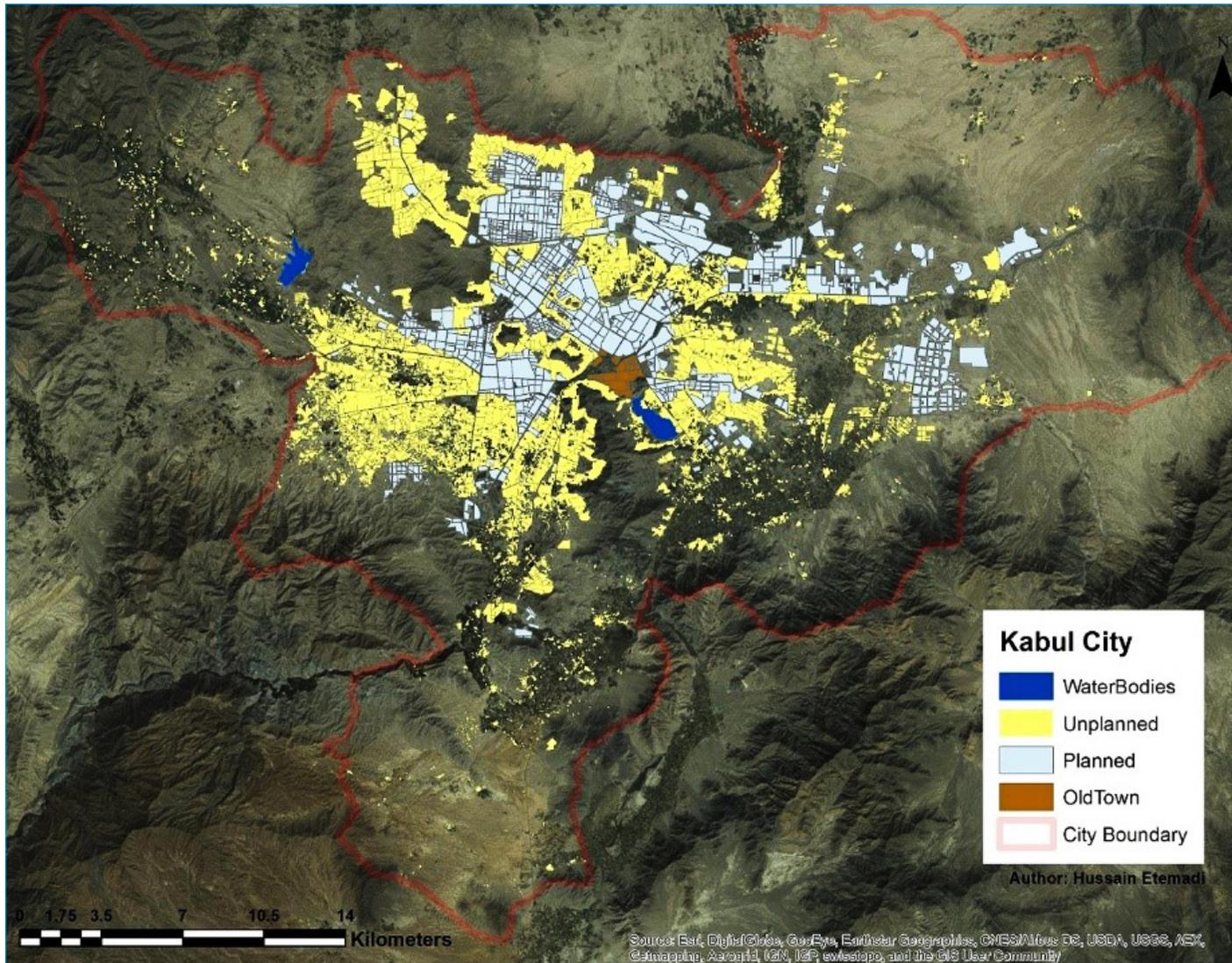


Figure 21: Kabul land use (Basemap: World Imagery. Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Author: Hussain Etemadi)

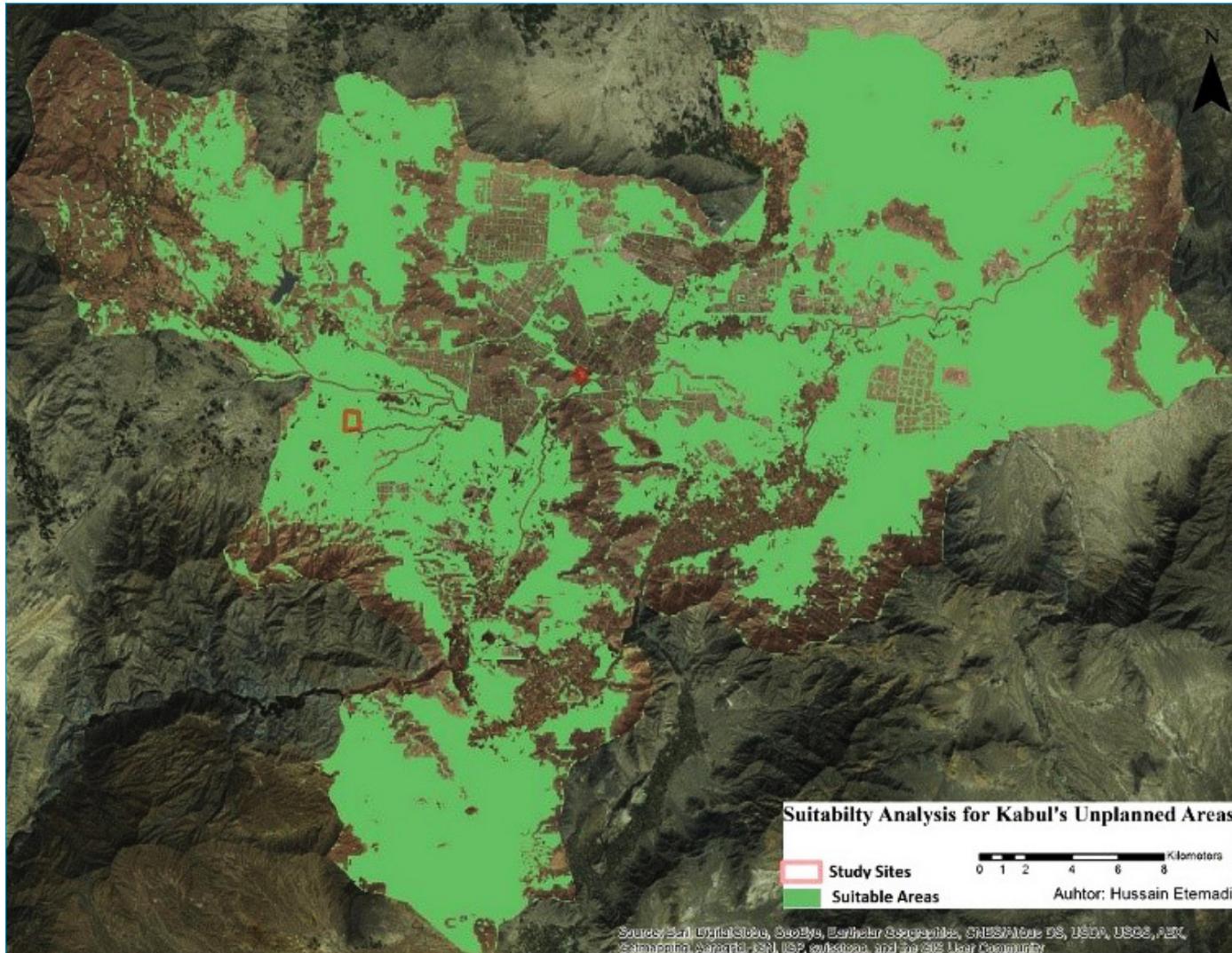


Figure 22: Suitability analysis using vector data (Basemap: World Imagery. Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Author: Hussain Etemadi)

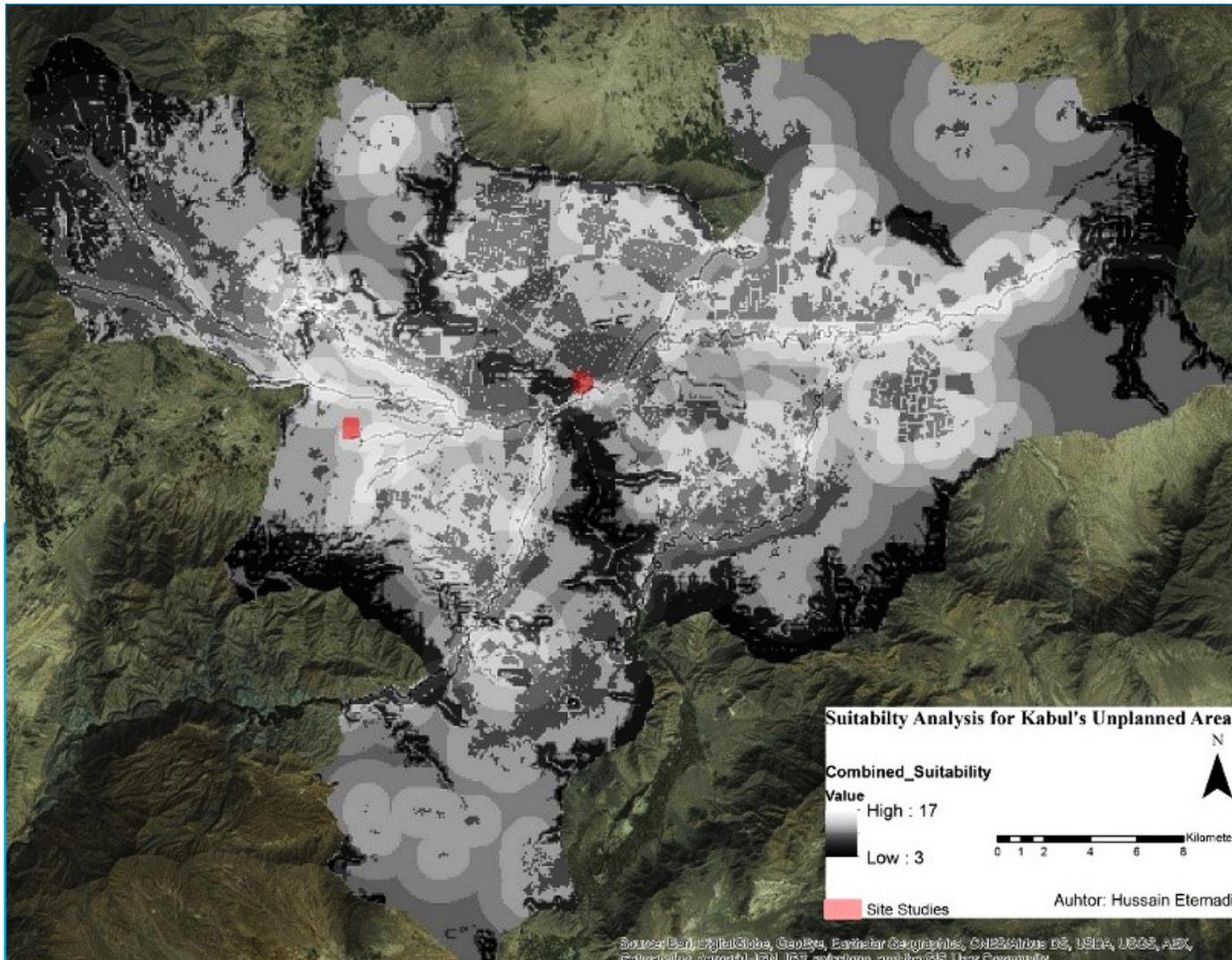


Figure 23: Kabul suitability analysis using raster data (Basemap: World Imagery. Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Author: Hussain Etemadi)

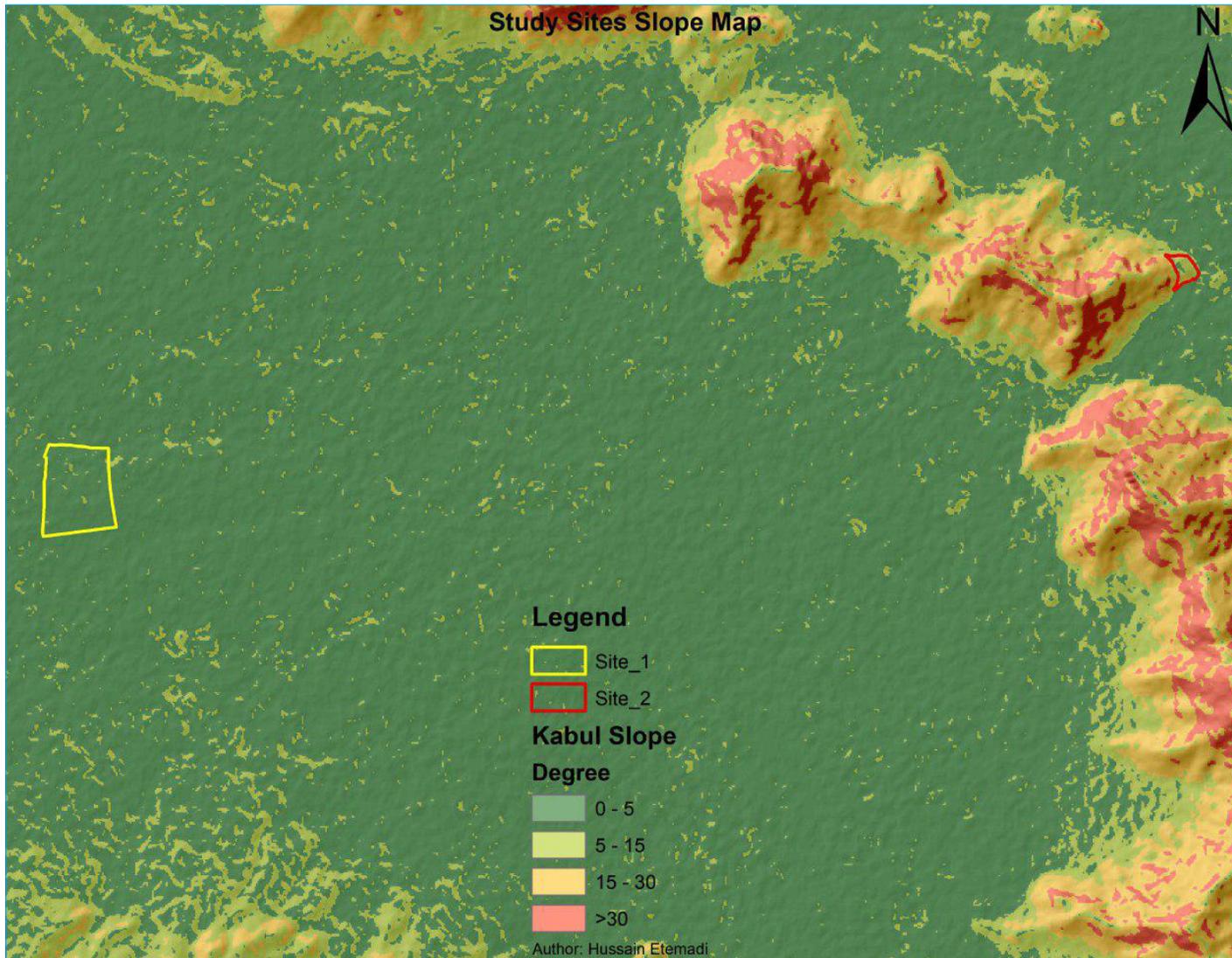
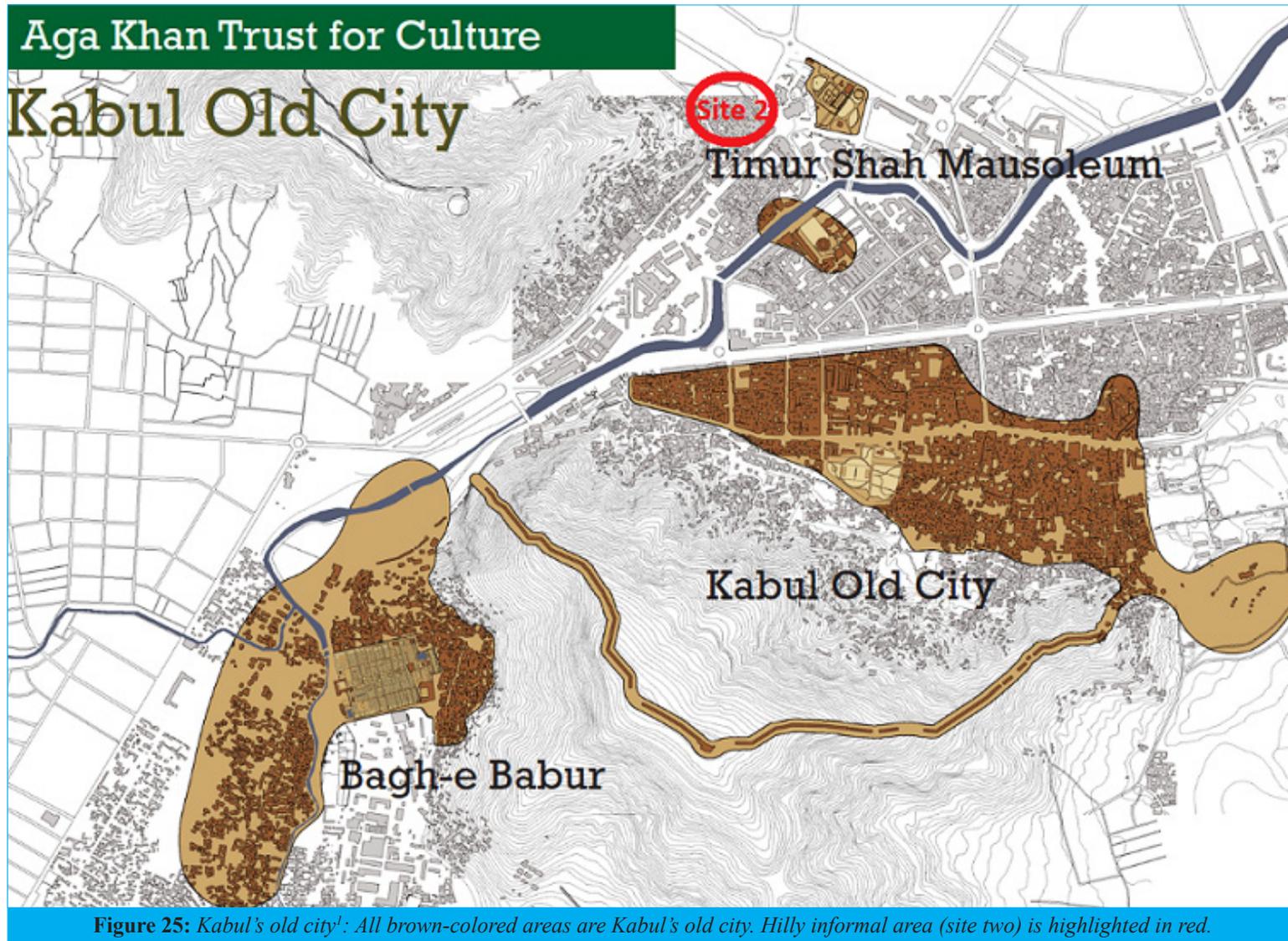


Figure 24: Study sites slope map (Basemap: World Imagery. Sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community. Author: Hussain Etemadi)



1. <https://www.akdn.org/where-we-work/central-asia/Afghanistan/cultural-development/restoration-kabul>

4.4. Sanitation Planning in the Study Sites

Considering the most common steps in the popular planning approaches which was discussed earlier, this study explains KURP upgrading plan, compare it with the recommended activities, and finally come up with a sanitation solution for the study areas. As mentioned in the previous chapters, the main steps for the sanitation plan would be problem identification, define objectives, design options, selection process and finally action plan for the implementation.

As a part of the study, SWOT Analysis will be also used to determine the best possible sanitation system for the study areas. This dissertation through SWOT Analysis will try to highlight the advantages and disadvantages of the recommended system for the study sites, but at the end to get a concrete answer there should be a robust and practical step as well: As an example using pilot projects, which is beyond the scope of this study, would help us for more robust result in respect to the selection of the best possible sanitation system.

There should be some minimal requirements before implementing a sanitation plan in an informal community (Lüthi, Morel, et al., 2011):

- Local government should support the initiative or at least tolerate it
- Availability of local champion within the targeted community
- Institutional capacities for facilitating multi-stakeholder processes

According to the survey conducted in Kabul by author, the aforementioned preconditions more or less were fulfilled by KURP at the first step of the planning. Preliminary meetings with all the stakeholders were supposed to facilitate the planning process. Furthermore, KURP hired several international consultants and also qualified NGOs to support the project in respect to the technical and social issues.

The only challenge at this preparation phase could be Kabul Municipality which was not in favor of the project at the early stages. Originally KURP project, which was funded by the World Bank, was supposed to be implemented through Kabul Municipality. But officials in the municipality were not in favor of upgrading in the informal areas. At the same time MUDH was supporting such approach, and finally Afghan Ministry of Finance and the World Bank decided to work with MUDH (A. Mohammadi, personal communication, May 17, 2015).

It is really difficult to understand how the disagreement in the municipality affected the upgrading project, but Kabul Municipality was cooperative during KURP implementation. They even finally accepted to implement the second phase of the upgrading, called KMDP (Kabul Municipal Development program).

Another noteworthy point for the preparation phase is creating a demand at the community level. The household survey in this study recognized an effective demand among the selected sites for sanitation improvement: KURP project implemented its upgrading projects in different areas of Kabul based on an official request submitted by the communities. They should show a strong commitment for contribution and cooperation. The official requests by the communities could be considered as an effective demand for the upgrading.

According to the KURP authorities, many official upgrading requests were submitted by different communities. But due to the limitations, some Gozars were selected for the upgrading projects. Following the selection, a preliminary meeting with each selected community and other related

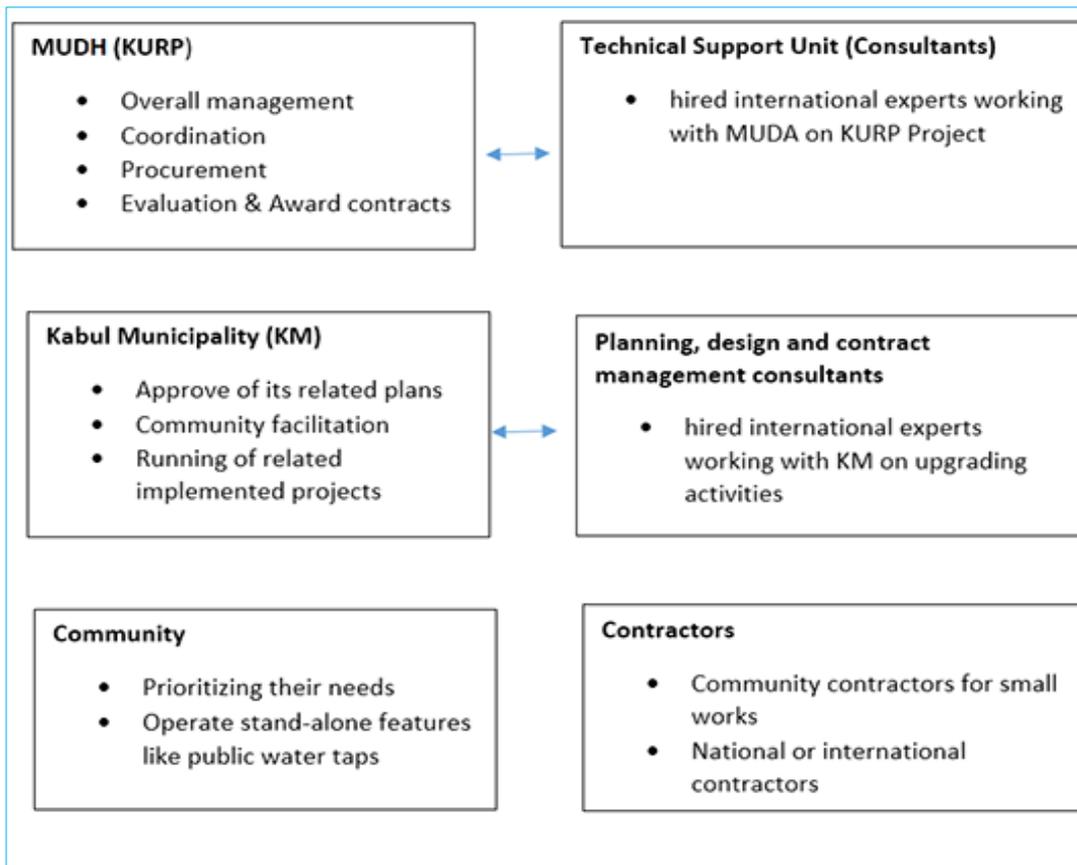
stakeholders were conducted. These meetings can be considered as the first step of KURP approach.

Several stakeholders were involved at the preliminary meetings. Table 7 shows the stakeholders, their roles and also the connections between them to implement the upgrading projects. Practitioners including farmers who were using the products of the dry toilets as soil conditioner were not considered as the stakeholder. Totally there was no stakeholders from the private sector in the planning process. Furthermore, during sanitation intervention, which was only improvement of the dry toilets at the household level, KURP did not consider the sanitation chain. They didn't close the nutrient loop as well. This lack of holistic approach toward the sanitation faced the upgrading with some challenges at the operation level.

KURP had responsibility for the project implementation, Kabul Municipality worked as the project assistant and approved its related parts including storm drains and trash collection points. They also acted as a community facilitator, and AUWSSC evaluated & approved the water supply plans (G. R. Nawabi, personal communication, July 7, 2015).

In step two KURP created a map of the selected areas. This step can be considered as the start of problem identification. Each community, which is called Gozar, in Kabul City has its own official boundaries determined by Kabul Municipality. These boundaries in some areas are more or less proper for implementing an integrated environmental sanitation planning. But there are also cases where due to the technical issues projects' boundaries don't correlate with the official Gozar's boundaries.

According to the KURP definition each neighborhood had about 500 households and each Gozar had 10 neighborhoods. Following determination of each selected Gozar, its neighborhoods were identified. In addition, community leaders were identified and potential social and environmental constrains at this stage were also assessed (G. R. Nawabi, personal communication, July 7, 2015).

Table 7: Stakeholders identification adapted from KURP (KURP-PMU, 2006)

Each Gozar in Kabul City has its own official representative usually suggested by the locals and accepted by Kabul Municipality. These representatives and also some well-known persons like religious leaders, etc. were as the first community leaders identified at step two of KURP project.

In some communities during other implemented projects, mainly by international organizations, community council had been already established. KURP also took the opportunity to use the same councils if they were still functioning.

If there was no council in a community, KURP project conducted a general election to make a task force group of each Gozar's representatives. To do so, KURP was sure that the representatives were truly accepted by the locals. But before the election or using the previous established council, KURP in a gathering at the community level explained its mission and activities to the people. At the end of this public meeting, KURP tried to identify if there was a council widely accepted by the locals. If there was no such a council, the next step was a general election to choose the elected representatives for each Gozar and also its neighborhoods. Here, which was the end of KURP step five, the problem identification was finished and the next step was started.

The planning process implemented by KURP in its upgrading project covers the five common steps for planning which was mentioned in chapter 3.4. Therefore in respect to the overall planning steps, it seems KURP has no major difference with the world-wide recommended approaches (Table 8).

Table 8: KURP planning versus common planning steps (adopted by the author)

<i>KURP Planning Steps adapted from (KURP, 2006)</i>	Common Planning Steps (discussed in chapter 3.4)
1- Preliminary meetings with stakeholders: <ul style="list-style-type: none"> • Ministry of Urban Development Affairs • Kabul Municipality • Key community leaders • Gozar official representatives • Water Supply and Sewerage Authority 	Preparation phase (minimal requirement)
2- Initial scoping of the neighborhood <ul style="list-style-type: none"> • Confirming Gozar's boundaries and its neighborhoods • Identify community leaders • Identify potential social and environmental constraints 	1- Problem identification
3- Community- start up meeting <ul style="list-style-type: none"> • Introduce KURP to the community • Service explanation • Discuss the community consultation process • To identify the existing community council 	
4- Existing community council assessment <ul style="list-style-type: none"> • If it works, next step can be skipped 	
5- Establishment of representative council <ul style="list-style-type: none"> • General election in the community 	
6- Information session and public awareness <ul style="list-style-type: none"> • KURP objective and implementation structure • Level of service and time frame • Community contribution and contracts (sanitation, solid waste management and street lightening) • Environmental management 	2- Define objectives
7- Development of the community upgrading plan (CPU) <ul style="list-style-type: none"> • Iterative process merged with step 6 	3- Design options 4- Selection process
8- Consultation (Implementation Phase) <ul style="list-style-type: none"> • Training workshops • Implementation issues • Health and education • Conflict management • Operation and management 	5- Action plan
9- Project closure (Implementation phase) <ul style="list-style-type: none"> • Feedback on the process 	

KURP step six was trying to identify the level of services provision to each community. KURP also tried to engage each community and its neighborhoods not only at decision making process but also at the construction activities especially street lighting, dry toilet improvement and trash point construction.

KURP's offers to the communities was not a blank check. There was budget and time limitations on KURP's side while the communities had also many problems to address. At the end, the communities had to prioritize their problems and ask help for the most urgent ones. Based on the documents and also the household survey, street pavement and water supply were the priorities. Road side ditch construction was also a part of the street pavement. If some communities, like site two, had no problems in respect to water supply or street pavement, they would go for the sanitation issue.

Putting road pavement and water supply first, was the attitude of the communities as well as the preferred approach by KURP. According to this approach sanitation provision, as dry toilet improvement, was left to the households through a financial support from KURP.

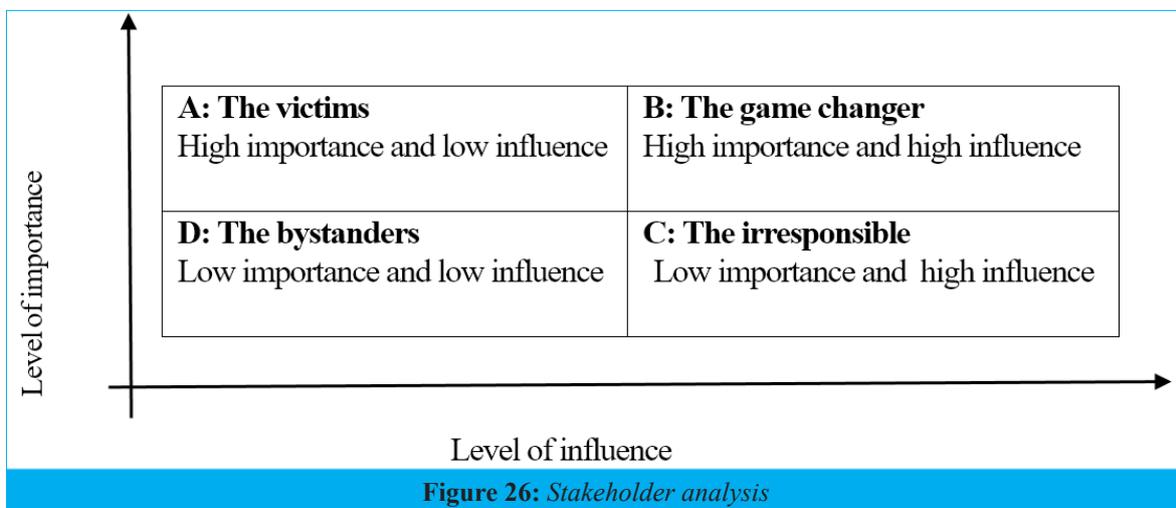
As a conclusion, during KURP step one to seven despite many positive points for an upgrading project, there were two main issues needed more discussion:

1. Stakeholder identification was not comprehensive enough. Due to the absence of some stakeholders like local practitioners, farmers and informal companies there was no comprehensive stakeholder identification and stakeholder analysis. This problem continued to affect the next project's steps until the end of the process which shows the importance of a holistic approach at each step.

Another important point is the role of different players in the upgrading process. Evaluating different documents produced by KURP and also information collected during this study showed that Government authorities had more influence on decision making process compared to the households. When stakeholder identification and analysis is not holistic, some stakeholders mainly officials and donors get the upper hand in the planning process. The beneficiaries and households as the main stakeholder had little influence on the decision making process.

To sum up, several stakeholders are engaged in a sanitation planning process. But in our study we categorized all of them in boxes A, B, C and D (Figure 26). Those included in these boxes were the key stakeholders in the activity: They could significantly influence the process or were most important (Dearden et al., 2003).

In this study households are considered in group A, practitioners including informal and formal companies in group D, and donors and government authorities in group B. In some cases people/organizations irrelevant to the environmental sanitation sector due to their political power and positions can influence on the process. The author cannot confirm such cases in this study, but its possibility in current Afghanistan's situation is high. Such people/organizations can be considered as group C.



2. Sanitation provision and solid waste management are neglected either by the communities or by the authorities. KURP based on the World Bank's experiences in the other countries and also similar projects in Afghanistan, was a kind of dry-technology biased. They had decided to improve dry toilets. Their main justification could be lack of reliable water supply in Kabul City. Therefore they were in favor of dry system as the traditional and best possible option. In next chapters there will be more discussion about the justification.

4.4.1. Service Priorities in the Study Sites

A part of Step 6 in KURP project was problem prioritization. Due to different limitations, KURP's policy was to provide the most prioritized services to the communities. A two-day workshop was carried out in each Gozar. Households' representatives had the chance to talk about their priorities and needs: Sanitation and solid waste management were considered the low budget activities which could be paid by KURP and handled by the community themselves.

According to KURP's documents three factors should be considered during choosing an option by the households (KURP, 2006): Cost, availability of space for the implementing the option, and finally respecting time schedule provided by KURP.

Site one had problem of water scarcity and also lack of paved roads. Due to the time and budget limitations, the community decided to go for a water supply project and road pavement. Above that due to low priority of solid waste and sanitation for KURP, those components were not at the center of KURP's attention from the early point.

In site two the community had no problem regarding water supply within the Gozar. Therefore they asked for road pavement and its rainwater drainage. Instead of water supply, which was already available, they asked for a water-based sanitation system using communal septic tanks. Site two is a hilly informal area, and digging the ground there is too expensive and in many cases impossible. Furthermore, space availability is another challenge in the hilly areas: despite many efforts by the community and KURP authorities, septic tank construction was not possible in the area.

Another noteworthy point here is that, road pavement was the highest priority compared to all the other activities. In KMDP, which is the new phase of upgrading in informal areas, sanitation improvement and water supply are not involved anymore. One reason could be the failed story of KURP.

From legal point of view, AUWSSC is in charge of water supply and waste water provision in the urban areas. That could be another reasons that KMDP as a project running under Kabul Municipality is not interested in implementing sanitation or water supply projects. But KURP as a project under MUDH was interested more in water supply and sanitation improvement activities.

Considering the low priority of sanitation in an upgrading package, perhaps a separate budget allocation for environmental sanitation issues can help to insist more on sanitation improvement. The focus of this study is also potential environmental sanitation solutions for the site studies, and finally the whole Kabul's informal areas. There is no intention to discuss other upgrading activities like road pavements, public space provision, etc.

Sanitation provision was not at the center of the upgrading activities in the site studies. KURP was only in favor of basic improvement for the available dry latrines. But still there is a question that ‘what kind of sanitation technology and system would be the best option for the upgraded areas?’

Figure 27 shows the different steps were taken to identify the best possible sanitation system. As an entry point to the selection of the sanitation system a briefing are provided here and detailed discussions will come later at each respected section.

At the first step, a flowchart was developed. Considering the existing situation and using the flowchart, primary sanitation technologies are identified. To select the primary technologies, access to water was considered as the entry point. Following that using a set of criteria a detailed investigation was done to rank the three pre-selected sanitation systems. The criteria selection was developed based on a vast range of literature review, and the contextualization of the criteria was done by the author using his own experiences in the field and also key informant interviews with local stakeholders.

To consider the influence and impact of all stakeholders in the selection of the sanitation technology a weighting system was also applied. According to that the highest weight was given to the community, following that to the government authorities and finally practitioners: At the end, project beneficiaries during a well-informed decision should choose the best option and make commitment for contribution in the construction, operation and maintenance phases. Therefore the highest weight was given to the community.

The output of the criteria-based analysis was a priority list of three sanitation systems suggested for Kabul’s informal areas. Finally a SWOT Analysis was used for the selected system to evaluate it based on the context situation.

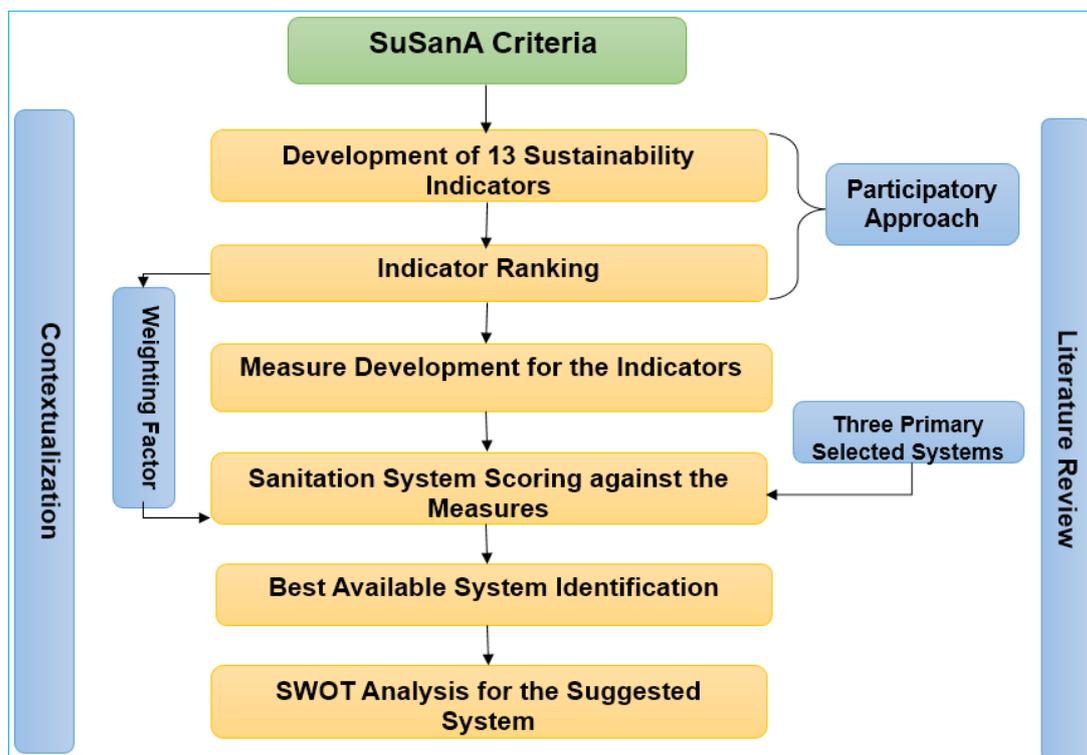


Figure 27: Selection of the best possible sanitation system

Developing a Ranking List for the Technology Selection: To develop the technological options in the site study areas, a set of indicators were used. The context-relevant indicators were developed based on SuSanA's sustainability criteria, literature review, stakeholders' input and finally some local factors determined by the author during his field visits: Comprehensiveness and contextualization are two main factors for this activity. This approach helped us to put sustainability at the center of our technology and system selection at the later stages.

List of 13 sanitation system indicators based on five SuSanA's criteria were provided to the interviewees including officials from Afghanistan Ministry of Urban Development and Housing (MUDH) and Afghanistan Urban Water Supply and Sewerage Corporation (AUWSSC) to rank them from 1 to 13 according to their importance for technology and system selection. The same indicators were provided to some engineers and managers in the private sector. Some NGO members, involved in the sanitation sector, were also asked to rank the indicators. Both of them were categorized as practitioners (Table 9).

During the household survey local people mentioned to their technological preferences and the reasons behind accepting some technologies over the others. Although households didn't mention to the all indicators, the results of household survey were used to rank on behalf of the households; it would be too complicated, and in some cases even beyond the knowledge of local people to ask them for ranking such technical indicators. Other stakeholders, except the households, should know about the indicators mentioned in Table 9. In some cases if they didn't know, there was briefing for them before asking them to rank the indicators.

However local people as the end users and beneficiaries are the most important stakeholder. During indicator ranking, this point was considered and higher scores were allocated to the indicators mentioned by the communities during the household surveys.

Finally for sanitation technology selection a weighting system was applied. As mentioned, the weighting system gives the highest score to the households, following by the officials and then the practitioners.

Theoretically, at the end developed sanitation options should also be shared with the stakeholders for their feedbacks. The informed choice by the community in consultation with other stakeholders would be the best technology option for implementation. It should be noted that other stakeholders except households should be only consultants without any considerable influence on the decision making process.

During the household survey, the interviewees mentioned to "hygiene, convenience, modern and easy to clean" as the reasons to accept a technology and at the same time to "dirtiness, need to be emptied soon, unhygienic, odor, inconvenience, hard to clean, old" as their justification to reject a technology. In fact considering the reasons all the households mentioned to technology, convenience and public health indicators. Therefore these three indicators highlighted as locals' important indicators among the all proposed indicators. Among these three indicators public health was mentioned more than others following with convenience and then technology.

During the survey local people didn't consider other indicators important or had no idea about them. The reason could be either lack of information or the low importance of those indicators according to the locals' opinions.

Table 9: Technology assessment indicators

SuSanA Sustainability Criteria	Technology Assessment Indicators	Measures (Through the sanitation chain)
Health & Hygiene	1- Public health protection	- Health risk (waterborne diseases) - Exposure to pathogens
Environment & Natural Resources	2- Environmental protection	- Environmental risk - Groundwater pollution
	3- Nutrient recovery	- Closed nutrient loop at local level
	4- Water consumption	- Dry or water based
Technology & Operation	5- Energy required to run the system	- Energy need
	6- Viable supply chains for the systems, spares and services	- Availability of spare parts - Capacity to produce or maintain the technology locally or in the country
	7- Technical capacity	- Availability of local trainers
Financial & Economic	8- Investment, operation and maintenance cost	- CapEx affordability - OpEx affordability
	9- Profitability	- Using lower fuel, energy or resources
	10- Land requirement	- Space for the system
Socio-cultural	11- Demand for the technology, system	- Strong demand
	12- Behaviour change requirement	- Need to behavior change - Appropriateness for the locals
	13- Convenience	- Comfort, Privacy and Smell

Source: (Tilley, Strande, et al., 2014), (Etemadi et al., 2012), (Khawaja, 2010), (Nayono et al., 2012), (Tilley, Ulrich, et al., 2014), (Lüthi, Morel, et al., 2011), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (F. Jafari, personal communication, June 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (M. Qaisari, personal communication, July 3, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (M. Mirzaei, personal communication, July 23, 2015), and compiled by the author.

To calculate ranking average for each indicator, three different scenarios were tried:

Average (try 1): in the first try three highlighted indicators by the households were ranked as 13 for health, 12 for convenience and 11 for technology based on the ranking suggested by the communities. The score for the remaining indicators in the household category were considered zero and for each indicators an average was calculated. As you see in Table 10, at average final (1) health has the highest score following by technology and ending by nutrients. It is noteworthy to mention that the ranking provided by the officials and practitioners are same in the three scenarios.

Average (try 2): At this try for each stakeholder a coefficient was considered. According to this try, coefficients 1.2 for practitioners' score list, 1.3 for the officials' score list and 1.5 for the households' score list were used. At the end for each indicator an average was calculated.

Average (try 3): three highlighted indicators by the households were multiplied by 1.5 and the other indicators were remained as it was, and then an average was made for each indicator.

As a conclusion, there is no big difference between three tries regarding their results and the results of tries 2 and 3 are same which was used as the final ranking list.

Table 10: Ranking list for the indicators

No	Officials	Practitioners	Households	Average (try1)	Average (try 2)	Average (try 3)
1	Public Health	Health	Health	Health	Health	Health
2	Investment	Investment	Convenience	Investment	Technology	Technology
3	Environmental	Environment	Technology	Convenience	Convenience	Convenience
4	Land	Energy	-	Technology	Investment	Investment
5	Water	Spares	-	Environment	Environment	Environment
6	Energy	Technical Capacity	-	Energy	Energy	Energy
7	Technology	Land	-	Land	Land	Land
8	Behavior	Convenience	-	Water	Water	Water
9	Convenience	Profitability	-	Behavior	Behavior	Behavior
10	Profitability	Water Consumption	-	Profitability	Profitability	Profitability
11	Technical Capacity	Nutrient	-	Technical capacity	Technical Capacity	Technical Capacity
12	Supply Chain	Behavior	-	Spares	Spares	Spares
13	Nutrient	Technology	-	Nutrient	Nutrient	Nutrient

The household survey showed many interviewees were interested in wet systems. Many new houses or locals with higher income have already shifted to such systems. They were mostly using flush toilets connected to soak wells or holding tanks.

Despite a high interest in water-based systems, still some households were satisfied with their dry toilets or due to their house locations that were lower than the street level, the owners were not able to use a water-based system. Below are more reasons behind evaluating dry system as one of the main sanitation options for Kabul's informal areas:

- There are many hilly areas in Kabul occupied by informal settlements. Providing water-based system is difficult and too expensive for such locations. If there is possibility of closing the nutrient loop, dry toilets in such conditions would be the best feasible option. Above that people located in steepy areas more than 20 or 30 degree, would be relocated in future and therefore provided sanitation services to them should not be a kind of permanent investment. Furthermore, in some hilly areas the land is rocky and construction works for a wet system is costly and sometimes impossible, but dry system can be used.

- There are some hilly or flat areas located on urban fringes or close to the agricultural areas. In such places there is high demand for human night-soil. In such locations we can consider dry system as an important option.

Kabul City has no central sewerage system. Therefore, many areas, especially in the informal settlements, should rely on on-site sanitation as their long term solution (Q. Salehi, personal communication, May 12, 2015). Considering this point during our primary selection, there was a special attention on decentralized systems as well.

Due to high population density in some informal areas and relying on groundwater as the only source of water in Kabul City, soak well is not the best water-based technology in the city. On the other hand holding tanks, which are lined, usually need to get emptied soon which makes it an unaffordable option for many households. Therefore any new wet-system suggestion should provide proper solution to avoid groundwater pollution and it should be also financially sustainable.

As a conclusion, considering aforementioned points and developing a structured sanitation selection process a flowchart was designed (Figure 28). This flowchart helped us to assess the technical points which are important in the context of Kabul City and choose the primary sanitation system options for our study sites.

Using the flowchart, finally three different systems were determined as suitable options for site one and site two. The three sanitation systems out of the flowchart were Urine-diverting Dry System (I), Pour Flush Pit System (II) and Vermi-digester System (III).

To find the best applicable sanitation technologies for Kabul City, EAWAG¹ Compendium of Sanitation Systems and Technologies was used. Among different technologies introduced there, three above-mentioned sanitation technologies are the most similar ones to already used & popular systems in Kabul. Therefore, similarity to the available technologies in Kabul was considered as an important selection factor. This similarity would help to apply the new technologies much easier.

1. <https://www.eawag.ch/en/department/sandec/publications/compendium/>

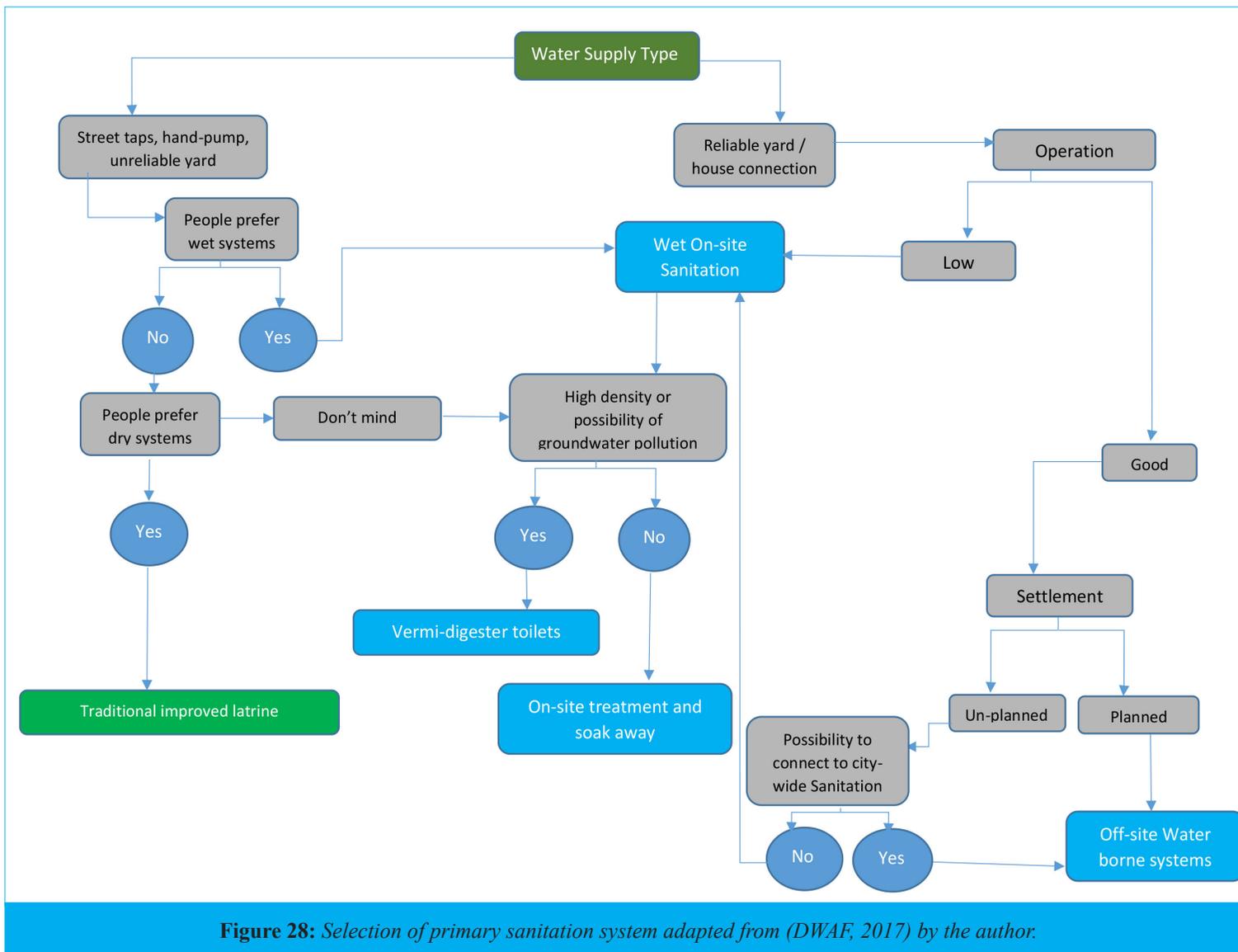


Figure 28: Selection of primary sanitation system adapted from (DWAF, 2017) by the author.

System (I): Urine Diverting Dry System: Raised vaults dry latrines are used to collect, store and dry (dehydrate) the products. Night soil will only dehydrate when the vaults are well ventilated, watertight to prevent external moisture from entering. To have the best functionality, urine and anal cleansing water shouldn't enter into the system (Tilley, Ulrich, et al., 2014). Despite all the facts, because of availability of only one chamber in the raised vault latrines, the product is not usually well dry or safe for collection. To make the traditional latrines in Kabul more efficient some improvements are needed, but in general they are comparable to the dehydration vaults introduced by Eawag in the Compendium of Sanitation Systems and Technologies (Figure 29).

As mentioned the traditional toilet has only one vaults which could be a positive point in areas where less space is available. It also needs less maintenance compared to the double vault latrines. But the efficiency due to the existence of only one vault is low and there is no enough resting time for the products before disposal or reuse.

Raised vault latrines are constructed above the ground which reduces the risk of groundwater pollution. Wipers has less difficulty using traditional toilet compared to the washers. Urine should also divert to keep the vault as dry as possible. The product of this technology was providing to the local farmers as compost and soil conditioner in the past. Although traditional raised vault latrine with minor changes can be used in Kabul's periphery or the areas close to the agricultural lands, but it does not work properly anymore as the main option in new Kabul.

Raised vault latrine can be the main sanitation option on the hilly areas where other options are not applicable: Local farmers are using the products of the traditional latrines, in form of semi-fresh, which is not safe in respect to the human health. Such unsafe products can also damage the plants (Jansen et al., 2000). Improvement in the technology and system, developing some standards and providing training to the farmers and also conducting public awareness campaigns can sensitize the people against such unsafe practices.

As mentioned using double vaults technology will help to have a resting time before the product collection. But in areas with no enough space for construction of two vaults, there should be some temporary transfer stations where the households can dispose their semi-dry products. These stations can provide resting time for the product before apply on agricultural land or disposal. If the transfer stations are not on a proper location as resting time, they can be only used as transfer stations to transport the collected semi-dry faeces to resting / composting places. The responsibility of dealing with the night soil currently is with Kabul Municipality, although they are not enough active in this regard.

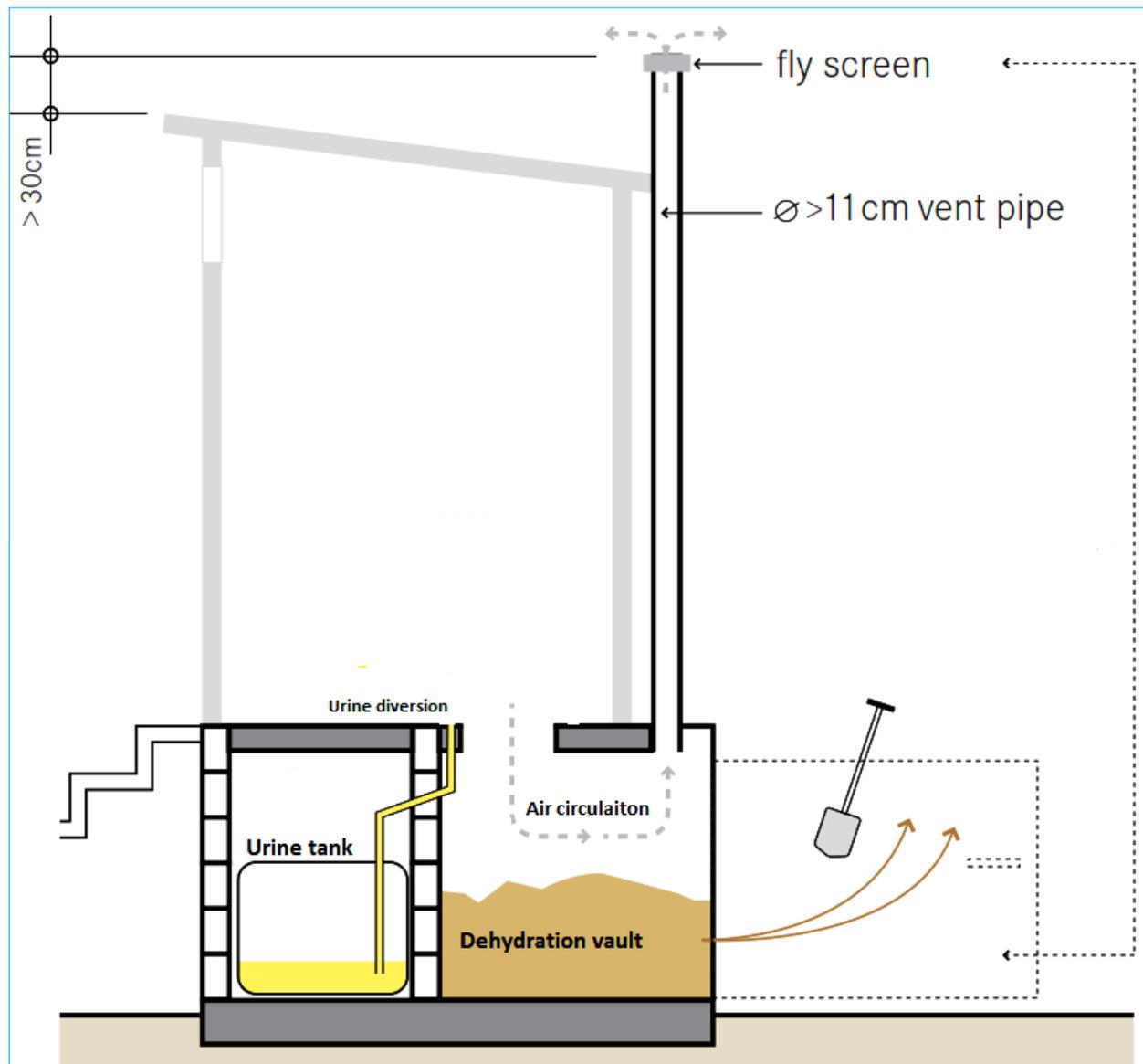


Figure 29: Simplified dehydration vault (Tilley, Ulrich, et al., 2014)

System (II): Pour Flush Pit System without Sludge Production: This is a water-based system with a 'Pour Flush Toilet' connected to a 'Twin Pits' to produce a partially digested, humus-like product which can be used as a soil conditioner.

The product of this system can be used as soil conditioner in farm lands. Black and greywater can be introduced to the system. The pits are not fully lined and liquid can infiltrate into the ground while solids collect at the bottom of the pits. Pits are used alternatively, and when one pit is in use, the other is in its resting time (Figure 30). It takes about two years to fill a pit, meanwhile the other pit should be in rest. As a result its products get partially digested and will be ready for the emptying. It is better to avoid discharge large amount of wastewater into the system which may result in excessive leaching, soil or even ground water pollution (Tilley, Ulrich, et al., 2014).

Following two years of resting time, Pit Humus which is also called EcoHumus is safe enough to apply directly on farm lands. It has a lot of nutrient and can be collected safely. Compared to

sludge it is more digested and much more hygienic. Above that it has no need for further treatment in a treatment facility (Tilley, Ulrich, et al., 2014).

Pour flush system is well known in Afghanistan, and currently many households in the urban areas are shifting from dry system to water-based system using pour-flush technology. Pour flush system is considered an affordable, convenient and modern technology in the urban areas. The constructional materials and local knowledge is also available. But there is no standard design or proper monitoring for the construction of pour-flush system in place.

Available pour flush systems in Afghanistan and specially Kabul have some differences with the standard version introduced by Eawag in the compendium. Many Kabul's households use pour flush technology connected to soak well. They usually dig the ground as much as possible. As explained & shown earlier, they use some porous cement rings to make the structure robust. Households dig their pits deep and extend it at the bottom in different directions. This structure help them to avoid the emptying for many years. In many cases the households don't need to empty their pits for a long time. This practice is considered one of the main reasons behind groundwater pollution in Kabul.

To make the current practice in Kabul City sustainable, there should be some changes to the system, and also a standard pour-flush design is necessary. A scheduled emptying and regular monitoring should be also introduced.

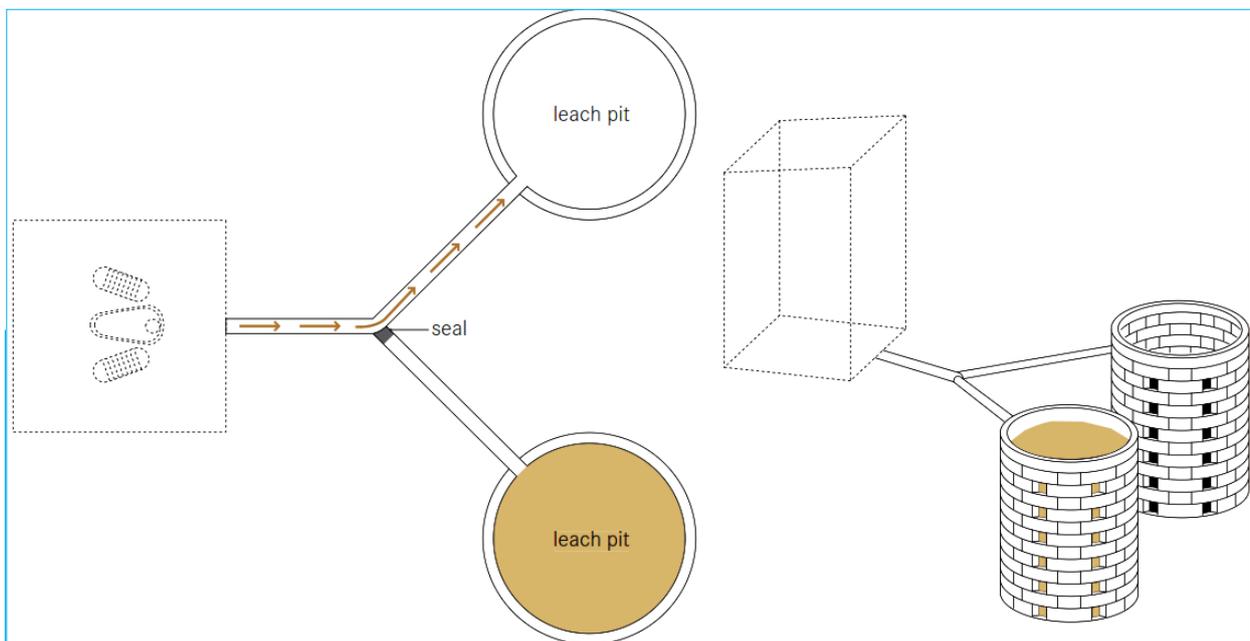


Figure 30: *Pour flush pit system without sludge production (Tilley, Ulrich, et al., 2014)*

System (III): Vermi-Digester System (Tiger Worm Toilet): The Tiger Worm Toilet (TWT) is an on-site system and can be installed at household level. In this technology composting worms are used to treat human waste. Composting worms are very efficient in reducing pathogens and volume of the faecal matter. Using this method the frequency of emptying significantly reduces (Figure 31). The product, i.e. vermi-composting, is safe and easy to handle and collect (McBride et al., 2017).

In Tiger Worm Toilet (TWT), the user interface is a pour flush toilet. Following that there is a vermicomposting unit for the digestion of excreta (Furlong et al., 2016).

For a biodigester an internal dimensions of 1.2 m high, 1 m long and 1 m wide is sufficient to provide service for 10 people. Based on the local condition, it can be above or below the ground or directly below the toilet. Its construction materials are usually cheap and available everywhere. Operation and maintenance is low, and its product is safe and easy for the collection. The produced vermicompost needs to be removed each 3 to 5 years and would be about 50 kg per toilet. The liquid part is sufficiently treated and its infiltration into the soil doesn't cause any problem to the environmental quality (McBride et al., 2017).

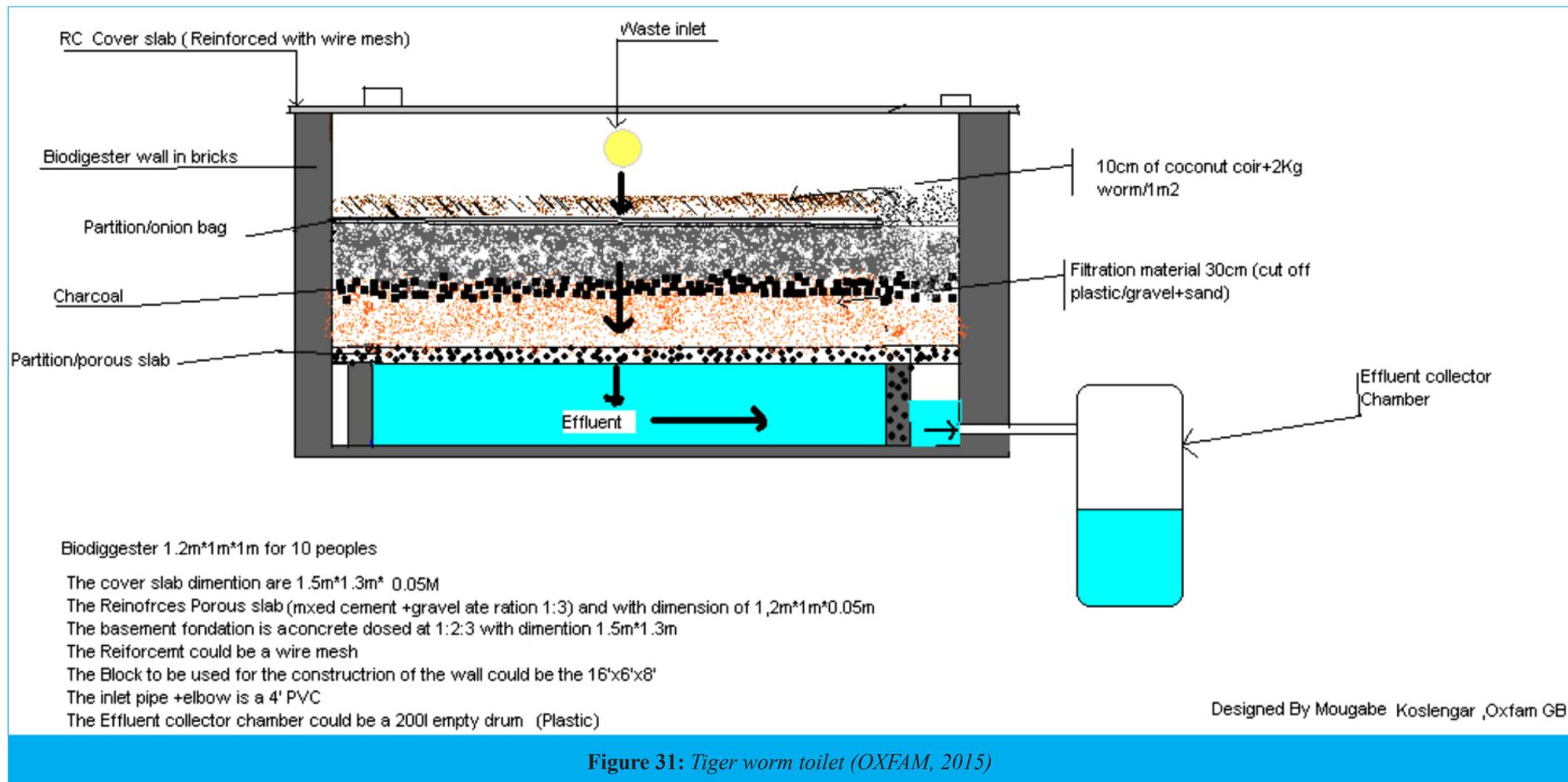


Figure 31: Tiger worm toilet (OXFAM, 2015)

The worm-based-toilet, which is another name given to TWT, can be used in areas with high level of groundwater (Figure 32). In this case the toilet should be built half above the ground. Only water, excreta and possibly toilet paper should be used in this kind of toilets. Although the required worms can be costly, but in larger scale it can be produced locally to decrease the price (Gensch et al., 2018).

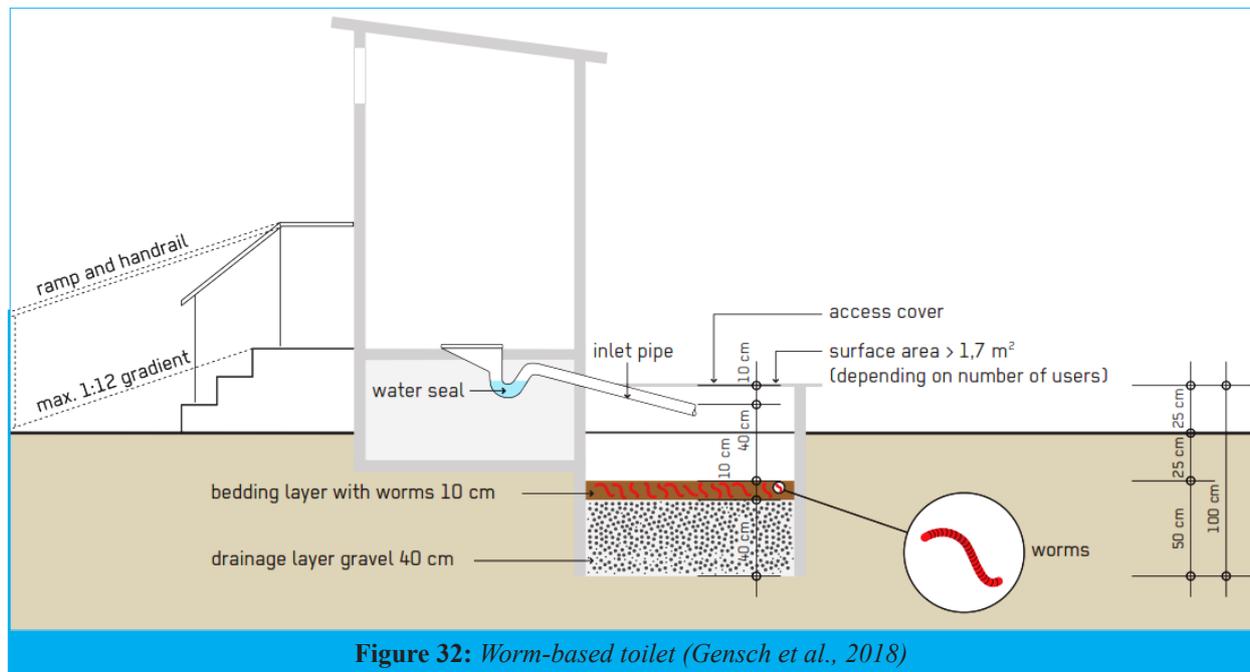


Figure 32: Worm-based toilet (Gensch et al., 2018)

In a pilot project in India after 12 months there was less than 10 percent surface coverage by the faecal solids. The effluent quality was good (COD reduction = 57 per cent, faecal coliforms reduction = 99 per cent). Due to very low product accumulation, the emptying frequency is about each five years.

For example, one kg of faecal matter in the pilot project in India was converted into 100 g of vermicompost (Furlong et al., 2016). This bioconversion is similar to what was seen in the laboratory-scale research, where one kg of faeces produced about 100 and 190 g of vermicompost (Furlong, Gibson, et al., 2014).

The acceptance of the system among the communities should be high: It needs low maintenance and significantly reduces the odour. Accumulation of the product is low compared to similar technologies and the level of pathogens is minimum (Lalander et al., 2013). In another study, no odour, adaptable design to locally available materials and also low emptying frequency are highlighted as the main advantages of TWT (Gensch et al., 2018) which are considerable points for the households.

In the pilot conducted in India, the user satisfaction was considerably high due to a high percentage of 'very satisfied' beneficiaries. The locals were satisfied with the use of worms, and also lack of smell in the system (Furlong et al., 2016).

Decreasing the frequency of emptying is a big advantage with the system. It can also reduce the impacts of TWT as well. Furthermore, worms reduce pathogens and make the product safe for the collection and also applying directly on the farm lands (Eastman et al., 2001).

Water consumption for the system in a prototype in UK was 5 liter per person per day (Furlong, Gibson, et al., 2014). In another study made by OXFAM, two liters of water per flush, which is an acceptable level of water compared to the other water-based systems, is recommended. In water scarce areas even anal cleansing water is enough to provide required moisture for the system. For a family of 10 persons maximum 2.5 kg of worms is enough which means one kg of worms feed one kg of faeces (OXFAM, 2015).

Although TWT reduces nitrogen (Wang et al., 2011) and phosphorus (Furlong et al., 2016), there is possibility of installing urine-diverting TWT and avoid introducing urine, as the main source of nitrogen and phosphorus, to the system.

The use of urine-diverting facilities could provide a concentrated source (i.e., urine) of the nutrients nitrogen (N) and phosphorus (P) (Tilley, Strande, et al., 2014).

Vermifilters can cope with excess use (shock loading) and the periods when no faeces are added (Furlong et al., 2016; Furlong, Templeton, et al., 2014). The temperature range for *E. fetida* (and therefore *E. andrei*) is 4–40°C with optimum temperature of 15–20°C (Edwards & Bohlen, 1996). It should be noted that the worms could adopt themselves to the environmental temperatures as they were sourced from a local worm farm (Furlong et al., 2016).

Generally the worms can be active if they are not frozen due to a cold climate. And if the worms are produced locally, they can adopt themselves easier with the local weather.

Due to possibility of occurring nitrification and denitrification process in the system, vermifilter can accept nitrogen as well (Furlong, Templeton, et al., 2014). If urine and faecal matter dispose together, flushing water should be used to facilitate the processing of faecal matter. If enough water is not used, the formation of ammonia in the vermifilter would be challenging: *E. fetida* hence *E. andrei* are sensitive to high levels of ammonia (Edwards & Bohlen, 1996).

The worms usually eat from below the human waste, and it is difficult to see them. Fresh produced vermicompost and its accumulation is usually the sign which shows they are doing their job to process the materials (Furlong et al., 2016).

Currently some companies in Kabul are producing vermicompost fertilizer using household rubbish. The process is similar to TWT. They use worms for decomposition of organic waste including household and agricultural waste and also animal manure mixed with regular garden soil: There is possibility of adopting such technology for the human waste as well.

Operation and maintenance training is a need: TWT is an aerobic system, good ventilation and also isolation, in cold season, are important. In case of keeping the vermifilter aerated, lack of smell

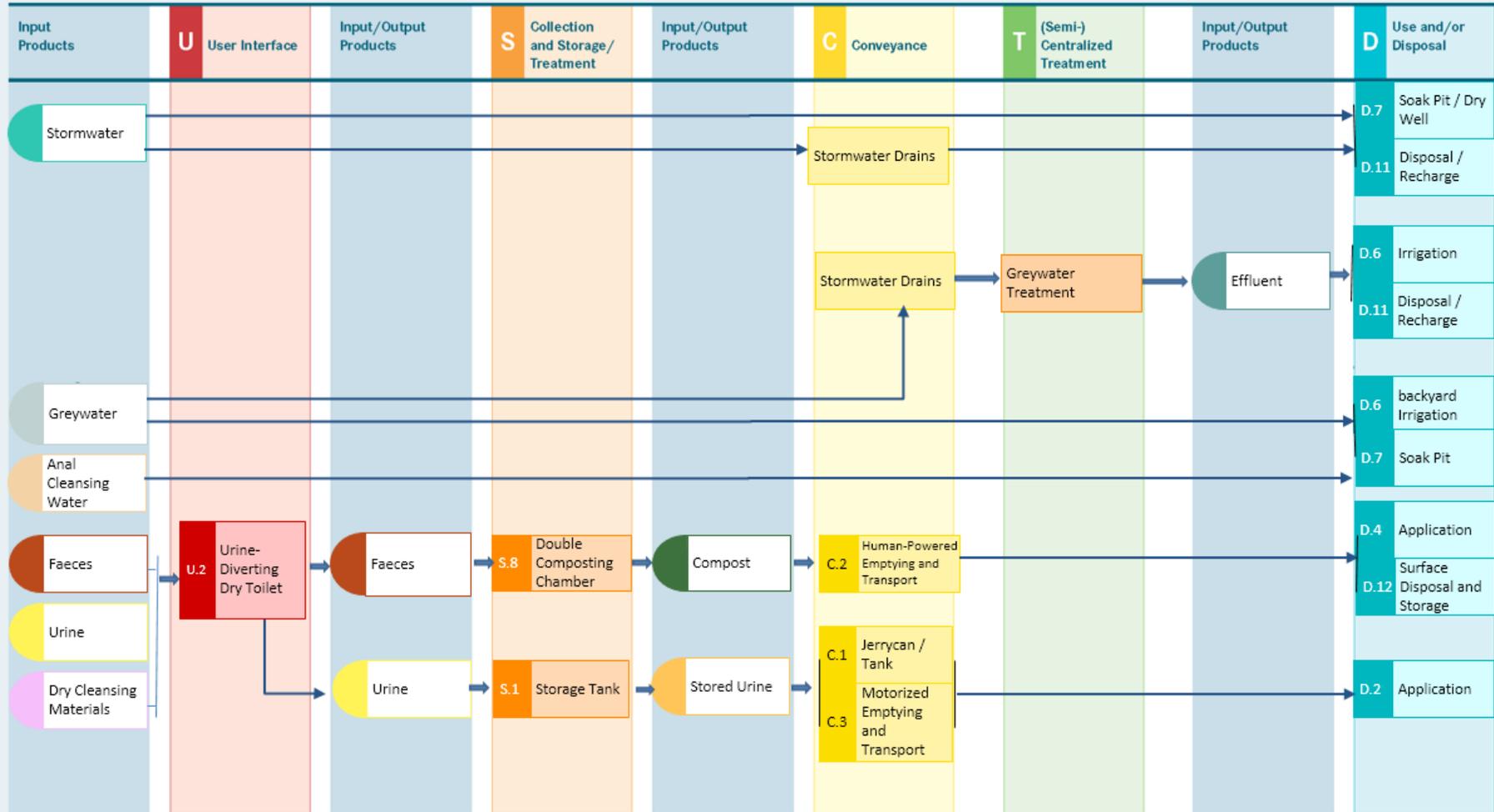


Figure 33: TWTs installed in the Maina IDPs camp in Myanmar (OXFAM, 2015)

and flies are another advantages. Bleach and cleaning products should not be used although there is a level of tolerance by the worms. To keep the worms active, water should be used constantly. But the level of required water is not that much and washers can use anal cleansing water to keep the process running.

In Figures 34, 35 and 36 three primary suggested sanitation systems, using EAWAG's sanitation system drawing tool, were illustrated. Following that a comparison between the three options were done and the best possible sanitation system was selected.

Sanitation System: Urine-diverting Dry System

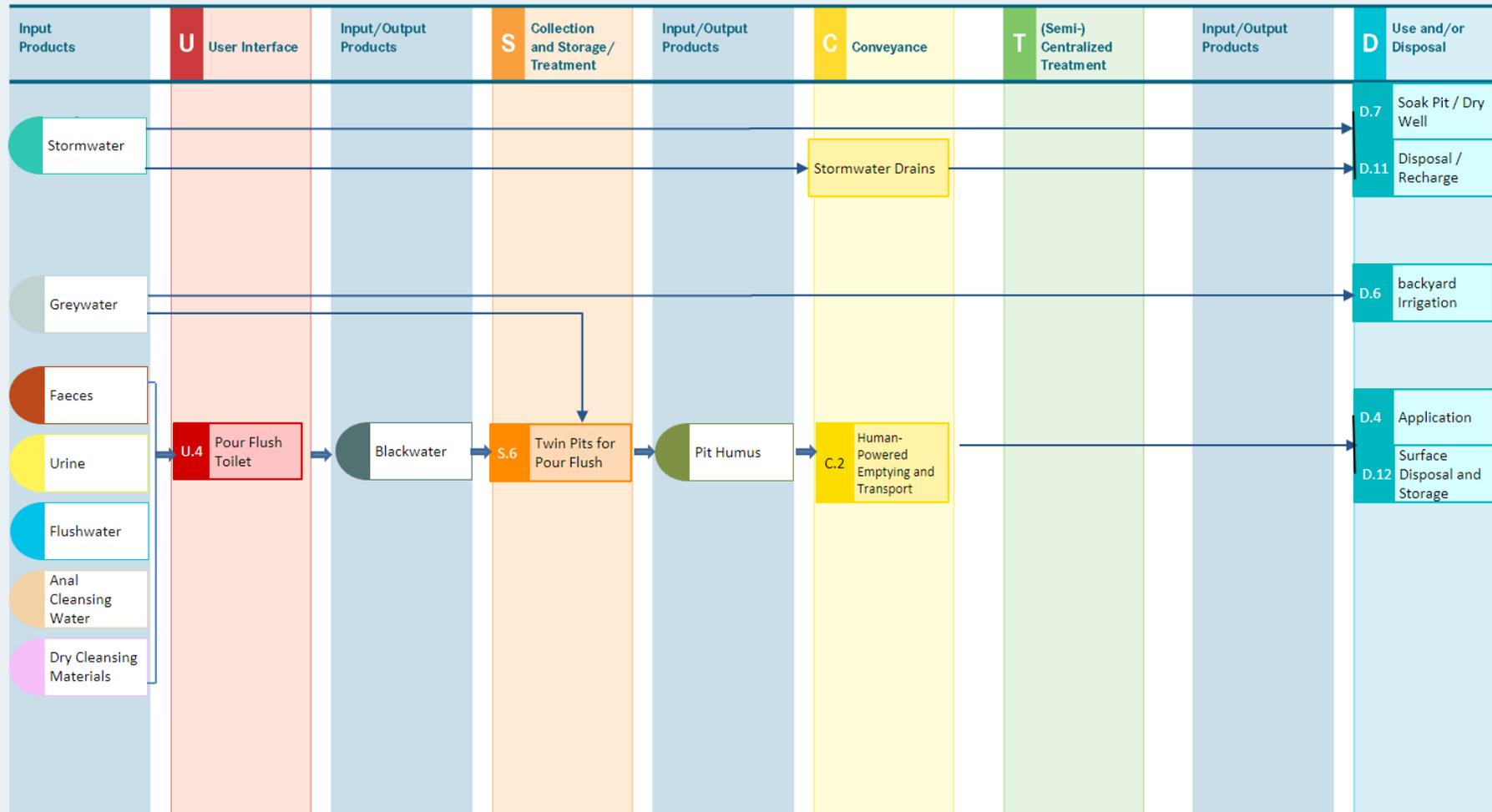


Disclaimer: This sanitation system was created using Eawag's Sanitation System Drawing Tool (Version 1). The user of this tool alone is responsible for the correctness and completeness of this system.

Figure 34: Urine-diverting dry system (Tilley, Ulrich, et al., 2014)

Sanitation System:

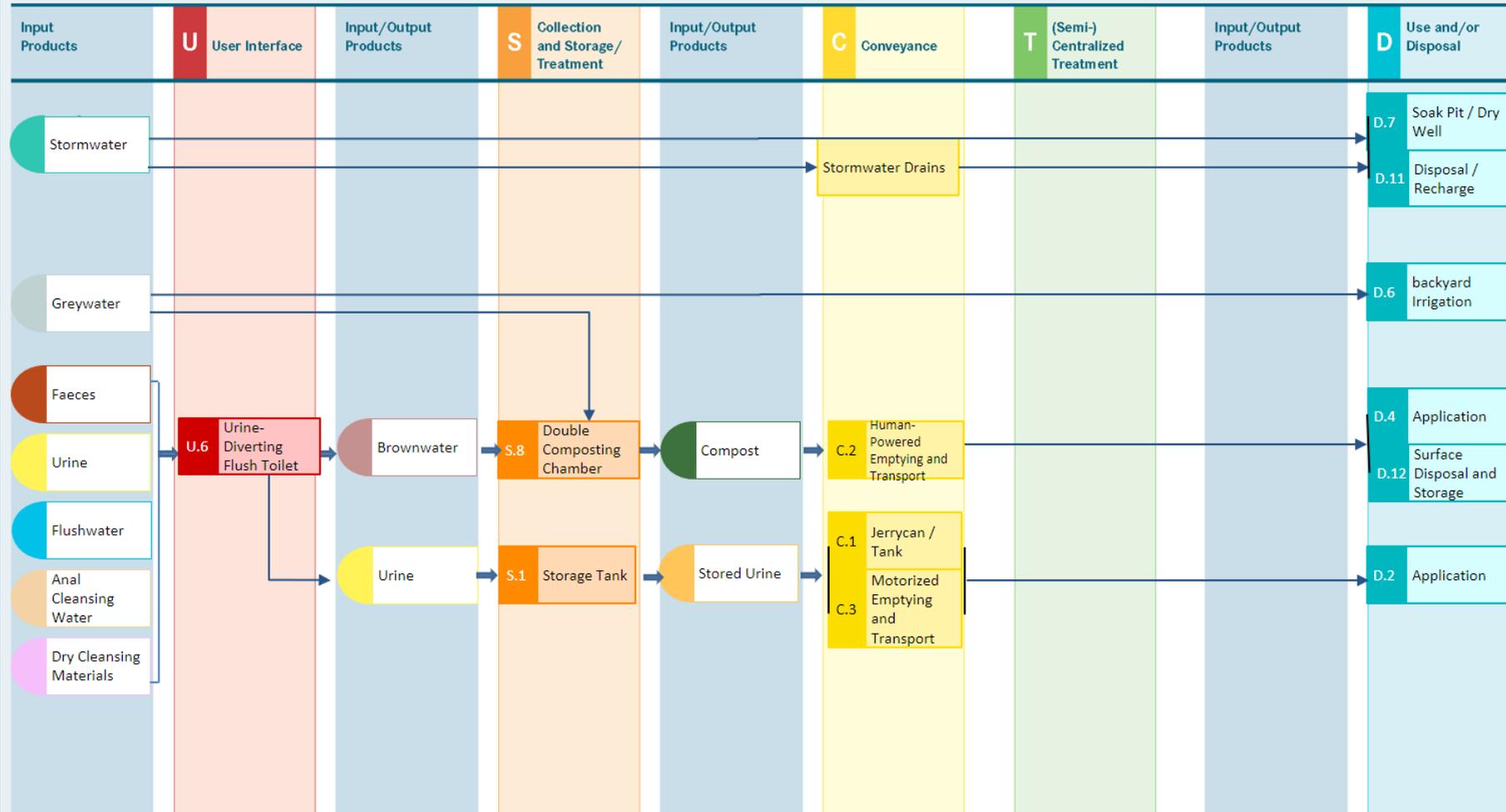
Pour Flush Pit System without Sludge Production



Disclaimer: This sanitation system was created using Eawag's Sanitation System Drawing Tool (Version 1). The user of this tool alone is responsible for the correctness and completeness of this system.

Figure 35: Pour flush pit system (Tilley, Ulrich, et al., 2014)

Sanitation System: Vermi-digester



Disclaimer: This sanitation system was created using Eawag's Sanitation System Drawing Tool (Version 1). The user of this tool alone is responsible for the correctness and completeness of this system.

Figure 36: Vermi-digester system (Tilley, Ulrich, et al., 2014)

4.4.2. Sanitation System Comparison and Selection

This step involves comparison between the three-primary systems based on the indicators and measures developed using SuSanA's sustainability criteria. Following that the best possible sanitation system is determined.

Up to now, several steps have been taken and three primary selected sanitation systems are the outcome. Few more steps should be done to identify the best possible sanitation system for the study sites. Following that the selected system using SWOT analysis will be evaluated more.

Tables 11 to 15 shows a briefing of comparison for the three primary selected systems against the indicators and their measures: Urine Diverting Dry System, Pour Flush System and Vermi-digester System are the outcomes of the primary selection. Finally to apply the weighting, the achieved score by each sanitation system was multiplied to the ranking numbers suggested by the stakeholders.

The comparison between three primary sanitation systems was done using SuSanA's criteria and the indicators developed based on that. For each indicator some measures were determined. All the indicators and measures were developed through literature review, and also suggestions by the stakeholders during the household surveys, focus group discussions and key informant interviews.

As you see in Tables 11 to 15, some indicators have several measures. Therefore, following scoring of all the measures, an average for the measures belonged to each indicator was calculated (Table 16). The sum of these averages is the final score for each sanitation system. The next step, as shown in Table 17, was applying the weight suggested by the stakeholders for each indicator. Final result after applying the weights shows that vermi-digester system has the highest score following by pour flush pit system and then dry system.

Sanitation system assessment and scoring is not only at the household level, but considers the whole sanitation chain. System I which is a dry-toilet is behind two water-based systems. In fact, for dry system the sanitation chain which was established in the past, is not functioning any more in Kabul City. Except the urban periphery, it is difficult to close the nutrient loop inside the city including our two site studies.

There are possibility to improve the dry toilets at household level, but still a proper transportation, treatment and re-use is not in place and the traditional sanitation chain has been collapsed. To run the dry system again, before everything a proper regulatory framework is needed. Developing legal documents and institutional requirements need to be available and proper facilities should be provided. Above that Kabul City has expanded very fast during last 15 years, and many agricultural areas were converted to residential neighborhoods and there is no high demand for the products of traditional latrines in many parts of the city.

The only current possibility for applying system I could be urban fringes where farm lands are close to the residential areas and there is demand for human night soil. In such places it is easy to close the nutrient loop, but still proper regulation and monitoring is needed to avoided negative impacts on human health and the immediate environment.

Furthermore, hilly areas in Kabul City has no choice except relying on dry systems. Wet systems have many constraints on hilly informal areas and are not recommended.

Another negative point regarding dry system in our site studies is greywater management.

Implementing dry toilet, we need to have separate plan to deal with greywater. But in case of a water-based system either pour-flush pit toilet or TWT, we can discharge at least a part of the greywater in the sanitation systems.

Soil layer within site one and many parts of Kabul in flat area consists of loess, sand and gravel which is suitable for land infiltration (RECS International & Yachiyo Engineering Co., 2011). In site 2 and other similar locations due to their rocky ground, a water-based system wouldn't be applicable and the best option is dry system. Construction a water-based system on hilly areas are expensive and in some cases due to physical conditions almost impossible. Furthermore, in such hilly areas there is no chance of land infiltration.

Above that as discussed earlier site two is located in Kabul's down town and subjected to a self-motivated relocation in long term. This area is supposed to be developed in future for the touristic purposes. Almost all the official buildings and trade centers will be also relocated to the other parts of the city. Therefore investment for the hilly areas there shouldn't be permanently. Until the relocation of the households on the hilly area, they can use an improved urine diverting dry system which is the scenario for other communities living on the hilly informal areas in Kabul city as well.

As a conclusion, the best possible sanitation option were analyzed more through a SWOT Analysis. The SWOT Analysis would help us to understand the advantages and disadvantages of the selected system.

Table 11: Criteria one: Health and Hygiene	Score		
	1 (low)	2 (middle)	3 (high)
<p>Health risk</p> <p>Dry system: There is a relatively high risk of infection from dry urine-diversion system compared to pour-flush toilet and vermi-digester at household level. But in downstream environment there is no risk out of dry system.</p> <p>Pour flush pit system: There is no direct exposure to the system and its product. But this system can seriously lead to soil and groundwater pollution and health risk.</p> <p>TWT (Vermi-digester): The products of TWT is safe and relatively easy to handle. Nitrogen and Phosphorous are mostly collected in urine, which is collected separately, and won't be introduced into the immediate soil and groundwater.</p> <p>Therefore in regard to health risk pour flush system (score 1) is the worst scenario following with dry system (score 2), and vermi-digester is the best option (score 3).</p>	Pour flush pit	Dry system	Vermi digester
<p>Exposure</p> <p>Dry system: Due to more contact in a dry system, there is more risk of exposure.</p> <p>Pour flush pit system: Regarding exposure and direct contact, this system has less problem compared to the other systems.</p> <p>TWT: Similar problem regarding exposure can be seen in TWT but in a lower level of risk. Exposure can be considered as visual pollution or an aesthetic issue. Due to availability of water in vermi digester system, there is more chance of taking proper measures to reduce the negative impacts of the exposure.</p> <p>To sum up, in respect to exposure pour flush pit system is the best option (score 3), following with vermi digester (score 2) and finally dry system (score 1).</p>	Dry system	Vermi- digester	Pour flush pit

Source: (Tilley, Strande, et al., 2014), (Etemadi et al., 2012), (Khawaja, 2010), (Nayono et al., 2012), (Tilley, Ulrich, et al., 2014), (Lüthi, Morel, et al., 2011), (OXFAM, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (F. Jafari, personal communication, June 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (M. Qaisari, personal communication, July 3, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (M. Mirzaei, personal communication, July 23, 2015), and compiled by the author.

Table 12: Criteria two: Environment & Natural Resources	Score / System		
	1	2	3
<p>Discharge BOD, nitrogen and phosphorous Dry system: In case of a proper maintenance there is a good chance of reuse of N and P in a dry system for agricultural purposes. Dry faeces can be used as soil conditioner (score 3).</p> <p>Pour flush pit system: Pour flush pit system discharges N, P and BOD into a soak pit which is not a sustainable solution for a long run. Above that there is low chance of decomposition of substrate in the soak pit if there is no resting time (score 1).</p> <p>TWT: Urine diverting vermi-digester also has similar situation to the dry system (score 3).</p>	Pour flush Pit	-	Vermi-digester Dry system
<p>Groundwater and soil pollution Dry system: Dry system and vermi-digester act similar and better than pour flush system: most of N and P are in urine which is not discharged into the soil in these two systems. There should be a urine diverting facility to collect urine separately (score 2).</p> <p>Pour flush pit system: Possibility of soil and groundwater pollution is higher in a pour flush system compared to a dry system or vermi-digester (score 1). Furthermore, N and P is also discharged into the soil which can lead to the environmental pollution.</p> <p>TWT: In terms of BOD discharge, due to possibility of aerobic digestion by biofilms in a vermi-digester system, there is a good level of BOD removal. In addition, nutrients are also collected separately which reduce the chance of immediate pollution in the surrounding environment. The highest score goes to the vermi- digester system (score 3).</p>	Pour flush pit	Dry system	Vermi-digester
<p>Nutrient recovery Dry system: There is a high chance of nutrient recovery in dry system in case of proper operation and maintenance (score 3).</p> <p>Pour flush pit system: Nitrogen can be wash away through infiltration and in some cases find its way toward the groundwater. Phosphorous can be also infiltrated into the soil. As a conclusion, there is possibility of nutrient recovery, but less compared to the other system (score 1).</p> <p>TWT: This system is similar to the dry system and there is a high chance of nutrient recovery in case of proper operation and maintenance (score 3).</p>	Pour flush pit	-	Vermi-digester Dry system
<p>Water consumption Dry system: in this part receives the highest score. But we should keep in mind that the locals are washers and they use water for anal cleansing in any system. Therefore score 2 allocates to this option.</p> <p>Pour flush pit system: Water is a key and without the water, the system does not work (score 1).</p> <p>TWT: Pour flush system and vermi-digester are acting similar. The lowest score goes to these two options (score 1).</p>	Pour flush pit Vermi-digester	Dry system	-

Source: (Tilley, Strande, et al., 2014), (Etemadi et al., 2012), (Khawaja, 2010), (Nayono et al., 2012), (Tilley, Ulrich, et al., 2014), (Lüthi, Morel, et al., 2011), (OXFAM, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (F. Jafari, personal communication, June 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (M. Qaisari, personal communication, July 3, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (M. Mirzaei, personal communication, July 23, 2015), and compiled by the author.

Table 13: Criteria three: Technology & Operation	Score / System		
	1	2	3
<p>Energy In regard to energy consumption in case of using passive method, all three systems have similar situation and don't use energy (score 3).</p>	-	-	Vermi-digester Pour flush pit Dry system
<p>Viable supply chains <i>Dry system:</i> As the traditional system, it has been used for a long time in many parts of Kabul City. It is well-known and can be considered a local technology (score 3). <i>Pour flush pit system:</i> During last 15 years many people came from abroad. They used to have water-based systems including pour flush toilet. One of the reason behind widely switching from dry system to wet technology was newcomers' interest. Therefore nowadays this kind of service is also considered a local system in Kabul City (score 3). <i>TWT:</i> There is possibility of converting a dry system into vermi-digester system. The overall structure of both systems are similar, and the functionality of vermi-digester is something between pour flush toilet and dry system. But still vermi-digester relies on biofilm for BOD removal which is a new approach in Afghanistan and currently used to produce vermicompost fertilizer by household organic waste. To sum up, introducing vermi-digester needs more education and training compared to dry and pour flush systems (score 1).</p>	Vermi- digester	-	Dry system Pour flush pit
<p>Technical capacity <i>Dry system & Pour flush pit system:</i> Although pour flush and dry systems are well-known and households used to have them for a long time, but for proper function some trainings is needed. Without some improvements and also raising awareness among the households, these systems cannot work properly (score 2). <i>TWT:</i> It is a new technology and needs more education and public awareness compared to the dry and pour flush systems. Therefore, there is less technical capacity available in this regards (score 1).</p>	Vermi- digester	Dry system Pour flush	-

Source: (Tilley, Strande, et al., 2014), (Etemadi et al., 2012), (Khawaja, 2010), (Nayono et al., 2012), (Tilley, Ulrich, et al., 2014), (Lüthi, Morel, et al., 2011), (OXFAM, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (F. Jafari, personal communication, June 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (M. Qaisari, personal communication, July 3, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (M. Mirzaei, personal communication, July 23, 2015), and compiled by the author.

Table 14: Criteria four: Financial & Economic	Score / System		
	1	2	3
<p>CapEx affordability All the systems are low cost and affordable. There is no need for community level construction activities which reduce the cost significantly.</p> <p>Pour flush and dry systems are already used in Kabul and vermi-digester is a new system but with some changes in the dry system can be installed. If some kind of subsidy provision is needed, it should be considered for all of them.</p>	-	Vermi-digester Dry system Pour flush pit	-
<p>OpEx affordability Dry system & Pour flush pit: Operation and maintenance is not also expensive for such kind of systems, and currently in many parts of Kabul City dry and pour flush pit system are working. In fact they are two mains sanitation systems in Kabul and other Afghan cities.</p> <p>TWT: This system is a new option and need public awareness which should be done by the government. The households have to buy the worms, but at the end the emptying frequency is lower than pour flush pit and dry system which reduce the cost of operation and maintenance. Furthermore, the quality of the products in this system is higher which increases its value, and there will be more demand for it.</p> <p>The most important point regarding O & M is a scheduled emptying, and a proper monitoring system to avoid any expensive service charges by the service providers. Otherwise the systems themselves are not costly in respect to operation and maintenance. To sum up, for this measure all three systems are more or less similar (score 3).</p>	-	-	Vermi-digester Dry system Pour flush pit
<p>Income by the products TWT & Dry system: Urine diverting vermi-digester and urine diverting dry system produce fertilizer and soil conditioner which are suitable for agricultural activities in the area. At least the households might empty their facilities free of charge due to the value of the products. Both systems score 3 for this measure.</p> <p>Pour flush pit system: the product can be applied directly on farm lands. But the quality of the product is less than TWT and dry system. Above that the nutrients can be washed away. Furthermore, in case of improper use, some harmful materials like heavy metal could be found in the products.</p>	Pour flush	-	Vermi-digester Dry system
<p>Space for the system All these three systems are considered as individual facilities maintained by the households. So there is no need for a common place allocated to them by the community: Introducing sanitation system at the household level makes the sanitation provision simple and requires no public land. All the primary systems score 3 at this measure.</p>	-	-	Pour flush pit Dry system Vermi-digester

Source: (Tilley, Strande, et al., 2014), (Etemadi et al., 2012), (Khawaja, 2010), (Nayono et al., 2012), (Tilley, Ulrich, et al., 2014), (Lüthi, Morel, et al., 2011), (OXFAM, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (F. Jafari, personal communication, June 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (M. Qaisari, personal communication, July 3, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (M. Mirzaei, personal communication, July 23, 2015), and compiled by the author.

Table 15: Criteria five: Socio-cultural	Score / System		
	1	2	3
<p>Strong demand</p> <p>Locals are interested in water-based systems, therefore there is low demand for a dry system. Vermi-digester is a new technology and also water-based. Vermi-digester and pour flush pit systems score (3) and dry system scores (1).</p>	Dry system	-	Vermi-digester Pour flush pit
<p>Need to behavior change</p> <p>Dry system: In case of dry system, people needs to avoid introducing water into the containment. They also shouldn't discharge urine and anal cleansing water into the open drain channels anymore. That means urine diverting facility should be installed for urine collection. Anal cleansing water should also be infiltrated into the soil.</p> <p>Pour flush pit: According to the households survey pour flush system does not need much behavior changes while for a proper function of vermi-digester and dry system more education and behavior change is needed.</p> <p>TWT: Handling of vermi-digester is more difficult than pour flush system but easier than dry system: vermi-digester is a water-based system. Anal cleansing water can be discharged into the containment. Even urine can be introduced to the compartment, but to prevent soil and groundwater pollution, it is better to avoid such practices.</p> <p>As a conclusion, although dry system is a traditional practice in Kabul, but significant behavioral and technical changes is needed to make the practice sustainable. Considering above mentioned points pour flush toilet takes score (3) following with vermi-digester scoring (2) and dry system scoring (1).</p>	Dry system	Vermi-digester	Pour flush pit
<p>Appropriateness for the locals</p> <p>Local people are washers, and many of them used to have water-based systems. Handling urine, faeces and anal cleansing water separately is a big challenge for them and contact with faeces or urine is also a taboo. Therefore introducing a water-based system similar to the traditional sanitation system would be the best option for the communities. Vermi-composting has the advantages of pour flush and dry toilets while does not have most of their disadvantages.</p> <p>Considering above mentioned points none of the options receives score 3. Dry system receives score (1) and wet systems receive score (2).</p>	Dry system	Vermi digester Pour flush pit	-

<p>Convenience</p> <p>Dry system: To operate a dry system properly, much more care and efforts compared to the wet systems is needed. Greywater, urine and anal cleansing water must not be introduced to the system. Current dry systems in the communities, following KURP upgrading, don't work properly. Bad smell is a big problem in these areas. Above that during cleaning, water should not be introduced to a dry system which is considered another limitation for an easy maintenance (score 1).</p> <p>Pour flush pit: According to the households, an easy-to-clean and free-of-smell are two main factors for the convenience. Pour flush toilet is the most convenient system among these three. Households even can use the soak well to discharge their greywater. There is no much to do at the household level except regular emptying (score 3).</p> <p>TWT: Following pour flush pit, TWT is the most convenient system. It is water based and greywater can be also introduced to the system. Much of the BOD are decomposed by the biofilms (score 2). TWT is an easy-to-clean system and different kinds of wastewater, anal cleansing water and also urine can be discharged into the system.</p> <p>Therefore dry system receives the lowest score in this part (1). Vermi-digester and pour flush toilet are more or less similar in this case: they are easy to clean, and smell with less efforts than a dry system can be avoided. So both take score (3).</p>	Dry system	-	Pour flush pit Vermi-digester
---	------------	---	--------------------------------------

Source: (Tilley, Strande, et al., 2014), (Etemadi et al., 2012), (Khawaja, 2010), (Nayono et al., 2012), (Tilley, Ulrich, et al., 2014), (Lüthi, Morel, et al., 2011), (OXFAM, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (F. Jafari, personal communication, June 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (M. Qaisari, personal communication, July 3, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (M. Mirzaei, personal communication, July 23, 2015), and compiled by the author.

Table 16: Sanitation system comparison for the study sites

No	Indicators	Measures (Through the sanitation chain)	System Comparison			System Scores (1-3)		
			I	II	III	I	II	III
			Dry system*	Pour flush	Vermi-digester			
1	Public health protection	-Health risk -Exposure to pathogens	-Medium health risk(2) -High exposure (1)	-Medium health risk(1) -Low exposure (3)	- Medium health risk(3) -Medium exposure (2)	1.5	2	2.5
2	Environmental protection	-Discharge BOD, N and P -Groundwater and soil pollution	-Possible (3) -Low (2)	- Possible (1) - Medium (1)	-Possible (3) -Low (3)	2.5	1	3
3	Nutrient recovery	-Re-use of nutrients	- Possible (3)	- Very difficult (1)	-Possible (3)	3	1	3
4	Water consumption	-Dry or water based	- Anal cleansing water is needed (2)	- Wet system (1)	- Wet system (1)	3	2	2
5	Energy	-Energy need	- No need	- No need	- No need	3	3	3
6	Viable supply chains	-local technology	- Well-known and used	- Well-known and used	- Trainings needed	3	3	1
7	Technical capacity	Proper O&M	Minor improvement and trainings needed	Minor improvement and trainings needed	More training and public awareness needed	2	2	1
8	Investment	-CapEx affordability (Subsidy) -OpEx affordability	- For poor people (2) - Affordable (3)	- For poor people (2) - Affordable (3)	- For poor people (2) - Affordable (3)	2.5	2.5	2.5
9	Profitability	-Income by the products	- Possible (3)	- Very difficult (1)	- Possible (3)	3	1	3
10	Land requirement	-Space for the system	-low space (3)	-low space (3)	-low space (3)	3	3	3
11	Demand for the technology, system	-Strong demand	- Very low	- High	- High	1	3	3
12	Behaviour change requirement	-Need to behavior change - Appropriateness	- High (1) -Low (1)	-Low (3) -Middle (2)	- Medium (2) - Medium (2)	1	2.5	2
13	Convenience	Easy to clean- Smell -	(Not easy (1 - (More potential (1 -	(Easy (3 - (less potential (2 -	(Easy (3 - (less potential (2 -	1	2.5	2.5
Sum						29.5	28.5	31.5

Table 17: *Selection of the best sanitation system*

Indicators	Sanitation Systems			Weighting Factor	System I	System II	System III
	Dry System	Pour flush	Vermi-digester		*	*	*
	I	II	III		Weighting Factor	Weighting Factor	Weighting Factor
1- Public health protection	1.5	2	2.5	13	19.5	26	32.5
2- Environmental protection	2.5	1	3	9	22.5	9	27
3- Nutrient recovery	3	1	3	1	3	1	3
4- Water consumption	3	2	2	6	18	12	12
5- Energy	3	3	3	8	24	24	24
6- Viable supply chains	3	3	1	2	6	6	2
7- Technical capacity	2	2	1	3	6	6	3
8- Investment (O&M and Land)	2.5	2.5	2.5	10	25	25	25
9- Profitability	3	1	3	4	12	4	12
10- Land requirement	3	3	3	7	21	21	21
11- Demand for the system	1	3	3	12	12	36	36
12- Behavior change requirement	1	2.5	2	5	5	12.5	10
13- Convenience	1	2.5	2.5	11	11	27.5	27.5
	29.5	28.5	31.5		185	210	235

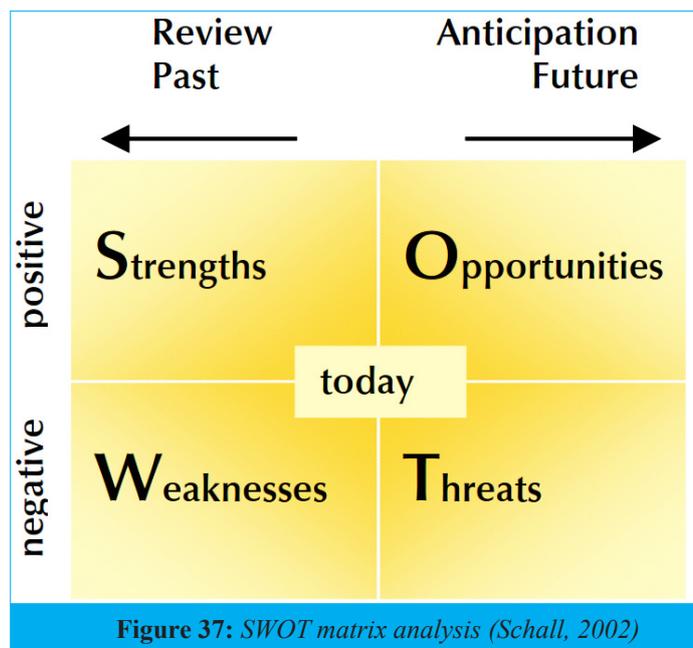
4.4.3. SWOT Analysis

Based on the previous steps and activities ‘Vermi-digester System’ was chosen as the best possible sanitation system for Kabul’s informal areas. But despite many advantages of this system, there are still some disadvantages which make the selection tricky.

We need to determine the strengths and weaknesses of the selected system. We should also have a clear idea about the opportunities and threats in the environment where the system is to be applied.

A SWOT Analysis for the selected system was therefore conducted. Such an analysis could be applied for the other primary sanitation systems as well (Figure 37). But due to the last steps done, there would be too much repetition. Therefore at this step, the focus will be on only the best possible sanitation system in Kabul’s informal areas.

The SWOT Matrix will show us the positive and negative factors that need to be considered. It will help us to increase the positive impacts and develop mitigation measures to reduce the negative impacts.



To conduct the SWOT Analysis for the selected sanitation system, the influential factors were divided into internal and external factors. In each category the factors were also subdivided into positive and negative factors.

The SWOT Matrix highlights the positive and negative influential factors. These factors can be categorized using the components of the enabling environment which was explained earlier in this dissertation (Strande et al., 2014).

As shown in Table 18, a list of weaknesses and also strengths in respect to the internal characteristics of the vermi-digester system were developed. A comprehensive literature review with focus on the related experiences regarding vermi-digester was the main source to list the internal factors. These factors focus mainly on the internal characters of the vermi-digester system.

The next step was to develop a list of opportunities and threats which mainly focus on the external environment where the sanitation system is implemented (Table 19).

Table 18: SWOT analysis: internal factors

Influential factors: Strengths	Influential factors: Weaknesses
<ul style="list-style-type: none"> • Availability of skill and capacity • Low cost on-site sanitation • Household based technology • Implementable by the community • No need for the public land • Water-based system • Can receive greywater if needed • No need for further treatment (direct application on land) • No energy needed • No odour • Adaptable design to locally available materials • Low emptying frequency • Groundwater protection • Soil conditioner / Compost production • Convenience of use • Socio-culturally acceptable 	<ul style="list-style-type: none"> • Lack of awareness about the system • Less productivity in cold seasons • Regular operation and maintenance is needed • Sanitation chain must be established

Source: (Edwards & Bohlen, 1996), (Eastman et al., 2001), (NETSSAF, 2006), (Khawaja, 2010; Lalander et al., 2013), (Furlong et al., 2015), (Tilley, Ulrich, et al., 2014), (Furlong et al., 2016), (Furlong et al., 2017), and compiled by the author.

Table 19: SWOT analysis: external factors

Opportunities (positive)	Threats (negative)
<ul style="list-style-type: none"> • Access to sanitation for all' policy • Decentralization promotion within the government • Community participation promotion by the government • Interest in wet systems among the households • Technology improvement policy 	<ul style="list-style-type: none"> • Implementation in informal unplanned areas • Lack of a pro-poor policy • Inadequate legal framework • Lack of proper institutional arrangement

Source: (Salam, 2006), (Khawaja, 2010), (Lüthi, Morel, et al., 2011), (RECS International & Yachiyo Engineering Co., 2011), (Etemadi et al., 2012), (Etemadi, 2015), (Parikh, 2015), (Hassib & Etemadi, 2016), and compiled by the author.

To guarantee a successful sanitation implementation, there should be a good harmony between the opportunities in the surrounding environment and the strengths of the vermi-digester system. In addition, there should be a proper strategy to benefit from the opportunities using the strengths. The strategy should also help us to mitigate the weaknesses using the opportunities.

The developed strategy is important because we cannot wait until the situation is ideal to implement a sanitation approach. The SWOT Matrix helps us to develop a proper strategy for the promotion of the novel sanitation system.

There are several strategies which can help us to achieve the favorite conditions:

Strength-opportunity strategies (SO): this strategies are trying to focus on the strengths to benefit from the available opportunities in the environment. This is the best scenario mentioned in the matrix.

Strength-threat strategies (St): in this scenario, relying on the available strengths, the focus will be on eliminating the threats on the system.

Weakness-opportunity strategies (WO): despite many opportunities available in the environment, the system due to its inherent weaknesses is not able to use them. In this scenario the focus should be on increasing the abilities and eliminating the weaknesses.

Weakness-threats strategies (WT): this is the worst a sanitation system faces: there are many weaknesses and also many threats in the environment. There should be very precise and well-developed strategies to overcome the tough conditions.

SWOT Matrix

Vermi-digester as the recommended sanitation system has also its own limitations. But such kind of limitations more or less can be seen with the two other sanitation systems mentioned in this study as well.

The main constraint with the vermi-digester system is its lower productivity in cold seasons. Some technological improvements like insulation, or using a kind of worm which is more suitable for the climate condition in Kabul can be tried.

To test the appropriateness of the vermi-digester system, this study suggests conducting some pilot projects for vermi-digester in Kabul City. The results would also help to improve the technology further. Furthermore, using the system, some weaknesses can be converted to strength. As an example, the lack of awareness about the system will be decreased after testing vermi-digester in some areas, especially if the system is a successful experience. Table 20 shows the SWOT strategies based on the advantages & disadvantages of the sanitation system.

Table 20: SWOT matrix strategies

Strength-opportunity strategies Considering the strength points, use the opportunities:	Weakness-opportunity strategies Using the opportunities, eliminate the weaknesses:
<ul style="list-style-type: none"> • Based on SDGs and also Afghan Government policy, all the citizens should have access to sanitation. Vermo-digester is a low cost and simple technology, and its scale up looks more promising. • According to the sector policy, decentralization should be promoted. Vermo-digester is an individual-based technology, and can be used at decentralized level as well. • Vermo-digester is a socio-culturally accepted system and has some common points with the traditional and also popular wet systems in Kabul. • Community based systems especially in the informal areas are promoted. Vermo-digester can be implemented through community participation. 	<ul style="list-style-type: none"> • If the system is successfully implemented, there will be more interest in its promotion and more people would choose it. • Vermo digester is a new technology and there should be more improvement in the technology itself. Introducing some pilot projects would help to identify the challenges and improve the system gradually. • Technology improvement can lead to lower operation and maintenance. Furthermore, through community participation, the quality of operation and maintenance can be increased. • Based on the new policies and government's approach an enabling environment including a better sanitation chain can be established.

Strength-threat strategies Strength points should be used to eliminate the weaknesses:	Weakness-threats strategies Weaknesses should be reduced and avoid from the threats
<ul style="list-style-type: none"> • Although some authorities are not in favor of upgrading activities in the informal areas, but the overall government policy is sanitation provision for all. • When a technology is widely accepted and implemented, there should be some regulations including pro-poor policies to manage the process. • Lack of coordination among major players is a general problem, and can be solved with creating an enabling environment. Many strengths contribute to creating an enabling environment which lead to creating legal framework and also more institutional arrangement. 	<ul style="list-style-type: none"> • There should be specific kind of campaigns at community levels, schools, etc. to increase the public awareness. • There should be some technological improvements like insulation to mitigate the negative impacts of the technology during cold seasons. • There should be more public awareness for a better operation and maintenance. Private sector can get involved to facilitate the job. • • Public and private sectors must be actively involved to establish an effective sanitation chain.

4.4.4. Development of the Community Upgrading Plan (CUP)

KURP's activities in step 6 & 7 is more or less similar with 'Design Options' and 'Selection Process' which are steps three and four in the common planning process mentioned in Table 8.

Communities had a role to prioritize their needs and also choosing the best option for sanitation and solid waste management. As mentioned, KURP provided budget and technical support for the communities to improve their existing dry toilets. KURP also paid money for construction of trash collection points. In respect to the road pavement and water supply, KURP considered those project beyond the ability of the communities and awarded the projects to local companies.

To have a proper operation and maintenance of solid waste management at the community level a community saving box was established: each community was responsible for the operation and maintenance of standpipes and stand-alone features including solid waste collection points. Operation and maintenance of the household toilets were individual responsibility of each family.

The final outcome of this step in KURP planning was a Community Upgrading Plan (CUP) which was developed by the consultants hired by the World Bank. They were also engaged with the communities from the early stages of the planning, option prioritizing by the community, and also design and supervision during the implementation phase. Each CUP had a memorandum of understanding including technical issues, roles and responsibility of the stakeholders in different phases of project implementation and cost sharing. After the approval of CUP by the community, the plan was submitted to the government authorities for the formalization (KURP-PMU, 2006).

From this point onward the implementation closure steps (step 8 & 9) at KURP plan started. These steps are equal to the step five or 'Action Plan' at the common planning process. When the design stage was finished by the consultants, MUDH prepared the bidding document and published it on the local media. Following that contractors were chosen through a national competitive biddings and finally winners implemented the projects.

Gozar council, alongside the consultants hired by MUDH supported by the World Bank, had responsibility to monitor the implementation process. The consultant companies furthermore had the role for supervision, community consultation, engineering design and contract development (SMEC International, 2011).

A few days before the project closure, in each Gozar a workshop was held. During these workshops roles and responsibilities of all the stakeholders during the operation and maintenance were highlighted. A manual called ‘Operation and maintenance Manual’ including the commitments made by the Gozars’ councils was disseminated to make sure that operation and maintenance went on smoothly.

To create public awareness and run the project smoothly several meeting, activities and workshops in site one and two by KURP were conducted. The household survey also showed that the local people have good knowledge about adequate sanitation and safe drinking water. But still more public awareness regarding hygiene is needed. Hygiene, as the neglected part in MDGs, needs to be addressed more seriously during sanitation interventions especially in informal areas.

As a conclusion, it seems the overall KURP’s procedure was designed well. But there were some important points missed or not developed properly. The focus on sanitation and solid waste was not enough. Road pavement and storm water drainage construction were the main components of the project while sustainable sanitation provision was not addressed properly.

4.5. Greywater Management in the Sites

Since there is no standard solution for greywater management at household or neighborhood levels, communities should select the best system that meets their needs. The selection process should be supported by sanitation experts (Morel & Diener, 2006).

Almost all houses in Kabul’s flat areas have their own backyard gardens. Size of the gardens depends to the size of their yards. Only apartment blocks usually don’t have such backyard ecosystem, but they are not much in Kabul’s informal areas compared to the courtyard houses.

Courtyard is the main kind of house type in Kabul’s informal areas. But in the formal area detached housing units are the most common forms (Figure 38). The size of the courtyard houses are different, but mainly are from 200 to 400 m². Their built areas vary also from 25 to 65 percent of the houses. This kind of architecture allows a high level of plot coverage while there is a good enough light and ventilation. Informal areas are usually denser than formal areas and about 25 houses in each hectare can be found. But in the formal area the average number of the houses is about 22 houses per hectare (Bertaud, 2005). Most of the households in Kabul City, including formal and informal areas, have enough space for having greenery and backyard gardens in their houses.

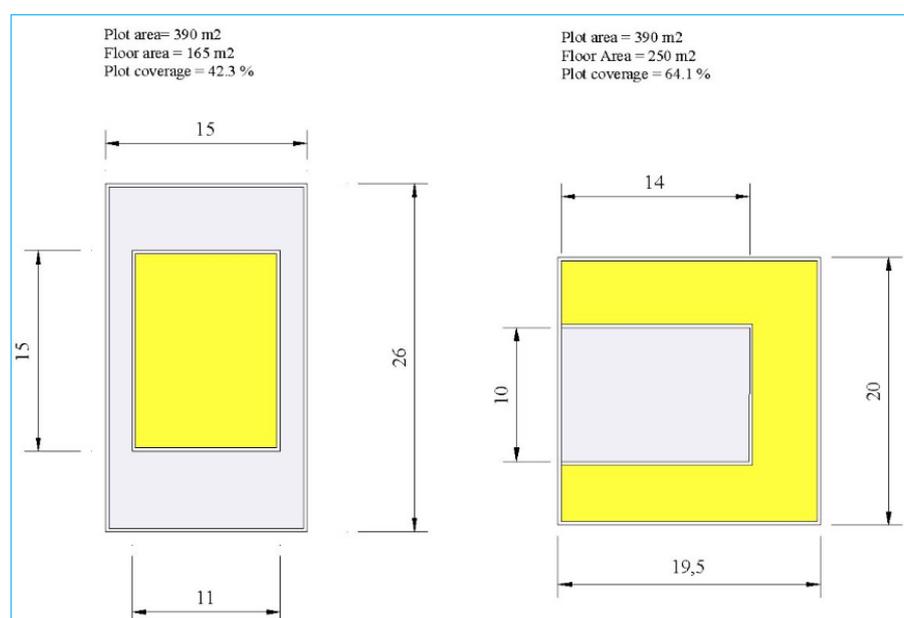


Figure 38: Courtyard versus detached housing (Bertaud, 2005)

Masjed Itfaq, site one, is located in western Kabul at district 13. It is a flat area and totally informal expanded rapidly during the last decade. Soil in the area (like many other parts in Kabul) consists of loess, gravel and sand which is prevailing case in Kabul's flat areas (RECS International & Yachiyo Engineering Co., 2011). Although most of the time dry, there is a stream in the south side of the site one which ends up finally at Kabul River. Most of the houses within the gozar are courtyards with allocated place for backyard greenery.

Site two which is the hilly area located in Kabul's downtown. It consists of 70 percent mountainous and 30 percent semi-mountainous areas (KURP, 2007). The Gozar has mostly rocky ground and soil infiltration is very low (Etemadi, 2015). Hilly areas, including site two, in many cases don't have enough space for backyard garden. Furthermore, the soil is not suitable for such kind of practices. Therefore much less can be done in respect to on-site greywater management like infiltration. The best option in site two would be a greywater management at community level which needs a public space somewhere around the community.

The first available option for greywater management in Kabul's flat informal areas is using it as irrigation water in the backyard gardens. Using plant-friendly detergents should also be promoted in the city to facilitate reuse of the greywater for the irrigation purposes: Although greywater may look a bit dirty but it is usually safe and suitable for irrigation. In addition, it has high level of nutrients which are important for plant growth.

The land can be shaped in a way to convey greywater to the backyard gardens instead of discharging into the streets. Currently people mostly discharge their greywater into the streets which finally goes to the waterbodies or open lands. This practice can lead to serious health risks due to the concentration of pathogens in the greywater. Above that BOD available in the greywater is easily biodegradable which can easily cause septic situation.

If the amount of greywater is more than needed for the backyard irrigation use or there is no greenery in the yard, greywater can be introduced to the vermi-digester system or infiltrated into the soil.

Obviously such kind of greywater management approaches are interim, and more advanced solutions can be applied in future: The overall idea is a gradual improvement step by step, and when it is possible. For example if in the future some public space within the community is available, a part of the greywater can be treated and used for the irrigation purposes at the community level. The treated greywater would be used for the greenery and parks or simply discharged into the water bodies close to the area or even used for the groundwater recharge.

In site two which is a hilly informal area there is less chance of greywater management. As much as possible, greywater in site two should be reused within the community. That can be for irrigation, soil infiltration and other possible purposes. But at the end the level of greywater reuse will not be that high. Therefore in site two constructed rainwater channels should be used for collection of the greywater which is not reusable within the community. This can be the main practice until the relocation of the community.

Kabul City is located in an arid and semi-arid region. Precipitation is about 300 mm per year which is low. In site two and its surrounding areas, surface water drainage finally reaches Kabul River which is in the vicinity. During the rain greywater and surface water can be bypass to Kabul River but in the other time there should be some decentralized facilities to treat the greywater

produced in site two and the other similar communities in the area.

To avoid digging in rocky ground in site two which is costly and time consuming, all the communal greywater treatment facilities should be built on the flat areas surrounding the hilly informal areas. There are many public places and government offices in the area. Those places can be used for the construction of suitable kind of on-site greywater treatment plants. To consume less space even the treatment plants can be constructed underground and the outlet can be used for irrigation purposes or discharge into Kabul River.

Site two is in Kabul's downtown and close to the main Kabul's market and government buildings. Many citizens due to their official or individual works have to travel on daily basis to the areas near site two. Storm drainage system in site two and its surrounding areas until reaching the treatment facilities should be covered. Covered storm water drainage protect the system from solid waste and any other materials that can block the drainage channels. But despite the protection, there should be possibility of proper operation and maintenance.

4.6. Rainwater Management

The rainy season in Kabul is not long, only few months in spring and autumn are considered rainy time. But even during that time there is no much rain. The amount of the precipitation is about 300 mm per year (Climatestotravel, 2019). But due to lack of proper surface water management system, Kabul citizens face many challenges during the rainy seasons. Water stagnation, blocked canals and in some cases flooding are the main problems in these periods. Surface water canals usually are constructed alongside the roads to convert rainwater finally to the main streams in the city.

Operation and maintenance of these channels are not always easy for Kabul Municipality. In many cases due to lack of efficient solid waste management, a lot of solid waste are collected inside the channels and block the water ways. In some cases due to lack of proper design and construction, drainage channels don't function correctly and the surface water cannot find its way toward main streams in the city. Sometimes the channels go to nowhere and are filled with stagnant water.

In north part of the city there is no natural stream, and management of surface water in rainy seasons is difficult task. Wazirabad canal is the main drainage system in this area to convey the stormwater, but usually operation and maintenance is weak (EIRP, 2006). Currently Kabul Municipality has started a project to rehabilitate the canal.

The level of groundwater in Kabul City has been drastically dropping down. Storm water should be considered as a resource to compensate a part of the loss. Using the stormwater for groundwater recharge should be strongly promoted. Rainwater harvesting including in-site infiltration should be practiced. Currently there are many dry shallow wells in site one and also across the city. In some cases households use these shallow wells as dumping site for their solid waste. This practice should be banned and households should be directed to use their dry wells properly for rainwater infiltration. Even in houses without shallow or dry wells, digging a soak pit is easy and possible by the landlords themselves. They can shape their landscapes to direct the rainwater inside the soak pits: only in emergency situation or in hilly informal areas where on-site infiltration is not possible, rainwater should discharge into the surface water channels alongside the streets.

4.7. Solid Waste Management

Lack of proper solid waste management at the community level is a further challenge. Solid waste collection is not done on a regular basis. As mentioned, some households even use their dry shallow wells to dump their solid waste. Surface water drainage is also in many cases blocked by solid waste.

Disposal and collection of solid waste which is not sorted makes later process and recycling or reuse expensive and difficult. In future there should be a plan to introduce solid waste segregation at household level.

Kabul Municipality has the responsibility to provide solid waste management services. Currently due to lack of demand for the products of traditional latrines, sometimes Kabul Municipality has to collect night soil as well. Most probably in future they should be officially and more structured in charge of human waste collection produced by dry toilets and the proposed vermi-digester systems. Therefore a proper mechanism of collection on a regular basis is necessary. Co-composting in the landfill sites can be installed to manage organic waste and products of traditional latrines installed on the hilly informal areas.

As a conclusion, introducing current solid waste collection points in the informal gozars was a good idea: in hilly informal areas and also in some flat informal areas, access to each housing unit is not possible and door-to-door collection is not financially viable. But better site selection for the collection points, proper operation and maintenance and finally regular collection is vital to keep the system working. Therefore, the current solid waste management system introduced by KURP can work in case of better operation and maintenance by the municipality.

4.8. Water Supply

Almost all Kabul's population uses groundwater. The water quality in the shallow (less than 100 meters depth), unconsolidated primary aquifer has been deteriorating. Lack of proper sanitation management is one of the main reasons. According to an investigation done in 2009 by USGS, at least 60 percent of the shallow wells would be affected or become dry due to the climate change (Mack et al., 2009). To this number we should add the percentage of decreasing water availability due to the population increasing in Kabul City.

From 2002 to 2004, to rehabilitate and expand the water supply, a "Feasibility Study for the Extension of the Kabul Water Supply System" was supported by the German Government-owned Development Bank (KfW). This is the most recent and comprehensive water supply development plan which works as 'Kabul water supply master plan.' The implementation of this master plan was supposed to be completed by 2015, but it is now far behind the schedule and seems to take a long time before the completion.

At the early stages of water supply master plan development, Kabul's informal areas were ignored which means even in case of full implementation there is not much benefit for the informal areas. Above that, since the development of the master plan by 2004, Kabul's informal areas has been expanded several times. A review and update of the master plan is an urgent need.

The water scarcity problem in Kabul City is serious. It is the main challenge for Kabul's development. Currently the whole city relies on groundwater which is not sustainable. Surface water should be used to provide adequate and affordable water for the citizens.

According to the estimation made by KfW, the potential of Kabul groundwater, as almost the only source of water in the city, is 44 million m³ (MCM) per year (KfW-Germany Development Bank, 2010; RECS International & Yachiyo Engineering Co., 2011). If we consider the population of Kabul City even 4 million and 120 lit per day water for each resident of Kabul City, we need approximately 173 million m³ (MCM) water per year. This simple calculation shows even now the residents have no access to enough water to meet their basic needs, and the situation in the informal areas is even worse.

Several investigations are going on to provide surface water for Kabul City. When these projects are completed, Kabul citizens will have a more reliable source of water, and the level of groundwater pollution will be reduced. Potential water resources for Kabul City are shown in Figure 39 (RECS International & Yachiyo Engineering Co., 2011).

Many parts of Kabul City especially in informal areas don't have water distribution networks. Even if they have water distribution network like the case of site one, there is no reliable source of water. Above that many of these distribution networks have been constructed by the informal private sector and financially supported by the communities. It is really difficult to verify the quality of implemented projects.

The Afghan Government needs to reconsider groundwater provision to Kabul's formal areas from groundwater resources. Formal areas mainly have the possibility of receiving water from surface resources. But informal areas due to their structures and also lack of water distribution network have to rely more on groundwater.

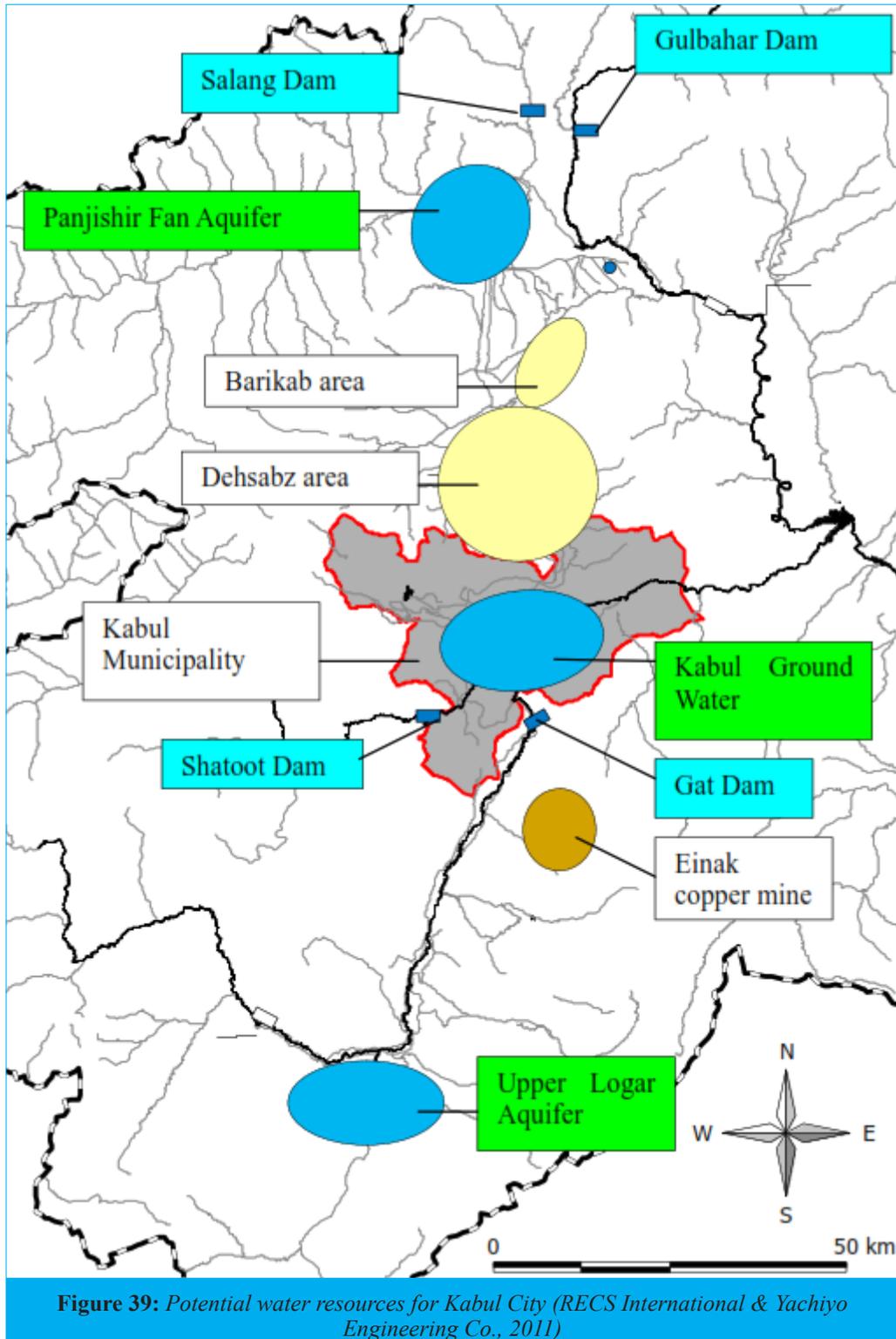
Currently almost all the water supply projects in Kabul are located in formal areas (KfW-Germany Development Bank, 2010). There are some public wells in the informal areas constructed and managed by Afghanistan Ministry of Rural Development Affairs (MRRD). There are also few areas in the informal part covered by AUWSSC as well. Households living in the informal areas have mainly their own shallow wells, if they are not dry, or have been serving by the informal private sector.

In most formal areas people receive better water quality with a high subsidy while mostly poor people in the informal areas are faced with water shortages. They have to pay more money to the informal private sector buying water. Due to the informal business of these companies there is no information on the quality of the water as well. Households in the informal areas themselves should come to an agreement with the private companies regarding water price and quality of the services.

It seems AUWSSC needs more time to capacitate itself for taking the responsibility not only in informal areas but also in the formal settlements. In some provincial cities and also in some Kabul's formal areas like Macroyan, which is a huge complex of apartment blocks constructed during the Soviet era, Kabul Municipality runs water supply and sewerage projects.

Figure 40 shows that public water supply plan doesn't cover many Kabul's informal areas. According to this plan Short Term Program (StP), Medium Term Program (MTP) 1, 2, and 3 are the components of the water supply master plan. Activities consists of studies and design, construction of boreholes and wells, collector mains and reservoirs and finally distribution and house connections. Currently Afghan Government works on MTP 2. Site one (in Figure 40) locates on D6 which is totally uncovered in the master plan.

AUWSSC should extend its services to all Kabul's urbanized areas. Furthermore, some parts of the MTP projects need to be halted until providing of surface water to the City (RECS International & Yachiyo Engineering Co., 2011). With the extension of the water supply network, more water in the areas facilitated with the network will be used. More water consumption means less water for the informal areas accommodating the most vulnerable people who rely on their individual wells, public wells or informal private sector. It seems before any further extension of the network, there should be more surface water available for the city.



Site one is among few locations in the informal areas where AUWSSC runs the water supply projects. But there are many problems especially in regard to water supply management. Many households have connections from the informal private sector as well. The households had to pay themselves even for the capital cost. The main reason to accept such a burden was unreliability of the public water supply. It seems in many cases, the informal private sector is more responsive to the community compared to the AUWSSC.

There is not enough capacity within AUWSSC to provide water to all Kabul's urban areas, and even in long term AUWSSC should not go for that. There are many private water supply companies in the informal areas. They implemented some successful water supply projects as well. MUDH, regulatory body and AUWSSC should try to manage and monitor those companies and let them to provide affordable and quality services to the communities. As long as those companies can meet the obligations, they are qualified to supply water to the citizens. MUDH and later the independent regulatory body should develop required legal documents for the operation of the private sector alongside the public sector.

Without prohibition of using individual shallow wells in Kabul City, any kind of water-based sanitation system could lead to more & irreversible groundwater pollution. Individual shallow wells, due to their vulnerabilities, are one of the main source of groundwater pollution. In many houses they are located few meters away from sanitation facilities.

In the short term households should be served by groundwater but in the mid-term, following upgrading in each community, surface water would be also used. Only in this case, water-based sanitation system can work without putting the citizens at major health risk.

According to the household survey, water supply project in site one due to full ownership and management by the government has faced many challenges. There are many technical and managerial problems. Above that, lack of transparency has created another challenge: it seems current running option cannot work properly for the water supply system which is a community asset.

Afghanistan Urban Water Supply and Sewerage (AUWSSC) or registered private companies using deep wells should provide water supply services to the people living in informal areas. Although, water can be provided by public or private sector, but some modifications for an effective service provision either by AUWSSC or by the private sector is needed. Maybe a kind of co-management between public, private sectors and the community in the informal areas would run the facilities better. More investigations including some pilot projects would provide us more concrete answers in this regard.

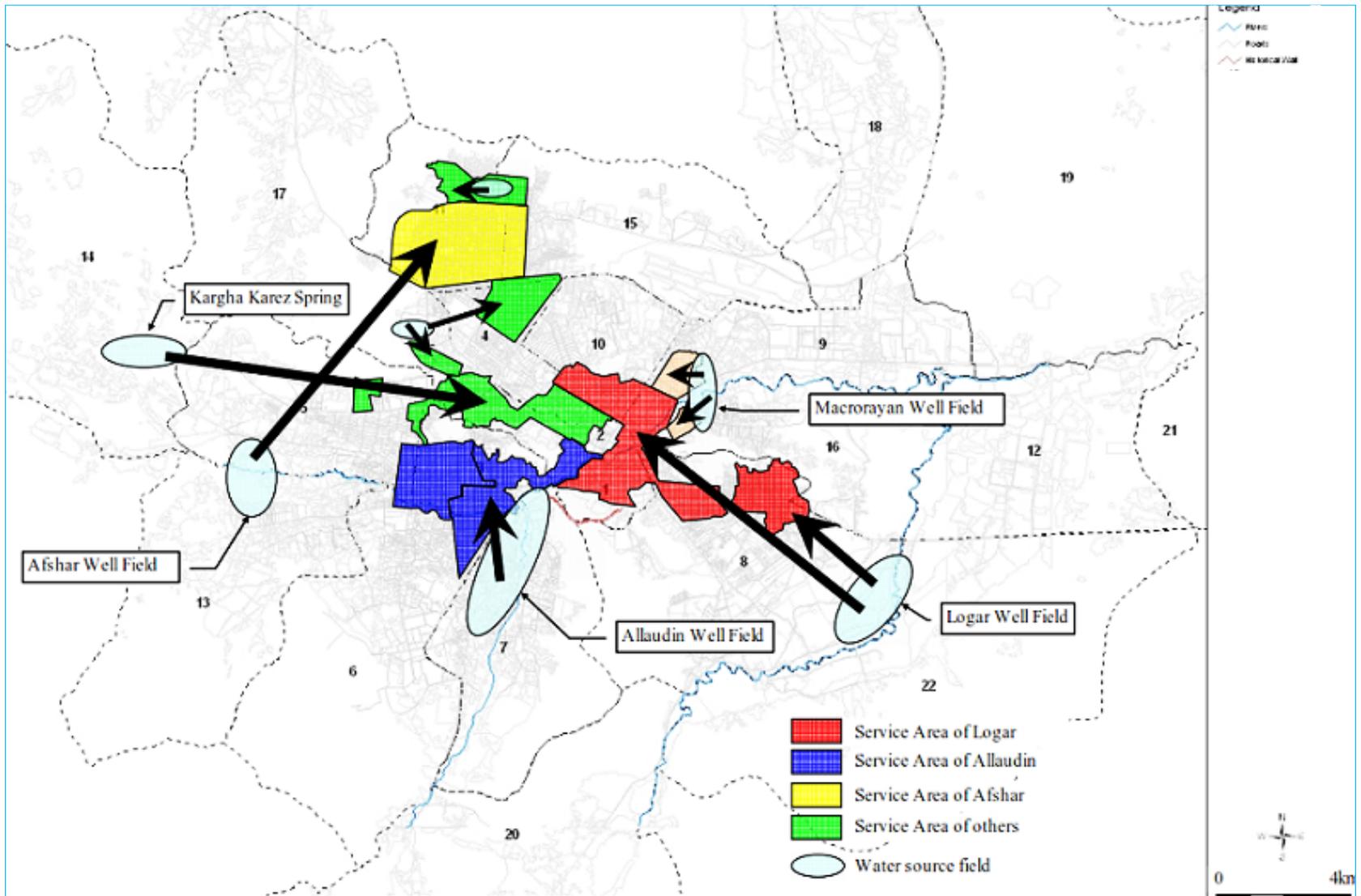


Figure 40: Extension of water supply system of Kabul (KFW-Germany Development Bank, 2010) simplified by (RECS International & Yachiyo Engineering Co., 2011)

4.9. Financial Sustainability: Willingness to Pay and Affordability

A detailed situation analysis is a key to proper sanitation planning. Although KURP conducted a site assessment, the poverty issue was not sufficiently highlighted. KURP had its own budget and didn't rely on financial contribution of the communities so much, therefore there was a justification to not focusing on poverty issue. There was a focus on financial sustainability but mainly at the operation level.

Although we can have a general idea about poverty in the city, it is a site specific issue as well and for a precise assessment there should have been separate surveys for each intervention area which was beyond the KURP's time schedule and budget.

KURP divided its project activities into two project scales (KURP, 2006):

- Small scale contracts: totally less than 50,000 US dollar which were implemented by each community at neighborhood levels. This section covered street lighting, sanitation at household level and solid waste management.
- Large scale projects including road pavement, water supply and rainwater drainage which were awarded to professional companies through competitive biddings.

Although with this approach and financing the project by donors, KURP did not deal with the affordability issue during the upgrading, but they had to keep sanitation at the household level without considering the entire sanitation chain. KURP also due to its already allocated budget did not investigate enough on poverty issue in the Gozars and no poverty assessments were conducted. Furthermore, the theoretical part of the project which was supposed to provide information regarding different aspects of sustainability was not conducted. The experiences of KURP including financial sustainability, subsidy provision for poor families, micro financing, etc. would be valuable data for the upcoming projects.

KURP let the households make a decision on sanitation themselves and share it with the authorities which was a democratic and open-minded approach, but they also allocated little budget to sanitation and insisted on a household level solution. So despite freedom of selection, there were few options for the households and the community representatives to choose from.

And finally to make sure that lack of affordability is not the reason for low willingness to pay for sanitation, some precautionary measures should be considered. To have an affordable conditions for the tenants, if some subsidies are given to the landowners, there shouldn't be any surcharge added to the rent.

Also, there should be eligibility criteria to recognize poor families subjected to receive the subsidy (Unit for Policy Implementation, 2005):

1. The breadwinner of family is a simple worker with salary below than the formal poverty line
2. Households managed by disabled, females or old aged (60+ years) persons.

If the landowner fulfils one of these two criteria, he/she should be considered eligible to receive subsidy.

4.10. Operation and Maintenance in the Study Sites

Currently in site one, sanitation should be managed at household level. When sanitation facilities are only located at the household level, each family should take care of its own facility. If there is a communal storage / partial treatment which is the case in site two, the community's representative, or anyone else in charge of, is responsible to collect money when needed and empty the facility.

According to the surveys and field visits, sanitation management in site one and site two don't work properly. But in site two, where there is a communal septic tank, there are more problems. The communal septic tank is connected directly to the drainage system: according to the locals in site two, there is no regular desludging plan. Furthermore, the houses without access to the communal septic tank discharge their blackwater into the storm water drainage without treatment.

Regarding sanitation flow chain, beyond the household or community level nobody knows what happens exactly. There is no proper monitoring system, law enforcement or sanitation chain. Informal truck drivers and farmers can collect the wastewater and dry faeces using for agricultural activities or just simply dumping it somewhere else. In the best scenario the wastewater are taken to the only Kabul's wastewater treatment plant which is not working very effective.

In respect to water supply provision, AUWSSC is responsible. But there are many deficiencies and the households in site one are not happy with AUWSSC's unreliable service. Currently many households receive water from an informal private water supply company parallelly. Furthermore, other components of the environmental sanitation are not managed properly as well. Therefore, a comprehensive sanitation management plan is needed to address the challenges during the operation and maintenance.

Although there was an operation and maintenance plan for each upgraded Gozar which was developed and validated during the project implementation, but the plans were not comprehensive and didn't not work properly: In fact there was no any follow up either by the communities or by the authorities to know if the plans were implemented or not.

The main challenge at the operation and maintenance level are in sanitation and water supply managements. The locals can take care themselves regarding maintenance of the drainage system, and each family tries to clean the drainage in its own vicinity. Municipality employees also clean the drainage although it is not on a scheduled plan.

In case of solid waste management there are few people in the communities who collect the garbage from each family and take it to the trash collection points. In few cases households take their solid waste to the trash collection points themselves. But collection from the trash collection points, which is the municipality's responsibility, is not on a regular schedule and in some cases it takes a long time. Therefore, for a better solid waste management, Kabul Municipality should increase its capacity and at the household level there is no much problems. In future in case of solid waste segregation, etc. there should be training or public awareness in the community levels.

Another noteworthy point regarding better operation and maintenance is the structure of streets. Roads in the informal areas usually are narrow, mainly from 4 to 6 m. But still they are wide enough for the vehicular traffic.

In respect to the streets, the main challenge is the lack of hierarchy. There is no network of primary and secondary roads (Bertaud, 2005). Upgrading packages in the informal areas should consider

this point as well. A proper street system will facilitate different issues including provision, operation and maintenance of the environmental sanitation components.

To manage sanitation and water supply within the community in an effective way, there should be a comprehensive operation and maintenance plan. Current management system in place is not working and there are many complaints against it. Two following options for a better operation and maintenance in respect to water supply and sanitation in the study sites are suggested:

4.10.1. Operation and Maintenance by Kabul Municipality

This option suggests the running of the sanitation management by Kabul Municipality. They are already responsible in terms of drainage and solid waste management. They can take responsibility for faecal sludge management as well. Currently the only Kabul WWTP is also run by Kabul Municipality, and AUWSSC's department in charge of wastewater management is almost a newly established office. AUWSSC stands for Afghanistan Water Supply and Sewerage Corporation. Still it is not clear in which extent AUWSSC will be engaged in faecal sludge management. In the long term when AUWSSC has enough capacity, it can take responsibility regarding products of TWTs and improved traditional toilets.

Sanitation at the household level should be managed by the households and following that Kabul Municipality should take care of it. For a proper management at the household level public awareness campaign and trainings should be conducted. It is the role of Kabul Municipality to complete the sanitation chain for TWTs and also close the nutrient loop for the dry system in cooperation with related organizations like the Ministry of Agriculture, Irrigation and Livestock.

Currently farmers are using animal cart collecting dry faeces to apply on their lands. But in many cases there is no demand for the products of traditional toilets and households leave them at the solid waste collection points where Kabul Municipality has to take care of it. Co-composting of this product alongside organic solid waste in landfill sites can be an option. But to do so a comprehensive assessment is needed to evaluate the feasibility of this plan and its proper implementation.

To ensure sustainable operation and maintenance by the municipality, there should be a regular emptying schedule. For cost recovery each household should be charged for the service. This money can be collected for each time service or included in the tax paid by the households. It is noteworthy to mention that although cost recovery based on user-pay principle should be the agenda, special care towards providing affordable services to poor families is needed. Furthermore, a proper tariff structure should be developed.

4.10.2. Owned by the Government and Run by Private Sector

Another option would be engaging of the private sector to run the projects while the government owns the facilities and makes the supervision job. In this case regarding sanitation management the private sector can be involved in the operation part while Kabul Municipality supervises the process. To have a sustainable system, an affordable tariff structure for the communities and also a profitable business plan for the private sector should be developed.

Private sector should have a scheduled plan and also proper facilities to collect the products of traditional latrines and also vermi-composting facilities. They should also collect urine separately.

Local farmers shouldn't be allowed to collect semi-dry faeces any more directly from the households. They should be in contact with the municipality or the private sector to receive safe fertilizer and soil conditioner.

Due to the nature of informal areas, and to avoid the problems regarding water supply management occurred in site one, it is better to involve the community in the management as well. In this case like the previous option co-management between public, private sectors and the community is recommended.

It is noteworthy to mention that water supply management in site two is also similar to site one. But site two is located in the vicinity of one of Kabul's main water reservoir top of a hilly area. They have enough water and also standpipes providing free water. This system of management although provides reliable water to the community in site two, but it is not sustainable and has been already led to the water scarcity in the other communities far from the reservoirs.

There is no doubt that sludge collection and disposal services either managed by the public or private sector should be supported by a comprehensive administrative mechanism. There should be a proper regulatory system, enforcing mechanism and high level of coordination between the stakeholders. A pro-poor tariff structure, scheduled emptying, regular inspection and trained staff can facilitate the operation and maintenance.

Another possibility for the operation and maintenance of water supply and sanitation facilities could be full investment and operation by the private sector under the supervision of the government. But this option needs rich and capable private sector which is not available in Afghanistan right now. Above that considering Afghanistan post-conflict situation, it does not look in short term possible. Therefore we avoid to discuss it as an option, but in the long run that could be the third option.

Based on some studies in Indonesia, sustainable O&M can be achieved through Co-Management of the facilities (Brückner & Dietrich, 2015). Currently in many informal areas, including site one, there is a kind of co-investment and co-management of water supply projects by the local communities and informal private sector. The households in the informal areas are satisfied with the operation and maintenance run by the private sector, or at least they prefer its service provision over unreliable government's service provision. If the government approves this model of service provision and tries to make it legalized and standard, another option would be available. But currently Afghan Government consider this kind of activities illegal and tries to have some kind of monopoly in the sector.

Although AUWSSC as a government-owned company could be the main service provider, but there shouldn't be monopoly in the sector. Any kind of monopoly would decrease the effectivity within the sector.

According to key informant interviews conducted with the authorities, AUWSSC is planning to apply public private partnership (PPP) model in some projects. They are going to engage private sector and locals in the operation and maintenance of the water supply projects, but still the roles and responsibilities of government is too much. In addition, government's plans are usually time consuming and there is no time horizon regarding implementation yet.

In terms of sanitation, the situation is a bit different. Sanitation in many cases and also in our

site studies is a household individual asset. In our suggested solution, sanitation should remain at the household level to keep the operation and maintenance simple: construction of communal sanitation facilities within the communities, needs public space, capital cost and high level of coordination. Plus that its operation and maintenance is also more complicated.

To make the upgrading of the informal areas simple, it is better to keep the sanitation as an individual household asset. Kabul Municipality and other stakeholders should try to complete the sanitation chain and close the nutrient loop. Sanitation management at the household level should be done by the households. But a comprehensive collection, transportation, treatment, disposal or reuse plan should be owned by the government and run by the private sector. In such a market driven approach, the government is the project owner and has regulatory and monitoring roles. But in the long term, when the private sector has enough technical and financial capacity, it can handle the whole sanitation management chain under the government supervision.

4.11. Land Regularization in the Study Sites

KURP upgrading project had several components including Land Tenure Regularization, but due to lack of enough budget this component was canceled (SMEC International, 2011). The results and outcomes of this part could provide useful recommendations on regularization process in Kabul's informal areas. That could be also an important driving force for a better implementation of the upgrading projects and its later operation and maintenance: regularization should be a part of the upgrading in the informal areas, and successful implementation, operation and maintenance can be a pre-condition for the land tenure regularization.

In fact, the rise of land tenure problem shows the weak rule of law in the country. It also shows that there is no enough legitimate shelter to meet the demands. Poor people should have the right and opportunity to formal their shelters, but at the same time, there should be enough law enforcement against those who try to abuse the post-conflict situation and make money out of land and house sale. The World Bank suggests several points regarding regularization of informal areas in Kabul which can be considered for our site studies as well (World Bank, 2004c):

- Regularization of existing occupancy as swiftly as possible,
- Capacitate the judiciary system to solve the property disputes
- Development of required policy and legal system

Informal settlements located on flat areas which is not flood-prone or essential for public interest, like groundwater protection zones or greenery, should be upgraded. According to this conditions and based on the suitability analysis conducted earlier in this dissertation, site one is suitable for the upgrading.

In general, steep slopes cause additional development risks, such areas also increase costs for service provision: Very often access to steep areas is not possible. In many cities the threshold for development on hilly areas is about 10% and if the slope is more than the limit, there should be special development standards. Furthermore areas with more than 30 % steep are not recommend for the development (RECS International & Yachiyo Engineering Co., 2011). Due to safety issues and also higher cost of providing urban infrastructure services in hilly informal settlements and in some cases even impossibility of providing services to steep areas such restrictions looks logic.

Intercontinental Consultants and Technocrats in a consulting service for Afghanistan Ministry

of Urban Development Affairs suggested a similar approach. Upgrading projects should be implemented on the hillside areas if it is within 30 m height distance from the existing main road, if it is within 30~80m, the areas should be left without any upgrading activities. People who live on the hilly areas higher than 80 m, should be relocated to safer places. Greening would be an option to their hillside areas (Intercontinental Consultants and Technocrats, 2008).

According to the suitability analysis and its technical criteria including slope, site two which is a hilly informal settlement was also subject to upgrading. As mentioned earlier KURP implemented an upgrading plan there.

Following the upgrading in site two, current sanitation system is falling short in respect to sustainability. The main reason for the failure is shortcoming in the sanitation planning approach. They neglected the sustainability criteria and also sanitation chain beyond the household level (Parikh, 2015). KURP due to water availability tried to facilitate the site with a wet system. But the post-upgrading studies show that sanitation intervention couldn't improve the sanitation management.

As discussed, system selection process in this research also ranked different suitable technologies in Kabul's informal settlements from vermi-digesting to pour flush and finally dry system. But due to the nature of the hilly informal settlements in site two and other similar areas in Kabul, water-based system financially and technically is not feasible.

In respect to hilly informal areas located in Kabul's downtown including site two another point should be also considered: Kabul City and specially its historical part which is located in Kabul's down town is the gateway of Afghanistan. It has the potential of becoming the tourism center of Kabul. The area has also good access to different tourist attractions in the city. Due to the availability of many potential public places, there is chance of conducting cultural events and public gathering there as well. Therefore according to the new development plan, the area should be converted to a tourist destination zone (RECS International & Yachiyo Engineering Co., 2011).

There is a high portion of greenery and public spaces belonged to the official buildings which can be open to the people following the relocation of the officials building to its new site. Kabul downtown is not far from Kabul's Airport which makes travelling to Kabul and out of the city easy. According to the approved Map of Kabul Urban Master Plan most of the ministries and official building located in the downtown will be relocated to Kabul's south-west (Figure 41) and the area will be developed based on a touristic approach.

Considering above-mentioned points despite the chance for upgrading of site two and similar places in Kabul's downtown, the long term plan should be relocation of the residents from these informal areas. But meanwhile an interim service provision approach, should be considered for the hilly informal areas.

It is noteworthy to mention that if there was no relocation plan for the informal hilly areas in Kabul's downtown, the best possible sanitation system, according to our investigations, was improved dry toilet at the household level. The interim approach should also focus on the sanitation chain beyond the household level.

The final goal for the improvement of the hilly areas in the downtown and steep slope areas in Kabul City is to encourage self-motivated movements from such areas to safer areas determined

by the government. Such a relocation process can be done in a mid-term plan developed by the government in cooperation with the local communities.

Most of houses on the hilly areas in Kabul's downtown are made of mud which need restoration each 15 to 20 years. This periodical restoration time can be used as an opportunity for the relocation. Any new or major construction activities legally should be banned, and the residents should be encouraged for relocation by free or subsidized relocation, facilitation of legal procedure for their new accommodation, etc. (RECS International & Yachiyo Engineering Co., 2011).

In general, land tenure regularization should be the last step in an upgrading process. After site selection, if the informal area is able to go through the upgrading process successfully, it can be formalized at the last step. Such kind of approach would be an incentive for the community to take responsibility and cooperate better during the upgrading process.

4.12. Sanitation Integration in the Study Sites

The original activity planned in KURP was service delivery in the selected neighborhoods for water supply, sanitation, solid waste management, roads, drains and street lighting. They also had plan to integrate the selected neighborhoods into the urban fabric of Kabul Municipality. To do so, Kabul Municipality was involved in the upgrading activities from the early stages (Afghanistan Independent Evaluation Group, 2011). Furthermore, by 2014 Kabul's urban master plan was developed, and approved by the relevant authorities which made the integration process easier.

Prevention of waterborne diseases needs to combine access to safe drinking water, good hygiene and adequate sanitation together. Previous failed efforts put a lot of focus on sanitation improvement at household levels and increase access to toilet. But the new approach tries to improve not only access to toilet, but also improving the whole sanitation chain. To avoid failed experiences, an integrated approach needs to be addressed: improved planning, considering economic opportunities, technology improvements, and behavior change could help to ensure not only access but also sustainable use, operation and maintenance of water, sanitation and hygiene interventions (Tilley, Strande, et al., 2014).

Although KURP tried to integrate the upgraded sites within the framework of Kabul Municipality which was a kind of institutional and physical integration, but their approach toward integration was not holistic enough: Different components of environmental sanitation are managed by different urban players. A level of harmony and integration between these organizations is also needed. According to KURP's assessment reports sometimes there was no enough coordination between different related engaged agencies. Such kind of weaknesses shows lack of proper sanitation planning to engage all the stakeholders and make a platform for their effective cooperation (Zar Consulting Inc., 2012).

To sum up, better use of generated synergies through integrated approaches could lead to more sustainable and cost effective solutions (Lüthi et al., 2012). There is no enough integration between different components of environmental sanitation in the study sites as well. Excreta, domestic wastewater, solid waste and stormwater are managed separately often by different agencies or institutions. With neglecting sanitation chain and the interlinkages between different components of environmental sanitation, KURP missed this important aspect of integration.

Kabul City Master Plan



LEGEND

- Low Rise Low Density Residential
- Low Rise Medium Density Residential
- Old City
- Medium Rise High Density Residential
- Business & Commercial
- Higher Education Area
- Administrative Area
- Hospital & Health Center
- Industry
- Park & Greenery
- Historical Place
- Grave Yard
- Landfill
- Military Field
- Infrastructure
- Kabul International Airport
- Policharkhi Prison
- New City
- Protection Area
- Mountain & Hillside
- Urbanization Control
- Sports complex
- Public Parks
- Water Bodies
- Warehouses
- Treatment plant
- Regional Bus Station
- Tunnel
- Rail Way

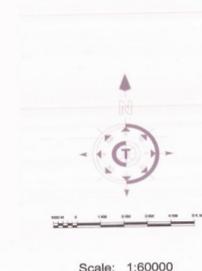
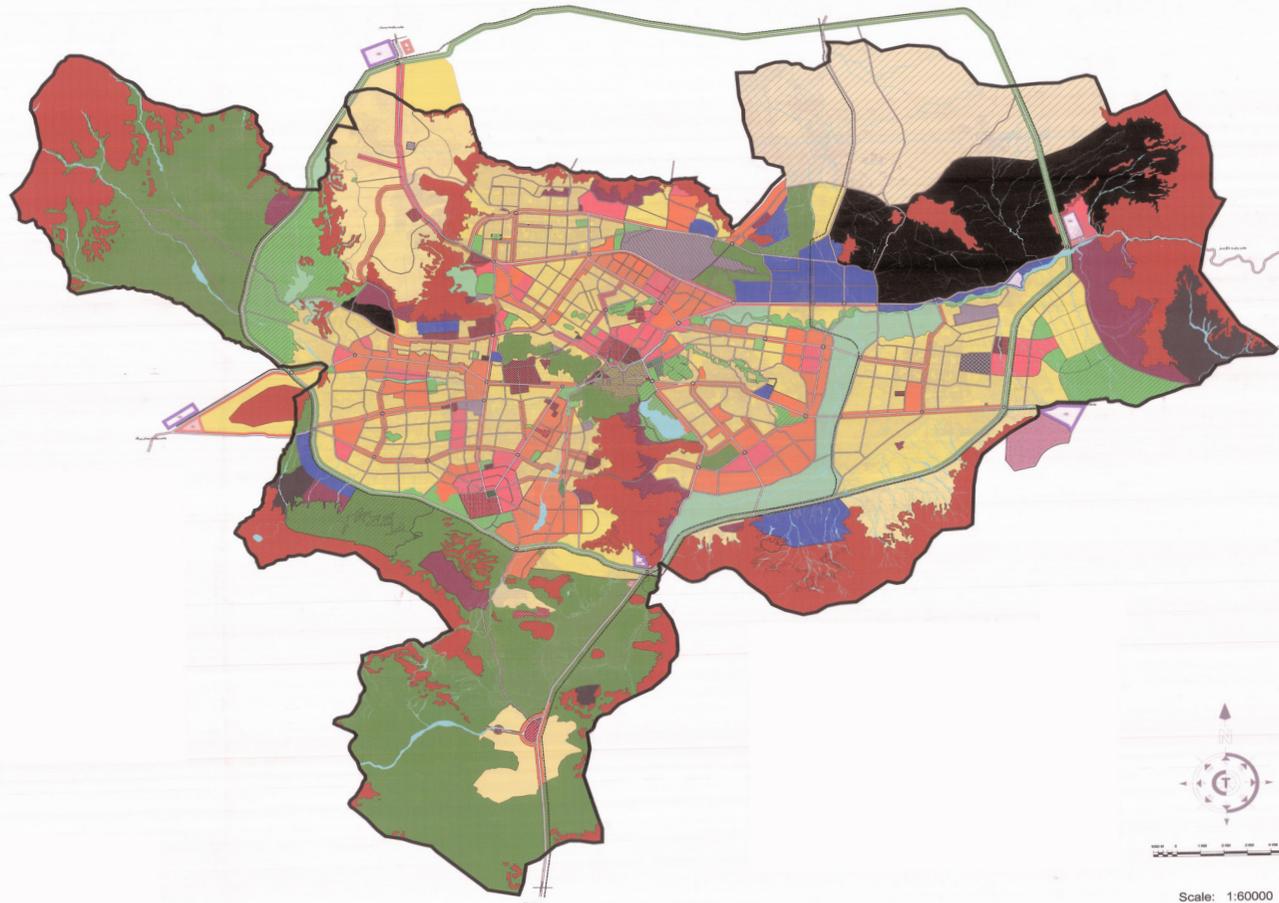


Figure 41: Kabul urban master Plan (MUDH, 2014)

KURP also ignored the integration of informal private sector like farmers or individual vacuum truck drivers into the municipal service frame work. Those stakeholders were totally missed and were not engaged in the planning process from the early stages.

To sum up, offering water supply, drainage construction, solid waste management and sanitation made KURP's package comprehensive but putting sanitation as the second priority was not a good idea: finally deficiency in sanitation provision at the household level was led to misuse of the drainage system for disposal of all kind of wastewater which shows the lack of integration and holistic planning. Furthermore, sanitation chain is not completed in the study sites. Dry systems discharge urine and anal cleansing water into the drainage system and lack of proper solid waste management blocks the surface water channels. Lack of enough coordination between responsible agencies for the management of different components of environmental sanitations is another challenge to be considered. And finally informal private sector was not seen and integrated into the institutional framework of sanitation sector.

5. Sanitation Approach for Kabul's Informal Settlements

According to the methodology of this dissertation, following selection of sanitation systems for the study sites which was done in the last chapter, there should be a sanitation approach for whole Kabul's informal areas. In fact, the sanitation solution suggested for the study sites should have the capability of scaling up for whole Kabul's informal areas linked to the city-wide sanitation plan.

Furthermore, suggested sanitation approach for Kabul's informal areas should focus on sustainable and integrated sanitation provision from the early stages in order to allow for adequate and affordable city-wide service provision (Schuen, 2013).

There are various examples of sanitation planning approaches that integrate local plans into city-level sanitation plans. In fact, local sanitation plans can enrich higher-level plans and provide input to develop a comprehensive city-level sanitation plan. Based on the investigations made in the last chapter, the focus in this chapter will be on making a link between sanitation provision at community level and higher levels.

City-level plans need to consider local plans and incorporate community level concerns and priorities. To do so, government planners should be well-informed and understand the importance of such kind of participatory sanitation planning approaches (Tayler et al., 2003). With such an approach, provided sanitation at local level would be joined up with higher level sanitation facilities, and an integrated sanitation approach would be achieved.

Any sanitation approach/intervention for Kabul's informal areas should cover short and long term and also hardware and software sanitation solutions. The aim of short-term intervention is to improve the existing sanitation situation. To do so, short-term sanitation interventions should focus on high priority, quick-impact and relatively low-cost activities. They should be also applicable within the boundary of targeted areas.

In chapter five, other investigations on sanitation provision in Kabul City will be also discussed, and their strengths and weaknesses in respect to the sustainable and integrated sanitation provision will be evaluated. At the end, the best possible sanitation intervention in short and midterm, based on the criteria insisted at this dissertation, will be introduced.

The sanitation approach suggested for Kabul city focuses on the informal areas but at the same time tries to have a holistic approach. City-wide sanitation provision & integration is a key for the investigations made in this chapter.

5.1. Kabul City

Kabul Province is the capital of Afghanistan. It is located in central-east Afghanistan (Figure 42). Kabul City as a high altitude capital is at 1800 meters above sea level and situated in a valley surrounded by mountains. It is also divided by a range of mountains into south-west and north-east zones.

Kabul City is the provincial capital and also one of the fifteen districts within the province. It has 22 Nahias which is called in some English texts also districts. These 22 Nahias are under jurisdiction of Kabul Municipality and also the focus of this dissertation. To avoid any confusion, in this dissertation Kabul's urban districts are called Nahias which is a local term (please see Figure 46).

According to Afghanistan Central Statistic Organization (CSO) Kabul Province has about 4,700,000 population while Kabul City has about 4,000,000 residents (Afghanistan CSO, 2018).

But the data estimated by Afghanistan CSO and other organizations are not accurate and in some cases largely underestimated. Figure 43 shows a comparison between different population data in a study made by Intercontinental Consultants and Technocrats (ICT). As it is shown, the official estimation including the estimation made by Afghanistan CSO is much different with the estimation provided by independent organizations especially in Nahias 5, 13 and also 16. In another survey made by RECS in 2011, there is also another estimation (Table 21). The analysis made here tried to consider these differences.



Figure 42: Map of Afghanistan(Afghanistan CSO, 2018)

Nahia	CSO 2008	Officials 2008	MOT 2008	JICA 2008	ICT 2008
1	72100	74129	77094	74129	190000
2	88400	90214	93823	90214	72472
3	106600	108999	113359	108999	162000
4	227300	232622	241927	371273	450,000
5	210000	215074	223677	215074	650000
6	232300	237796	247308	237796	200000
7	277800	284591	295974	284591	300000
8	231000	236559	246021	236559	236676
9	199900	204500	212680	267463	237774
10	245100	251070	261112	427772	380288
11	191800	195839	203672	195839	280000
12	35300	34871	36266	34871	156000
13	162200	166030	172671	545559	230000
14	-	117323	122016	117323	130000
15	262300	268618	279362	268618	383826
16	113900	116648	121314	648924	110000
17	71400	73004	75924	73004	220000
18	-	16873	17548	16873	13500
19	-	50619	52644	50619	45000
20	-	61868	64342	61868	61867
21	-	1012	1053	1012	3300
22	-	22497	23397	22497	20000
Total	2727400	3060754.944	3183185	4350876.1	4532703

Figure 43: Comparative population estimates by ICT for Kabul City for year 2008
(Intercontinental Consultants and Technocrats, 2008)

All Kabul Province including Kabul City is a part of Kabul River Basin. Some areas on the north part of the city in Nahia 17, 18 and 19 belongs to Ghorband and Panjshir River Sub-basin while the remaining part of the city belongs to Kabul Sub-basin. Both Sub-basins are under Kabul River Basin (Figure 44). Kabul River finally goes to the Indus River Basin which is the main source of water for agricultural activities in neighboring Pakistan. Afghan Government has plan to use Kabul River Basin for different purposes including municipal, industrial, and agricultural and hydropower projects.

The situation of Kabul City with minimal existing infrastructure provides opportunities for development of sanitation management systems in novel ways. It holds the potential for focusing on sustainability from the early stages of strategic planning and integrating sustainability aspects in all stages of implementation and management of improved sanitation systems and services. Despite these positive points there are some big challenges to consider as well. Kabul City has a large informal area accommodating the majority of its citizens.

Following the fall of the Taliban some efforts have been made to improve the urban infrastructure services in Kabul City, the capital of Afghanistan. Some parts of these activities focused on environmental sanitation components in the formal and informal areas.

According to some estimation Kabul city is the fifth fastest growing city in the world. Rapid urbanization is a big challenge, and it seems very difficult for Afghan authorities to cope with this fast expansion. Furthermore, providing sanitation services to Kabul's informal areas and its integration into the city-wide sanitation would be a complicated task.

As Choguill describes, many cities in developing countries have two major parts which are formal and informal settlements (Choguill, 1996). So the infrastructure services of water, sanitation, drainage, solid waste management and transport facilities can be also divided into formal and informal facilities (Montgomery, 1988). This kind of zoning and sub-dividing would be useful to upgrade Kabul's informal settlements gradually. The upgraded areas can be finally linked to the whole city sanitation services in order to have an integrated sanitation system for the entire city.

In Kabul's formal areas, like other formal areas, the approach is a supply driven process. The vacant plots are divided among the citizens for the construction while urban infrastructure services are provided by the government at the early stages. In some cases all constructions including houses and urban infrastructures are developed by the government and following that the citizens occupy the houses. The capital cost for the service provision is provided by the government or international funds and in many cases a level of subsidies are also applied for the operation and maintenance. The main beneficiaries of such facilities which are located on formal areas are mostly the middle class and government staff.

But in the informal areas another approach is prevalent; in most cases people who need shelters try to buy cheaper land plots mostly from some landlords. They construct their houses on the lands where in many cases are not recognized legal or formal by the government, and sometimes are not even suitable for residential purposes. For such land developments before or even after the construction there is no chance of urban service provision by the government.

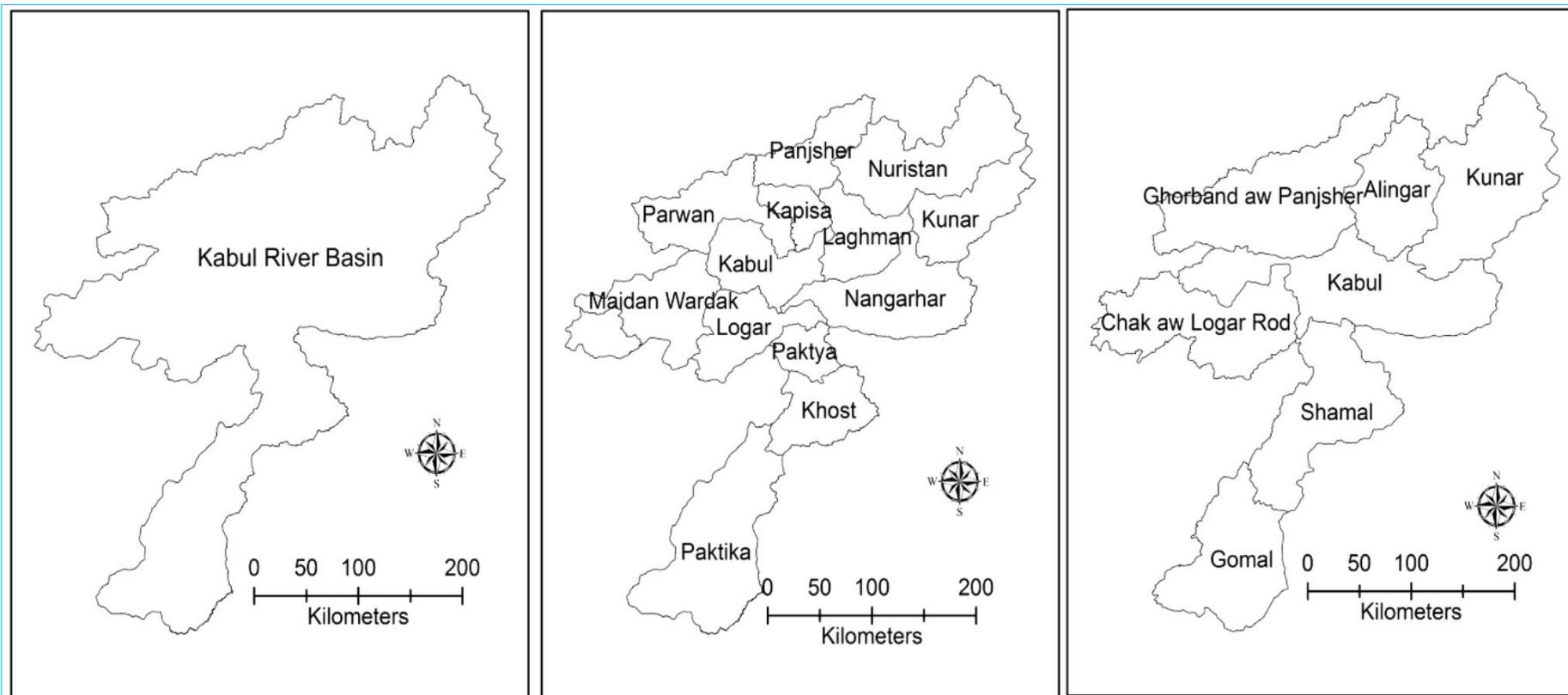


Figure 44: Segregation of Kabul River Basin (l) into its provinces (m) and sub-basins (r) (Akhtar F. 2017)

In the best scenario, the informal areas can be subjected to upgrading and formalization in an undetermined future. Informal areas are usually developed when the authorities are not able to offer enough affordable shelters to the citizens.

As mentioned while the households in the formal areas have access to better environmental sanitation services, they are also supported by some subsidies as well. At the same time mostly poor people in the informal neighborhoods have no access to urban services or they have to pay higher prices for lower quality services mainly provided by the informal sector.

Kabul's main problem is not housing but provision of urban infrastructure and in some cases access to land for the construction (World Bank, 2004b). According to some researches, there are a lot of vacant plots inside and in the periphery of Afghan Cities including Kabul (French et al., 2016). Many of these vacant plots or townships belong to some speculators with close ties to war lords or corrupt politicians.

The majority of houses constructed in the informal areas are robust and reliable, and all the residents in the informal areas are not poor people. But in respect to urban infrastructure there are many shortages in the informal areas. Despite the interest among the households, many residents in Kabul's informal areas are not willing to spend their limited resources for sanitation improvement within their neighborhoods. Sometimes they cannot afford such kind of investments and sometimes they are concerned with the future of their investments due to the legal ambiguity of the informal areas.

Resolution of land tenure issues is an important prerequisite for a successful upgrading in Kabul's informal areas (Lowder, 1993). To address the problem, the World Bank suggested following approach (World Bank, 2004a): (1) Develop a new master plan that unplanned areas are incorporated within Kabul's planned areas. This step more or less was completed and based on that the informal areas could be also formalized (2) Upgrade the informal areas and provision of urban services to the informal neighborhoods as well (3) Informal regularization following meeting a set of specific criteria. It is several years that a similar approach are being conducted in Kabul City. KURP and following that KMDP are the main activities in this regard which were already discussed.

As discussed before about KURP and KMDP, such a top-down, and sometimes supply-driven, sanitation approach, which is expensive and inflexible, wouldn't be suitable for Kabul's informal areas. There should be some changes to make the upgrading programs suitable for Kabul City. Complexities of Kabul's informal settlements need more holistic and interdisciplinary approach to provide the citizens more sustainable sanitation services.

The demand-led innovations in sanitation planning could be a better approach for the dilemma of sanitation provision in informal areas of developing countries. Such approaches have a greater emphasis on the actual need and situation on the ground. They also consider affordability of the users and involve all the main stakeholders in the process (Lüthi et al., 2012). Such kind of initiatives look more promising to achieve a sustainable and integrated sanitation systems especially in the informal settlements.

It is noteworthy to mention that due to lack of recognition of informal areas at least before upgrading by the government, NGOs as non-governmental organizations can play an important role. They can arrange and facilitates many activities to pave the way for the government interventions

(Hogrewe et al., 1993). Although in Kabul City many NGOs were active, but later most of them left the city toward rural areas justifying that ‘Kabul City is no more in an emergency situation.’ Above that it seems there has been always a rural tendency in respect to development among the Afghan authorities and the international community.

Regarding access to safe water and adequate sanitation in many cases urban informal areas are in deteriorating situation, sometimes even worse compared to some rural areas. It seems NGOs need to reconsider the scope of their activities according to the conditions of the contexts they work in. Contribution in finding a way for the problem of informal settlements in Kabul would be worthwhile task for the NGOs as well, if they can work as facilitators and connection points between the government and informal settlements.

5.2. Sanitation Zoning in Kabul

Kabul is not a homogenous city. It has different characteristics in different parts of it. Before every sanitation approach, there should be a proper zoning according to the important factors affecting sanitation provision within the city. To divide Kabul City into several zones for sanitation provision below steps were taken:

1- Baseline data collection: the baseline data information consists of geophysical, social and urban services data about the city. These information helped us to develop some GIS-based maps for the whole city. The produced maps & data was also used in the earlier stages of this dissertation for the suitability analysis of the study sites. In an overall view the collected information can be categorized as follow:

Physical information:

- Ground water and surface water bodies
- Geology, soil and greenery
- Nahias’ boundaries and characteristics
- Urban infrastructure facilities with focus on environmental sanitation
- Planned and unplanned areas and house typology
- Slope, hilly and flat areas
- Land use pattern in Kabul

Social studies / activities:

- Social data including population, population density in each Kabul’s Nahia, administrative boundaries, etc.
- Site selection study in Kabul
- Household survey in the study sites
- Key informant interviews and transect walk in the selected sites

2- Identification of high priority areas: At this step the collected data was analyzed and based on that the priority intervention areas were determined. Another purpose of the data analysis was dividing the city into several sanitation zones. Sanitation zoning will help us to know how we should provide sanitation services to the city considering background situation.

Furthermore, due to lack of enough resources, it is not possible to provide sanitation services to the whole citizens at the same time. Therefore, there should a kind of time-bound action plan for

sanitation improvement.

In developing and least developed countries, the immediate priority is providing sanitation services to the most vulnerable people who are living in geographically stressed areas. In fact, governments should ensure themselves that everybody, and especially the most needy peoples, have access to the limited basic environmental sanitation services.

Suggested priority intervention in this dissertation consists of geographically stressed areas in Kabul City where the sanitation situation is much worse compared to the other areas.

A noteworthy point here is that ‘priority intervention areas’ is the target for the first sanitation action within the city. But the kind of intervention should make the future improvement in that areas also possible. In fact the purpose of intervention is decreasing the level of vulnerability in such areas as an upgradable solution to make the areas liveable, until more proper sanitation facilities are in place: The idea behind the priority intervention should be a kind of incremental improvement.

Incremental approach is an important concept. In many cases, after provision of very limited and basic services to geographically stressed areas, government ignores such areas for later upgrading. After a while the other parts of the city are facilitated with much better services while the stressed areas have to deal with basic and deteriorating services with no plan or budget for upgrading to the level of the other parts of the city.

5.2.1. Priority Intervention Areas

Using the collected baseline data in the previous step and through a GIS analysis, the areas subjected to an immediate intervention were determined. Several criteria were used to find the geographically stressed areas within the City:

- Most vulnerable areas in respect to environmental sanitation components including excreta and wastewater management, water supply, solid waste management, health and hygiene issues.
- Groundwater situation in the area considering groundwater protection zones, soil and geology conditions, Kabul’s aquifers and sanitation practices
- Hilly and steep slope areas
- Population and its density

According to the collected & produced data, the expansion of informal areas in Kabul City can be seen mainly in south-west and central part of Kabul. The results of priority intervention areas show that some informal areas should be subjected to the immediate intervention (Figure 45).

Among the informal areas those settlements located in western Kabul, including site one, and central south due to the existence of the groundwater protection zones are more vulnerable. There are some areas in north Kabul where should be also subjected to the immediate intervention. To sum up, many red areas are hilly areas which are vacant. Therefore, the focus of high priority intervention should be on the areas in pink.

The details about the GIS-related activities behind geographically stressed areas is beyond the scope of this study, and can be found in a master thesis by Jonas Weiter completed at HafenCity

University titled “Konzeption und prototypischer Aufbau eines WebGIS zur Planung sanitärer Anlagen in Entwicklungsregionen.” The main data for the investigation was provided by the author of this dissertation, and the author was also directly involved in the methodology development and consultation to determine the priority intervention areas (Weiter, 2015).

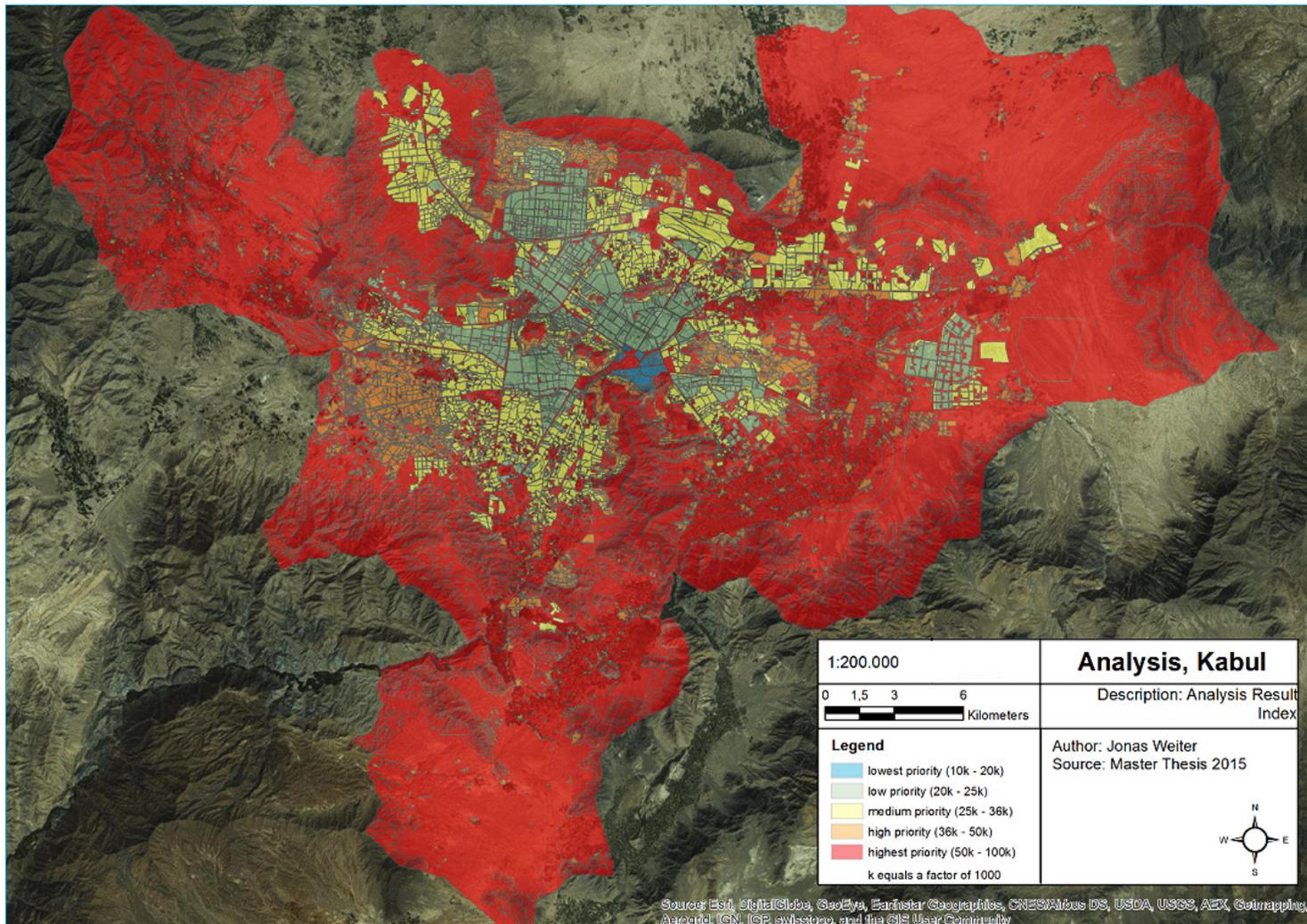


Figure 45: Priority intervention areas in Kabul City: most of the areas in red color are vacant. Therefore, areas in pink color have the highest priority in terms of sanitation intervention. Areas in blue color have the best sanitation situation in Kabul City (Weiter, 2015).

5.2.2. Creation of Sanitation Zoning

Kabul has no similar characteristics all over the city. It needs to be divided into several sanitation zones for a better service provision. To do so, the data collected about Kabul City was analyzed in GIS and QGIS software, and following that different GIS layers including population density, built-up areas, hilly and flat areas, rivers, agricultural areas, etc. were produced and overlaid. According to the results, Kabul City was delineated into four main zones. Each zone has its own geo-physical characteristics which makes it different compared to the other zones. Therefore, each zone needs its own plan and preparations for sanitation intervention: These four zones are divided by physical features like mountains, topography and river basins into different areas located on north, south-west, north-east and west parts of the city.

The delineated zones are considering issues like population density, topography, slope and watershed areas which are important for a gravity-based wastewater management as well. Furthermore, due to the existence of several major streams in Kabul City, considering current sanitation zoning there will be more flexibility for surface water management as well. But the sanitation zoning in this study mostly focuses on excreta and wastewater management in Kabul City.

In a sanitation improvement study by Gauff Company, and also the draft version of Kabul master plan developed by RECS, there is also insisting on zoning for a better sanitation provision. This dissertation recommends a similar zoning approach to what was suggested by RECS (EIRP, 2006; RECS International & Yachiyo Engineering Co., 2011), but still there are major differences between this dissertation's recommendations with RECS and Gauff Ingenieure regarding zoning in Kabul City and also sanitation provision in each zone. Below is the main disadvantages from the author's point of view regarding the studies done by RECS and Gauff Ingenieure in the sanitation sector for Kabul City.

In 2005 Gauff Ingenieure recommended three sanitation zones at north, west and center Kabul (EIRP, 2006). The locations of WWTP for these three zones are suggested in Nahias 19, 16 and 21. Nahias 19 is in north Kabul, Nahia 16 is in center and Nahias 21 is located at the east part. There are several disadvantages with the Gauff's plan as below:

- i) The sanitation plan is outdated and there have been many changes, especially in respect to the expansion of the informal areas, since the sanitation plan was developed.
- ii) It does not have proper solution for Nahia 17 and also south-west Kabul as populated areas in the city. South-west Kabul is considered a geographically stressed area as well, and needs immediate intervention.
- iii) Gauff Ingenieure recommends a WWTP at Nahias 19 where is a part of a construction activities for development of a new city. Therefore, construction a WWTP in that area is not applicable anymore.
- iv) Nahia 19 is a part of panjshir river sub-basin area. But Gauff Ingenieure suggested to treat the wastewater produced in Kabul Sub-basin River in that area. From environmental point of view it is better to discharge the produced wastewater of each basin in the same basin (RECS International & Yachiyo Engineering Co., 2011).
- v) Major part of the city is informal area. But Gauff Ingenieure recommends only some basic

improvement including ventilation pipe installation and lining for those most vulnerable areas. It seems their recommendations more or less was adopted by KURP project, but as discussed earlier it was a failure. Kabul is a rapid urbanizing city while the majority of population live in the informal areas. Without finding a robust and sustainable solution for sanitation management in the informal areas the whole city would be facing with public health and environmental problems.

- vi) According to Gauff Ingenieure plan many part of the city including informal areas covering more than 70 percent of Kabul will rely on on-site facilities including cesspits for even several decades (EIRP, 2006). Such system can easily lead to the pollution of groundwater which is the main source of drinking water in the city. Above that current sanitation facilities including dry toilets and cesspits have created many hygiene and public health problems within Kabul City. But according to Gauff Ingenieure, these kind of on-site sanitation system will remain as the main sanitation facilities for a long time.
- vii) Gauff has no specific plan for water supply for Kabul City. It seems the investigation of water supply for Kabul City was not within the scope of the activities determined for Gauff Ingenieure. That was a disadvantage of Gauff's study and made it non-comprehensive. Currently in Kabul City, water is a limiting factor and any activity in respect to urban development including sanitation management should consider water supply. Above that the idea of integrated environmental sanitation services insists on considering the interlinkages between all the environmental sanitation components.

As you can see in Figure 46, RECS in 'Draft Kabul City Master Plan' has divided the city into two main sanitation zones including Kabul south-west, north-east and also one sub zone in east Kabul. The WWTPs for these zones are located in Nahias 9, 19 and 21 (RECS International & Yachiyo Engineering Co., 2011). Although the overall zoning by RECS is similar with the suggested zoning in this dissertation, but there are also major differences in respect to the coverage areas and also the sanitation approach (Figure 47).

- i) Sanitation plan suggested by RECS is neglecting informal areas and focuses only on the planned areas or in the best scenario, the areas are covered by public water supply. The approach is a top-down approach which does not consider the integration of different components of environmental sanitation as well.
- ii) Informal areas are among the most vulnerable areas, and many parts of the informal areas were highlighted as geographically stressed areas. RECS same to Gauff Ingenieure only recommends for some basic improvements of sanitation facilities at these areas where most of the residents rely on dry systems. In the household survey and our investigation it was clear that such basic improvements are failed, and the majority of people are not happy with the dry system at all.
- iii) Some areas like the whole Nahias 13, and the majority of Nahias 17 and 6 are completely neglected in the sanitation plan. RECS believes due to lack of public water supply, those areas should rely on dry system for a long time. Many households especially in Nahias 6 and 13 are washers and also many households come from abroad where they were used to water-based systems. It is really difficult to convince them to use dry system. Above that many others comparing dry and wet systems shift to water-based systems

as a modern and convenient option. It seems the solution suggested by RECS and also Gauff Ingenieure for such areas does not reflect the reality on the ground, and according to our survey is already failed.

Currently, low coverage area and high dependency on groundwater are the main problems regarding water supply provision in Kabul City. RECS has specific plan for water supply, as an important factor for sanitation management and also the future development of Kabul City. They suggested different options including a contingency plan for water supply provision to Kabul City if the Water Supply Master Plan has delay. There is a clear delay in respect to water supply and also sanitation improvement. This study believes water supply and wastewater management should go ahead side by side as an integrated plan and also it is time to think about the contingency plan to provide water to the city. About the water supply master plan and the contingency plan briefing information in the last chapters was provided.

Gauff and RECS both mentioned to the lack of enough water as the main reason behind not covering a big areas in sought-west Kabul and also in Nahia 17. According to the current Kabul Water Supply Master Plan many parts of the city will not have public water supply even after full implementation of the current master plan. By chance most of those areas are informal settlements and geographically stressed areas. Currently the master plan is far behind the schedule and it takes a long time to be completed while it has the least for the most vulnerable and needy people in Kabul (Figure 48).

As mentioned before in south-west Kabul, Nahia 13 is totally neglected and vast majority of Nahia 6 and 7 are not covered by the sewerage system: if there is no enough water in these areas, there should be an immediate updating in the water supply master plan to provide water for the populated south-west area. But RECS only recommends to let the local use their shallow wells: this recommendation also means there is enough groundwater in the area and the households can rely on their shallow wells for a long time. Because there is no even a plan on a paper to provide public water supply to this areas. Above that Afshar well field and Allaudin well field which provide water to Kabul's north and central parts are located in south-west Kabul which means there is water at least for the people who live in the south-west Kabul (Figure 49).

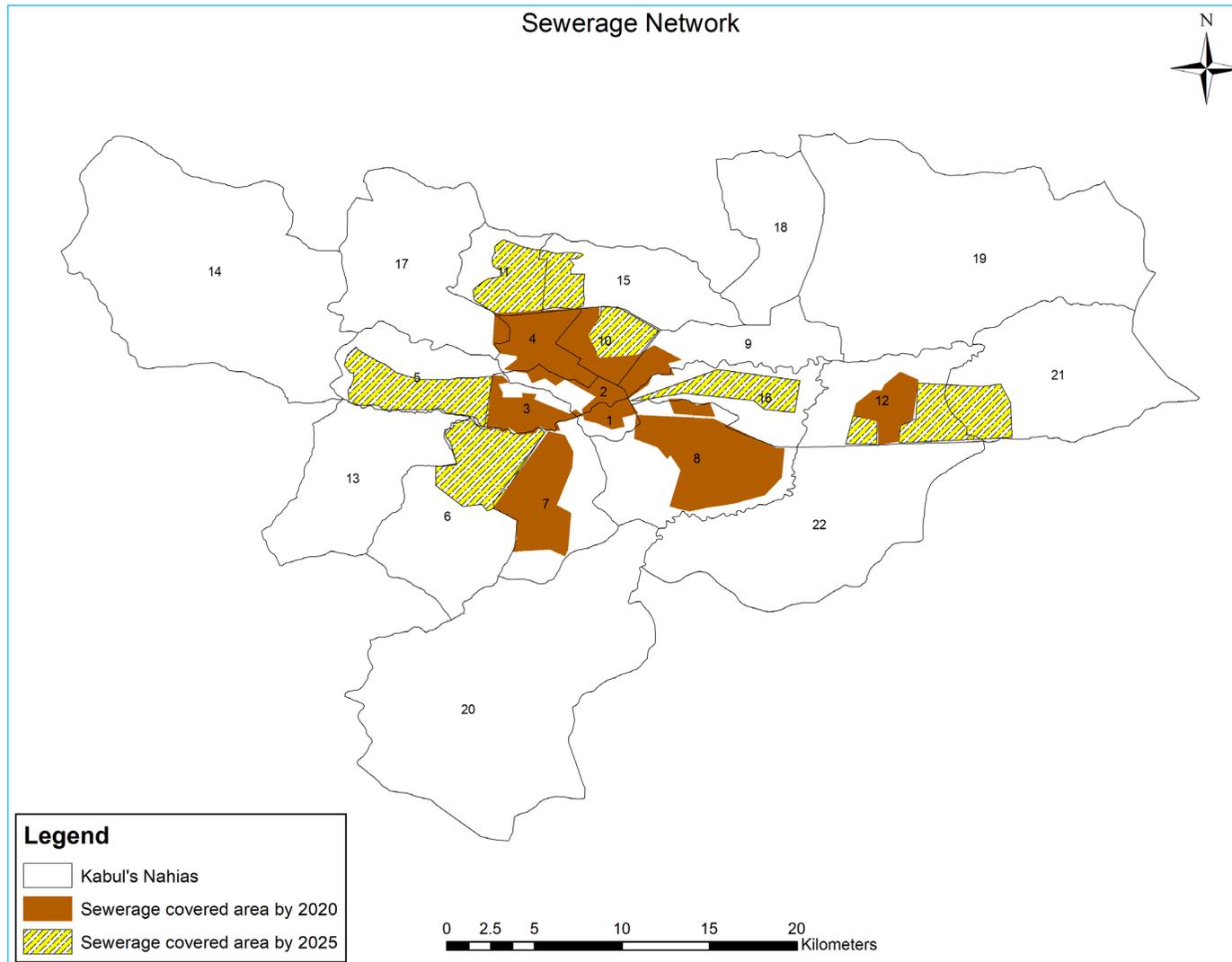


Figure 46: Sewage development plan (RECS International & Yachiyo Engineering Co., 2011)

To sum up, when there is enough groundwater in the area to meet the basic needs of the local people and also provide water to other parts of the city, they should have a chance of connection to the public sewerage system. We shouldn't forget that this area is a part of the geographically stressed areas as well, and need more care instead of neglecting until undetermined time due to its informal context.

- iv) Although RECS has plan for water supply provision for Kabul, but still enough investigation on Kabul's informal area is missing. It seems following overall investigation which showed there is no plan or public water supply network in some informal areas, RECS and Gauff didn't go for further study about those areas. Lack access to the public water supply was enough for them to consider those areas as ineligible for a water-based or sewerage system. Despite this fact in many cases households in informal areas, including south-west zone, either have access to their own wells or receive piped water from informal water supply companies. These informal companies, according to the experience of the author and the household survey made in Kabul, in some cases are more reliable than AUWSSC.

In some informal areas shallow wells are getting dry, and the households rely on deep wells run by informal private companies. Without such private and mostly informal companies many households have no water at all. Even in such areas many households have wet technologies or switching into wet technologies. That shows that lack access to the public water supply does not mean lack to enough water at all.

To sum up, this study suggests four sanitation zones for Kabul City delineated in Figure 47. These zones include formal and informal areas. Above these four zones there are some scattered rural and semi-urban areas mainly in Nahias 20, 22, 14 and 18. In the next topic there will be more discussion on city-wide sanitation planning including details on city-level sanitation provision.

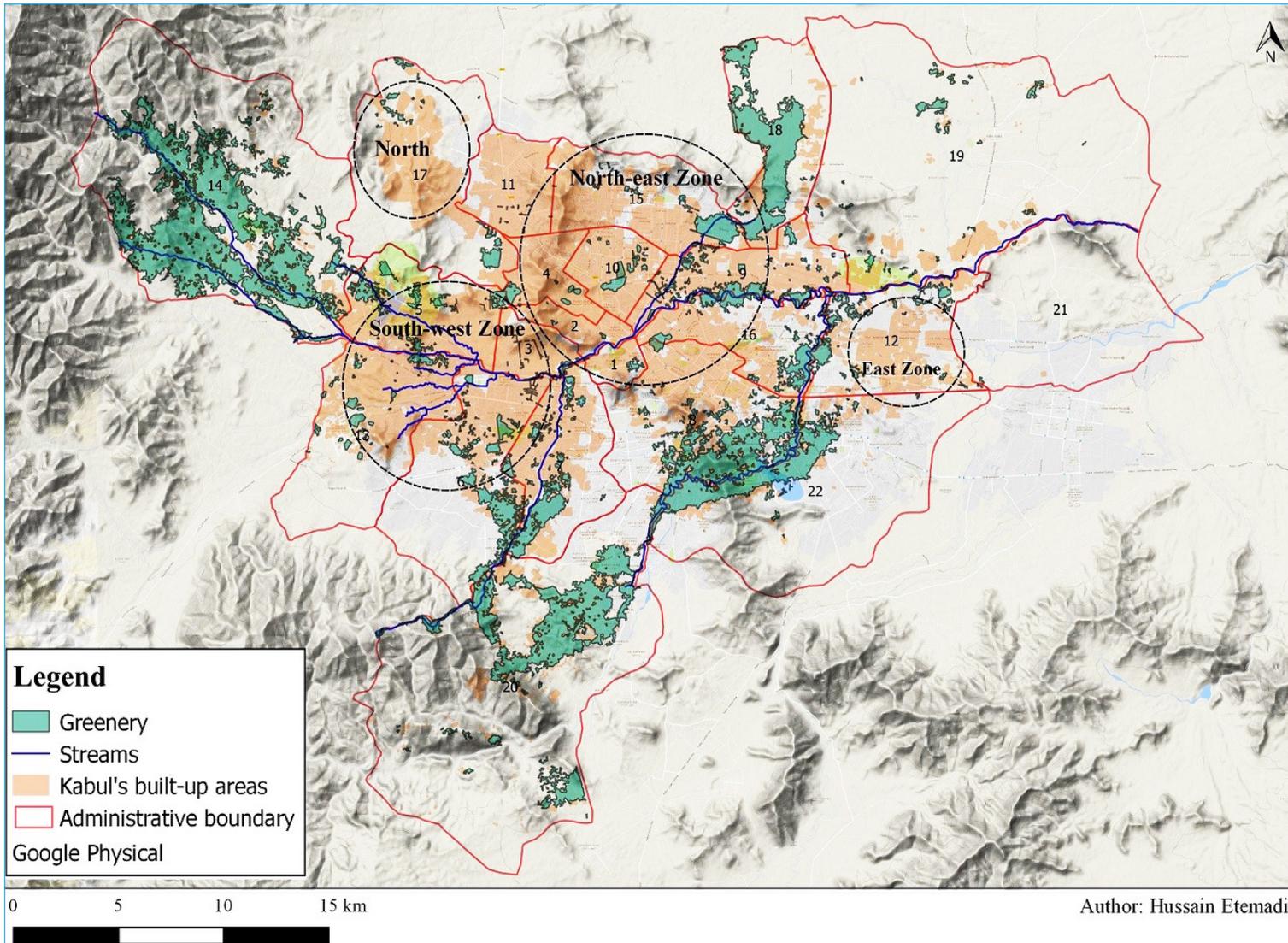


Figure 47: Creation of sanitation zones for Kabul City

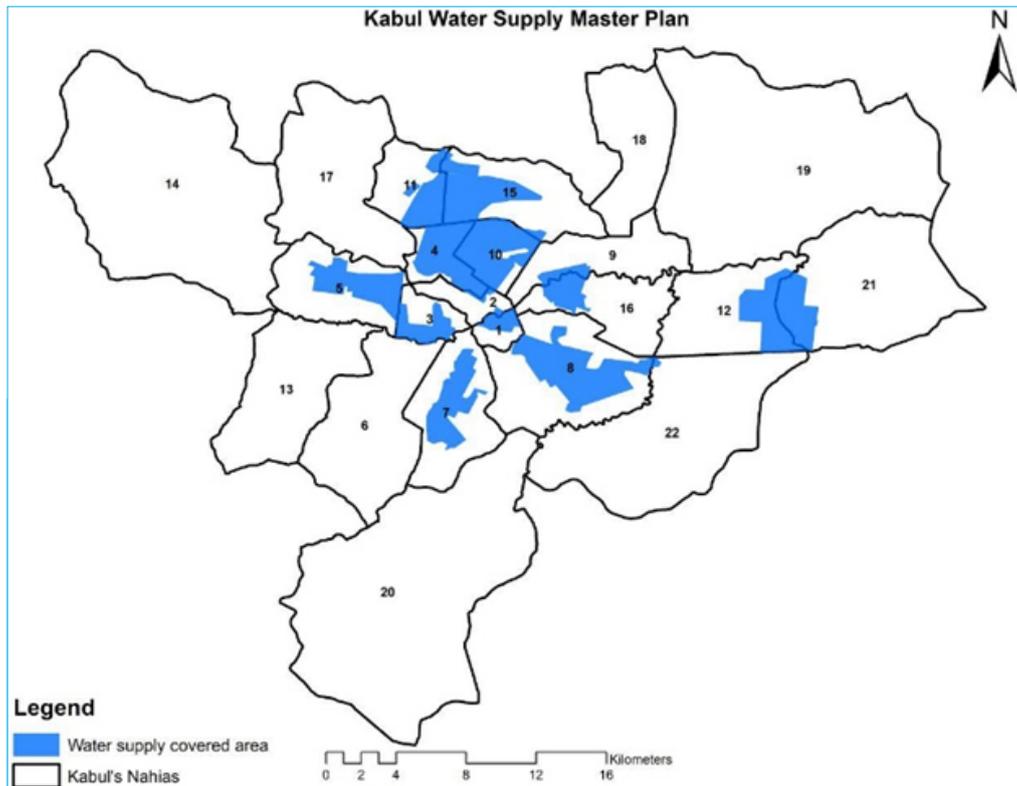


Figure 48: Kabul water supply master plan (KFW-Germany Development Bank, 2010), and simplified by the author

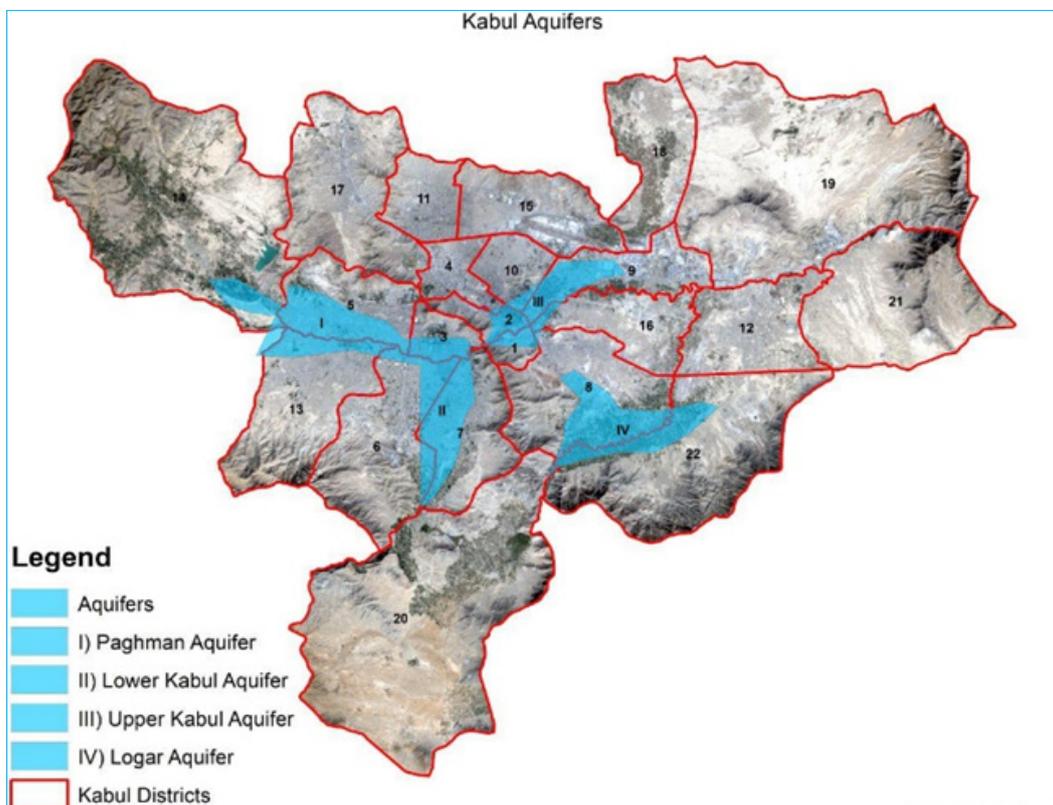


Figure 49: Kabul aquifers

5.3. Sanitation Provision at Zone Level

According to Figure 50 Kabul's population mostly concentrated in south-west and north-east: a range of mountains divides the city into these major settlement areas. Far north-west (Nahia 14), north-east (Nahias 18 and 19), south (Nahias 20 and 22) and south-east (Nahia 21) the population is not considerable or it is very scattered. In some cases they are separate from the main body of Kabul City by mountains. In addition, some areas such as Nahias 18 and 19 belong to Panjshir Sub-river Basin. According to long term urban development plans, Nahias 18 and 19 will be a part of a new planned city in north of Kabul with its own sewerage system and treatment facilities.

Current city development in mid-term is in east Kabul and following that in long run in north Kabul. Any development in north Kabul including Nahias 18 and 19 is separate from current city development plan in the existing city and also beyond the scope of this study as well. Furthermore, the Population in these areas are very low compared to the other parts of the city. Nahias 19, 20, 21 and 22 have no much population. In addition, their populations are very scattered and low density.

Nahia 18 which has more population compared to Nahia 19, is more semi-urban or rural areas (Ahmadi & Kajita, 2017) like what we have in Nahias 20 and 22 in south Kabul. In fact, these areas are still agricultural lands and in case of Nahia 20 and 22 should be kept in that way for groundwater protection and recharge. Due to water limitation, it is not also logic to develop urbanization in this area. Currently, Kabul urban development plan is focusing on east and north Kabul for future development. Above that as mentioned before Nahias 18, 19, 20, 22 and 14 are more or less rural or semi-urban areas.

Considering population and density within the city, it makes sense to have semi-centralized sewerage system for two major areas in the South-west and North-east zones. Above that river basins in these areas and also geo-physical features are in favor of such kind of approach. The areas out of these zones should rely on decentralized or on-site sanitation facilities.

Among the Nahias out of the major trend of south-west and north-east only Nahia 17 has about 103,739 population in 2018 (Afghanistan CSO, 2018). The population in Nahia 17, in 2008, was 248,926 and its density was about 40 person/ha (RECS International & Yachiyo Engineering Co., 2011). Nahia 17 belongs to Panjshir Sub-river Basin. In addition, geo-physical characteristic of Nahia 17 needs a separate sanitation system (Figure 51).

Only southern part of Nahia 17 is a part of Kabul sub-river basin and technically suitable to join to north-east zone. This southern part in both RECS and Gauff studies joined to the semi-centralized system determined for zone north-east. Due to lack access to groundwater in Nahia 17, the contingency water supply plan can be used to provide water in this area. But until securing enough water, there shouldn't be any plan for more development in this area.

Nahia 14 has also a considerable and dense population in Paghman City which is the district center as well. The municipal services in Paghman City is provided by Paghman Municipality (Afghanistan CSO, 2018). Above that the settlement area with high density is far away from other parts of existing Kabul City and technically cannot be integrated into the current structure of semi-centralized sewerage system determined for the city. RECS and Gauff studies don't recommend this Nahia as a part of the sewerage system for Kabul City due to the mentioned technical issues (EIRP, 2006; RECS International & Yachiyo Engineering Co., 2011). This area is also contains a major part of Kabul's greenery and agricultural areas. Many households live within agricultural

and greenery areas and use their individual sanitation facilities. These areas should be kept at this way as recreation areas for Kabul City.

To sum up this dissertation suggests four main sanitation zones which are mainly corresponded to the areas where the city's population live:

- **Zone North** is a densely populated area because the residential area is small compared to the population. Gauff believes due to the availability of land within the city and expansion of the municipal area, the population in this zone will be decreased (EIRP, 2006). Comparing ICT population data in 2008 to Afghanistan CSO data in 2017, the population in Nahia 17 has decreased, but according to other sources, we have increase in the population. In any case Nahia 17 should be considered a separate zone with its own sanitation system either on-site household-centered or community-based decentralized system. Due to limitation of water resources in this zone, any further development should be halted until enough water for the area is secured.

Kabul – North Afghanistan highway passes through Nahia 17 and the population and markets are usually expanded along the highway. Nahia 17 which mostly adopted to zone north has many informal areas. The informal areas should follow the similar approach suggested for the study sites and in some cases wherever possible, the community can go for decentralized sanitation system.

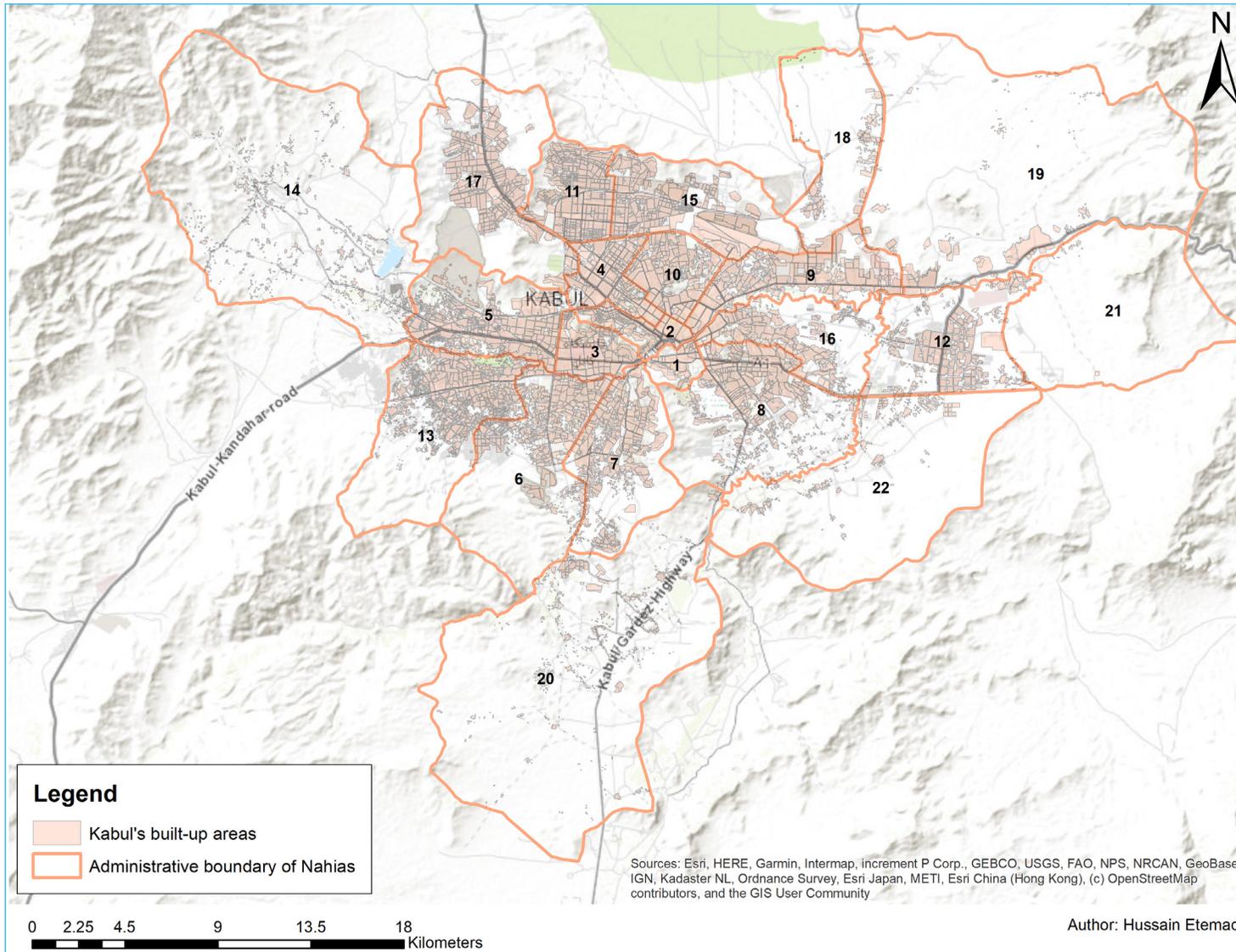


Figure 50: Kabul's built up areas

Table 21: *Kabul's population by Nahias in 2008 (RECS International & Yachiyo Engineering Co., 2011)*

<i>Nahia</i>	<i>Nahia Area (ha)</i>	<i>Residential Area (ha)</i>	<i>Population</i>	<i>Nahia Density (person/ha)</i>	<i>Residential Area(person/ha)</i>
1	483	124	35,402	73	286
2	684	257	83,295	122	324
3	911	414	139,742	153	338
4	1,172	598	204,049	174	341
5	2,845	894	283,489	100	317
6	4,918	957	285,255	58	298
7	3,334	1,478	416,675	125	282
8	4,825	1,124	331,554	69	295
9	2,433	616	188,569	77	306
10	1,303	885	270,157	207	305
11	1,742	829	287,853	165	347
12	3,490	1,221	298,847	86	245
13	4,719	1,660	467,440	99	282
14	11,902	524	147,910	12	282
15	3,253	626	200,465	62	320
16	2,507	713	206,701	82	290
17	5,602	780	248,926	44	319
18	3,388	121	12,850	10	280
19	14,143	11	150,000	0	356
20	14,294	152	31,836	2	210
21	6,395	22	6,040	1	279
22	7,925	258	48,187	6	187
Total	102,270	14,264	4,220,256	41	296

- **Zone North-east** consists of Nahias 2, 3, 4, 5, 9,10, 11, 15 and the southern part of Nahia 17. According to the RECS studies the best location for the WWTP for this zone is Nahia 9 (RECS International & Yachiyo Engineering Co., 2011).

Kabul City currently has only one semi-centralized WWTP located in Nahia 16. The WWTP has the capacity for extension and rehabilitation. Currently the United Nations Office for Project Services (UNOPS) is conducting a feasibility study to do some improvement works (UNOPS, 2017). This WWTP as the main Kabul WWTP should be improved in a way to cover Nahias 1, 7, 8, 6, 12 (RECS International & Yachiyo Engineering Co., 2011) and also Nahia 13. The informal areas in zone south-west including our flat site study should have on-site sanitation system as suggested for the study sites, but they should have the possibility of connection to the sewerage system, at least in mid-term. The wastewater produced in this area will be finally conveyed to the WWTP located in Nahia 16.

Informal areas in this zone, zone north-east and also zone east following the assurance regarding availability of enough water to transport the materials in the sewerage lines should have the chance of connection to the sewerage system. Following that if an informal community is willing to connect its facilities to allocated semi-centralized sewerage system, there should be a proper community-based plan. It is noteworthy to mention that due to the complexity of informal areas, each household cannot decide on the connection individually.

- **Zone East** consists of Nahias 12 and 21. Informal areas located in this zone can also keep their individual sanitation facilities according to the explained sanitation approach in this study. They should also have the chance of connection to the semi-centralized WWTP following a technical feasibility study when their water resources is secured. That means, at least, there should be a plan for proper water supply and also some considerations for potential future connection to the semi-centralized sewerage system.

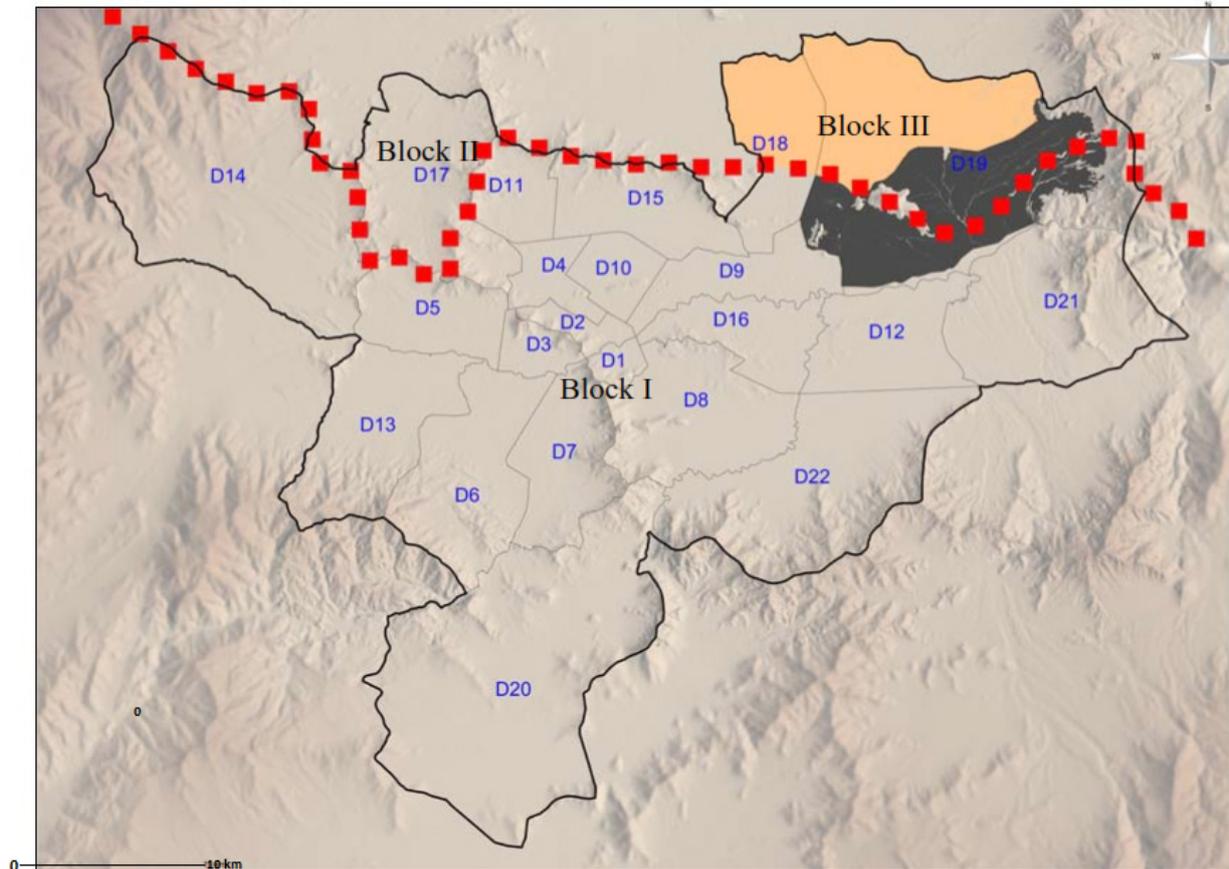


Figure 51: Kabul blocks based on river basin areas (RECS International & Yachiyo Engineering Co., 2011)

- **Zone South-west** consists of Nahias 1, 13,6,7,8 and 16. The location of WWTP for this zone is the existing Kabul's WWTP which needs to be expanded and improved. RECS for this zone excludes the whole area of Nahia 13 and also the informal areas in others Nahias located in zone south-east. As mentioned the main reason behind this exclusion is lack access to piped water. About this point there was a discussion earlier in this chapter and no need to repeat it again.

At the end it should be noted that in mid-term all urbanized informal areas in the city located in zones north-east or south-west should have a chance of decision on connection to the semi-centralizes sewerage systems or staying on their own. Only rural or semi-urban areas within the jurisdiction of Kabul Municipality, if are not subjected to urbanization based on the master plan, should not be connected to the semi-centralized sewerage systems. In fact for those areas there is no urban development plan and the government should protect the areas for the public interest.

5.4. City-wide Sanitation Provision

To have an efficient sanitation improvement in Kabul City, all Kabul's settlements including its informal areas should be considered. We cannot leave the geographically stressed areas with only some basic improvements. There should be a quick and interim intervention to provide a basic improvements until the next steps of an incremental approach can be implemented, but these steps cannot postpone to an undetermined future.

This study suggests sanitation planning for Kabul City areas at three different levels including community level for each informal community, zone level for each sanitation zone and finally city level which includes the whole settlements under the jurisdiction of Kabul Municipality (Table 22).

Each informal community before formalization needs to go through the community upgrading plan. This plan should try to improve the overall situation within the community and pave the way for the formalization. In fact a successful upgrading should be as a pre-condition for the formalization.

A part of the upgrading plan should be environmental sanitation improvement. Based on the experiences from KURP and KMDP upgrading projects, sanitation and hygiene have usually low priority compared to the road pavement and water supply. It is recommended that environmental sanitation package should be insisted alongside the other upgrading activities like road pavement or electricity provision which could have more demands within the communities. The residents should not have to choose between different components of environmental sanitation: all the services should be offered within one package although with an incremental approach for improvement. Otherwise when the residents have to choose between different components of upgrading activities, sanitation would be largely neglected.

A sanitation plan at each zone should cover the whole areas either formal or informal. Regarding informal areas, the approach recommended in our site studies should be applied and regarding formal areas, with respect to the context, a relatively top-down approach as used in a city-wide master plan is also applicable. The approach for formal areas would be more or less similar to the suggestions made by RECS studies.

And finally the informal areas based on their geo-physical and administrative characteristics should also have their own community-based sanitation plan. The plan should be integrated at the higher level with their respected sanitation zones and following that through sanitation zones should be linked to the city-wide sanitation masterplan. It is noteworthy to mention that each city-wide sanitation planning (sanitation master plan) should be itself integrated into the urban development master plan. In mid-term formal and informal areas within a sanitation zone should have similar level of sanitation facilities.

Nahias 14, 20, 22, 18 and 19 are not covered by the zones. Earlier in detail about the reasons were discussed. These areas should keep their rural or semi-urban characteristics in mostly in Nahia 20 and 22. In Nahia 14, 18 and 19 as mentioned they are not technically and officially part of the current Kabul City and should be addressed in another sanitation plan.

Within each zone also there are some agricultural, public or greenery lands. According to the urban master plan in some cases those areas should keep their current land use. In such cases those areas should rely on their on-site sanitation facilities. It is noteworthy to mention that each of these

areas should be evaluated separately, and has its own context-based sanitation solution. The solution for those areas should follow the sustainable approach which was explained for the study sites.

To run the system properly, there should be enough water in the sewerage system. Therefore the plan suggested in the previous chapter is briefly repeated here again: people in informal areas should have access to the groundwater through deep wells co-managed by the public sector, private sector and the community. Surface water including the contingency plan should be supplied mainly for the areas with access to the public water supply network. When there is enough water for the connection of informal areas to the main trunk of sewerage system in each zone, the option should be offered to the people living in the informal areas. But according to the technology preferences of the peoples in the flat informal areas and also our investigations, a water-based sanitation system should be installed for such communities. The system can be individual on-site or connected to the semi-central sewerage system after providing enough water to run the system. This water could be only from the groundwater through deep wells located in the informal areas or surface water in mid-term.

The only difference regarding connection to the sewerage system in formal and informal areas would be the approach; in the informal areas the decision regarding connection to the system should be made at the community level. But in the formal areas the decision should be made by the municipality or leave it to each household individually if they can manage their wastewater or excreta hygienically without using the sewerage system.

The reason behind community-based or household level decision is the background situation in informal and formal areas. For sewerage connection in the informal areas, due to the mostly unplanned character of the areas, more effort and coordination among the residents is needed, but in the planned areas each household can make a decision alone. A proper plan for the connection to the sewerage system for each informal community should be developed and also operation subsidy for poor family should be considered.

Cost recovery is an important criteria for a sustainable sanitation provision. To do so, an additional charge is suggested for the services offered to the formal and rich areas. The extra revenue can be allocated as a subsidy for the people living in informal areas (Choguill, 1996). Sometimes poor households cannot afford even a life-line rate services.

Table 22: Kabul city-wide sanitation master plan

level of planning	Details of Environmental Sanitation Plan
Kabul Sanitation Master Plan at city-level	<p><i>Objective</i></p> <ul style="list-style-type: none"> • To develop a sanitation master plan for Kabul City <p><i>Characteristics</i></p> <ul style="list-style-type: none"> • Inclusive sanitation plan covering formal and informal areas including quick and mid-term interventions • Integrated and sustainable • Integrated into Kabul urban master plan
Zoning Plan	<p><i>Objective</i></p> <ul style="list-style-type: none"> • To develop a sanitation plan for each sanitation zone • Integrated into city-wide sanitation master plan <p><i>Characteristics</i></p> <ul style="list-style-type: none"> • Inclusive sanitation plan covering formal and informal areas • Includes quick and mid-term interventions • Integrated and sustainable • Linked to city-wide sanitation plan
Community Level	<p><i>Objective</i></p> <ul style="list-style-type: none"> • To develop a community-based plan for sanitation improvement, hygiene, water supply, surface water management and solid waste management • Regularization through implementation of the sanitation plan in each community <p><i>Characteristics</i></p> <ul style="list-style-type: none"> • Integrated and sustainable • Planning and implementation in a close coordination with the community members • Upgradable to a higher level of sanitation services in future • In-lined with the upgrading plan for the community • Integrated to the zoning sanitation plan

6. Reference Cities: Erbil and Beirut

Beirut, the capital of Lebanon, and Erbil City, the capital of the Kurdistan Region of Iraq (KRI), are both located in the Middle East. They share some common characteristics with Kabul; a long and protracted civil war, a similar historical and socio-cultural background, conflict, continuing regional tensions and also reconstruction. Such similarities make the comparison of these three cities meaningful.

To investigate the sanitation situation in Erbil and Beirut, the results of literature review and key informant interviews were used. The outcome of these investigations are the sources for comparison of Beirut and Erbil to Kabul, as the main case study, in this dissertation. Based on the comparison a generalization for the similar contexts in the developing world was developed.

During the field visit in Erbil City and literature review & key informant interviews (KIIs) for Erbil and Beirut, the required sanitation information was collected. The gaps were identified, secondary data was triangulated and the existing situation in terms of current sanitation practices, facilities and plans with the interviewees was discussed. To make a better comparison, the results of Kabul study was also shared and discussed with the interviewees from Beirut and Erbil. In some cases, the interviewees themselves had some knowledge and experiences about Kabul as well.

The main activities were as follow:

- Review of secondary literature on sanitation management in Erbil and Beirut
- Questionnaire development & key informant interviews for Beirut
- Site visits in Erbil City, questionnaire development & key informant interviews in Erbil

6.1. Methodology

This investigation relies on two kinds of data:

- Primary data which was collected during the field visit or KIIs. This data includes direct observations, in case of Erbil, and interviews with related stakeholders.
- Secondary data which was collected from different related sources.

The field visit of Erbil City was conducted from 17th to 30th October 2016. As mentioned, the trip had two main purposes: firstly, to cross checking the collected information during the desk study, and secondly to fill the information gaps of the first step. To do so, several key informant interviews (KIIs) were conducted and several site visits were arranged.

The sanitation assessment in Beirut City consisted of two parts: The first part includes some questions about the enabling environment in terms of sanitation management within the city, and the second part tries to catch the actual situation on ground. In the case of Beirut there was no opportunity for a field visit, therefore the focus was on KIIs and desk studies. And finally, some findings from Kabul's investigations were shared with the interviewees in Erbil and Beirut to discuss the differences and similarities between Kabul and their cities.

6.2. Sanitation Management in Iraq

The republic of Iraq is located in the Middle East, is bordered by Turkey to the north, Iran to the east, Kuwait to the southeast, Saudi Arabia to the south, Jordan to the southwest, and Syria to the west (Figure 52).

The Kurdistan Region of Iraq (KRI), located in northern Iraq, comprises of the three governorates including Erbil (Arbil), Slemani and Dohuk. It borders Syria to the west, Iran to the east, and Turkey to the north, lying where fertile plains meet the Zagros Mountains. It is traversed by the Sirwan River and the Tigris and its tributaries, the Great Zab and the Little Zab. Kurdistan region is 40,642 km² in area and its population is about 5.2 million (KRG, 2016). The climatic conditions in northern Iraq including Kurdistan Region is semi-arid and characterized by hot summers and a moderately cold winters.

The Kurdistan Regional Government (KRG) was formed in 1992 by the Kurdistan National Assembly, the first democratically elected parliament in Kurdistan. Since 1992 to 2003, two separate administrations, one based in Erbil and the other one in Slemani controlled the region. In 2006, the two separate KRG cabinets, based on the new Iraqi Constitution, formed the first unified cabinet (KRG, 2016).

According to the Iraqi Constitution of 2005, the Kurdistan Region of the Republic of Iraq (KRI) is a constitutionally recognized semi-autonomous region in northern Iraq with a population of 5.1 million (2012 estimate). Its government (the KRG), based in Erbil, has the right to exercise legislative, executive and judicial powers according to the Iraq constitution, except in what is listed as exclusive powers of the federal authorities under that constitution (World Bank & KRG Ministry of Planning, 2016). Compared with the other parts of the country, KRI has better urban infrastructure services: Kurdistan Region-Iraq (KRI) has experienced substantial development especially during the last decade while the other parts of the country witnessed very unstable conditions due to the conflicts.

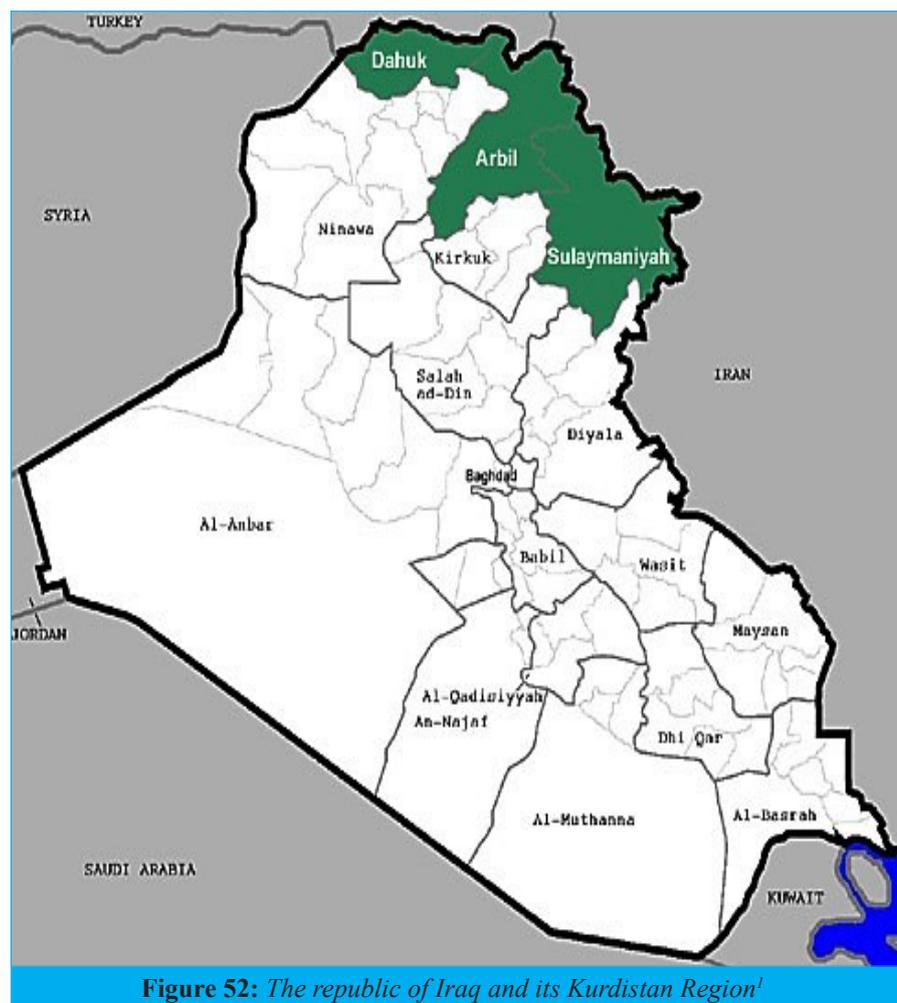


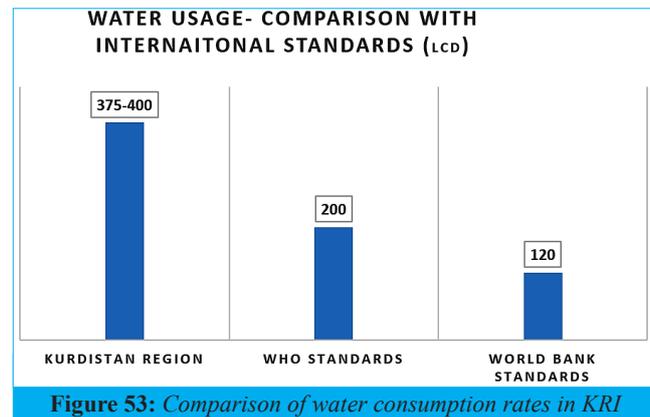
Figure 52: The republic of Iraq and its Kurdistan Region¹

¹ <http://musingsoniraq.blogspot.de/2012/10/new-public-opinion-poll-on-iraqi.html>

6.3. Environmental Sanitation in KRI

The quality of water services (continuity of service and water pressure) is poor and the existing infrastructure is not in a good condition with a very high leakage. The supply of water is intermittent. At present, water tariffs, which is about 1 USD per month, is not based on real consumption. Water connections are not metered and there are no intensives to reduce the current high level of water consumption. It results that: (i) revenues covered only 3% of operation and maintenance costs in 2011, and (ii) per capita water consumption is very high, ranging from 375 to 400 liters per capita per day (lpcd) in urban areas and 237 to 292 lpcd in rural areas (KRG Ministry of Planning, 2012).

Improved management of water resources will play a key role in the future of the KRI. In particular the pollution of surface water and the rapid exhaustion of groundwater present an existential threat to the entire region. Both surface and groundwater sources are exposed to contamination by nitrate heavy fertilizers and pesticides, uncontrolled waste dumps and landfill sites, and the use of unsealed cesspits.



There are several reasons behind water supply deficiency in KRI (KRG Ministry of Planning, 2012):

- i. Although the overall level of water supply provision is high, it still does not cover the whole of KRI;
- ii. Poor water supply services (e.g. unpredictability of supply, low pressure, and limited potability);
- iii. There is no incentive for water conservation because of low tariffs and lack of water metering systems;
- iv. Lack of clear policies to regulate water abstraction and use, water polluters and proper operation and maintenance of the facilities. Current responsible institutes have many deficiencies which need to be addressed.
- v. Overstaffing: there is a high level of staff compared to international norms with 5 employees / 1000 connections. The overall sector management is weak and ineffective.

Currently, water supply in KRI is not efficient, water consumption is too high and subsequently the produced wastewater is also excessive. At the same time, there is no WWTP in KRI to treat the produced wastewater. Considering the expansion of the cities and population increasing during the last decades, KRI has been faced with many challenges regarding environmental protection. There is also a lack of legislation and regulation for recovering the cost of treated wastewater which will become necessary as soon as sewers are installed.

A majority of households in KRI rely on cesspools to manage their blackwater: the sludge is collected by private vacuum trucks and discharged in remote areas outside of the cities. Depending on the soil quality and the depth of cesspools, households need to empty their sanitation facilities

at different time intervals.

In some parts of major cities, storm sewerage networks are available which collect surface runoff and greywater. But in some cases citizens are illegally connecting their blackwater outlets to the networks as well.

For the sector to deliver appropriate services in a sustainable way, both policy and investment on infrastructure is needed. Reforms in the structure of water and sanitation organizations should be considered. Investment on required WWTPs is necessary. Water loss and leakages should be addressed. Public awareness, hygiene promotion and community education should be considered (KRG Ministry of Planning, 2012).

Sanitation systems were already facing challenges before the current crisis in providing reliable service to the KRI population, but the sharp increase in access to water supply services has not been accompanied by similar investments in wastewater infrastructure, and sanitation remains a major concern in environmental management (World Bank, 2015).

About 95% of solid waste produced in urban areas is collected and disposed of using landfills. But this percentage in rural areas is much lower. Landfill sites are seen across the region as well. Solid waste burning with soil coverage is usually practiced in the landfills (World Bank & KRG Ministry of Planning, 2016).

6.4. Erbil City

Erbil city (also known as Hawler) is located in the northern part of Iraq, approximately 350 km from the Iraqi capital, Baghdad. It is the capital of the Iraqi Kurdistan Region. In total, Erbil Province covers an area of 14,873 km² (Kurdistan Region Statistics Office, 2014) and had a population of about 2,062,380 people in 2015, which included roughly 358,260 internally displaced people (IDP). Erbil City spans an area of about 491 km² with a population of approximately 1,341,130 including about 232,870 internally displaced people (IOM, 2015).

Erbil is considered as one of the oldest cities in the world because of its citadel which has been placed on the UNESCO World Heritage List (UNESCO, 2014). But for a long time it was a small city and only in the last decades found its importance again. Following the influx of the population into Erbil, the city expanded very fast.

The Ministry of Municipalities & Tourism within the Kurdistan Regional Government assigned Dar Company to develop a visionary master plan for Erbil City (Figure 54)¹. The plan includes guidelines for redeveloping the different districts with relevant community facilities (Dar, 2019).

¹ <http://momt.krg.org>

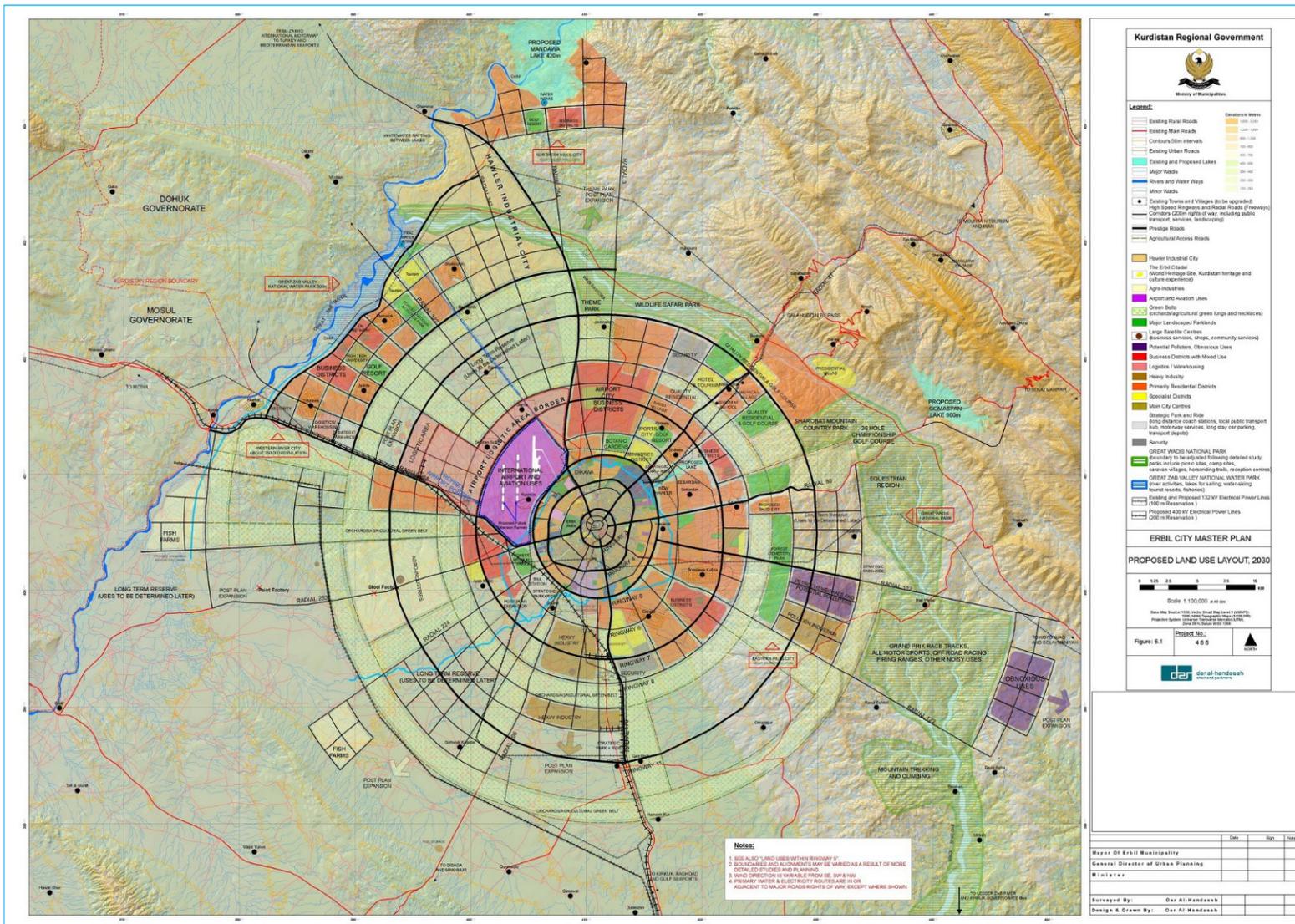


Figure 54: Erbil City master plan, approved in 2009 (Sabr C. A., 2014)

6.4.1. Urbanization in Erbil

Erbil city is built according to a system of concentric rings circling around the citadel in the center. Development densities within the fifth ring is low. Despite space availability, the city is expanding beyond Ring Five due to private development. As a result, the cost of infrastructure implementation is increasing and the government is failing to cope with this kind of city expansion (KRG Ministry of Planning, 2012).

Despite fast urbanization, Erbil City has no major informal or unplanned residential settlements inside the rings which considered the official Erbil City. The citadel is considered a cultural heritage and is no longer used for residential purposes. Some informal and unplanned areas are located around the citadel. But these areas have not been renovated for a long time, and most of their residents are moving to new built areas: Government has plan to change the land use of this area.

There are some informal areas outside of the Erbil City just adjacent to it. Although these areas are not considered a part of the city, but based on the interviews and a conducted field visit, the residents have access to similar facilities as other Erbil City residents. It seems the main reason for development of such informal areas around the city is price of land, otherwise there is enough space inside the city for different kind of developments.

Considering Erbil City, the informal areas surrounding the city are very small and there is low chance of more informal expansion. During the last ten years Erbil has experienced a massive city expansion and population growth, but the development was still under control and based on the master plan. Currently, due to availability of a master plan and also high level of government control on the city, and also political will to keep the city planned, the risk of informal or unplanned expansion is low.

To sum up, according to the authorities, there is no big problem in terms of informal settlements in Erbil City. There are some individual houses which are not built according to the master plan, but the number is small and totally there are no informal neighborhoods within Erbil (M. Hamed, personal communication, Oct. 23, 2016).

6.4.2. Institutional Framework

Several Iraqi government institutions are involved in the water and sewerage sector. But the Ministry of Municipalities and Public Works (MoMPW) is the main government authority dealing with water and sewerage issues in the country. MoMPW has seven General Directorates including Water and Sewerage Service Directorate. But Iraqi Kurdistan has its own semi-autonomous government and structure.

In KRI several government institutions are involved in the sector, but the main organization in charge of water supply and sanitation is the Ministry of Municipalities and Tourism (MoMT); all urban environmental sanitation projects are under management of this organization. Coordination between different local and international stakeholders are also arranged through this Ministry (Figure 55).

KRI suffers from poor legislation to regulate water issues in the sector. A new Water Law for the KRI has been developed and submitted to the regional parliament for approval. When the law is approved, other required documents including policies, regulations, etc. should be developed.

In each of the autonomous governorates in KRI, urban water supply and sewerage are under the responsibility of a Directorate for Water and Sewerage (DWSE) placed under the supervision of the Ministry of Municipalities and Tourism in Erbil City. The municipal directorates are in charge of solid waste management, street cleaning, surface runoff management, parks and road maintenance.

6.4.3. Water Supply

Erbil City has two main types of water resources: There are about 800 deep wells in the city including 80 private wells mostly belonging to the government offices. The second source of water is upper Zab River which provides surface water to the city.

Three water treatment plants (WTP) were constructed with intake of raw water from upper Zab River; Efrac 1 (conventional WTP) constructed in 1968 with design capacity of 38400 m³/day. Efrac 2 constructed in 1985 with a design capacity of 69000m³/day. Currently it supplies about 44000 m³/day. Efrac 3 constructed in 2006 with a design capacity of 144000 m³/day. The treatment processes in these plants have four main steps; screening, sedimentation (coagulation and flocculation) filtration and chlorination. Each WTP has a quality control lab for daily water analysis (Shareef & Muhamad, 2008).

Due to the population growth and also the influx of refugees and also Internal Displaced Persons (IDPs), water demand is increasing and there is now much more pressure on water resources and associated infrastructures. The additional demand for water for refugees and IDPs is estimated about 11 percent, which needs further water resources and investment on related infrastructures (World Bank, 2015).

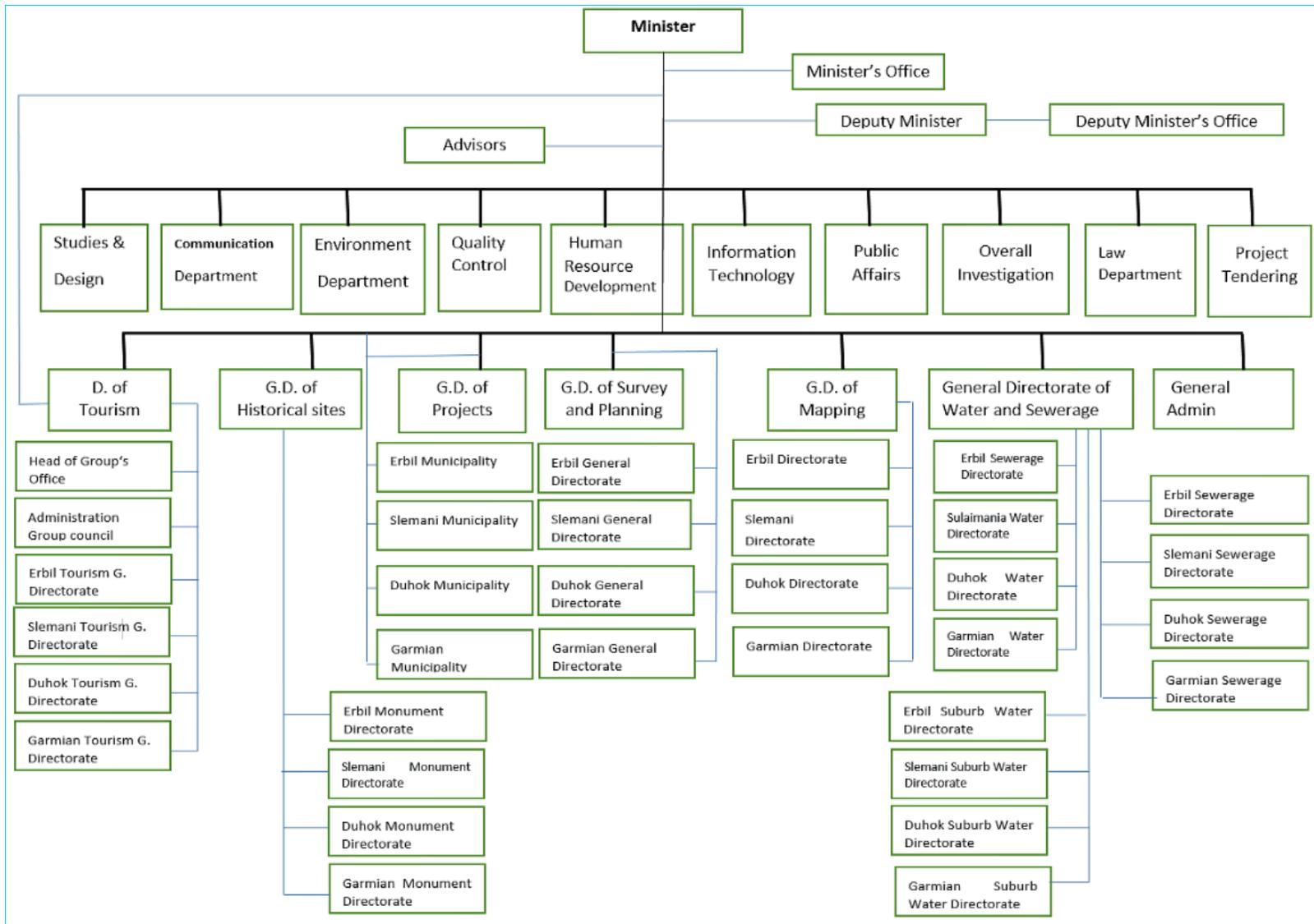


Figure 55: Organizational chart of Kurdistan Ministry of Municipalities and Tourism (<http://momt.krg.org/>)

Local people are usually using drinking water for washing their vehicles, watering gardens and greeneries within the city. It seems lack of awareness regarding the values of water is a major challenge in the region. Such kind of wasteful lifestyle adds to the pressure on limited water resources and aging infrastructures.

KRI still has no Water Law and other legal sector documents. The draft version of Water Law is currently in the regional parliament, and needs to be approved. Lack of legal documents, usually leads to overlaps or gaps in terms of responsibilities of different stakeholders in the sector. Currently, there is no clear regulatory roles and responsibilities. Respected authorities are not enough aware of the overall sector policy and there is much focus on infrastructure development and business as usual by different stakeholders.

Water distribution network in KRI is aging, and needs to be replaced & repaired in many parts. While water pressure in pipes is too low, there is a considerable amount of leakage in the distribution network which is not yet estimated accurately.

Almost the whole city relies on soak pits for blackwater discharge: Pathogens seep into the old leaking water network and deteriorate the quality of drinking water. Diseases associated with unsafe drinking water are usually reported during the warm seasons.

According to Swedish International Development Cooperation Agency (Sida) and conducted interviews, Table 23 shows the main problems in terms of water, not only in Erbil but also other big cities including Slemani and Dohuk (Andersson et al., 2011):

Table 23: *Main water problem issues in KRI*

Technical aspects	Managerial aspects
<ul style="list-style-type: none"> • Lack of enough water pressure in the networks, due to leakages and old distribution network • Booster pump installation by individuals to increase their water pressure • Water leakages in the system • Deterioration of water quality due to penetration of wastewater or stormwater into the network 	<ul style="list-style-type: none"> • A bureaucratic system and too much work paper • Poor operation and maintenance system • Low capacity • Inadequate budgetary system; the budget is not “owned” by the Directorate of Water and Sewerage • Lack of proper tariff system • The collection revenue is not efficient • Lack of regulations for water use and no enforcement measures • Lack of sufficient data • Leak repairs are not efficiently used for recording the piping system’s data and qualities

The master plan for the modernization of water distribution networks in cities of Dohuk, Erbil and Slemani proposed a reorganization of the water and sanitation sector in Kurdistan. They also suggest for more decentralization and creation of efficient independent bodies to manage the sector (Andersson et al., 2011).

6.4.4. Wastewater Management

Most of the households in Erbil City rely on on-site sanitation technologies. Local people are washers and use anal cleansing water. Blackwater is generally disposed of in soak pits: According to the authorities about 95 percent of the population are using unsealed soak pits, and about five percent have septic tanks or holding tanks. Cesspools in many cases are made in a way to increase intentionally the infiltration and increase the emptying intervals. Furthermore, about 10 percent of households who have cesspools do not use their cesspools and discharge the blackwater directly to the stormwater networks (F. Karim, personal communication, Oct. 17, 2016).

Due to the different characteristics of the soil in Erbil City, the interval for desludging of the soak pits are different and in some cases there is no need to desludge them at all. Areas using septic tanks or holding tanks use private vacuum trucks to empty their facilities. Vacuum trucks discharge the wastewater outside the city, but sometimes they discharge it in stormwater gutters which is considered illegal. According to the authorities due to lack of treatment possibilities in KRI, government cannot take tough measures against Environmental Law violations until providing proper treatment facilities (M. Sorud, personal communication, Oct. 18, 2016).

Currently in Erbil City there are about 800 deep wells as a complementary water source. Based on a survey conducted by Erbil Water Directorate in 2012, water quality in 20% of water wells exceeded the drinking water standards. Almost half of the wells were polluted by nitrite which shows the infiltration of wastewater into the groundwater resources (JICA, 2015).

KRI has received an Official Development Assistance (ODA) loan from the Japanese Government to construct sewerage collection networks and its associated wastewater treatment plant (WWTP) for Erbil City.

There is a similar project for Slemani City as well. According to the authorities, the detailed design was finished and the construction phase is soon to begin. The maximum capacity of the treatment plant will be 840,000 m³/ day (M. Karrash, personal communication, Oct. 20, 2016).

The total capacity of the designed project is 2.4 million people, which is the expected population in 2035. The phase one of this project covers 1/4 of it, with about 600,000 inhabitants. Thus, the WWTP in the project covers 210,000 m³/day which is enough to cover the population (JICA, 2015).

The sewerage network will cover the entire Erbil City, and it will also feature a faecal sludge treatment unit in the treatment plant as well: therefore products of on-site sanitation facilities will also be collected and transferred to the treatment units.

Based on the design, there will be two underground systems to collect greywater and blackwater together and stormwater separately. Blackwater and greywater will be transferred to the treatment plant, but stormwater will be discharged to water bodies without treatment. The executing agency for the project is the General Directorate of Water and Sewerage under the Ministry of Municipality and Tourism of Kurdistan Regional Government.

6.4.5. Solid Waste Management

More than 90 percent of produced solid waste in the urban areas is collected, transferred and disposed of using landfill sites (Kh. Majid, personal communication, Oct. 23, 2016).

The responsibility for solid waste collection and disposal in the majority of Erbil's 26 municipalities has been transferred to the private sector through tendering of the contracts. Most of the contracts have the duration of 3 years and the payment is on monthly basis (World Bank & KRG Ministry of Planning, 2016).

Erbil City produces about 2,200 tons of municipal solid waste per day. All kind of solid waste produced in Erbil Governorate is transferred to Kani Karzalah Dumping Site located in eastern part of the Erbil city. There is no landfilling, separation or compost facilities available on the site. The total collected solid waste is dumped into the area and covered by a layer of soil. There are some informal waste pickers using the opportunity to collect recyclable materials for their own usage (Kh. Majid, personal communication, Oct. 23, 2016).

Due to the influx of refugees and IDP, Erbil's solid waste increased by a little more than 300 tons daily. Even before the crises, the city of Erbil had been faced with many challenges to manage its solid waste. The system could benefit from improvements, especially through introducing waste sorting and recycling schemes by public-private sector partnership. This may include composting (56 percent of solid waste in Erbil City is organic waste), waste to energy, and also production of gas (World Bank & KRG Ministry of Planning, 2016).

Erbil's solid waste management master plan has been developed by UNICEF with funding from the European Union. The activities mentioned in the Master Plans will be implemented subject to fund allocation. Recently a contract was signed by the Kurdistan Region's Ministry of Municipalities and Tourism and a Canadian company to recycle the city's garbage. The contract also includes construction of two recycling centers in the eastern and western sides of Erbil City (F. Kh. Majid, personal communication, Oct. 23, 2016).

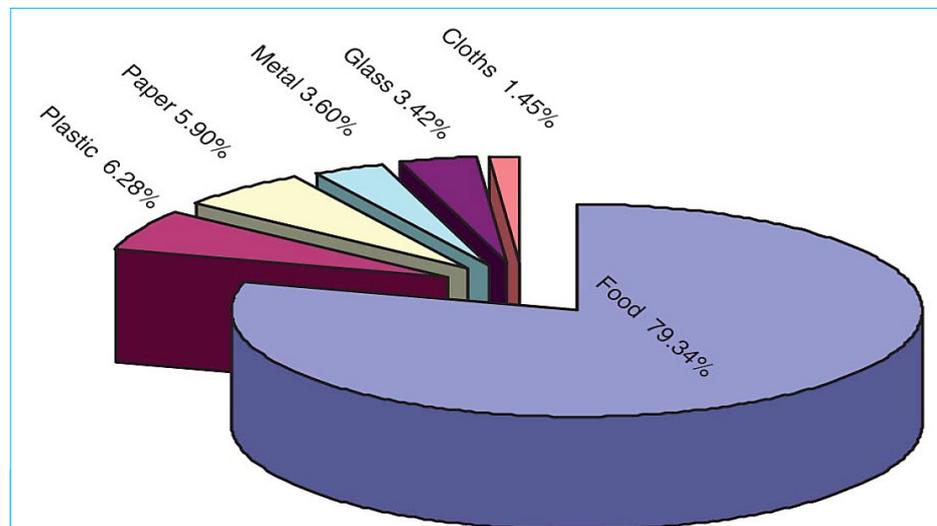


Figure 56: Solid waste Component in Erbil City (Shuokr Q. Aziz et al., 2011)

The fact that more than 60 percent of solid waste generated in the KRI is organic waste, makes this either an opportunity for composting in cooperation with the private sector. If not so, which is the case now, there will be many environmental risks (World Bank & KRG Ministry of Planning, 2016).

The National Solid Waste Management Plan (NSWMP) for Iraq was developed in 2007. The plan states that Iraq will build 33 sanitary landfills with the capacity of 600 million square meters all over the country including Erbil, Dohuk, and Slemani Governorates, by 2027. In addition to

constructing landfills, the plan also insists on proper collection, transportation, recycling, disposal and reuse practices (World Bank & KRG Ministry of Planning, 2016).

6.4.6. Stormwater Management

In a series of incidents in 2016, there was heavy rain and following that flooding in Erbil City. Many sewers overflowed, which led sewage to escape and mix with the stormwater. Roads were damaged and drainage systems got blocked even several days after the raining (Nanekely et al., 2016). The failure of the drainage system is usually occurred in rainy seasons, and in many cases collapse and blockage are the most important problems.

Currently Erbil City relies on a combined drainage system to carry surface runoff and greywater. The collected wastewater is discharged finally into distant water bodies around the city.

Some households with no possibility of connection to the stormwater network for greywater disposal simply discharge their greywater into the streets which finally finds its way to the stormwater network or infiltrate in the ground. Among those who have access to the surface drainage system, some households connect their blackwater pipes illegally to the system. According to the authorities the percentage of these illegal connections is about 10 percent (M. Sorud, personal communication, Oct. 18, 2016).

6.5. Beirut City

The Lebanese Republic located in the eastern side of Mediterranean Sea. Lebanon bordered by Israel to the south, and Syria to the east and north. It is mostly a mountainous country. For a long time Lebanon has been an important commercial port for the Middle East. Lebanon due to its multi-ethnic context and also geopolitical situation, has also been the center of conflicts in the region.

Lebanon is a small and densely populated country with a total area of 10,452km². It has Mediterranean climate; hot summers and cold winter with short spring and autumn seasons. The average annual rainfall is about 823 mm/yr. (Sogesid, 2005).

Lebanon can be divided into four main zones including a narrow coastal area along the Mediterranean shore, inner mountains, the Beqaa Valley which is the country's agricultural area and finally the Anti-Lebanon Mountain which makes a part of the border with Syria (UNEP, 2007).

During 1975-1990, Lebanon faced a long bloody civil war. Following that there was the strongest period of sustained growth which was ended by the July-August war



Figure 57: Lebanon regional map (UNEP, 2007)

with Israel at 2006. Lebanon's economy has several aspects: Although agriculture and industry are important in the country, but the main drivers of economic growth are service sector and tourism (UNEP, 2007).

Beirut, the capital of Lebanon, is the largest and main port city in the country. It is located between the Mediterranean Sea and the Mount Lebanon (Y. Habib, personal communication, Feb. 12, 2017). Beirut is a very congested area with the population's density about 20,167 person/km². The overall population density in Lebanon is about 520 person / km² (Council for Development and Reconstruction, 2016).

Lastly, due to Syrian war there was an influx of refugees into Lebanon while the country is already hosting several hundred thousand Palestinian refugees.

It had a significant negative impact on the environment in the country. Currently there is high demand of water, more wastewater production and dumping of solid waste.

The large wave of refugees had also adverse effect on safe drinking water and wastewater management (SDC, 2016).

6.5.1. Urbanization

Lebanon is a highly urbanized country and more than 87% of the population live in the urban areas (Council for Development and Reconstruction, 2016). In Lebanon, urbanization drastically increased before the civil war (1975-1990), and after the civil war because of sustained economic growth.

Beirut was terribly affected by a civil war. Following the war, Beirut was rebuilt and extended with no obvious and comprehensive city development plan. Exposing high-rise buildings are constructed in areas dominated by low-rise buildings. They also put a lot of pressure on the infrastructure and utilities. Lebanon Government mainly failed to provide required infrastructure in such mixed areas. Furthermore, after the civil war the city has seen a sectarian divide with areas inhabited predominantly by one of the many religious confessions (Y. Habib, personal communication, Feb. 12, 2017).

Beirut urban master plan has been amended several times. The reason for these changes is usually increasing building ratios and change land use plan which leads mainly to reducing the surface areas of greenery and agricultural areas but increasing the income of the municipality (Council for Development and Reconstruction, 2016).

There is no considerable informal areas in Beirut (Y. Habib, personal communication, Feb. 12, 2017). In general, the city is an already congested area, empty space is very limited and expensive. There is very little chance of informal expansion in future (M. A. Najm, personal communication, Jan. 18, 2017). Currently, any changes on land use should be based on an official procedure and through related authorities.

There have been several reasons behind the consecutive waves of urbanization in Lebanon including rural exodus, suburbanization, war displacements and finally influx of refugees (Council for Development and Reconstruction, 2016).

As mentioned immigration from rural areas to cities mainly occurred due to rapid economic growth which was the case before the civil war and after it. Suburbanization was the result of the government's policies which supported scattered development. But in case of war displaced people, they didn't mainly come back to their original areas. And finally the war in neighboring Syria, caused another round of

mass immigration toward mainly cities in Lebanon (Council for Development and Reconstruction, 2016).

Another reason for mass immigration, especially in recent years, into the cities could be lack of employment opportunities in the rural areas. But job shortage is a problem in Lebanon's cities as well, and many people finally have to leave the country for better opportunities in another countries (World Bank, 2012).

Currently, in case of Beirut there is no much possibility of new waves of immigration either by refugees or rural immigrants. The city is already too much congested and there is limited and super expensive places to live. Refugees or internal immigrants prefer to stay out of unaffordable Beirut.

Beirut City can be categorized into several parts (Council for Development and Reconstruction, 2016):

- i) Beirut's informal areas mainly poor families, worker class and rural migrants are settled
- ii) High-rise buildings in central Beirut
- iii) Popular neighborhoods accommodating young generations looking for job opportunities
- iv) Some middle class live in Beirut suburb which is not a part of the main city. They travel on daily basis to their works in central Beirut.

The first slum developments in Beirut was during French colonial era of 1920 on-ward. The city development and informal expansion was continued during the 1960s and 1970s when urbanization increased rapidly in Lebanon. Following the civil war, there was another round of rapid urbanization. Informal areas can be found around agricultural and industrial sites or as sub-standard neighborhoods of Beirut's downtown or suburb (Council for Development and Reconstruction, 2016).

6.5.2. Legal / Institutional Framework

The current Water Law was introduced by 2000 (Council for Development and Reconstruction, 2016). According to the Water Law, Ministry of Energy and Water (MEW) is in charge of policy issues in the sector. MEW also monitors service provision through a performance evaluation commission based in the Ministry: The commission acts, in somehow, as a regulatory body. At user level, four public water establishments take care of implementation, operation and maintenance all over the country (Sogesid, 2005). While MEW sets the quality standards, but municipalities are in charge of wastewater management (Rothenberger, 2010).

Furthermore, there is a Council for Development (CDR) in charge of large investment projects. It is considered the main public actor for development in Lebanon. CDR facilitates the implementation of large scale projects by preparing the general development plans and also mobilizing the required resources (Sogesid, 2005).

Ministry of Environment has the quality control role over water resources and beside that Ministry of public health monitors the quality of drinking water according to its drinking water standard (Rothenberger, 2010).

Although there are some legal documents to manage the sector, but still further complementary documents are needed. For example, some future oriented approaches like wastewater reuse are neglected in the national level documents and policies (Rothenberger, 2010).

Current legal system insists on decentralization, privatization and cost recovery as the corner stones in

the sector (M. A. Najm, personal communication, Jan. 18, 2017). Lack of enough rules, regulations and policies in the sector is a problem. Furthermore, some regulations even date back to the French colonial era (Sogesid, 2005).

6.5.3. Water Supply

Lebanon, in the region, is a relatively well-watered country (El-Fadel, 2008; UNEP, 2007). Total renewable water resources in Lebanon is 1,261 m³/capita year and rate of access to improved drinking water in urban and rural areas is almost 100 % (Sogesid, 2005).

Beirut City and its suburb accommodate about 2.4 million citizens, almost two thirds of the country's population. Almost all the citizens have access to the water network. But due to low water quality and also distrust to municipal services, many citizens buy their drinking water from water vendors. About 10-16 percent of low income basic salary are spent on water and 60% of that concerned drinking water (Formas, 2009).

The main reasons for low water quality are cross connection between domestic sewer pipes and domestic water pipes, and also the intrusion of sea water into fresh aquifers (Mcheik et al., 2017). Currently safe water provision to overpopulated cities like Beirut and its suburb is a big challenge (Jurdi et al., 2003).

Public water network is deficient and according to some reports about 40% of water is lost due to the leakage (Lebanon Ministry of Environment, 2014). Furthermore, since the water consumption is not metered there is no incentive to save water. This situation has led to a sharp water crisis.

Due to water scarcity, there is a water rationing in Beirut City, and the residents receive 10 hour water every other day (Mcheik et al., 2017). Beirut residents in some cases to meet their water needs have to dig their own wells. Therefore uncontrolled private wells are common in the city and the number is increasing (Korfali & Jurdi, 2009).

According to Lebanon Water Law, citizens don't need any permit to dig a water well on their private lands for drinking purposes. But the maximum flow shouldn't exceed 100 m³/day (Jagannathan et al., 2009)

Overexploitation of groundwater has led to the infiltration of sea water into the aquifers (Acra & Ayoub, 2001). At the same time, there is no monitoring or quality control system in place (El-Fadel et al., 2003).

Water vendors and water wells are used as the complementary water sources in Beirut which increase the level of pressure on water resources as well: Currently, a major water project is underway to convey surface water from the Litani River (in the South of the country) to Beirut (Y. Habib, personal communication, Feb. 12, 2017).

6.5.4. Wastewater Management

The combined total designed treatment capacity of large and medium size treatment plants is sufficient for only 19% of all municipal produced wastewater in the country. Generally, the level of treatment is primary and usually meets the least required thresholds. In many cases the wastewater discharged in the environment without treatment (Ahlbäck, 2011). According to a domestic water assessment in 2007, about 33% of the well water samples in Beirut City, were polluted due to wastewater or sea water

intrusion (Korfali & Jurdi, 2007).

In respect to sewerage system, Beirut has the highest connection rate in the country which is above 99% (Verdeil, 2018), and Ghadir is the main treatment plant for the city. But the treatment is just a simple screen with a sea outfall. KFW has been planning a small WWTP to protect the main water source (Y. Habib, personal communication, Feb. 12, 2017).

Although there are some small scale treatment plants constructed by NGOs and research centers, but mainly households without sewerage connection rely on on-site technologies including septic tanks and cesspools (M. A. Najm, personal communication, Jan. 18, 2017).

In a joint cooperation between the CDR and Lebanon Ministry of Energy and Water 18 WWTP are constructed. Furthermore, USAID is implementing 32 small scale WWTP in cooperation with municipalities across the country (Council for Development and Reconstruction, 2016).

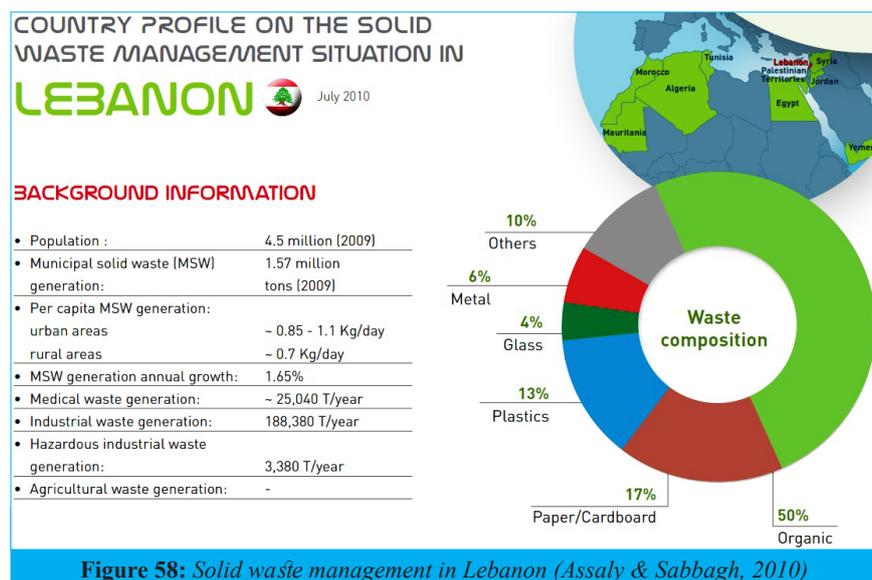
In general, from environmental point of view Lebanon is not in a good condition and there are many deficiencies (I. Aquilué, personal communication, Jan. 22, 2017). The mismanagement of water resources is a big challenge. Surface water pollution and rapid exhaustion of groundwater resources put a major risk to the public health and environmental quality. Wastewater reuse is not very common in Lebanon, only in some cases it is used for irrigation purposes: Due to availability of renewable water resources, Lebanon still has not considered wastewater reuse significantly. It discharges about 80% of its wastewater following a basic treatment into the sea (Rothenberger, 2010).

6.5.5. Solid Waste Management

For about two decades Lebanon Government had hired a private company to manage solid waste almost all over the country. The contract was finished in 2015. Furthermore, an important landfill reached also its full capacity, and couldn't accept more solid waste. Following that and for a relatively long time, Lebanon has faced with a major problem in respect to solid waste management. Solid waste collection interrupted which created many problems for the citizens. Following that uncontrolled landfills and incinerations have emerged in living areas and added another aspect to the problem (Hilal et al., 2015).

Although sometimes not functioning, but solid waste collection is high and mainly managed by contracted companies. Currently in Lebanon, there are 504 MSW dumpsites with a total capacity of 5 million cubic meter (Lebanon Ministry of Environment, 2017).

Solid waste management in Lebanon has been facing important challenges. About one third of the



produced solid waste are dumped without any treatment. According to UNDP, currently 53% of the solid waste is landfilled. 8% is recycled and 9% goes for composting process. Beirut produces 58% of the all solid waste in the country and needs especial attention for proper management (Ahlbäck, 2011).

The main method of solid waste disposal is landfilling. Due to the components of the produced solid waste in the country, it is not the best option and there should be a better approach: Half of the produced solid waste in Lebanon is organic waste. Paper with 17% is the second major portion followed by plastic 13% (Assaly & Sabbagh, 2010).

Usually informal scavenger collect recycling materials and sell them to private formal or informal companies. Due to the high portion of organic materials in the solid waste, another treatment practice is composting. But it is costly and needs a lot of efforts. Without proper sorting, the quality of produced compost is not also good (Ahlbäck, 2011). In landfill sites or dumping areas practices like open burning is also common. Furthermore, if there is no proper management, which is the case mainly in dumpsites, leachate generation, air pollution, soil pollution and ground water pollution are major risks.

6.5.6. Stormwater Management

Surface water management in Beirut City, especially in densely populated areas which has less in-filtration possibility, is challenging. Flooding in rainy seasons is common, and citizens face different problems during rainy time (Council for Development and Reconstruction, 2016). As mentioned the average rainfall in Beirut is higher than 800 mm/yr. which is quite high and needs proper management.

Stormwater occurs mainly in the winter and autumn seasons. There is a drainage system that directs the storm water either into the Beirut River or directly into the Mediterranean Sea (Y. Habib, personal communication, Feb. 12, 2017). In some other parts of the city there is combined sewerage system which collect all kind of wastewater and also surface water (M. A. Najm, personal communication, Jan. 18, 2017).

7. Comparative Analysis between Kabul and its Reference Cities

The comparison between Kabul with Beirut and Erbil has different aspects. First of all, there will be a briefing about the general situation, in a comparable way, on geographic locations, historical backgrounds and political conditions. The required data for such analysis mainly was provided in the last chapters and the focus here will be more on the comparison itself. Following that, there will be (i) explanation of the urbanization process & dealing with informality in three cities and (ii) environmental sanitation management in three cities, similarities and differences.

The comparative analysis explains the water sector management with especial focus on sanitation provision as the core part of this research study. Water sector management is divided itself into policy, regulatory and implementation levels. There was detailed discussions earlier in this dissertation about each respected city, here the focus is more on the comparison.

The last part of this comparison explains about the specific geographic condition of Kabul City which makes it different and in somehow unique for sanitation provision approach. In addition, community approach in Afghanistan, which was explained before, is compared to Iraq and Lebanon.

7.1. General Situation

It's almost 40 years that Afghanistan is in a conflict, and still the end is not in sight. Iraq and Lebanon also faced with political instability and war during last decades. But still the scale of war and specially the duration was not as long as Afghanistan. Even from different aspects we could call them failed states, but especially in case of Iraq before the 'Second Gulf War' there was a high level of political stability in the country.

The war in Afghanistan now seems more like a trap: Following the invasion of Soviet Union in late December 1979, a war against the occupation was started. But soon it was converted to a war between East and West blocks.

Finally the Soviet Union left the country in February 1989, and following that its supported government in Kabul collapsed. But that time was only the start of a civil war between the Mujahidins who fought side by side against the Soviet Union. Mujahidins who were created during the invasion of the Soviet Union and supported by different regional and international powers, started a proxy war on behalf of the regional powers in Afghanistan.

Long and bloody war between Mujahidins was led to the rise of the Taliban. They took over most of the country during several years of war. Taliban was supported mainly by neighboring country Pakistan and foreign fighters who came to Afghanistan during the war against the Soviet Union. Al-Qaida leading by Osama bin Laden perhaps was the most famous organization supported Taliban.

After 9/11 terrorist attack in New York by Al-Qaida, the US and its allies invaded to Afghanistan to defeat the Taliban which was considered a major threat to the international security. Currently, After 18 years of war against terrorism, the country is still highly vulnerable to war either by the terrorist groups or by the ethnic minorities who feel themselves excluded.

During the last decades the world has faced many changes including the rise of new economic powers like China and India. They started very poor, but with a rapid growth could catch economic

powers and convert themselves to solid middle income countries.

Tendency of big international companies to invest in suitable developing countries, due to high cost of investment in western countries, provided a unique opportunity for economic growth in this period (Collier, 2008).

Afghanistan, Iraq and Lebanon has been facing several regional conflicts and civil war during the last decades. Lebanon is at war with Israel (Council for Development and Reconstruction, 2016) while its eastern neighbor, Syria, is in a complicated proxy war. Furthermore, Lebanon has always suffered from interferences by regional powers. KRI is relatively stable compared to the overall situation in Iraq, but still has many political problems with the central government in Baghdad. In addition, Iraq's neighboring countries are worried of an independent Kurdish country, which is a dream among many Kurd peoples in the region. Afghanistan has been also the battle field for a long proxy war between the regional powers. Above that a border dispute between Pakistan and Afghanistan has been always a source of political tension between these two countries.

Afghanistan and KRI, as landlocked areas, both need high level of regional integration. Even though KRI is an oil-producing area, without support of central government in Baghdad and Iraq's neighboring countries cannot sell its oil and make money. In the other hand, Afghanistan is the connection point of the Middle East, South Asia, Central Asia and East Asia. But still without a considerable support from its neighbors and good harmony in the region, Afghanistan cannot benefit from its strategic location. Although Lebanon is not landlocked, but from south Israel is its neighbor which has not a normal relationship with Lebanon. From east and north, war-torn Syria surrounds the country: It seems Lebanon has no much space for a regional integration.

And finally Beirut as a coastal city has more capacity to be a center for trade and service-oriented activities. It has more resources for development as a capital city. Although Kabul has also a long history as a junction to connect different part of its region, but as the capital of a landlocked country, it has its own limitations for a proper development. Afghanistan had faced with resource limitation because of least developed situation of the country before its conflict era.

7.2. Informal Areas

Informal areas in Kabul, Beirut and Erbil are one of the main focus of this study. Kabul, Beirut and Erbil are the capital cities in their regions. Kabul and Beirut due to their long history as capital cities have more historic and also informal areas. Erbil has experienced a rapid development in the last decade and the autonomous government in Erbil had the chance to develop the new established capital based on a master plan. There were few unplanned areas at the center of Erbil which was demolished and its residents relocated to planned areas. Currently, there is no major informal area inside the city.

Beirut has some unplanned and informal areas at their central parts mainly belong to the time before its civil war. Furthermore, there are informal areas in result of urbanization or conflicts. But still there is few informal areas compared to Kabul City.

There was a rapid urbanization in Lebanon before the civil war (1975-1990). Many people from rural areas immigrated to the cities especially Beirut the capital. A part of informal development happened at this time. After the civil war Lebanon experienced a sustained repaid growth rate which increased the urbanization including informal development again: about 90% of Lebanon's

population live in the urban areas and almost half of it in Beirut Metropolitan Area.

Following the war in Syria another wave of immigration into Lebanon happened which partly increased the problem of affordable houses and contributed to the development of the informal settlements. But due to congested situation and also lack of affordable shelter in Beirut, usually refugees and immigrants are not interested in the city (M. A. Najm, personal communication, Jan. 18, 2017),

Except the short history of Erbil as the capital of KRI, the city is homogenous and is controlled by one political party that controls the government as well. But Kabul and Beirut were the center of civil war and both cities were divided between different rivals and in each part of the city different communities were settled. In post-conflict Kabul and Beirut usually in some middle class areas a level of integration are seen: currently the presence of different political players with their strongholds at different part of the city (and country), still makes difficult the enforcement of urban management plans:

political decisions usually make the technical issues as the second priority and each player tries to implement the plans based on its own interests. Both in Kabul and Beirut, fragmented urban development can be seen as the result of such socio-political context.

The Lebanon Government has not recognized informal areas yet, although in many cases those areas also receive urban services. In some cases, even upgrading is encouraged (Council for Development and Reconstruction, 2016). This is a similar approach in Kabul and Beirut: Despite lack of enough and affordable legal houses, the authorities considered informal development illegal and subject to demolition. But finally they couldn't come up with a solution for the informal development and tried to start a kind of upgrading at such areas. Noteworthy to mention that the role of international organizations to convince the national authorities for changing their attitudes was also important.

Current legal procedures and administrative issues are still a challenge to provide urban basic services in Lebanon's informal areas. Furthermore, lack of upgrading policies and guidelines makes the situation even more complicated (Council for Development and Reconstruction, 2016).

In Erbil City, as mentioned, there was an opportunity to deal with the informal areas from the early stages of the development. Therefore within the city, except a small community close to the citadel there was no other informal areas. With a new master plan in place, enough resources and political will there was a relatively smooth formal development within the city.

Currently, the three cities are hosting some refugees due to the conflict situation in their countries or regions. But these mostly tented settlements are considered temporarily and cannot be compared to the nature of informal areas which are the focus of this study. Furthermore, these refugee camps have been made by the governments & their international partners, and would be easy to manage them.

7.3. Environmental Sanitation Management

Sanitation and in general water sector is another important point focused in this comparative analysis. This comparison are based on different components of environmental sanitation management, finance and also available technologies in Kabul, Beirut and Lebanon. In the previous chapters, there was in depth discussion regarding water sector management. Here only the main similarities and differences are highlighted:

Institutional Structure: Figure 55 shows that KRI has a very centralized sanitation sector and Ministry of Municipalities and Tourism is in charge of all relevant issues. But Afghan Government and also Lebanon are focusing more on decentralization. In Afghanistan, as explained, water sector has three different levels managed by MUDH, an independent regulatory body and AUWSSC. MUDH is responsible at policy level including development of the legal framework and national policies. In Lebanon such responsibility is done by Ministry of Energy and Water (Table 24).

Lebanon is also experiencing a decentralization. Beside the Ministry of Energy and Water, a performance evaluation commission is in charge of regulatory issues. There are also semi-autonomous public institutions in charge of project implementation and operation.

KRI still has a very centralized system. All the responsibilities in respect to policy, regulatory and implementation in the sector are managed through the Ministry of Municipalities and Public Works. This Ministry deals with solid waste management and surface water issue as well.

Following the establishment of the no-fly zone in Iraqi Kurdistan, United Nations and Kurds have the chance to implement environmental sanitation projects without severe control of the central government. This kind of decentralization provided a great opportunity for KRG to develop its infrastructure rapidly. Following that in 2005 and after introducing new Iraqi constitution, KRI has better opportunity for urban infrastructure provision: It is time to developed decentralization within the KRI itself.

Law enforcement is still weak in Kabul, Beirut and Erbil. But Lebanon has a longer history of law development for its urban areas. Afghanistan before the civil war had a communist regime, and following the fall of the Taliban changed its political system and had to develop new laws, regulations and policies. KRI is also a relatively new established political system and still has to develop its legal system.

Despite availability of some legal documents, lack of proper policies and regulations, in three cases, is a challenge. As an example, privatization is encouraging in Afghanistan, Lebanon and Beirut. But there is no clear policies in that respect, and still complementary documents are needed.

And finally in respect to the rule of law, there are some problems in all three cities. Despite availability of some legal documents, many developing projects implemented based on political reasons, and technical issues are not always the first priority for the development.

Table 24: Regulatory framework

City	Legal Documents	Main Actors
Kabul	<p>According to Water Law, in the sector there is three main levels including policy, regulatory issues and finally implementation. Each level should be managed by different independent organizations.</p> <p>There are some gaps and overlaps in the sector which create different problems at each level.</p>	<ul style="list-style-type: none"> • MUDH at policy level. • Independent regulatory body yet need to be established. • AUWSSC at implementation level (water supply and wastewater management)
Erbil	<p>Currently the sector has a very centralized structure in KRG. Policy making, regulation and project implementation all are done by one organization.</p> <p>Lack of enough and required regulations is a major problem in the sector.</p>	<ul style="list-style-type: none"> • Ministry Of Tourism and Municipalities (MoMT)
Beirut	<p>More or less similar to Afghanistan and in a decentralized way. Ministry of Energy and Water is in charge of policy and regulatory issues. At user level there independent public water supply institutions. Municipalities are also in charge of wastewater management.</p> <p>Regulatory gaps and overlaps in the sector is an important problem needs to be addressed.</p>	<ul style="list-style-type: none"> • CDR for large scale project planning. • Ministry of Energy and Water. • Public water supply institutions • Municipalities for wastewater management

Source: (Etemadi et al., 2012), (Etemadi, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikiyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (Etemadi, 2016), (Hassib & Etemadi, 2016), (F. Karim, personal communication, Oct. 17, 2016), (M. Sorud, personal communication, Oct. 17, 2016), (R. Kanaganathan, personal communication, Oct. 18, 2016), (M. Mahmood, personal communication, Oct. 20, 2016), (Y. Habib, personal communication, Feb. 12, 2017), (M. A. Najm, personal communication, Jan. 18, 2017), (I. Aquilué, personal communication, Jan. 22, 2017), and compiled by the author.

Table 25: Water resources

City	Available Resources	Water Supply Management
Kabul	<p>According to Water Law, in the sector there is three main levels including policy, regulatory issues and finally implementation. Each level should be managed by different independent organizations.</p> <p>There are some gaps and overlaps in the sector which create different problems at each level.</p>	<ul style="list-style-type: none"> • MUDH at policy level. • Independent regulatory body yet need to be established. • AUWSSC at implementation level (water supply and wastewater management)

Erbil	KRI has been facing with water scarcity, and currently government trying to secure water resources for the citizens & increasing demands. Erbil City has relatively good access to surface water.	Although the coverage is very high, but lack of enough infrastructure, pressure on water resources and also high water consumption are big challenges in Erbil City and its suburb.
Beirut	Lebanon in its region has relatively high amount of water. It has several major rivers and springs to provide water to the citizens.	Old and insufficient infrastructure is a problem in Beirut City. Despite almost 100% coverage, water provision is not reliable. Furthermore the quality of water is not good.

Source: (Etemadi et al., 2012), (Etemadi, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (Etemadi, 2016), (Hassib & Etemadi, 2016), (F. Karim, personal communication, Oct. 17, 2016), (M. Sorud, personal communication, Oct. 17, 2016), (R. Kanaganathan, personal communication, Oct. 18, 2016), (M. Mahmood, personal communication, Oct. 20, 2016), (Y. Habib, personal communication, Feb. 12, 2017), (M. A. Najm, personal communication, Jan. 18, 2017), (I. Aquilué, personal communication, Jan. 22, 2017), and compiled by the author.

Technology: In respect to the sanitation practices & existing situation, there is not much similarity between Kabul, Erbil and Beirut. But all of them suffer from urban basic service deficiency. Water shortage, lack of safely managed wastewater, lack of proper solid waste management and also stormwater management problems during rainy seasons are common among them. Poor water quality and quantity is a major problem. At household level based on their affordability and water accessibility, using complementary sources of water like bottled water, well water, etc. are common.

Despite all aforementioned similarities, sanitation practices is different in Kabul compared to Beirut and Erbil. If we don't consider trend of switching to wet systems in Kabul during the last decade, dry system was the dominant sanitation system within the city. It is still one of the major sanitation technologies in Kabul.

Transition to wet system from current dry system is happening now in Kabul. But for a smooth and sustainable transition, an enabling environment is vital. Following the transition time, Kabul City would rely more on wet system, but it shouldn't be similar to the current failed sanitation situation of Beirut or Erbil.

Usually countries and their peoples, based on their resources, adopt different kind of environmental sanitation management. Furthermore, the investigations during this study showed when Afghan Government or its citizens had enough financial resources, they tried to convert dry systems to wet systems much more similar to the approaches applied in Beirut and Erbil. In chapter three, there was a detail discussion on creating an enabling environment for the sanitation sector. It seems despite all similarities and differences, available human and financial resources act as the main drivers to bring changes in the sanitation system. Therefore, national and individual income can be an important reason behind the differences in Kabul with Beirut and Erbil.

Table 26: Technologies applied in the sector

City	Existing Situation	Official Approach
Kabul	<p>On-site sanitation technologies at household level is very common. During the last decade wet technologies are expanding, but still dry toilet is a big portion of sanitation facilities in Kabul mainly in poor neighborhoods.</p> <p>Except for irrigation purposes, wastewater reuse is not practiced.</p>	<p>Decentralization is promoting by the government. Kabul Sanitation Maser Plan is also developing. But currently at implementation level there is much focus on water supply issues.</p> <p>Lack of budget and other priorities is a big challenge for the government. Sanitation in many cases is ignored.</p>
Erbil	<p>All households have water connection and also wet sanitation facilities at household level. During the last decades sharp increase in access to water supply was not accompanied with access to sanitation.</p> <p>Except for irrigation purposes, wastewater reuse is not practiced.</p>	<p>KRI is constructing a centralized WWTP for Erbil City. Infrastructure development going on.</p> <p>It seems that KRI wants to increase the level and quality of access to sanitation which was mostly ignored in the last decades.</p>
Beirut	<p>Water and wastewater coverage is almost 100%, although there are some deficiencies in the systems.</p> <p>Wastewater collection in Beirut and Lebanon is relatively high, but the level of treatment is not sufficient. In many cases untreated wastewater simply discharged into the sea or infiltrated to the soil. Technologies applied for wastewater treatment is very basic.</p> <p>Except for irrigation purposes, wastewater reuse is not practiced. Beirut has almost no agricultural fields in and around the city. Therefore there is no plan for wastewater reuse at all.</p>	<p>Government has problems in respect to operation and maintenance. Furthermore, the level of treatment is not sufficient. Currently there is focus on system optimization, improving the quality of services and also further infrastructure development.</p>

Source: (Etemadi et al., 2012), (Etemadi, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikiyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (Etemadi, 2016), (Hassib & Etemadi, 2016), (F. Karim, personal communication, Oct. 17, 2016), (M. Sorud, personal communication, Oct. 17, 2016), (R. Kanaganathan, personal communication, Oct. 18, 2016), (M. Mahmood, personal communication, Oct. 20, 2016), (Y. Habib, personal communication, Feb. 12, 2017), (M. A. Najm, personal communication, Jan. 18, 2017), (I. Aquilué, personal communication, Jan. 22, 2017), and compiled by the author.

Although Beirut and Erbil also have major differences in sanitation practices and management, but with a huge investment, Erbil moves on the path where Beirut already is: Erbil is constructing a huge centralized wastewater treatment. If KRI had been established earlier and Erbil was a capital city decades ago, as Beirut was, perhaps there was much more similarity between these two cities in terms of sanitation practices and technologies.

Financial Mechanism: Inequality of income/GDP in these three countries is a major difference. Lebanon is a service-based economy and its GDP is about 8250 USD. This number for Iraq is 4600 USD and for Afghanistan is 560 USD¹.

The level of incomes puts Lebanon and Iraq among the upper middle income countries (\$4,036–\$12,475), while Afghanistan stands among the low income countries (\$1,025 or less). Lebanon as

¹ <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

a service-based country and Iraq with its oil reservoirs have sustainable source of income while the current level of GDP in Afghanistan is mostly because of international aids.

Furthermore during the sanctions in Iraq, north Iraq enjoyed from direct allocated money, and a big portion of that was invested in basic needs, including water supply. Currently, not only cities but also villages have their own water networks although in some cases not functioning well. Access to water is a precondition for a wet sanitation system. Both Beirut and Erbil have almost 100 % water supply coverage. In case of KRI, its two main cities have secured the budget for wastewater collection network and treatment plants as well. In Erbil the design for the sewerage network was done, and construction phase is going on. Currently, as mentioned, all the citizens have water-based technologies and mainly rely on soak pits for the product disposal. Few percentage have septic tank, and others are connected illegally to the surface stormwater network.

Table 27: Financial mechanisms

City	Operation Cost	Tariff System and Investment
Kabul	There is no reliable data available. Revenue collection in the sector is not sufficient and effective.	A tariff system for water is in place, but revenue collection is not effective, and illegal connections are a challenge. Investment for new projects is made mainly by international aid.
Erbil	There is not enough data available. Mainly government subsidies run the project.	A tariff system for water is in place although very ineffective and cheap. Investment for new projects by national and international funds including loans and grants.
Beirut	There is not enough data available. Revenue collection and partly subsidies by the government.	Water tariff system for water and waste water is available. There is also flat rate charge for irrigation water. Investment for new projects by national and international funds including loans and grants.

Source: (Etemadi et al., 2012), (Etemadi, 2015), (Q. Salehi, personal communication, May 12, 2015), (A. Mohammadi, personal communication, May 17, 2015), (D. Baheer, personal communication, June 23, 2015), (S. N. Masoomyar, personal communication, June 23, 2015), (N. A. Habibi, personal communication, July 3, 2015), (G. R. Nawabi, personal communication, July 7, 2015), (G. M. Malikiyar, personal communication, July 23, 2015), (M. Noor, personal communication, July 21, 2015), (Etemadi, 2016), (Hassib & Etemadi, 2016), (F. Karim, personal communication, Oct. 17, 2016), (M. Sorud, personal communication, Oct. 17, 2016), (R. Kanaganathan, personal communication, Oct. 18, 2016), (M. Mahmood, personal communication, Oct. 20, 2016), (Y. Habib, personal communication, Feb. 12, 2017), (M. A. Najm, personal communication, Jan. 18, 2017), (I. Aquilué, personal communication, Jan. 22, 2017), and compiled by the author.

Beirut before its civil war (1975-1990) experienced a rapid urbanization and city development. The trend of economic growth continued sharply after the civil war especially since 1995 until 2006. Construction of big centralized sewerage systems as the ultimate solution of wastewater treatment was popular among the managers in sanitation sector. Above that Beirut City and its suburb accommodate about half of the country's population. The population density is very high compared to Erbil and Kabul which makes a centralized sewerage system more efficient.

Water supply in Beirut is not very effective, but still the level of access to water network, as a precondition for a wet sanitation system, is almost 100 percent. All the aforementioned factors made Beirut City suitable for a high coverage of sewerage system: almost all the households in

Beirut have sewerage network connections although the collected wastewater does not managed safely.

Kabul experienced a rapid expansion in the last decade. Specific topographic situation divides the city into several zones surrounded by mountains or streams. Almost the entire city relies on limited groundwater resources. There is ethnic segregation in many parts of the city. About 80% of the population live in informal areas.

Considering above mentioned points, Kabul needs its site specific sanitation planning and implementation. Chapter 5 discussed in depth about the creation of sanitation zoning in Kabul City and the reasons behind it.

Each sanitation zone, mostly made based on physio-social data, includes formal and informal areas. Sanitation intervention in the informal areas could be more or less based on the approach developed in chapter 4 of this dissertation. But at the end, the implemented sanitation system in an informal neighborhood needs to be integrated into the sanitation services within its respected zone and finally through that zone should be linked to the city-wide sanitation. Therefore three level of sanitation provision need to be considered and integrated: community level, zone level and city level.

Another specific aspect of sanitation provision in Kabul's informal area is the role of community. Afghan Government and its international partners have conducted several national level project within the country through community participation. As discussed in chapter 3 (3.8 and 3.9), it seems community-based approaches could be a successful methodology for different project implementation. In chapter 4 of this dissertation there is a discussion on community-based approach, co-management of environmental sanitation components and public-private partnership in Kabul's informal areas.

In Lebanon, there is few space for the citizens to take part in urban development process (Council for Development and Reconstruction, 2016). Based on the surveys and interviews conducted by the author, in KRI including Erbil there is also low level of public participation. Generally, in Iraq including its Kurdistan Region, even in rural areas, projects are implemented through a top-down approach. Generally citizens are considered as beneficiaries of highly subsidized infrastructure services. But in Afghanistan, as mentioned, major national level projects have been implemented through community participation.

Perhaps one of the main reason behind high level of community participation in Afghanistan is donors' insist. Community-based project implementation is a pre-condition in many projects implemented by international aid.

Finally, it is noteworthy to mention that due to unaffordable lands and also lack of available lands and the less social cohesion in rapid developed informal areas in many neighborhoods of Kabul City, this study suggests to keep sanitation facilities at household level instead of promoting community-based or decentralized sanitation services.

Kabul Urban Reconstruction Project (KURP) during its upgrading plan faced several problems to secure land for communal water supply or wastewater facilities. The reason was lack of public lands which is an important issue in the informal areas.

The first priority of KURP (and also the inhabitants) was street pavements in the informal areas.

Communal wastewater facilities need ditching canals across each neighborhood, allocation of treatment site and new demolition and construction activities. There was not enough budget for all those activities. Therefore, local peoples asked for street pavement and water supply as their main priorities.

Household level sanitation has a long history in Kabul and local peoples are used to do it. Most of the citizens have been taking care of their facilities, and in case of proper sanitation management beyond the household level, local residents can continue operation and maintenance at the household level themselves.

Most parts of Kabul's informal areas have been expanded during the last two decades and there isn't enough social cohesion among their inhabitants for communal projects. Faecal sludge and blackwater handling is a kind of taboo. Therefore its community-based management is more challenging compared to the other components of environmental sanitation.

Lastly, in respect to water supply system, solid waste management and stormwater management, community-based planning would be the best option. Furthermore, proper management of sanitation chain, beyond the household level, also needs a high level of community arrangement. Each community has a lot of community-level tasks to do: Kabul Municipality and other relevant authorities can complete the sanitation chain and let the households manage their sanitation facilities.

7.4 Generalization

Low income countries, including Afghanistan, need to meet the preconditions for longer-term sustainable economic development. Basic urban services and infrastructure like access to adequate sanitation, safe drinking water, public health, education, affordable accommodations, etc. should be the main part of governments' facilities provided to the citizens. Furthermore, the focus of service provision should also include most vulnerable peoples.

Efficient human resources are the main driver for sustainable development. But without providing basic services to the most vulnerable peoples, they cannot contribute to the development process. The poorest of the poor in Afghanistan, and elsewhere, cannot meet its basic needs without special support from the government. Due to the high level of poverty in the country, without providing country-wide basic services, there is no chance for a sustainable development.

Afghanistan's budget relies heavily on international support. Therefore, donors have a lot of influence on Afghanistan's development plans. Direct attack on poverty through basic service provision to the most vulnerable communities should be an important principle within the government and insisted by its international partners.

The author of this dissertation has observed different political projects with few benefits for the people, over-investment and also projects with many advantages for the corrupted politicians and war lords. In some cases such projects have been implemented by the international community or following their accord.

Therefore, one aspect of poverty reduction and meeting the preconditions for sustainable growth depends on a restructuring of development aid in Afghanistan. Another important aspect of poverty alleviation is Afghan Government's policies: Afghan high profile politicians have been neglectful

toward vulnerable people, especially minorities.

Since several years the Afghan Government is trying to convince the international community to spend their aids through Afghanistan's national budget. Although currently a big portion of the aid is spent through the Afghanistan Ministry of Finance, lack of capacity has always been an obstacle for proper budget planning, allocation and also implementation. Above all, the Afghan Government must be more accountable and spend money more efficient.

Furthermore, corruption and discrimination are other issues that make aid allocation through Afghanistan's national budget challenging. Many citizens have no trust in the government system either because of the pervasive corruption or the discrimination towards ethnic minorities.

Minorities are targeted by different kinds of discriminations: Extortion through illegal taxation, physical abuse and forced labor and detention, etc. against Hazaras and other minorities are reported by the NGOs. In some cases minorities are assigned to some positions, but mostly symbolic with little authority (US Department of State, 2017).

Tensions between different ethnicities in multi-ethnic countries like Afghanistan is a great challenge. This leads to a kind of patronage politics in the country. The ethnic leaders are bribed from the government side: Satisfying popular corrupt ethnic leaders is much easier and cheaper than providing services to their peoples.

Although the level of poverty in low-income countries is high, it is even worse among the ethnic and religious minorities. In fact most of the low-income countries are multi-ethnic societies as well (Collier, 2008), and the highest rate of poverty is among the minorities. Therefore, promoting equity, social inclusion and a great focus on minorities would lift these countries out of extreme poverty. Lack of social inclusion and balanced development is a big challenge in today Afghanistan, and the government needs to do more to improve the situation.

It is vital to make the budget planning & spending in the country trustworthy. It can be happen through efficient monitoring by the international community, more transparency and accountability and also fighting against the corruption in the country. This is more or less the case in other low middle income countries relying on international aid for development as well.

As mentioned, the main priority in low-income Afghanistan is poverty alleviation and providing basic services including sanitations to the most vulnerable groups. Such provisions make the human resource able for contribution in a sustainable growth. Lebanon and Iraq as upper middle income countries have more opportunities and resources to focus on sustainable development. In fact they either have the preconditions or have the required resources for a sustainable development. Unfortunately, without long and sustained commitment of the international community for sustainable development in the low-income countries, we may leave these group of countries behind. Such neglect would put the whole globe at a major risk in future, as past mistakes have shown.

In 1978, Afghanistan's GDP per capita was 247 USD and China's GDP per capita was 156 USD¹. In the same year China changed its major policies and started significant socio-economic reforms, but since that time Afghanistan has been faced with a series of wars and conflicts which is still on-going. Today, China is the world's second largest economy and the engine of global growth. But

¹ <https://data.worldbank.org/indicator/>

Afghanistan still heavily relies on international aid to meet the basic needs of its citizens.

Low-income countries, like Afghanistan, are usually stagnant in poverty (Collier, 2008). They are struggling to meet their basic needs including sanitation. Without a support from international community, they cannot overcome to this primary obstacle. Without poverty alleviation and basic service provision to the poor peoples, they have no chance to move towards sustainable development.

Afghanistan and many low-income countries are resource-rich. But the exploitation of their resources is not as easy and cheap as oil & gas: They need relatively high level of technology and investment, which is beyond the capacity of such countries.

Iraq or other oil-producing countries, mainly in the Middle East, are stagnant but at the middle income level (Collier, 2008), and they don't suffer from extreme poverty. Urban basic services are usually in place. If there is extreme poverty, usually a lack of proper resource management is the main problem. Furthermore, the rate of extreme poverty is not that high compared to the low-income countries. Public health is more or less available and access to public education is possible. Therefore, such countries have more chance to move toward sustainable development. Proper contextualized policies and efficient resource management can help them to start a sustainable development.

Currently in respect to sanitation management both Iraq and Lebanon can be considered failed countries. They cannot safely manage their produced wastewater. They also need to consider sustainability in their service provisions. But the level and kind of their problems are different with Afghanistan's context: The level of exposure to the pathogens is much lower compared to Afghanistan. Waterborne diseases are more manageable. And finally, Beirut and Erbil both are able to keep their immediate environment much safer compared to Kabul case. It is noteworthy to mention that the emergency situation of refugees in Lebanon and north Iraq is not the focus of this study, otherwise they also need immediate attention from the international community.

Considering moving toward sustainability, Beirut and Erbil are ahead of Kabul City. Creating an enabling environment is a key to introduce a sustainable sanitation approach. Table 28 shows that Beirut has done more compared to Kabul. In Erbil City, although still long way ahead, there is a strong political will and proper financial resources.

Afghanistan, as a low-income country, needs to focus more on human resources, financial arrangement and government support while other aspects are more or less similar in these three cities.

Without an inclusive economic progress there is less chance to have poor peoples, who live mainly in informal areas, on-board. Therefore each development plan should consider providing urban basic services to the all citizens, especially the most vulnerable: those who need to free their minds of daily survival, and then contribute to the sustainable development.

Although the level of income is an important factor for comparison between countries, it is not a comprehensive measure. In many countries GDP is increasing, but still the level of poverty is high and many people have no benefit from such economic growth: Economic growth should be as much as possible socially inclusive.

Furthermore, even relatively strong GDP growth doesn't automatically generate an inclusive socio-economic progress and broad-based improvement in the living standards (The World Economic Forum, 2018).

Table 28: Comparison of Enabling Environment in Kabul with Erbil and Beirut

Aspects of Enabling Environment	Cities
Government support	Kabul: counterterrorism activities and peacebuilding are the first priorities for Afghan Government and most of the resources are spent on the security sector. There is no considerable political support for urban service provision.
	Erbil: despite security issues in Iraq, Erbil is relatively safe and the government of KRI has focused on urban service provision.
	Beirut: many infrastructures are in place and the government should take care of operation and maintenance plus more infrastructure development. Despite some deficiencies, Lebanese Government has conducted a long term plan in the sector.
Legal Framework	Kabul: in a transitional state and development of legal framework. Law enforcement is a big challenge.
	Erbil: in a transitional state and development of legal framework. Law enforcement is a big challenge.
	Beirut: since 2000 a reform in the sector was introduced. Law enforcement is a big challenge.
Institutional arrangement	Kabul: in a transitional situation, and new organizations need to be established.
	Erbil: Centralized structure & reforms should be introduced.
	Beirut: Institutional arrangement is in place, but need to be more efficient.
Skills and capacities	Kabul: lack of enough skilled staff in the sector.
	Erbil: lack of enough skilled staff in the sector. But in the entire Iraq, the situation is better compared to Afghanistan.
	Beirut: Compared to Kabul and Erbil, Beirut has better situation in terms of human resources.
Financial arrangement	Kabul: Lack of enough budget is a big challenge.
	Erbil: the government has good financial resources to allocate for the sanitation sector. Huge investment has been done in Erbil City for sanitation provision.
	Beirut: there are budget limitation, but the government tries to manage it by its income and also international aid.
Socio-cultural acceptance	Kabul: in general is similar to Erbil and Beirut.
	Erbil: in general is similar to Kabul and Beirut.
	Beirut: in general is similar to Erbil and Kabul.

GDP alone does not reflect properly quality of life among citizens. Nowadays, there are some efforts to introduce alternatives for GDP.

The Inclusive Development Index (IDI) is a national economic performance index which has 12 indicators distributed in 3 areas; growth and development; inclusion and; intergenerational equity and sustainability (The World Economic Forum, 2018).

8. Conclusion

In this chapter, based on the information provided in the last chapters, a wrap-up comparison between Kabul and its reference cities, Erbil and Beirut, was made. In addition, answering briefly to the questions asked at the beginning of this dissertation was done. In-depth discussion for the research questions can be found in their related chapters.

Following the comparison and also answers to the questions, some recommendations for further research on sustainable and integrated sanitation provision in the contexts similar to Afghanistan were provided.

8.1 Kabul's Findings and Comparison to the Reference Cities

While Afghanistan is in a transition period moving toward decentralization, KRI has a very centralized water and sanitation sector. Only one Ministry is in charge of all relevant issues at different levels of sanitation management. Regarding decentralization, Lebanon is ahead and they have different players at policy, regulatory and operational levels.

There is no proper rule of law in Kabul, Beirut and Erbil. In case of Afghanistan and Erbil, many new laws and legal documents should be developed while Lebanon has already established its legal system in the sector. But in three investigated cities usually political justifications are the main reasons to define and run sanitation projects.

Sanitation sectors have been facing many challenges in the three cities of Kabul, Erbil and Beirut though the natures of their problems are quite different. In case of Beirut, centralized WWTP is in place but not in a good condition. Wastewater is mostly discharged without proper treatment and create many environmental problems.

KRI is planning to construct a huge centralized WWTP for entire Erbil City. Currently, residents of Kabul and Erbil mostly use on-site sanitation systems. In Erbil, people mostly use wet on-site technologies but Kabul's residents are divided into two big categories using wet or dry on-site sanitation technologies. Switching from dry systems to wet is getting popular during the last decade in Kabul while dry system was the dominant sanitation system in the past.

Lebanon as a service-based economy is a quite solid middle income country, and Iraq, as an oil producing country, has also a reliable source of income. Both are considered as middle income countries with enough resources to develop their sanitation infrastructures. But Afghanistan, as a low-income country, heavily relies on international aid.

Lebanon has its water & sanitation infrastructure in place and its main challenge is a proper management of sanitation facilities. In KRI, despite lack of acceptable operation and maintenance, water network coverage is almost 100 percent. In addition, KRI has plan to construct a centralized WWTP for Erbil and its other major cities. Considering Beirut and Lebanon, Kabul lags behind and has not secured the required resources yet.

Despite many similarities between Kabul and its reference cities, available resources especially sustainable financial resource act as a main driver to bring changes in the sanitation sector.

Therefore, national and individual income play a key role to differentiate Kabul with Beirut and Erbil. Transition from traditional sanitation systems to new technologies are happening in

Kabul. But to avoid the failed sanitation systems in Erbil and Beirut, there should be an enabling environment in the sector.

When it comes to sanitation project design and implementation, Afghan Government, national and international companies have the key roles. Currently, there is no a proper link between organizations seeking sustainable sanitation with companies in charge of sanitation provision. Despite existing laws and regulations that promote sustainability and decentralization, there is no enough attention to take care of such vital issues during project design, implementation and operation. The gap between legal documents and implementation level should be addressed by the stakeholders involved in the sector.

Kabul, due to its least-developed situation, in regard to sanitation infrastructure is behind cities such as Erbil and Beirut. Though wet sanitation systems are popular and there is a sharp increase in the number of households with wet systems, but still Kabul's residents, in many areas, don't have enough water to switch into water-based systems. In nutshell, the main reasons lead to increasing wet sanitation systems are as follows:

- Lower demand for the products of dry systems inside Kabul and its surrounding agriculture lands
- Lack of proper collection system to deal with dry-system products in fast-growing Kabul
- Increasing access to piped water
- Groundwater level has been dropping down that makes more possibility for wet- systems
- Expansion of the city to the areas with lower groundwater levels
- Higher standards of living after the fall of the Taliban

Considering Kabul's topography, lack of enough resources and also engagement of different local, national and international stakeholders in the sector, there should be a proper sanitation zoning and well-developed site specific sanitation plan for the city. In addition, to make the sanitation projects especially in Kabul's informal areas sustainable, already discussed strategies such as household-centered or community-based approaches, co-management of environmental sanitation components and public-private partnership should be considered.

8.2 Answers to the Research Questions

The first research question asked 'What are the main limiting factors affecting the adoption of more sustainable sanitation management practices in Kabul City?'

As discussed in chapter 3, 4 and also in the separate 'household Survey Report' developed for this study, the lack of an enabling environment is a key challenge to providing sustainable sanitation management practices. Kabul City is experiencing a transition period. Creativity and developing new approaches are vital for future sustainable sanitation provision.

Before introducing any sustainable approaches, the socio-economic conditions need to be ready. Currently in Afghan cities and especially Kabul, urbanization is characterized by exponential growth. Many changes are happening. Sustainable sanitation approaches are a necessity and most of these approaches are new initiatives as well. Therefore creating an 'enabling environment' is vital before any sanitation intervention.

In the sanitation sector, there are many deficiencies in respect to the different aspects of the enabling

environment. As mentioned in chapter three, different aspects of the enabling environment need to be evaluated, discussed and properly addressed.

As an example, Sanitation services are always considered as the last priority either by the authorities or the communities. It seems dedicated sanitation budget, which needs a kind of political will, would support more and better sanitation intervention in Kabul City.

Furthermore, lack of skilled staff in the sector is a challenge. Even with sanitation budget in place, many interventions are not sustainable. Low level of knowledge on sustainable sanitation provision makes many projects inefficient.

Lastly, Kabul City with high percentage of informal areas should have comprehensive plans, legal and technical documents for sustainable sanitation provision in such areas. Currently, there is no available enough capacity and resources for dealing with sanitation intervention in the informal areas.

The second research question is ‘What kinds of sanitation systems are sustainable for Kabul’s informal areas?’

Chapter 4 discussed in detail about sustainable sanitation planning & provision for the study sites. Chapter 5 explained sustainable sanitation provision for Kabul’s informal areas based on the results achieved in chapter 4. Different indicators & measures based on SuSanA’s sustainability criteria were produced and discussed in chapter 4. These indicators can be used as the basis for sustainable sanitation provision in informal settlement.

Another important aspect that needs to be considered is the level of sanitation provision. The current situation of Kabul’s informal areas is more suitable for individual based sanitation services. Considering the complexity of informal areas in Kabul, it is quite tricky and difficult to introduce community-based sanitation services. Therefore unlike water supply services, currently sanitation facilities should be kept at the household level.

It is noteworthy to mention that a household level sanitation facility also needs a proper and holistic sanitation chain like other community-based or centralized sanitation systems. But only to avoid the challenges created by unplanned neighborhoods, lack of social cohesion, lack of enough space, etc., household-based sanitation facilities would work out better.

The third reach question is ‘How would these systems lead to long-term sustainability in terms of technology, economics, institutional, environmental and health/hygiene?’

To make sure sanitation provision is holistic and considers all the aspects that focus on sustainability, a sanitation planning approach was applied. In chapter 3, there was a discussion on comprehensive sanitation planning and a review of some of the more popular sanitation planning approaches. Following that during approach development for the study site, the five common steps for sanitation planning were used. The focus of these five steps is designing a sanitation planning approach which considers technology, financial, institutional, environment and health aspects in order to allow a sustainable sanitation provision.

Furthermore chapter 4 and 5 discuss in-depth on the suggested sanitation systems for Kabul’s informal areas with focus on long term sustainability. It also considers the integration between different components of environmental sanitation.

This discussion considers the different aspects of SuSanA's sustainability criteria at the center of technology identification & suggestions for the study sites and later for all of Kabul's informal settlements. To do so, the primary sanitation technologies & systems were prioritized based on a set of indicators & measures developed from SuSanA's sustainability criteria through an extensive literature review and interviews with different stakeholders. The developed indicators and their measures, including 13 indicators and 18 measures, cover all relevant aspects of sustainable sanitation provision in a low resource urban setting such as Kabul.

As the next step all the indicators and measures were ranked according to the long term sustainability followed by a detailed discussion on the ranking method. Following that, using a SWOT analysis, the best possible sanitation system was also evaluated (4.8, 4.9 and 4.11).

The fourth research question is 'What are the specificities of Kabul's informal settlements regarding the provision of improved sanitation services?'

Chapter 4 (4.2.1) explains about the suitability analysis in Kabul City for residential purposes and chapter 5 (5.2) discusses on sanitation zoning. In both chapters one of the reasons for the analysis and discussion is the specificities in different parts of Kabul's informal areas. These characteristics make Kabul a unique city which needs its own contextualized sanitation approach. In respect to specificities, Kabul's informal areas can be divided into four main areas:

- (i) **Geographically stressed areas:** informal areas with low level of access to basic sanitation services. These areas require immediate sanitation intervention. This intervention should be the first part of an incremental approach toward sanitation improvement within the areas.
- (ii) **Kabul's downtown:** As discussed mainly in chapter 4, these informal areas including site study 2, should be subject to relocation. In the long term, Kabul's downtown will be developed based on a touristic approach with a lot of public space and social gathering places and its informal areas will be relocated. Any urban basic services provided for this area should consider the relocation plan.
- (iii) **Access to water in Nahia 17:** As discussed in chapter 5, Nahia 17 has some difficulties to meet its required water needs. Any development in this area, including formal and informal, should consider this point. The area also belongs to another sub-river basin different from the remaining part of Kabul City which requires its specific wastewater management as well.
- (iv) **Informal areas on public interest lands:** Some informal areas are located on lands which are important due to special public interests like groundwater protection zones, agricultural areas and greenery. The general policy should be to keep such areas away from urban development. Chapter 4 and 5 has more on that.
- (v) **Vulnerable informal areas:** As discussed in 4.2.1, some areas are not suitable for residential purposes. Therefore, any further urban development should be banned in such places. These areas include hilly informal areas with slope of more than 30 degrees or areas that are prone to flooding.

The fifth research question is 'Can the provision of sanitation services bring about greater stability and satisfaction by Kabul's urban poor?'

Chapter 3 (3.1, 3.2 and 3.4) discusses on economic development, sustainable development and also sustainable sanitation. It explains that economic growth which is not inclusive cannot bring sustainable peace and stability within a country.

In chapter 3.9 there is also discussion on social inclusion, equality and putting poverty alleviation at the center of sustainable development in low-income countries including Afghanistan. There is also more on that in some other sections in 7.2.

Sanitation provision especially in the informal areas, where mostly poor people live, can pave the way for sustainable development itself. The most vulnerable people cannot be effective human resources for sustainable development until they meet their basic needs including sanitation.

Furthermore, poor people who are struggling to meet their basic needs and need money to survive, are easy targets for gangs or terrorist groups to misuse them against peace and stability.

Based on the household survey made in the study sites, the upgrading project was considered as failed. It was unable to ease the difficulties of living in the informal areas. But despite this fact, still the residents were satisfied with the implemented projects. During the survey, the interviewees mentioned the deficiencies of the projects, but they also insisted that the upgrading activities were much better than doing nothing. This high level of satisfaction shows that sanitation provision for the informal areas, and poor people, can ultimately lead to a better stability.

The sixth research question is ‘considering the results of comparative analysis and generalization, what would be the core part of sustainable environmental sanitation provision in Afghanistan and similar contexts?’

Human resources are the main asset of each society for development. The level of poverty among citizens of low-income countries is so high and many of them cannot meet their basic needs, leave alone contribution for sustainable development. Therefore, the primary condition to have an efficient human resource is decrease the level of poverty especially among vulnerable peoples and make them capable to have a proper role in sustainable development process within their societies. Providing basic services including environmental sanitation is a major aspect of poverty alleviation within a society.

Afghanistan and other low-income countries need to increase the level of access to basic services including sanitation among its citizens. Many citizens in such countries, especially in rural and informal areas, don't have reliable basic services and in some cases there is no such facilities at all. Without a holistic service provision plan by governments of low-income countries and proper support from relevant international organizations, there is low chance of improvement. Furthermore, any plan for service provision should have short and mid-term activities with focus on the most vulnerable peoples.

Recommendations for Future Research Perspective: This study is the first academic research on sustainable sanitation provision in Kabul's informal areas. The study explains the existing sanitation situation in Kabul City with focus on the informal areas. Conducting a household survey, transect walk and key informant interviews explain the sanitation practices and the reasons behind it. Furthermore, it tries to discuss on the implemented sanitation intervention in the informal areas. Following that, based on the aforementioned data collection and analysis, a set of prioritized sanitation systems for the study sites, and through that for the whole Kabul's informal areas are suggested. Based on a sanitation zoning, Kabul City divided into several zones. Each zone includes formal and informal areas but linked to each other. Finally, different sanitation zones integrated to create a city-wide sanitation management. At the end, there was a generalization for similar contexts following a comparison of Kabul with Beirut and Erbil cities.

Although major part of Afghanistan's population live in rural areas, but rapid urbanization is a big challenge for the government. There is no enough resources to cope with this trend: providing affordable formal shelters and also sustainable urban basic services to new comers is a major task. Above that, current Kabul City lacks required infrastructure as well. In general, much further researches and investigations can be done to find different parts of the puzzle solution.

This study came up with three prioritized sanitation systems for Kabul's informal areas. There is still space for further researches on the suggested sanitation systems by conducting some pilot projects. Three suggested systems and especially the first recommended technology, Tiger worm toilets (TWT), can be evaluated through field studies.

TWT is a new technology and there is no much data about it. In case of a pilot study on TWT, two main issues should be evaluated:

- i. Possibility of implementing such sanitation system in Kabul and finding its advantages & disadvantages
- ii. Exploring more TWT itself, as a new technology & system, and improving its capabilities in the context of Kabul (optimization)

In the last few years there was a lot of efforts to put Afghanistan back on the economic development track. Economic growth, increasing GDP, providing more chances for the private sector, etc. are the focus strategy of the government and its international partners. There is a general concern that such concentration on economic development could leave the most vulnerable people behind.

The SDGs comprise different components and include 17 different goals. It tries to be as comprehensive as possible and does not focus only on economic growth. SDG 1 as the first goal insists on 'eradicate the extreme poverty for all.' SDG 6 insists on 'access to adequate and equitable water, sanitation and hygiene for all.'

SDG 6 also includes a set of indicators to monitor the progress regarding its different goals. It has specific targets with special focusing on vulnerable peoples and communities.

Another recommendation for further research, as a complementary for this dissertation, could be the disaggregation of SDG's indicators and measures based on income, sex, geographic location, ethnicity, etc. to evaluate the level of equitable sanitation provision in Afghanistan.

Bibliography

- Acra, A., & Ayoub, G. M. (2001). Indicators of coastal groundwater quality changes induced by seawater infiltration. *International Journal of Environmental Studies*, 58. doi:10.1080/00207230108711367
- Afghanistan CSO. (2018). Afghanistan Population Estimation. Retrieved Dec 16, 2018 from <http://cso.gov.af/en/page/demography-and-socile-statistics/demograph-statistics/3897111>
- Afghanistan Independent Evaluation Group. (2011). Afghanistan: A Synthesis Paper of Lessons from Ten Years of Aid. World Bank. Washington. DC. USA. Retrieved Feb. 2, 2019 from https://ieg.worldbankgroup.org/sites/default/files/Data/reports/Afghanistan_Lessons_Ten_Years.pdf
- Afghanistan MoF. (2016). Urban National Priority Programme (U-NPP). Afghanistan Ministry of Finance (MoF). Retrieved Dec 20, 2018 from <http://policymof.gov.af/home/wp-content/uploads/2019/01/Urban-NPP.pdf>
- Ahlbäck, J. (2011). Green Job Assessment in Lebanon. International Labour Organization. Retrieved Dec 20, 2019 from http://www.ilo.org/wcmsp5/groups/public/---arabstates/---ro-beirut/documents/genericdocument/wcms_210689.pdf
- Ahmadi, A. S., & Kajita, Y. (2017). Evaluation of urban land development direction in Kabul City, Afghanistan. *International Journal of Urban and Civil Engineering*, 11(2), 152-162.
- Andersson, B., Ryan, T., & AB, I. (2011). Evaluation of the Water Network Management Programme in Erbil, Iraqi Kurdistan. (2011:5). The Swedish International Development Cooperation Agency (Sida). Retrieved May 12, 2018 from <https://www.sida.se/English/publications/111526/evaluation-of-the-water-network-management-programme-in-erbil-iraqi-kurdistan/>
- Assaly, N. A., & Sabbagh, B. (2010). Country Report on Solid Waste Management in Lebanon. SweepNet. Beirut. Retrieved May 12, 2018 from <http://www.databank.com.lb/docs/CountryreportLebanon-En-mai2011.pdf>
- Bangladesh Ministry of Local Government, R. D. C. (2005). Retrieved Nov. 12, 2018 from <https://itn.buet.ac.bd/publications/sector-documents/documents/Pro-poor-Strategy-for-Water-and-Sanitation.pdf>
- Bertaud, A. (2005). Urban Land Management in Afghanistan Kabul Urban Development Current City Structure. World Bank. Washington. DC. Retrieved Dec. 10, 2018 from http://alainbertaud.com/wp-content/uploads/2013/06/AB_Kabul_Report_2-with-graphs.pdf
- Brito, L. (2014). *The Role of Science, Technology and Innovation Policies and Instruments for a Paradigm Shift Towards Sustainable Development*. Switzerland: Springer International Publishing.
- Brückner, M., & Dietrich, M. (2015). Establishing Sustainable Operation & Maintenance and Monitoring & Evaluation Schemes for Community-Based Sanitation Infrastructure: Experiences from Indonesia. Paper presented at the Key Elements for a New Urban Agenda: Integrated management of urban waters and sanitation, Germany. https://www.borda.org/wp-content/uploads/2018/09/2016-Key_Elements_for_a_New_Urban_Agenda_Conference_Report-webversion.pdf

- Calogero, P. (2011). Kabul Cosmopolitan: Geopolitical Empire from the Planner's Viewpoint. *Urbanisms and Worlding Practices*, 10(1), 66-78.
- Choguill, C. L. (1996). *Ten Steps to Sustainable Infrastructure*. Elsevier, 20(3), 389-404.
- Climatestotravel. (2019). *World Climate Guide*. Retrieved Dec 26, 2019 from <https://www.climatestotravel.com/climate/Afghanistan>
- Collier, P. (2008). *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It*. Oxford, England: Oxford University Press.
- Council for Development and Reconstruction. (2016). *Habitat III National Report*. Council for Development and Reconstruction (CDR). Retrieved Dec 23, 2019 from http://habitat3.org/wp-content/uploads/National-Report_LEBANON.pdf
- CStep. (2016). *Technology Options for the Sanitation Value Chain*. Center for Study of Science, Technology and Policy. Bangalore, India. Retrieved May 12, 2018 from <http://www.indiaenvironmentportal.org.in/files/file/Technology%20Options%20for%20the%20Sanitation%20Value%20Chain.pdf>
- Dang, G., & Sui, P. I. (2015). *Infrastructure Investments in Developing Economies*. Singapore: Springer.
- Dar. (2019). *Erbil Master Plan*. Retrieved Oct 28, 2019 from <https://www.dar.com/work/project/erbil-master-plan>
- Dearden, P., Jones, S., & Sartorius, R. (2003). *Tools for Development. A Handbook for Those Engaged in Development Activity*. Performance and Effectiveness Department. UK: DFID – Department for International Development.
- Eastman, B. R., Kane, P. N., Edwards, C. A., Trytek, L., Gunadi, B., Stermer, A. L., & Mobley, J. R. (2001). The Effectiveness of Vermiculture in Human Pathogen Reduction for USEPA Biosolids Stabilization. *Compost Sci.*, 9(1), 38-49. doi:10.1080/1065657X.2001.10702015
- Edwards, C. A., & Bohlen, P. J. (1996). *Biology and Ecology of Earthworms* (3 ed.). London: Chapman & Hall.
- EIRP. (2006). *Emergency Infrastructure Reconstruction Project: Sanitation Improvements in Kabul City*. Kabul Municipality. Retrieved May 26, 2018 from <http://siteresources.worldbank.org/INTAfghanistan/Resources/AFUpdateOct06.pdf>
- El-Fadel, M. (2008). *Briefing Notes On The Circe Urban Case Studies: Beirut*. Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich, UK. Retrieved May 15, 2018 from https://crudata.uea.ac.uk/projects/circe/urban_beirut_final.pdf
- El-Fadel, M., Maroun, R., Semerjian, S., & Harajli, H. (2003). A Health-based Socio-economic Assessment of Drinking Water Quality: The case of Lebanon. *Management of Environmental Quality*, 14(3), 353–368.
- Etemadi, H. (2015). *Sustainable Sanitation Management in Kabul: Household Survey*. Dec 15, 2015. HafenCity University, Hamburg. Germany.

Etemadi, H. (2016). Sanitation Management in Kurdistan Region of Iraq. BORDA. Internal BORDA Report: Unpublished.

Etemadi, H., Khawaja, N., & Noor, M. (2012). Process of Developing Urban Wastewater Policy for Afghanistan Paper presented at the Conference on Decentralised Wastewater Management in Asia, India. www.iwadewats-nagpur.com

Formas. (2009). Drinking Water Sources, Sanitation and Safeguarding (J. Förare Ed.). Stockholm, Sweden: The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning.

French, M., Turkstra, J., & Farid, M. (2016). Vacant Land Plots in Afghan Cities: A Problem and an Opportunity. *SAGE*, 1(2), 79-94. doi:10.1177/2455747116671825

Furlong, C., Gibson, W. T., Oak, A., Thakar, G., Kodgire, M., & Patankar, R. (2016). Technical and User Evaluation of a Novel Worm-based, On-site Sanitation System in Rural India. *Waterlines*, 35(2), 136-147. doi:10.3362/1756-3488.2016.013

Furlong, C., Gibson, W. T., Templeton, M. R., Taillade, M., Kassam, F., Crabb, G., . . . Patankar, R. (2014). The Tiger Toilet: From Concept to Reality. Paper presented at the IWA Specialist Conference on Municipal Water Management and Sanitation in Developing Countries, AIT, Bangkok, Thailand.

Furlong, C., Gibson, W. T., Templeton, M. R., Taillade, M., Kassam, F., Crabb, G., . . . Patankar, R. (2015). The Development of an Onsite Sanitation System Based on Vermifiltration: the 'Tiger Toilet'. *Water, Sanitation and Hygiene for Development*, 6(2), 608-613. doi:10.2166/washdev.2015.167

Furlong, C., Rajapaksha, N. S., Butt, K. R., & Gibson, W. T. (2017). Is Composting Worm Availability the Main Barrier to large-scale Adoption of Worm-based Organic Waste Processing Technologies? *Cleaner Production*, 164, 1026-1033. doi:10.1016/j.jclepro.2017.06.226

Furlong, C., Templeton, M. R., & Gibson, W. T. (2014). Processing of Human Faeces by Wet Vermifiltration for Improved On-site Sanitation. *Water, Sanitation and Hygiene for Development*, 4(2), 231-239. doi:10.2166/washdev.2014.107

Gebremedhin, Y. (2005). Preliminary Assessment of Informal Settlements in Kabul City. USAID, AREU. Retrieved May 12, 2019 from <http://www.nzdl.org/gsdmod?e=d-00000-00---off-0areu-00-0---0-10-0---0---0direct-10---4-----0-11--11-en-Zz-1---20-about---00-0-1-00-0--4----0-0-11-00-0utfZz-8-00&a=d&c=areu&cl=CL1.35.29&d=HASHfe2e9f1195d1e0a0d850a5>

Gensch, R., Jennings, A., Renggli, S., & Reymond, P. (2018). Compendium of Sanitation Technologies in Emergencies. Berlin, Germany: German WASH Network (GWN), Swiss Federal Institute of Aquatic Science and Technology (Eawag), Global WASH Cluster (GWC) and Sustainable Sanitation Alliance (SuSanA).

Giovacchini, T. (2013). Jalalabad City Profile. Land Reform in Afghanistan -LARA. USAID. Retrieved 10 Oct. 2017 from <https://collaboration.worldbank.org/docs/DOC-10691>

Government of Islamic Republic of Afghanistan. (2016). Citizens' Charter National Priority Programme. Retrieved Dec. 10, 2019 from <https://www.refworld.org/pdfid/5b28f2ed4.pdf>

Hassib, Y., & Etemadi, H. (2016). SFD Promotion Initiative, Kabul, Afghanistan. Retrieved Dec 28, 2019 from <http://www.susana.org/en/resources/library/details/2612>

Hilal, N., Fadlallah, R., Jamal, D., & El-Jardali, F. (2015). Approaching the Waste Crisis in Lebanon: Consequences and Insights into Solutions. Knowledge to Policy (K2P) Center. Beirut, Lebanon. Retrieved April 12, 2019 from https://www.aub.edu.lb/k2p/Documents/K2P%20Evidence%20Summary%20Waste%20Management_Final_%20Dec%2014%202015.pdf

Hogrewe, W., Joyce, S. D., & Perez, E. A. (1993). The Unique Challenges of Improving Peri-Urban Sanitation. USAID. Washington, USA. Retrieved Dec 19, 2019 from http://empslocal.ex.ac.uk/people/staff/fam203/developing%20countries%20database%20-%20Jacob%20Marsh/pdf_san_rev_csu/WASH%20Challenges%20of%20Peri%20Urban%20Sanitation.pdf

Intercontinental Consultants and Technocrats. (2008). Consulting Services for Preparation of Development Plan for Kabul City. MUDH. Kabul, Afghanistan. Retrieved May 12, 2017 from <http://ictonline.com/Matrix.aspx?id=10>

IOM. (2015). Iraq Mission, International Organization for Migration. Retrieved Nov. 23, 2017 from <https://iomiraq.net/reports/erbil-governorate-profile-may-2015>

Islamic Republic of Afghanistan. (2015). 2015 Afghanistan Country Report. Kabul, Afghanistan: MUDH Retrieved May 11, 2018 from <http://habitat3.org/wp-content/uploads/Afghanistan-Country-Report-Habitat-III-1.pdf>

Jagannathan, N. V., Mohamed, A. S., & Kremer, A. (2009). Water in the Arab world : management perspectives and innovations. (49593). World Bank. Retrieved Dec 25, 2019 from <http://documents.worldbank.org/curated/en/590691468052797602/Water-in-the-Arab-world-management-perspectives-and-innovations>

Jansen, P., Pinera, J. F., Bernard, O., Dross, J. F., & Conti, R. (2000). A Strategic Response to Urban Sanitation in a War-Torn City - Water, Sanitation and Hygiene: Challenges Of the Millennium. Paper presented at the 26th WEDC Conference, Dhaka. <https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/822>

Jaramillo, C. (2008). Cultural Heritage Management Plan. KURP. MUDA.

JICA. (2015). Technical Cooperation to the Kurdistan Region in Iraq: Detailed Design Study for Sewerage Construction Project in Kurdistan Region. JICA. Retrieved Dec. 12, 2018 from <https://www.jica.go.jp/iraq/english/office/topics/c8h0vm00008n84ix-att/press150716en.pdf>

Jurdi, M., Al-Razzak, A. M., & Bassma, S. (2003). The Introduction of Water Resources Management in Western Asia Region. *Water Policy*, 5(3), 253–268.

Kammeier, H. D., & Issa, Z. (2017). Urban Governance in Afghanistan: Assessing the New Urban Development Programme and Its Implementation. (978-9936-628-70-0). AREU. Retrieved June 12, 2018 from <https://areu.org.af/wp-content/uploads/2017/06/1716E-Urban-Governance-in-Afghanistan-assessing-the-new-urban-development-programme-and-its-imple.pdf/>

KFW-Germany Development Bank. (2010). Extension of the Water Supply System of Kabul. KFW and MUDH.

- Khawaja, N. (2010). Assessment of Alternative Sanitation Systems in the Navin Well-Field Project Area, Herat, Afghanistan. Germany. Retrieved Januray 28, 2019 from <https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/1024>
- Korfali, S., & Jurdi, M. (2007). Assessment of Domestic Water Quality: Case Study, Beirut, Lebanon. *Environ Monit Assess*, 135, 241–251. doi:10.1007/s10661-007-9646-x
- Korfali, S., & Jurdi, M. (2009). Provision of safe domestic water for the promotion and protection of public health: a case study of the city of Beirut, Lebanon. *Environmental Geochemical Health*, 31, 283-295.
- KRG. (2016). Kurdistan Regional Government. Retrieved April 11, 2018 from <http://previous.cabinet.gov.krd/p/page.aspx?l=12&s=050000&r=303&p=213>
- KRG Ministry of Planning. (2012). Building the Kurdistan Region of Iraq. Retrieved Oct. 12, 2017 from <https://us.gov.krd/media/1318/building-the-kurdistan-region-socio-economic.pdf>
- Kurdistan Region Statistics Office. (2014). Report on Population Projections for the Kurdistan Region for the Period 2009–2020. Ministry of Planning-KRG. Erbil, Iraq. Retrieved Apr 20, 2019 from <http://documents.worldbank.org/curated/en/672671468196766598/pdf/106132-v2-main-report-P159972-PUBLIC-KRG-Economic-Reform-Roadmap-post-Decision-Review-05-30-16.pdf>
- KURP-PMU. (2006). KURP Project Implementation Manual. KURP. MUDA.
- KURP. (2006). Community Consultation Manual. KURP. MUDA.
- KURP. (2007). Upgrading Package One. KURP. MUDA.
- Kvarnström, E., & afPetersens, E. (2004). Open Planning of Sanitation Systems. (2004-3). EcoSanRes Publications. Retrieved DEC. 23, 2019 from <https://www.sei.org/publications/open-planning-sanitation-systems/>
- Lalander, C. H., Hill, G. B., & Vinnerås, B. (2013). Hygienic quality of faeces treated in urine diverting vermicomposting toilets. *Waste Manag.*, 33, 2204–2210.
- Lebanon Minisry of Environment. (2014). Lebanon Environmental Assessment of the Syrian Conflict & Priority Interventions. Retrieved April 12, 2019 from <https://www.undp.org/content/dam/lebanon/docs/Energy%20and%20Environment/Publications/EASC-WEB.pdf>
- Lebanon Minisry of Environment. (2017). Updated Master Plan for the Closure and Rehabilitation of Uncontrolled Dumps Throughout The Country Of Lebanon. Retrieved Oct. 12, 2019 from https://www.undp.org/content/dam/lebanon/docs/Energy%20and%20Environment/Publications/Updated-Master-Plan-Volume-A_Final-ilovepdf-compressed.pdf
- Lennartsson, M., Kvarnström, E., Lundberg, T., Buenfil, J., & Sawyer, R. (2009). Comparing Sanitation Systems Using Sustainability Criteria. SEI. Sweden. Retrieved Dec. 28, 2019 from <https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/1138>
- Lowder, S. (1993). The Limitations of Planned Land Development for Low-income Housing in Third World Cities *Urban Studies*, 30(7), 1241-1255

Lüthi, C., Lehn, H., Norström, A., Panesar, A., Rüd, S., Saywell, D., . . . Ingle, R. (2012). Planning of Sustainable Sanitation for Cities - Factsheet of Working Group 6. In SaSanA (Ed.): Sustainable Sanitation Alliance (SuSanA).

Lüthi, C., Morel, A., Tilley, E., & Ulrich, L. (2011). Community-Led Urban Environmental Sanitation Planning: CLUES. Swiss Federal Institute of Aquatic Science and Technology (Eawag) Dübendorf, Switzerland: Eawag.

Lüthi, C., Panesar, A., & Schütze, T. (2011). Sustainable Sanitation for Cities – A framework for action. The Netherlands: papirozifou.

Mack, J. T., Akbari, M. A., Ashoor, M. H., Chronack, M. P., Coplen, T. B., Emerson, D. G., . . . Litke, D. W. (2009). Conceptual Model of Water Resources in the Kabul Basin, Afghanistan: USGS Scientific Investigations Report. USGS. Retrieved Oct. 21, 2019 from https://www.researchgate.net/profile/Thomas_Mack4/publication/325488341/inline/jsViewer/5bec800e299bf1124fd205c8?inViewer=1&pdfJsDownload=1&origin=publication_detail&previewAsPdf=false

McBride, A., Muturi, C., Githiri, D., & Parker, J. (2017). Tiger Worm Toilets: Best Practice Guidelines for Refugee Camps. OXFAM/UNHCR. Retrieved Dec. 10, 2019 from <https://www.humanitarianlibrary.org/sites/default/files/2018/12/Tiger%20Worm%20Toilets%20Best%20Practice%20Guidelines%20%28Oxfam%20and%20UNHCR%202017%29%20PDF.pdf>

McConville, J. (2010). Unpacking Sanitation Planning – Comparing Theory and Practice. (PhD), Chalmers University of Technology, Gothenburg, Sweden.

Mcheik, A., Ibrik, A., Mehdi, R., & Houhou, J. (2017). Assessment of the Domestic Water Profile of the Region Surrounding Al-Ghadir River, Mount Lebanon. *Science PG*, 5(5), 123-127.

Metcalf, V., Haysom, S., & Martin, E. (2012). Sanctuary in the City? Urban Displacement and Vulnerability in Kabul. Humanitarian Policy Group. UK. Retrieved Oct. 20, 2019 from <https://www.odi.org/publications/6685-sanctuary-city-urban-displacement-and-vulnerability-kabul>

Montgomery, J. D. (1988). *The Informal Service Sector as an Administrative Resource* (P. A. Hall Ed.): Macmillan International Higher Education.

Morel, A., & Diener, S. (2006). *Greywater Management in Low and Middle-income Countries, Review of Different Treatment Systems for Households or Neighbourhoods*. Sandec (Water and Sanitation in Developing Countries) at Eawag (Swiss Federal Institute of Aquatic Science and Technology). Dübendorf, Switzerland. Retrieved April 24, 2018 from <https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/947>

MUDH. (2005). *Urban Water Supply and Sewerage Sector Policy*. Kabul, Afghanistan Retrieved

MUDH. (2014). *Urban Water Supply and Waste Water Sector Policy (draft version)*. Urban Water Supply, Environment and Sanitation. MUDH.

Müllegger, E., & Lechner, M. (2008). *Solutions in Sanitation*. EcoSan Club. Vienna. Retrieved May 12, 2018 from https://www.entwicklung.at/fileadmin/user_upload/Dokumente/Publikationen/Brosch%C3%BCren/Solutions_in_Sanitation.pdf

- Nanekely, M., Scholz, M., & Al-Faraj, F. (2016). Strategic Framework for Sustainable Management of Drainage Systems in Semi-Arid Cities: An Iraqi Case Study. *Water, Sanitation and Hygiene for Development*, 8(9). doi:10.3390/w8090406
- Nayono, S. (2014). Development of a Sustainability-based Sanitation Planning Tool (SustA) for Developing Countries. (Ph.D.), Weimar University, Weimar, Germany.
- Nayono, S., Lehn, H., Kopfmüller, J., Lehmann, A., & Londong, J. (2012). Development of a Tool to Analyze Wastewater Treatment Sustainability: Indicators to Assess Technologies for Rural Areas in Developing Countries. Germany: Conference Proceedings IWRM (Integrated Water Resources Management).
- NETSSAF. (2006). Criteria for the Evaluation and Classification of Conventional and Innovative Low Cost Sanitation Technologies. TUHH/TTZ. Retrieved Dec 22, 2019 from <https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/592>
- OXFAM. (2015). Design, Construction and Maintenance of a Tiger Worm Toilet.
- Palau, R. G. (2013). Rapid Urbanisation and Displacement: The Case of Kabul City. The Civil-Military Fusion Centre (CFC). Kabul. Retrieved Dec 2, 2019 from <https://www.scribd.com/document/175137382/CFC-Thematic-Report-Rapid-Urbanisation-and-Displacement-The-Case-of-Kabul-City-24-September-13>
- Parikh, D. (2015). Planning for Urban Informal Settlements: The Case of Deh Ghouchak, Kabul City. (Master), HafenCity University, Hamburg, Hamburg.
- Parkinson, J., Lüthi, C., & Walther, D. (2014). Sanitation21: A Planning Framework for Improving City-wide Sanitation Services: IWA, Eawag-Sandec, GIZ.
- PWC Network. (2016). SDG 6: Clean Water and Sanitation. Retrieved May 12, 2019 from www.pwc.com/globalgoals
- RECS International, & Yachiyo Engineering Co. (2011). Draft Kabul City Master Plan. Kabul, Afghanistan. Retrieved Oct. 26, 2019 from http://pdf.usaid.gov/pdf_docs/PA00JMMJ.pdf
- Rothenberger, S. (2010). Wastewater Reuse in Arab Countries. Arab Countries Water Utility Association (ACWUA). Retrieved Dec. 30, 2019 from https://www.ais.unwater.org/ais/pluginfile.php/356/mod_page/content/128/Jordan_Summary-Report-CountryCasestudies_final.pdf
- SACOSAN V. (2013). Afghanistan Country Paper on Sanitation. Retrieved April 10, 2015 from http://www.sacosanv.gov.np/filelist/17/Country_Paper
- Salam, A. (2006). Evaluation of Community Based Upgrading Method for Improving Informal Settlements. USAID. Retrieved Dec 24, 2019 from http://www.terrainstitute.org/pdf/Evaluation_Community_Upgr.pdf
- Schall, N. (2002). Practitioner's guide: Strengths, Weaknesses, Opportunities & Threats. Retrieved May 22, 2017 from www.methodfinder.net
- SDC. (2016). Improved Water Management in the Bekaa Valley Lebanon. Swiss Agency for Development and Cooperation (SDC). Retrieved Dec 20, 2018 from https://www.eda.admin.ch/dam/countries/countries-content/lebanon/en/20180613-wes-bwe_EN.pdf

- Shareef, M. K., & Muhamad, G. S. (2008). Natural and Drinking Water Quality in Erbil, Kurdistan. *World Environ.*, 3(2), 227-238.
- Sisk, P. (2014). Afghanistan Reconstruction Trust Fund (ARTF) Results Matrix 2014. World Bank Group. Washington, DC Retrieved Oct. 19, 2018 from <http://documents.worldbank.org/curated/en/472131468197966845/Afghanistan-Reconstruction-Trust-Fund-ARTF-results-matrix-2014>
- SMEC International. (2008). Kabul Urban Reconstruction Project: Knowledge, Attitude & Practice Survey, Hygiene & Sanitation in Kabul, Afghanistan. MUDH.
- SMEC International. (2011). Kabul Urban Reconstruction Project: Final Report. KURP. MUDH.
- Soave, A. (2008). Neighbourhood Planning in Kabul's Old City Retrieved. Retrieved Dec. 26, 2019 from <http://www.dpu-associates.net/node/166>
- Sogesid. (2005). Local Water Supply, Sanitation and Sewage-Lebanon. EMWIS Technical Unit. Retrieved June 12, 2019 from http://www.emwis.org/documents/emwis-main-studies/studies-country/Lebanon_Final.pdf/download/1/Lebanon%20Final.pdf
- Strande, L., Ronteltap, M., & Brdjanovic, D. (2014). Faecal Sludge Management. London, UK: IWA.
- SuSanA. (2008). Vision Document. Retrieved May 12, 2016 from <http://www.susana.org/lang-en/sustainable-sanitation/156-introduction-of-sustainable-sanitation/267-vision-document>
- Tanguay, A. G., Rajaonson, J., Lefebvre, J. F., & Lanoie, P. (2010). Measuring the sustainability of cities: An analysis of the use of local indicators. *Elsevier*, 10(2), 407-418. doi:10.1016/j.ecolind.2009.07.013
- Taylor, K., Parkinson, J., & Colin, J. (2003). *Urban Sanitation, a Guide to Strategic Planning*. United Kingdom: Practical Action.
- The World Economic Forum. (2017). The Inclusive Growth and Development Report. Retrieved Dec. 12, 2018 from <https://www.weforum.org/reports/the-inclusive-growth-and-development-report-2017>
- The World Economic Forum. (2018). The Inclusive Development Index. Retrieved April 10, 2019 from <https://www.weforum.org/reports/the-inclusive-development-index-2018>
- Tilley, E., Strande, L., Lüthi, C., Mosler, H. J., Udert, K. M., Gebauer, H., & Hering, J. G. (2014). Looking beyond Technology: An Integrated Approach to Water, Sanitation and Hygiene in Low Income Countries. *Environmental Science and Technology*, 48(17), 9965-9970. doi:10.1021/es501645d
- Tilley, E., Ulrich, L., Lüthi, C., Reymond, P., & Zurbruegg, C. (2014). *Compendium of Sanitation Systems and Technologies* (2 ed.). Switzerland: Swiss Federal Institute of Aquatic Science and Technology (Eawag).
- Tomasevski, K. (1992). Monitoring Human Rights Aspects of Sustainable Development. *American University International Law Review*, 1(8), 77-102.
- UN-Habitat. (2003). *Slums of the World: The Face of Urban Poverty in the New Millennium*.

Retrieved May 11, 2018 from <https://oldweb.unhabitat.org/books/slums-of-the-world-the-face-of-urban-poverty-in-the-new-millennium/>

UN-Habitat. (2017). *Rebuilding Urban Communities in Afghanistan: Upgrading of Informal Settlements*. Retrieved Dec. 13, 2017 from <http://mirror.unhabitat.org/content.asp?cid=4907&catid=245&typeid=13>

UN-Habitat. (2004). *The Challenge of Slums: Global Report on Human Settlements 2003*. *Management of Environmental Quality*, 15(3), 337-338.

UN Water. (2010). *The Human Right to Water and Sanitation*. Retrieved Dec 18, 2019 from http://www.un.org/waterforlifedecade/human_right_to_water.shtml

UN Water. (2017). Indicator 6.2.1 – Sanitation and Hygiene. Retrieved Nov. 13, 2019 from <https://www.sdg6monitoring.org/indicators/target-6-2/indicators621/>

UNEP. (2007). *Lebanon Post-conflict Environmental Assessment*. Retrieved Nov. 20, 2019 from https://postconflict.unep.ch/publications/UNEP_Lebanon.pdf

UNESCO. (2014). *Erbil Citadel*. Retrieved Dec. 12, 2019 from <http://whc.unesco.org/en/list/1437>

Pro Poor Strategy in Bangladesh, (2005).

United Nations. (2010). *The Human Right to Water and Sanitation* Retrieved Dec. 11, 2019 from https://www.un.org/waterforlifedecade/pdf/human_right_to_water_and_sanitation_milestones.pdf

United Nations. (2015a). *The World Economic Forum*. (2018). *The Inclusive Development Index*. Retrieved April 10, 2019 from <https://www.weforum.org/reports/the-inclusive-development-index-2018>

United Nations. (2015b). *Sustainable Developmentknowledge Platform*. Retrieved 13/02/2018 from <https://sustainabledevelopment.un.org/topics/povertyeradication>

United Nations. (2018). *Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation*. New York. Retrieved Nov. 12, 2019 from https://sustainabledevelopment.un.org/content/documents/19901SDG6_SR2018_web_3.pdf

UNOPS. (2017). *Makroyan Waste Water Treatment Plant Expansion and Rehabilitation Feasibility Study*. Retrieved January 12, 2020 from https://procurement-notice.undp.org/view_notice.cfm?notice_id=31250

US Department of State. (2017). *Afghanistab 2017 Human Rights Report*. United States Department of State • Bureau of Democracy, Human Rights and Labor. Retrieved from <https://www.state.gov/documents/organization/277519.pdf>

USAID. (2017). *Economic Growth*. Retrieved from <https://www.usaid.gov/Afghanistan/economic-growth>

Verdeil, É. (2018). *Infrastructure crises in Beirut and the struggle to (not) reform the Lebanese State*. *Arab Studies Journal*, 16(1), 84-112.

Vliet, W. (1996). *Sustainable development, global restructuring and immigrant housing*. *Habitat*

International, 20, 349-359.

Wang, I., Guo, F., Zheng, Z., Luo, X., & Zhang, J. (2011). Enhancement of rural domestic sewage treatment performance, and assessment of microbial community diversity and structure using tower vermifiltration. *Bioresource Technology*, 102: 9462–70.

WCED. (1987). World Commission on Environment and Development, the so-called Brundtland report, *Our common future*. United Kingdom. Retrieved Dec 21, 2019 from <https://www.admin.ch/are/en/home/sustainable-development/international-cooperation/2030agenda/un-milestones-in-sustainable-development/1987--brundtland-report.html>

Weiter, J. (2015). Konzeption und prototypischer Aufbau eines WebGIS zur Planung sanitärer Anlagen in Entwicklungsregionen am Beispiel Kabul, Afghanistan. (Master), HafenCity University, Hamburg, Hamburg.

Whittington, D. (2010). What Have We Learned from 20 Years of Stated Preference Research in Less-Developed Countries? *Annual Review of Resource Economics*, 2, 209-236.

WHO, & UNICEF. (2015a). Progress on Sanitation and Drinking Water. World Health Organization. USA. Retrieved Oct. 16, 2018 from https://data.unicef.org/wp-content/uploads/2015/12/Progress-on-Sanitation-and-Drinking-Water_234.pdf

WHO, & UNICEF. (2015b). WASH POST-2015: Proposed Targets and Indicators for Drinking-water, Sanitation and Hygiene. Retrieved Oct. 12, 2018 from <https://washdata.org/sites/default/files/documents/reports/2018-03/JMP-2014-post-2015-WASH-targets-12pp.pdf>

World Bank. (1991). *World Development Report 1991: The Challenge of Development* (O. U. Press Ed.). USA: New York: Oxford University Press.

World Bank. (2003). *World Development Report 2003 : Sustainable Development in a Dynamic World - Transforming Institutions, Growth, and Quality of Life*. World Bank Group. Washington, DC. Retrieved Nov. 11, 2018 from <http://documents.worldbank.org/curated/en/262521468337195361/World-development-report-2003-sustainable-development-in-a-dynamic-world-transforming-institutions-growth-and-quality-of-life>

World Bank. (2004a). *Informal settlement in Kabul: Kabul Urban Policy Notes Series n.1*. World Bank. Kabul. Retrieved Oct. 20, 2019 from http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1150905429722/Policy_Note_1.pdf

World Bank. (2004b). *Informal settlement in Kabul: Kabul Urban Policy Notes Series n.2*. Retrieved Oct. 12, 2018 from <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/223546-1150905429722/PolicyNote2.pdf>

World Bank. (2004c). *Kabul Urban Policy Note Series 6*. Retrieved May 12, 2019 from <http://documents.worldbank.org/curated/en/351891468740659786/pdf/370880ENGLISH01licy1Note1601PUBLIC1.pdf>

World Bank. (2012). *Good Jobs Needed : The Role of Macro, Investment, Education, Labor and Social Protection Policies (MILES)*. World Bank. Washington, DC. Retrieved March 15, 2019 from <http://documents.worldbank.org/curated/en/230521468089355499/Lebanon-Good-jobs-needed-the-role-of-macro-investment-education-labor-and-social-protection-policies-MILES-a>

multi-year-technical-cooperation-program

World Bank. (2013). Implementation Completion and Results Report (Kabul Urban Rehabilitation Program). World Bank. Retrieved Dec 15, 2019 from <http://documents.worldbank.org/curated/en/609331468196447153/Afghanistan-Kabul-Urban-Reconstruction-Project>

World Bank. (2014). Afghanistan - Kabul Municipal Development Program Project. World Bank Group. Washington DC Retrieved Oct. 23, 2018 from <http://documents.worldbank.org/curated/en/885711468187133218/Afghanistan-Kabul-Municipal-Development-Program-Project>

World Bank. (2015). The Kurdistan Region of Iraq. World Bank. Erbil, KRI. Retrieved Nov. 23, 2019 from <http://documents.worldbank.org/curated/en/672671468196766598/text/106132-v2-main-report-P159972-PUBLIC-KRG-Economic-Reform-Roadmap-post-Decision-Review-05-30-16.txt>

World Bank. (2016). Afghanistan - Citizens Charter Afghanistan Project. World Bank Group. Washington, D.C. Retrieved Dec. 22, 2019 from <http://documents.worldbank.org/curated/en/25739147792873512/Afghanistan-Citizens-Charter-Afghanistan-Project>

World Bank. (2017a). Afghanistan - Urban Development Support Project. World Bank Group. Washington, D.C. Retrieved Nov. 14, 2018 from <http://documents.worldbank.org/curated/en/718311497578432906/Afghanistan-Urban-Development-Support-Project>

World Bank. (2017b). Afghanistan Development Update. World Bank. Washington, DC. Retrieved Dec. 21, 2019 from <https://openknowledge.worldbank.org/handle/10986/28928>

World Bank & KRG Ministry of Planning. (2016). Kurdistan Region of Iraq: Reforming the Economy for Shared Prosperity and Protecting the Vulnerable. Retrieved May 19, 2019 from <http://documents.worldbank.org/curated/en/672671468196766598/pdf/106132-v2-main-report-P159972-PUBLIC-KRG-Economic-Reform-Roadmap-post-Decision-Review-05-30-16.pdf>

World Bank Group. (2016). Supporting Growth and Stability in Afghanistan : The Country Partnership Framework Summary 2017 to 2020. World Bank. Kabul. Retrieved May 12, 2019 from <https://openknowledge.worldbank.org/handle/10986/25849>

Wright, A. (1997). Towards a Strategic Sanitation Approach. Improving the Sustainability of Urban Sanitation in Developing Countries. (17435). World Bank and UNDP Water and Sanitation Programme. Retrieved Nov 15, 2019 from <http://documents.worldbank.org/curated/en/245141468137390560/Toward-a-strategic-sanitation-approach-improving-the-sustainability-of-urban-sanitation-in-developing-countries>

Zar Consulting Inc. (2012). Stakeholder Assessment of Kabul Urban Reconstruction Project. KURP. MUDH.

Annexes

1. List of experts interviewed in Kabul, Erbil and Beirut
2. Questionnaire conducted in Beirut and Erbil
3. Assessment of Enabling Environment in Erbil and Beirut
4. Household Survey in Kabul

Annex 1.

List of experts interviewed in Kabul				
No	Name	Organization	Position	Date
1	Mr. Mohammadi	MUDA	Deputy Minister	Summer 2015
2	Mr. Qasim Salehi	MUDA	Urban Water & Sanitation Director	Summer 2015
3	Ms. Fatema Jafari	MUDA	Advisor	Summer 2015
4	Mr. Baheer	AUWSSC	Director	Summer 2015
5	Mr. Masoomyar	AUWSSC	Manager	Summer 2015
6	Eng. Qaisari	Kabul Municipality	Operation and Maintenance Director	Summer 2015
7	Mr. Habibi	Kabul Municipality	Sanitation Director	Summer 2015
8	Mr. Vali	Kabul Municipality	KBL WWTP Officer	Summer 2015
9	Mr. Nawabi	Kabul Municipality	KURP Director	Summer 2015
10	Mr. Malikyar	NEPA	Technical Deputy	Summer 2015
11	Mr. Noor	BORDA	Advisor	Summer 2015
12	Ms. Mirzaei	BORDA	Monitoring Officer	Summer 2015
13	Service Provider 1	-	-	Summer 2015
14	Service Provider 2	-	-	Summer 2015
List of experts interviewed in Erbil				
No	Name	Organization	Position	Autumn 2016
1	Mr. Fazl Karim	Erbil Governorate	WASH Coordinator	Autumn 2016
2	Mr. Sorud	MoMT	Erbil Sewerage Directorate	Autumn 2016
3	Mr. Kanaganathan	Action Against Hunger (ACF)	WASH Head of Department	Autumn 2016
4	Mr. Masood Karrash	KRG	KRG General Director, Water and Sewerage	Autumn 2016
5	Mr. Mahmood,	KRG	Deputy Director General of Water and Sewerage	Autumn 2016
6	Mr. Hamad	Erbil Municipality	Planning Director	Autumn 2016
7	Mr. Farnen Khalil Majid	Erbil Municipality	Environment Director	
8	Prof. Ahmed	Ishik University	Associated Prof.	Autumn 2016
List of experts interviewed in Beirut				
No	Name	Organization	Position	Winter 2017
1	Mr. Younes Hassib	GIZ	Project leader	Winter 2017
2	Mr. Majdi Abou Najm	AUB	Assistant Professor	Winter 2017
3	Ms. Lillian Volat	CEWAS	Project leader	Winter 2017
4	Ms. Inés Aquilué	UPC	Researcher	Winter 2017

Annex 2.

Sanitation Management in Erbil and Beirut

*System type	Household Level	Sludge Removal	Transport	Treatment	End-use/disposal
Centralized System	What technologies are used as user-interface?	-	What methods are used to transport the wastewater?	Is there any treatment? If yes, How?	What Happens to the final products?
Decentralized System	What technologies are used as user-interface?	-	What methods are used to transport the wastewater?	Is there any treatment? If yes, How?	What Happens to the final products?
On-site Sanitation	What technologies are used as user-interface?	How the produced sludge is emptied?	How the produced sludge is transported?	Is there any treatment? If yes, How?	What Happens to the final products?
Centralized System	What technologies are used as user-interface?	-	What methods are used to transport the wastewater?	Is there any treatment? If yes, How?	What Happens to the final products?
<p>1- How many treatment plants are existed in the city? What are their management structures and capacity (or estimation by covered population directly and inlet by vacuum tankers)? Is there any map/report?</p> <p>2- What are the main water sources? How do people receive water and how is the water treated?</p> <p>3- Please explain about different kind of typology in the city including planned, unplanned, hilly areas, apartment blocks, old city, urban agriculture, greenery and water bodies. How is the situation in terms of urban planning and informal settlements? How urban poor especially in informal areas have access to sanitation services?</p> <p>4- Why are people using above-mentioned technologies?</p> <p>5- Please explain about solid waste management in the city and possible link with fecal sludge management and surface run-off?</p> <p>6- Please explain about the vacuum trucks, government and private roles, licensing procedures and their profitability?</p>					

* Based on FSM materials and definitions: <http://www.sfd.susana.org/>

*Annex 3.***Assessment of Enabling Environment in Erbil and Beirut**

Topic	Questions
Policy	Policy: Which legislations are governing water and sanitation sector in Lebanon? How they are connected to each other and how is the level of coordination?
	Coordination: Is there enough coordination among stakeholders themselves and with international partners?
	Institutional Roles: Are roles and responsibilities are clearly defined and respected? Any charts?
Regulatory	Regulation: Does current legal documents facilitate investment and implementation of sanitation projects by public and private sector?
	Monitoring: To what extent is monitoring, evaluation and reporting performed? Who is responsible for this?
Implementation	Service Provision: Is service delivery including water supply and wastewater management at an acceptable level? What is the role of private sector and their cooperation methods?
Social inclusion	User preference: Are there safe, affordable, acceptable and appropriate sanitation technologies available for all citizens? How are the many refugees served?
	Inclusion: Are there measures to make sure sanitation services are provided for all users, especially poor communities?

Sustainable Sanitation Management in Kabul Household Survey

Hussain Etemadi
December 2015



Acknowledgement

I would like to thank BORDA¹ for their consistent support during several months of field study in Kabul: BORDA-Afghanistan provided me financial support to hire required surveyors, and offered me logistic help for training and survey arrangement.

I also would like to take the opportunity and thank seven surveyors who helped me during the survey and dedicated themselves for an efficient and accurate data collection.

¹ <http://www.borda-net.org/>

Table of Contents

1-Introduction	2
2-Household Survey	2
2-1- Objective	3
2-2- Targeted Study Areas	4
2-3- Methodology	5
3-Findings of the household survey in Site no. 1	8
3-1- General Information	8
3-2- Household Information	9
3-3- Water	10
3-4- Drainage System	12
3-5- Sanitation	13
3-6- Hygiene	20
3-7- Solid waste Management	21
3-8- Health Issues	24
3-9- Financial Issues	26
3-10- Sanitation satisfaction	27
3-11- Urban Previous Setting.....	28
3-12- Observation Checklist	29
3-13- Focus Group Discussions.....	34
4-Findings of the household survey in Site no. 2	39
4-1- General Information	39
4-2- Household Information	40
4-3- Water	41
4-4- Drainage System	42
4-5- Sanitation	44
4-6- Hygiene	48
4-7- Solid Waste Management.....	49
4-8- Health Issues	52
4-9- Financial Issues	54
4-10- Satisfaction.....	55
4-11- Urban Previous Setting.....	56
4-12- Observation Checklist.....	57
4-13- Focus Group Discussions.....	61
5- Fecal Sludge Management	64
5-1- The Diagram.....	64
5-2- General Information	64
5-3- Service Delivery Context	67
5-4- Results	67
5-5- Conclusion	68
6-Lessons learnt	69
7-Conclusion and Recommendations	71
Annexes.	74
1-Key Informant Interviews (KIIs).....	75
2- Focus Group Discussion (FGD) With Service Providers.....	77
3-Household Questionnaire	79
References	89

List of Figures

Figure 1: <i>Site Study Areas</i>	3
Figure 2: <i>Site No. 1, Flat Informal Settlement</i>	4
Figure 3: <i>Site No. 2, Hilly Informal Settlements</i>	5
Figure 4: <i>Household Survey in Kabul</i>	7
Figure 5: <i>Gender of Respondents</i>	8
Figure 6: <i>Distribution of Respondent's Age</i>	8
Figure 7: <i>Level of Formal Education</i>	9
Figure 8: <i>The percentage of Family Head</i>	9
Figure 9: <i>The number of Household Members</i>	9
Figure 10: <i>Water Supply In Site No. 1</i>	10
Figure 11: <i>Water Source</i>	11
Figure 12: <i>Water Accessibility</i>	11
Figure 13: <i>Water Treatment Methods</i>	12
Figure 14: <i>Functionality of the Public Drain</i>	12
Figure 15: <i>Existence of Stagnant Water</i>	13
Figure 16: <i>Flooding Problem in the Neighborhood</i>	13
Figure 17: <i>User Interface</i>	14
Figure 18: <i>Dry Toilet</i>	14
Figure 19: <i>Final Disposal</i>	15
Figure 20: <i>Toilet Sharing</i>	16
Figure 21: <i>Fecal Sludge Collector</i>	17
Figure 22: <i>Frequency of Emptying</i>	18
Figure 23: <i>Greywater Discharge</i>	18
Figure 24: <i>Greywater Discharge</i>	19
Figure 25: <i>Satisfaction</i>	19
Figure 26: <i>User Preference</i>	20
Figure 27: <i>Handwashing Practice</i>	20
Figure 28: <i>Handwashing Materials</i>	21
Figure 29: <i>Solid waste Storage</i>	22
Figure 30: <i>Solid Waste Collection</i>	22
Figure 31: <i>Solid Waste Management</i>	23
Figure 32: <i>Solid Waste Sorting</i>	23
Figure 33: <i>Frequency of Collection</i>	24
Figure 34: <i>Presence Of Medical Waste In Garbage</i>	24
Figure 35: <i>Health Condition-Winter</i>	25
Figure 36: <i>Health Condition-Summer</i>	25
Figure 37: <i>Diseases Preventing Measure</i>	26
Figure 38: <i>Monthly Income</i>	26
Figure 39: <i>Paying Environmental Fees</i>	27
Figure 40: <i>Willingness to Pay</i>	27
Figure 41: <i>Sanitation Satisfaction</i>	28
Figure 42: <i>Satisfaciton with Operation and Maintenance</i>	28
Figure 43: <i>Previous Setting</i>	29
Figure 44: <i>Collective Practices</i>	29
Figure 45: <i>Community Cooperation</i>	29
Figure 46: <i>General Appearance</i>	30
Figure 47: <i>Hygienically Food-storage</i>	30
Figure 48: <i>Kitchen Hygiene Condition</i>	31
Figure 49: <i>General Hygiene</i>	31
Figure 50: <i>Cleanliness of Vicinity</i>	31
Figure 51: <i>Hand-washing Facilities</i>	32

Figure 52: <i>Handwashing Facilities</i>	33
Figure 53: <i>House Type</i>	33
Figure 54: <i>FGDs methodology</i>	34
Figure 55: <i>FGD in Site No. 1</i>	38
Figure 56: <i>Gender of Respondents</i>	39
Figure 57: <i>Distribution of Respondents' Age</i>	39
Figure 58: <i>Level of Formal Education</i>	40
Figure 59: <i>Family Head</i>	40
Figure 60: <i>Household Members</i>	40
Figure 61: <i>Landlord versus Tenant</i>	41
Figure 62: <i>Water Source</i>	41
Figure 63: <i>Water Treatment Methods</i>	42
Figure 64: <i>Public Drain Functionality</i>	42
Figure 65: <i>Stagnant Water in the Neighborhood</i>	43
Figure 66: <i>Flooding in the Area</i>	43
Figure 67: <i>User Interface in the Neighborhood</i>	44
Figure 68: <i>Final Disposal</i>	45
Figure 69: <i>Toilet Sharing In the Area</i>	46
Figure 70: <i>Fecal Sludge Collection</i>	46
Figure 71: <i>Frequency of Emptying Containment</i>	47
Figure 72: <i>Discharge of Greywater</i>	47
Figure 73: <i>Level of Satisfaction</i>	48
Figure 74: <i>User Preference Technology</i>	48
Figure 75: <i>Handwashing Practice within the Neighborhood</i>	49
Figure 76: <i>Hand-Washing Materials</i>	49
Figure 77: <i>Solid Waste Collection</i>	50
Figure 78: <i>Solid waste Management</i>	50
Figure 79: <i>Solid Waste Reuse/Recycle</i>	51
Figure 80: <i>Frequency of Solid Waste Collection</i>	51
Figure 81: <i>Medical Waste in the Garbage</i>	52
Figure 82: <i>Health Problems in summer</i>	52
Figure 83: <i>Health Condition - winter</i>	53
Figure 84: <i>Healthcare Measures</i>	53
Figure 85: <i>Salary Scale</i>	54
Figure 86: <i>Financial Contribution</i>	54
Figure 87: <i>Willingness to Pay</i>	55
Figure 88: <i>Satisfaction level</i>	56
Figure 89: <i>Satisfaction with Operation and Maintenance</i>	56
Figure 90: <i>Previous Living Location</i>	57
Figure 91: <i>Community Action</i>	57
Figure 92: <i>Community Cooperation</i>	57
Figure 93: <i>General Appearance</i>	58
Figure 94: <i>Food-Storage Condition</i>	58
Figure 95: <i>Kitchen Condition</i>	58
Figure 96: <i>General Hygiene</i>	59
Figure 97: <i>Cleanliness Of The Neighborhood</i>	59
Figure 98: <i>Hand-Washing Facilities near the Latrine</i>	59
Figure 99: <i>Distribution of Dwelling Type within the Neighborhood</i>	60
Figure 100: <i>FGDs at Site no. 2</i>	63
Figure 101: <i>Shit Flow Diagram In Site No. 1</i>	65
Figure 102: <i>Shit Flow Diagram in Site No. 2</i>	66
Figure 103: <i>KIIs and FGD</i>	78

List of Tables

Table 1: <i>Male Focus Group Discussion-Site no. 1</i>	34
Table 2: <i>Female Focus Group Discussion-Site no. 1</i>	36
Table 3: <i>Male Focus Group Discussion-Site no. 1</i>	37
Table 4: <i>Male Focus Group Discussion-Site no. 2</i>	61
Table 5: <i>Female Focus Group Discussion-Site no. 2</i>	62
Table 6: <i>Key Informant Interview List</i>	75
Table 7: <i>FGD with Service Providers</i>	77

Executive Summary

As a part of my PhD research on sustainable sanitation management for Kabul City, field study is an important tool that helps to develop a sustainable and integrated sanitation management plan. Therefore, site selection and its following site study are the basis for later stages.

The main specific objective to conduct the survey was collecting data and get impression about the current level of sanitation provision, understanding household sanitation and hygiene practices and recommendations for future sanitation intervention in the informal settlements.

This report has been developed based on the results of the household survey conducted in a flat area and also in a hilly informal settlements in Kabul City. Both areas were upgraded almost five years ago by Afghanistan Ministry of Urban Development and Housing (MUDH).

The flat area is located in western Kabul including around 1000 housing compounds which usually accommodate two households in each unit. The average number of each household is 8 persons which is the case in Afghanistan and used in official estimations as well. One third of the housing compounds were interviewed and the household in each compound was selected randomly.

In the hilly informal area, 179 housing compounds were existed. Due to possibility of covering all houses in the hilly area, all households were interviewed.

The household survey report covers preparation phase, in-field interviews, FGDs in the site for males and females, official works and arrangements. To understand the existing environmental sanitation situation 10 different topics including water, sanitation, hygiene, food, solid waste, health condition, financial issues, satisfaction and urban living were questioned.

To avoid possible problems related to paper-based survey, the household survey was conducted using the ODK software, which is a mobile-based application. There is a free server for each user, and all surveyors can submit their forms to the server where all data could be exported as an excel format to an individual computer for later analysis.

After data collation, analysis started and following that the results were discussed. At the end using Fecal Sludge Management developed by SuSanA, the SFD diagram depicted¹. For cross checking several key informant interviews with different stakeholders were held and their comments were considered during analysis and discussion.

According to the results, there is much difference between formal output published by the project authorities and the community-based surveys conducted during this study. If only the achieved numbers in terms of constructed toilets or meter of extended water pipe are considered, as the project authorities did, the project is successful. However, if we look from a result-based perspective, it could be a failure.

¹ www.sfd.susana.org

1- Introduction

After the fall of the Taliban in 2001, many changes in Kabul City has happened. Presence of international community, new political structure, job opportunities and promising future were important factors encouraging Afghans to come back and live in Kabul. They usually came from other Afghan cities, rural areas and neighboring countries.

During last 15 years, Afghan Government and its international allies were busy with their main priorities including security, counter-terrorism, and rehabilitation of countrywide transportation networks. Reconstruction of urban infrastructure and its expansion was not in the priority list.

While the population of Kabul City increased surprisingly since 2001 from roughly less than one million to around 3.5 million¹ in 2015, most of this population were settled in informal areas where expanded rapidly. Nowadays Kabul's informal settlements accommodate around 70 percent of Kabul's population.

Despite above-mentioned priorities, some environmental sanitation projects in Kabul City were implemented, but most of the projects could not improve the overall sanitation situation.

During the last few years, Afghan Government and international donors have been focusing more on urban infrastructures; this is a unique opportunity to consider sustainability criteria from the early stages of sanitation planning. At the same time considering large Kabul's informal settlements, it is vital to investigate properly at these areas as well.

This household-survey report aims to evaluate the existing situation in two targeted study areas and investigate sustainability and integration. The two site studies were upgraded by Kabul Urban Reconstruction Project (KURP) which was a multi-donor project funded by World Bank. However, the project was implemented officially under Afghanistan Ministry of Urban Development Affairs (MUDA).

2- Household Survey

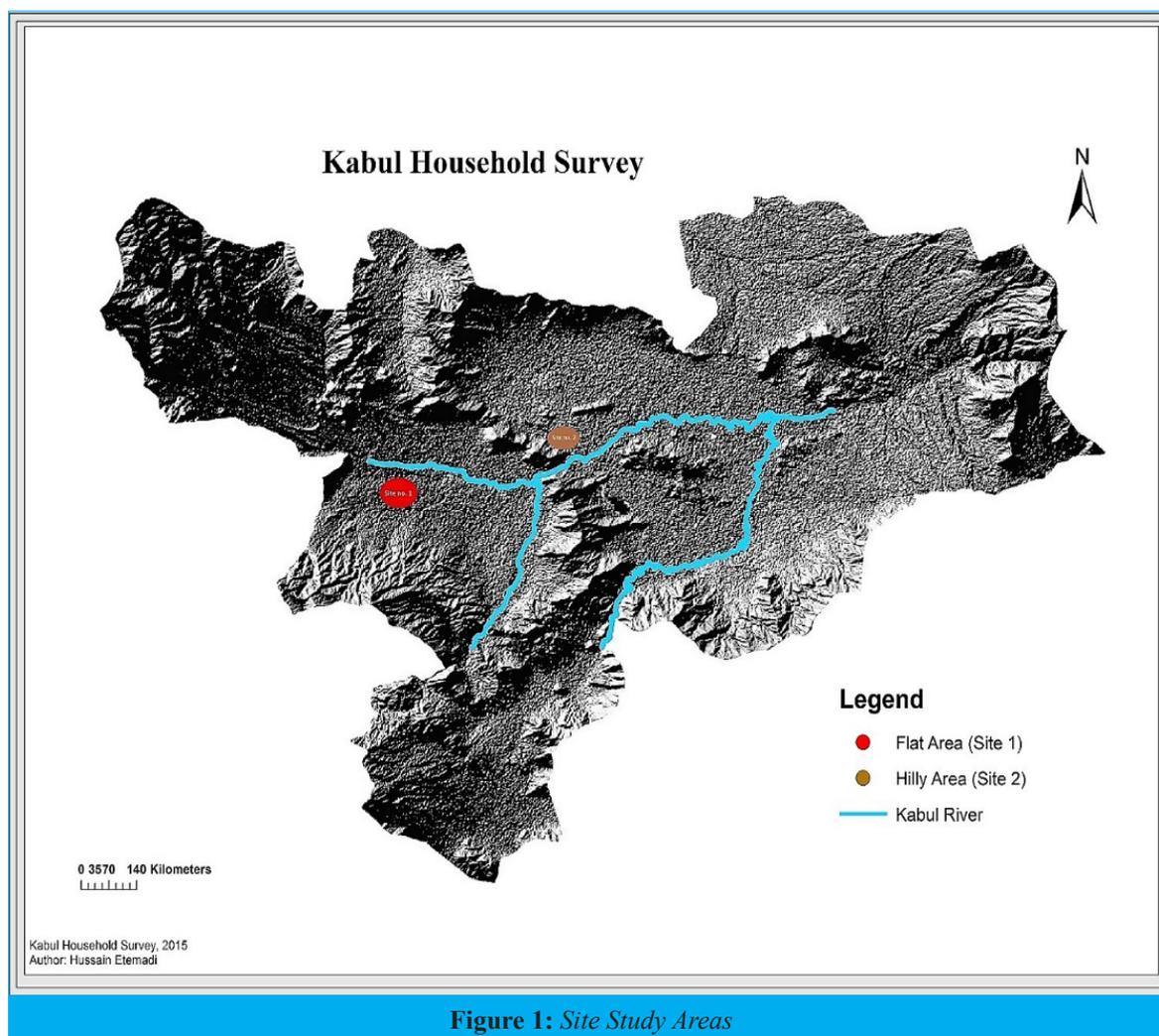
The main purpose behind the survey was to know the existing sanitation situation in the targeted study areas. This survey was designed to get impression about Kabul's informal settlements. During this survey the impacts and efficiency of implemented sanitation projects in the study areas were investigated.

To achieve the above-mentioned goal, two sites one in the flat area and the other one on hilly area were selected (Figure 1).

Two semi-structured household surveys launched in the flat area, site no. 1, and in the hilly area, site no. 2. Following that to clarify some ambiguities raising during the primary data analysis several focus group discussions (FGDs) covering males and females were also conducted.

Masjed Itefaq, site no. 1, is located in western Kabul at district 13 which is a flat area in some parts prone to flooding. District 13 is considered totally informal and expanded rapidly during the last decade. Dehghouchak area, site no. 2, is an informal hilly area located in Kabul's downtown.

¹ <http://cso.gov.af/en/page/demography-and-socile-statistics/demograph-statistics/3897111>



During the survey 10 different subjects including water, sanitation, hygiene, food, solid waste, health condition, financial issues, satisfaction and urban living were covered.

2-1- Objective

The main objectives to conduct the survey are as follow:

- Collect data and get impression about the current level of sanitation provision
- Understanding household sanitation and hygiene practices
- Justification behind existing sanitation services
- To identify the relationship between hygiene and sanitation
- Recommendations for future sanitation intervention in the informal settlements

2-2- Targeted Study Areas

As discussed earlier, two informal settlements at flat and hilly areas were selected to represent Kabul's informal settlements. Both areas have been upgraded by Afghanistan Ministry of Urban Development Affairs financed by World Bank as a multi-donors funded project. There were several reasons behind this site selection as follow:

- Easy access to the sites
- Presenting two main types of Kabul's informal settlements: hilly and flat areas
- Existing of a knowledge, attitude and practice survey (KAP Survey) before the project implementation
- Well-developed reports to examine the upgrading activities
- Both areas upgraded by the main Kabul's informal upgrading project (KURP)

Site no. 1, Flat Informal Settlement is located in western Kabul at district 13. District 13 is totally informal. It is located between two main streets in its southern and northern sides (Figure 2).



Site no. 2 which is located on a hilly area is a historical neighborhood. It is in Kabul's downtown and just few kilometers away from several high profile government buildings. The whole neighborhood is unplanned and not included in Kabul's master plan (Figure 3).

Due to historical character of the area before starting any activity environmental and social impact assessment (ESIA) was developed. Based on ESIA a cultural heritage management plan (CHMP) was prepared and the whole upgrading activities complied with the CHMP (Jaramillo, 2009).

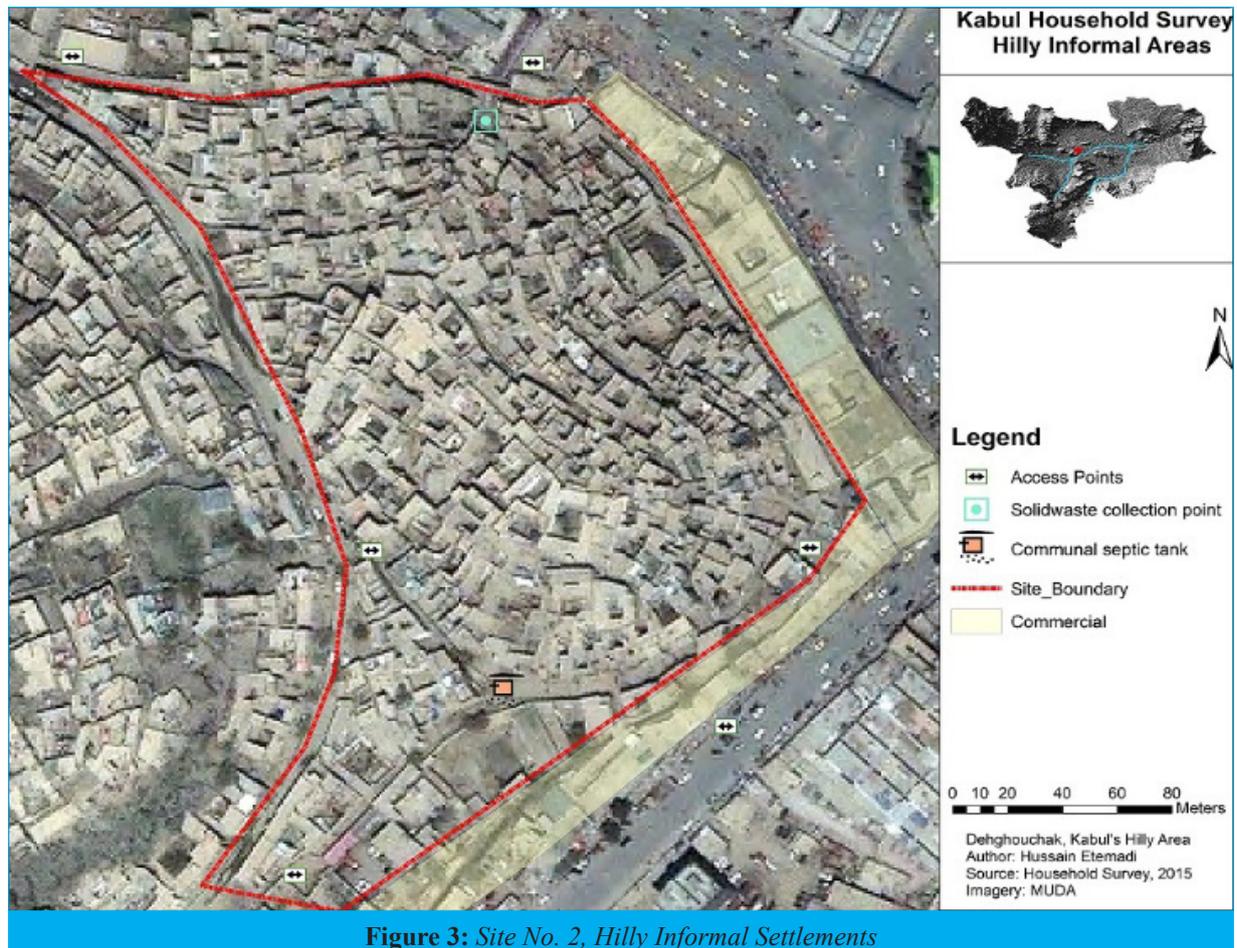


Figure 3: Site No. 2, Hilly Informal Settlements

2-3- Methodology

This social study consists of a semi-structured questionnaire divided into ten sections which covers specific topics. The questionnaire is started with general questions like age, sex, and demographic information. After general questions, interviewers approached to specific questions under different categories. The questionnaire is finished with an observation checklist which needs to be filled out by the interviewers.

To conduct the survey, several meetings with representatives of the neighborhoods was held and finally after getting approval the survey started.

Household survey was conducted in randomly selected households for each housing units in the sites. In the other words in each compound, only one household was interviewed. It is noteworthy that household is the unit of analysis in this study and means people who eat from same pot in a housing unit which is usually around eight persons in the study area.

In site no. 1 totally 319 households were interviewed which means one third: the whole neighborhood is consist of about 960 housing compounds.

In site no. 2 totally 179 households were interviewed. The neighborhood is not big and considering the scale, we were able to cover the hole housing compounds.

Only contested interviewees aged 18 or more were interviewed and to have a comprehensive investigation, have a balance between males and females was considered during the survey.

During the survey, for a better coordination and covering all interviewees including men and women, several survey teams including one male and one female in each team were assembled. To respect the culture, female surveyors interviewed females and male surveyors interviewed males.

To go more in details, two focus group discussions, after the household survey in each site, one for males and the other for females was held. For each focus group discussion participants among members of Gozar Council Shura (GCS), Cluster's representatives or community members were invited to join.

For cross checking and making a concrete analysis several interviews with key informants among sanitation project stakeholders were conducted; the main stakeholders were Ministry of urban development affairs (MUDA), KURP authorities, Kabul Municipality and practitioners.

All field activities including direct observation, household survey, and key informant interviews (KIIs), focus group discussions and their arrangements took around four months.

Survey Tool

To avoid possible problems related to paper-based survey including data collection and especially transfer, ODK Software, which runs on mobile device, was used. There was an internet-based data base secured with a password for each user, and all surveyors can submit their data to the server where all forms could be exported in an excel file to an individual computer for later analysis. For more information about the tool please visit ODK website¹.

Selection of Surveyors

Job vacancy for the survey was developed and announced. Totally 12 candidates were selected for the interview. Among those, finally 7 surveyors including four females and three males were selected to conduct the survey. The main criteria to select the surveyors were: educational background, experience, availability, flexibility and the level of their English skills. All of the surveyors were university graduated or senior university students.

Training of the Surveyors

The surveyors were trained for two days; before starting the survey at each study site one training session at BORDA Office in Kabul was held. Also at the beginning of each working day, there was a daily briefing work, and to determine the area which was covered by each survey team.

¹ <https://opendatakit.org>

Pre-testing Survey

To validate the survey, several questionnaires using ODK Software were filled out before starting the main survey to understand the possible deficiencies with the survey's tools & methodology.

During the training session, as an exercise, the surveyors were asked to run their mobiles and make sure that ODK Software is installed and work properly.

Data Management and Analysis

At the end of each working day all interviewers were submitting their completed forms via Internet or later manually to the server; considering some limitations due to use of free version of ODK, all surveyors could not upload their data at the same time. All collected data, manually or via Internet, was in excel format and easy to analyze. Excel software was used to analyse the data and produce the graphs.



Household interview



Training session



Focus group discussion



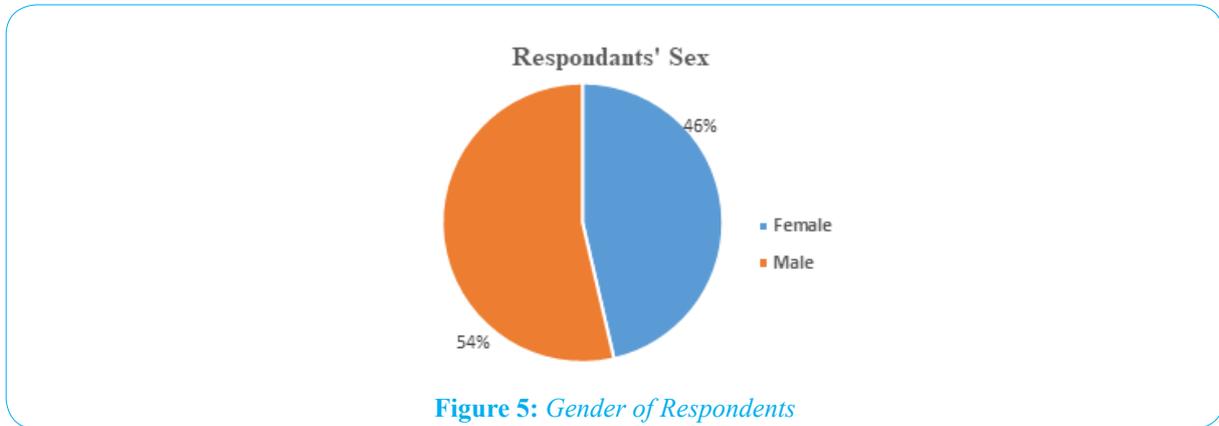
Focus group discussion

Figure 4: Household Survey in Kabul

3- Findings of the Household Survey in Site no. 1

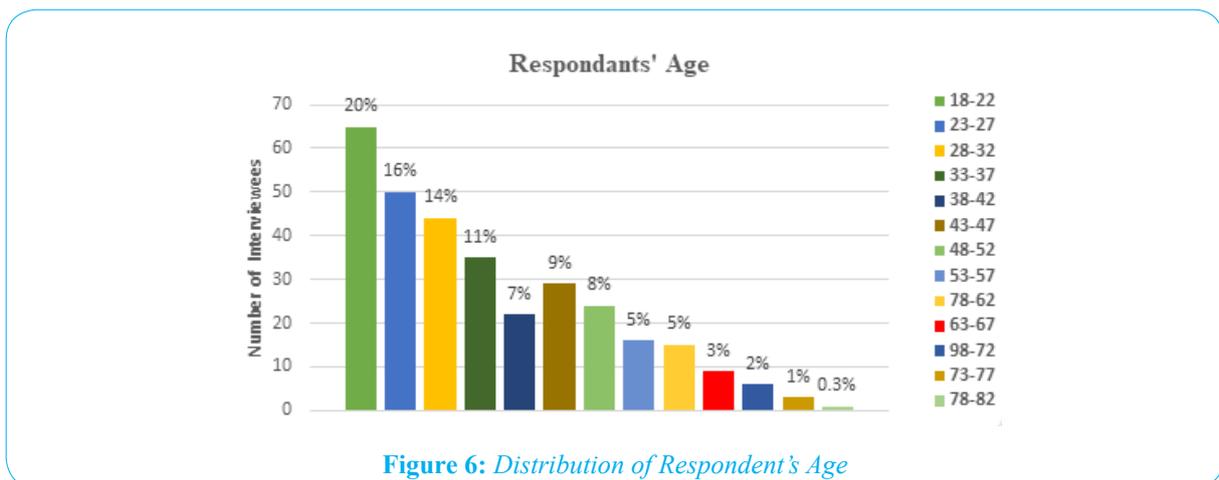
3-1- General Information

Gender: As you see in figure 5, the percentage of male interviewees is 54 percent comparing to female interviewees, which was 46 percent.



The percentage of male interviewees was eight percent more than females; there were several main streets and local markets in the neighborhood where many local males were working. Despite conducting the survey in day time there was a good chance of interview with men in the area as well. Due to men's role mostly as family heads, having their answers along with females for a better understanding of the situation was important.

Age: As you see in Figure 6, 50 percent of respondents were less than 32 years old and the average of respondent's age was almost 36 years old.



Education: Interview questions were simple enough for every adult to answer but to get an impression about the level of education in the area, a relevant question on education was also asked during the survey. As you see below, 45 percent don't have formal education while totally 25 percent have primary and secondary formal education.

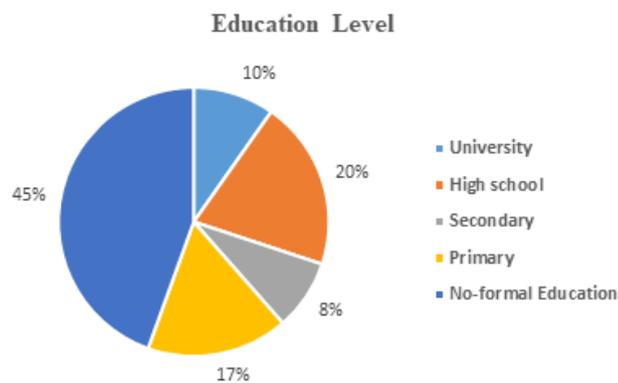


Figure 7: Level of Formal Education

Due to several decades of conflict in the country many people didn't have access to formal education, but some have managed to study in informal schools or by themselves; it is possible to face with people without formal education but able to read and write well.

3-2- Household Information

Based on Figure 8 and Figure 9, 42 percent of respondents were head of family and more than 50 percent of families had between 6 to 10 members.

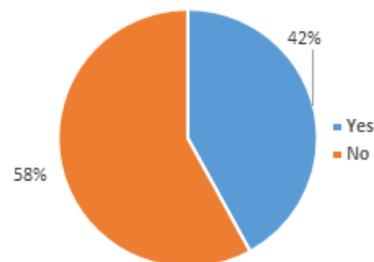


Figure 8: The percentage of Family Head

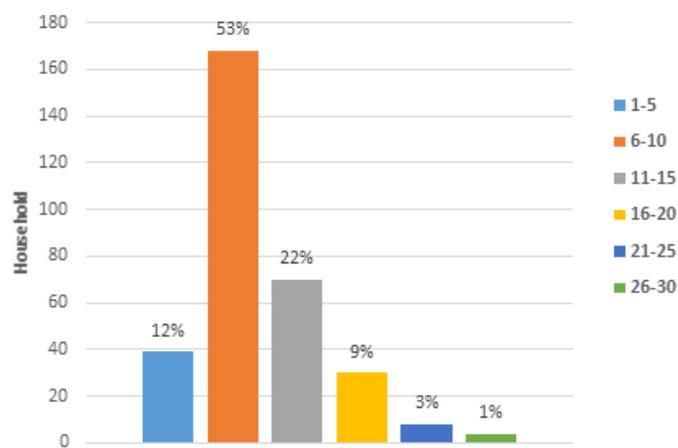


Figure 9: The number of Household Members

The average number of family members in Afghanistan is usually considered eight persons; According to Figure 9 more than 50 percent of families were in the same range.

3-3- Water

KURP project has provided the neighborhood with groundwater shooting out directly from a well to the distribution network. Each household had its own meter and based on that paid its bill. When the project was completed, KURP handed it over to AUWSSC, which has responsibility for operation and maintenance of water supply and sewerage projects in urban areas. There are few public wells in the area, but most of them are either broken or dry. Many households are using different kinds of water services at the same time. Some households have water meters from government as well as private companies.



Public water supply by KURP



Public well



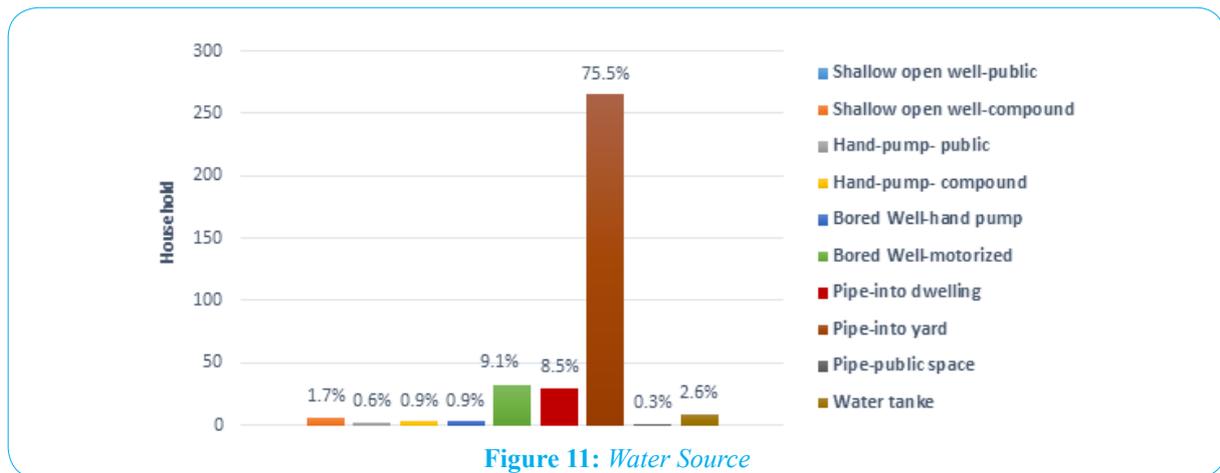
Shallow private well



Pipe water

Figure 10: Water Supply In Site No. 1

Water source: The source of water in different seasons was mainly pipe into yard with 75 percent, following that nearly 10 percent of households used bored-well motorized and almost seven percent had pipe into dwellings.



Despite the above-mentioned graph and data, matter of accessibility to water was beyond of only having pipe or well in the compound. There were some deep public bored hand-pump wells in the neighborhood, but most of them were not functioning any more. Some of them were broken and others were dry due to dropping down the level of groundwater in recent years. Many shallow hand-pump within the compounds were also dry.

Some areas within the neighborhood had access to water only during day and even the pressure was not enough to get water. During wintertime due to shortage of energy, water was available only for few hours per day. Water accessibility was even worse in some parts of the neighborhood where people had to remove a trash point and dig a well on its place (Figure 12).

Many households except using tap water had no chance while the tap water was not reliable. Considering their affordability, households were trying several water sources: being connected to government facility, private sector connection, and private wells in within their compounds or public well.



Figure 12: Water Accessibility

Water Quality: According to the survey, 88 percent of households used the water without further treatment. However, 12 percent treated their water during the last two weeks when the survey conducted.

In another question, they were asked about their usual treatment method in case; according to Figure 13, the main treatment methods were boiling the water with almost 35 percent, following that adding chlorine, which was almost 5 percent.

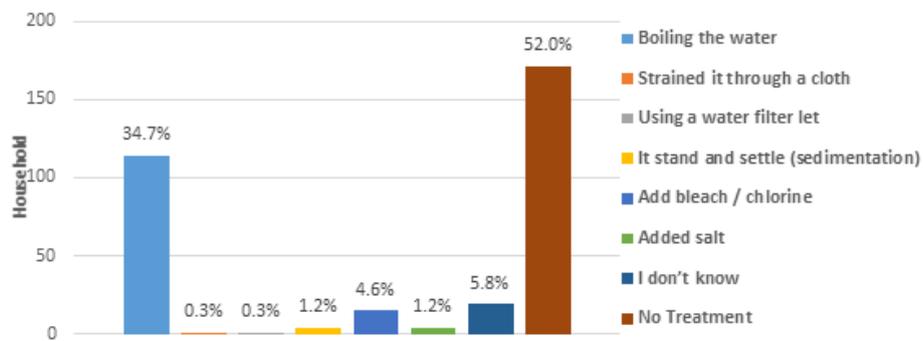


Figure 13: Water Treatment Methods

3-4- Drainage System

During KURP Project, drainage system in the neighborhood was also improved. Three questions about the public drains within the neighborhood were included in the questionnaire.

87 percent of people believed that the drainage system was functional while 22 percent mentioned to stagnant water in the neighborhood and 28 percent were complaining about flood problems during rainy seasons.

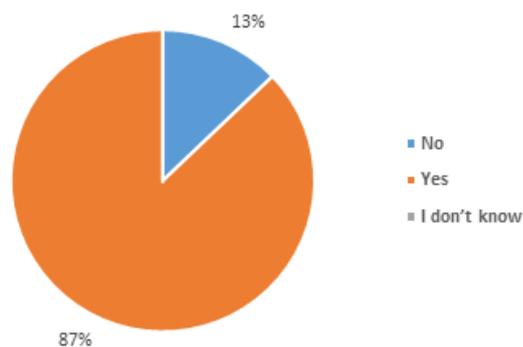


Figure 14: Functionality of the Public Drain

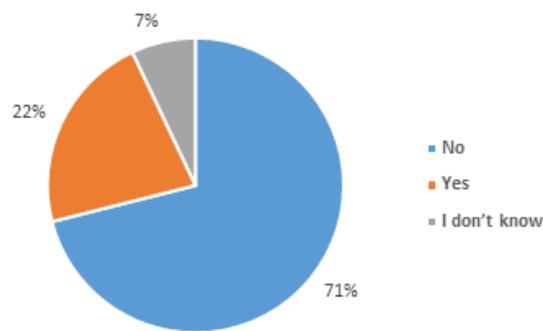


Figure 15: Existence of Stagnant Water

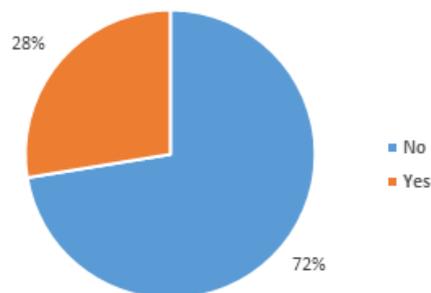


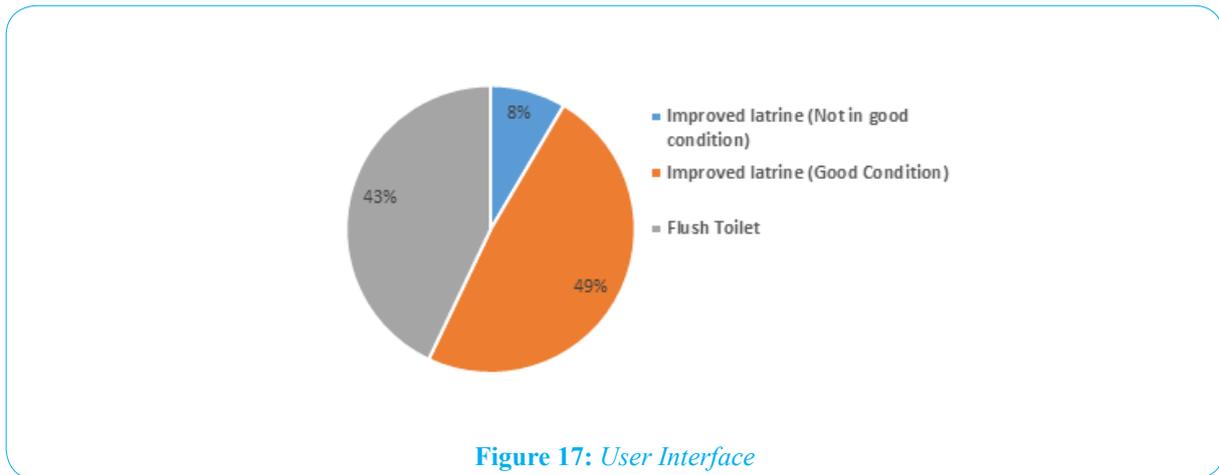
Figure 16: Flooding Problem in the Neighborhood

Usually locals are complaining of improper design or construction in the drainage system, but except that others reasons were also important to avoid of stagnant water or flood in the neighborhood. In some parts of the neighborhood there was no enough operation and maintenance. Some canals were permanently blocked by the residents. There was one street in the neighborhood without any upgrading: there was no resident in this area during the upgrading project.

3-5- Sanitation

Nine different questions about sanitation provision, user interface, waste collection, emptying, satisfaction and preference at this section were asked.

User Interface: Concerning different kind of user interface, 57 percent of people had improved latrine while its eight percent was not in a good condition. 43 percent of households were relying on water-based technology and used flush toilets.



The material which was used for the construction of a dry (traditional toilet) were bricks, concrete and in the old houses mud, but usually all were strong enough and in a good condition in terms of robustness. Dry toilets in most cases were not lined, but constructed above the ground to prevent groundwater pollution. They had a pipe which diverts urine and anal cleansing water to the street while dry feces was collected later for agricultural purposes; containments had doors which were opened in the streets: when a dry toilet was full the collector had access to it from the street side.



Figure 18: Dry Toilet

Before upgrading the project about 11 percent of households used flush toilets and KURP project only improved dry toilets (SMEC International, 2008). KURP Project with installing a door for the containments, and ventilation pipe at the top of the roofs improved the conditions of dry toilets.

However, according to the data collected during the survey, the percentage of households using water-bases system was increasing; almost all of the water-based systems were flush toilets connected to a soak pit which was getting popular especially in areas with access to pipe water and also low level of groundwater.

Usually households couldn't afford to have a proper septic tank; they constructed flush toilets connected to a soak pit which costed around 200 \$¹ while a holding tank or a septic tank could cost 10 times more. In terms of operation and maintenance, a soak pit should be emptied each two or three years while a regular septic, holding tank or traditional toilets should be emptied more.



Box 1: Switching To Water-Based Technology



Many households are converting their dry toilets to water-based technology, mainly soak pits.

Usually Concrete hollow cylinders are used to construct a soak pit. There is possibility of wastewater infiltration into the ground at the bottom, through the pores in the cylinders' walls and the space between the cylinders: usually takes several years to have a soak pit full and needed to empty.

Final disposal: when people were asked about the final disposal, 80 percent did not know what happened to the collected sludge while seven percent believed that night soil or wastewater was taken to agricultural areas.

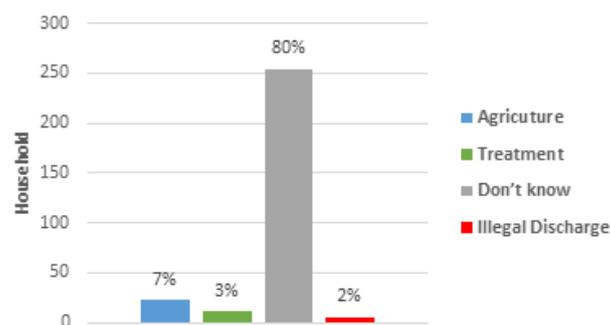


Figure 19: Final Disposal

¹ Based on an interview with a service provider

During the project implementation the focus was on improving the traditional toilets. Project authorities did not consider the whole sanitation chain or beyond the household level. There was no any feasibility study in terms of dry system possibility in the area and no any kind of preference survey about sanitation system.



Box 2: Fecal Sludge Disposal

Content of dry toilet was taken away by animal carts to agricultural areas. The sludge was spread on the ground under sunlight for a while and then applied on the agricultural lands. But the sludge produced in a water-based system was usually collected by vacuum trucks and delivered to only Kabul treatment plant and through that to the Kabul River.



Toilet Sharing: almost half of the households shared their user interface between 8-13 persons following 23 percent which 2-7 persons.

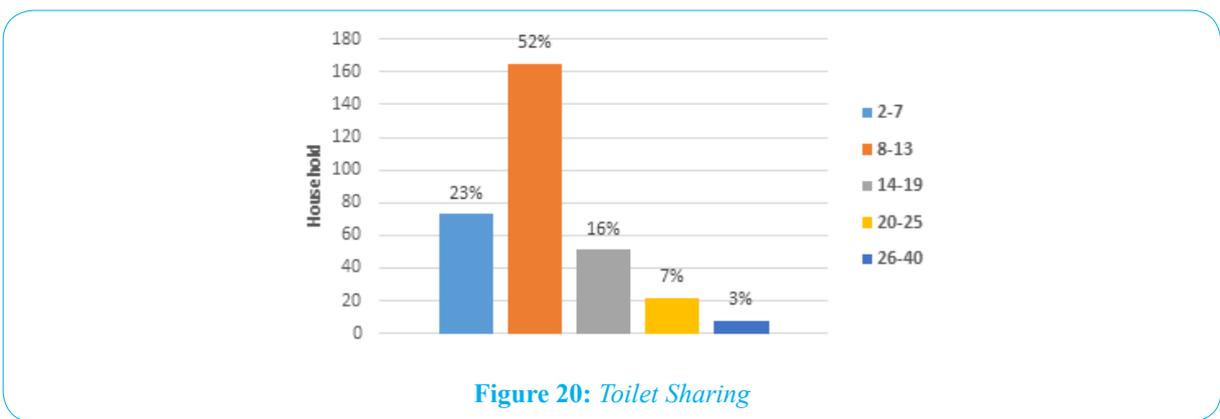


Figure 20: Toilet Sharing

In most cases, there was one toilet in the yard of each housing compound and all households within the compound shared it. But in new constructions, specially apartments, toilets are located inside the units and shared between one household’s members.



Flush toilet in the yard

Flush toilet inside the building

Box3: Toilet sharing

Water-based systems are usually installed inside or outside a building. But dry toilets are only installed in yards: containments have a door which opens in the street.

Fecal Sludge Collection: Wastewater and night soil within the neighborhood was collected mainly by the private sector or local farmers. Almost 94 percent mentioned to private sector as the collector and 2 percent mentioned to “no body.”

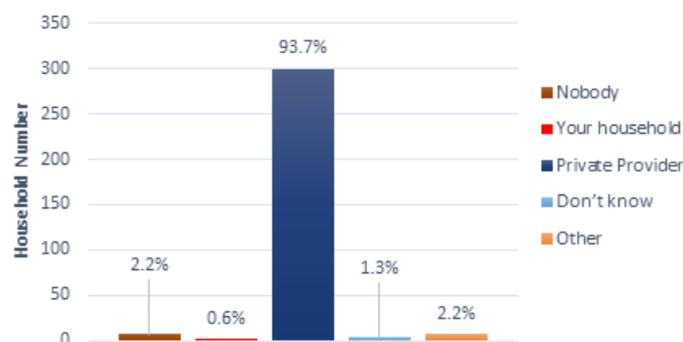


Figure 21: Fecal Sludge Collector

Private sector here meant companies, truck owners and local farmers who received money to empty and take away the waste. About two percent of households mentioned that “the waste is collected by no one.” These households used flush toilets connected to a soak pits which took a long time to get filled and emptied. Therefore, we could consider these households were also among private sector category.

Frequency of Emptying: According to the survey almost 66 percent emptied the containment each 2-5 months following with 12.9 percent of households which mentioned more than six months and 10 percent who mentioned emptying on a monthly basis.

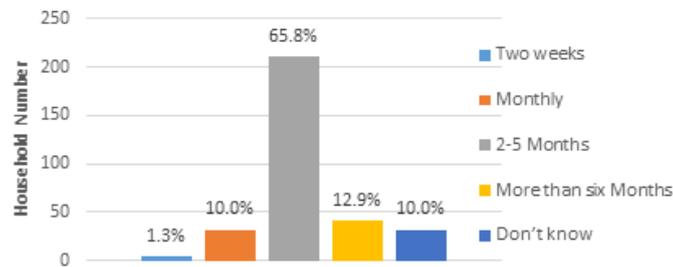


Figure 22: Frequency of Emptying

Households with eight members rely on dry toilets need to empty their toilets in average each six months. Households with same family members who used septic and holding tank needed to empty their facilities in average around six months too; usually septic and holding tanks didn't have any infiltration into ground. As discussed earlier households who were using flush toilets mostly relied on soak pit which was cheaper than septic tanks and more convenient comparing to dry toilets.

Greywater Discharge: Greywater as an important part of household wastewater was mainly discharged into the drainage channels or street without treatment. As you see below almost 70 percent of households discharge their greywater into the drainage canals in the neighborhood.

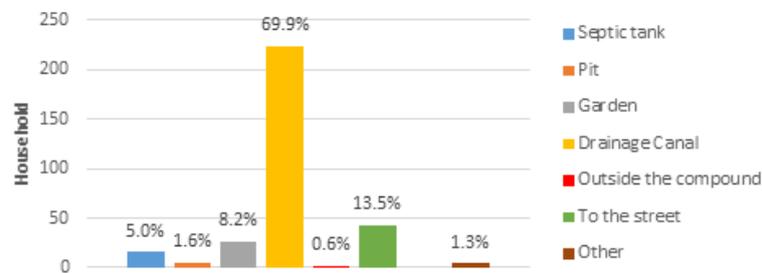


Figure 23: Greywater Discharge

From cultural point of view exposure to greywater is not a major problem and people comparing to black water discharge it freely into drainage. Greywater was a mixture of kitchen, laundry and bath wastewater which made it difficult to use for irrigation or other purposes. Due to high volume of greywater, any sanitation management plan should consider proper treatment of greywater as well.



Figure 24: *Greywater Discharge*

Satisfaction: In terms of satisfaction, 72 percent of households were satisfied with current situation management.

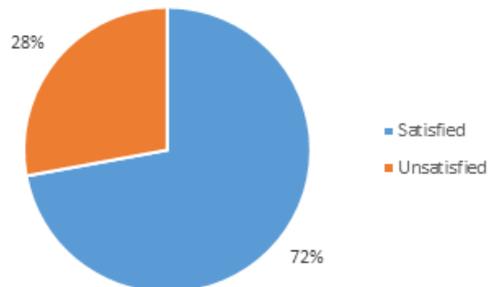
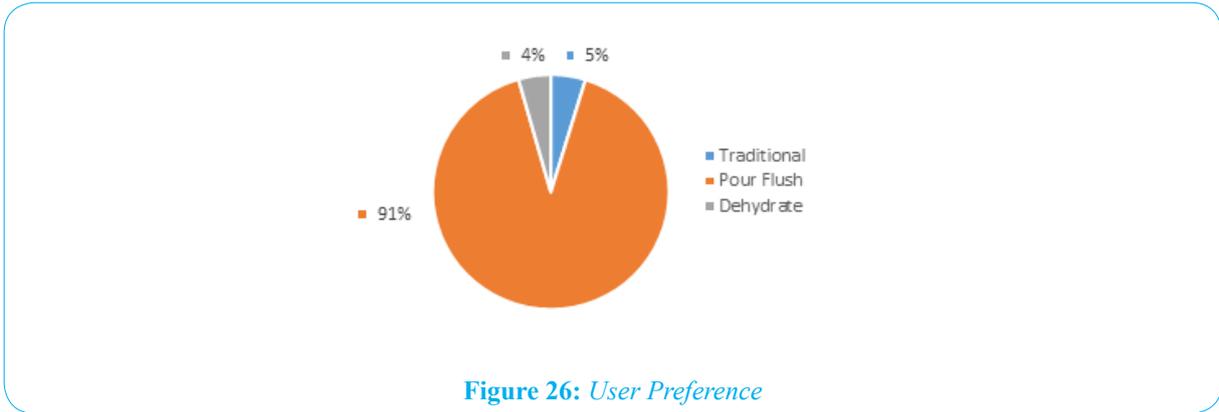


Figure 25: *Satisfaction*

72 percent is not very high, but still considerable. This percentage of satisfaction didn't mean locals had selected the technology and were comfortable with it. As discussed before more and more people despite lack of enough water accessibility were switching to water-based systems. Many households were simply satisfied with the current technology because they can not afford their willingness; the point that many of them mentioned as a reason for their satisfaction.

Most of the households who were not satisfied with their current technology mentioned to uncleanliness, odor, frequency of emptying, lack of convenience and old.

User Preference: For this question, three different options including flush toilet, composting toilet and dry toilet were introduced to the interviewees. Each interviewee was allowed to choose his preference. As you see below, 91 percent prefer flush toilet following five percent dry toilets and four percent composting toilet.



The results out of this question showed that most households were not willing to use traditional toilets. That could be the main reason behind switching to water-based system. According to the Figure 25, they were not interested in composting toilet as well: dealing and exposure to black water and fecal sludge is prohibited culturally and it is also considered a low profile practice. Proper public awareness and increasing the level of education on sanitation would change the people’s mindsets.

3-6- Hygiene

In the first question, people were asked about their handwashing practices and in the second question about the materials which are used for handwashing. Interviewees were allowed to give multiple answers to each question, totally, 1447 answers were given, and the percentage for each answer was out of 100 percent.

As you see in Figure 26, the most cited occasion for handwashing is 67 percent which was “before eating food”, and 42 percent mentioned to after visiting latrine. 60 percent mentioned when their hands were dirty, they washed it while 44 percent mentioned before praying and 54 percent answered every morning.

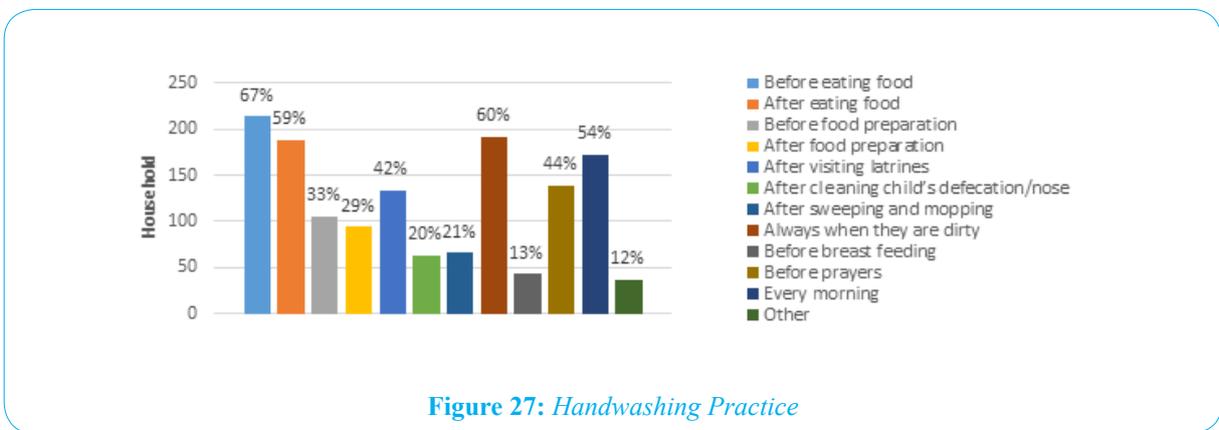


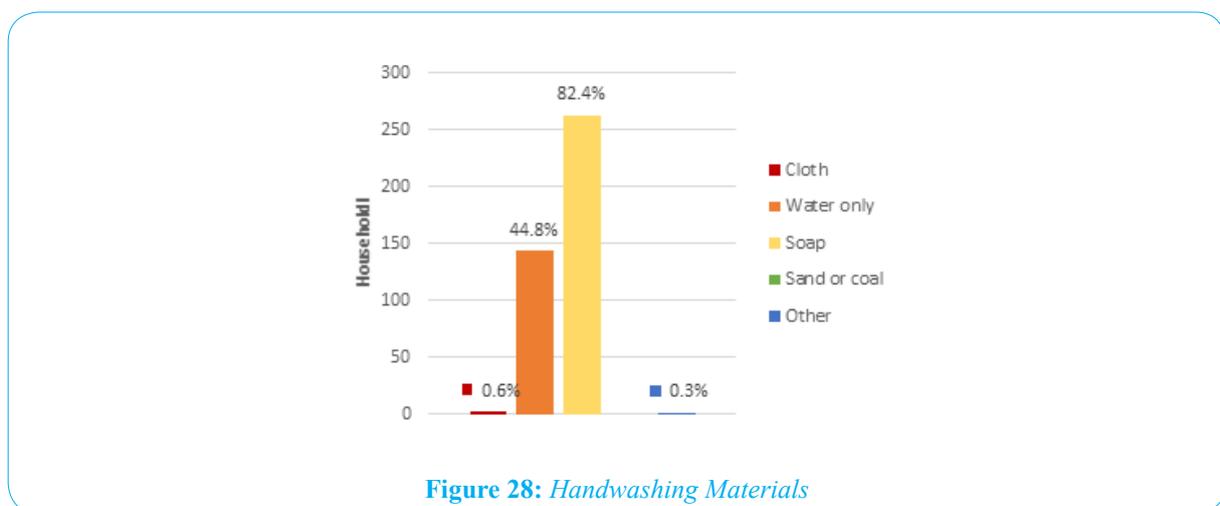
Figure 27: Handwashing Practice

Considering the role of handwashing practice as one of the most effective way of hygiene improvement, two questions in this regard were asked; There were some other hygiene-related questions discussed at food and observation checklist sections.

Eating with hand without using devices like spoon, fork...was a common practice between some households, therefore 59 percent of households washed their hands after eating meal as well.

Occasions like before eating food and after visiting toilets were more important comparing to others and occurs on a regular basis. Therefore the related percentage was expected to be higher than current level: public awareness specially through children and school would be useful.

Handwashing Materials: almost 82 percent answered using soap when needed.



According to the above figure about 18 percent of interviewees didn't use soap to wash their hands which was a big number while 82 percent mentioned to using soap when it was needed. Due to lack of enough hygiene awareness among the households use of soap in the right time and right way was an important question.

3-7- Solid waste Management

Households used different kind of temporary storage at houses to put their solid waste; 43 percent of households were using un-covered containers inside their houses following with 25 percent had plastic bags. Please keep in mind that due to rounding, the total percentage is not exactly 100 percent.

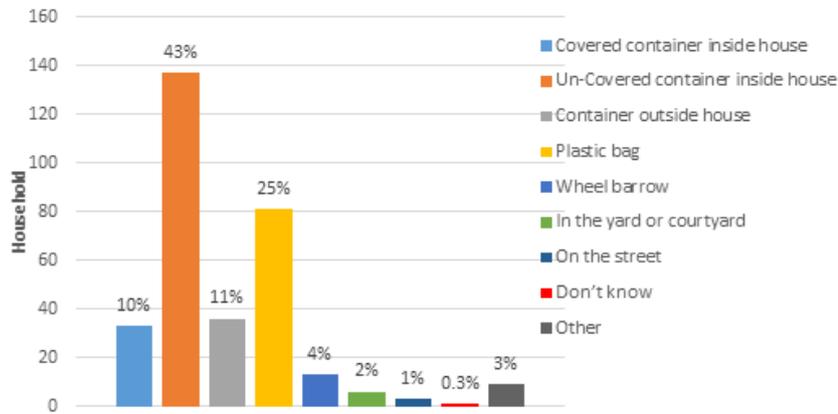


Figure 29: Solid waste Storage

Solid Waste Collection: There are different practices in terms of solid waste collection within the neighborhood: While 47 percent relied on collection points, 33 percent used public spaces allocated for solid waste collection and 15 percent had door-to-door collection practice in the area.

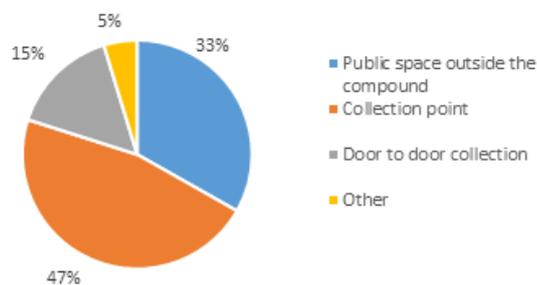


Figure 30: Solid Waste Collection

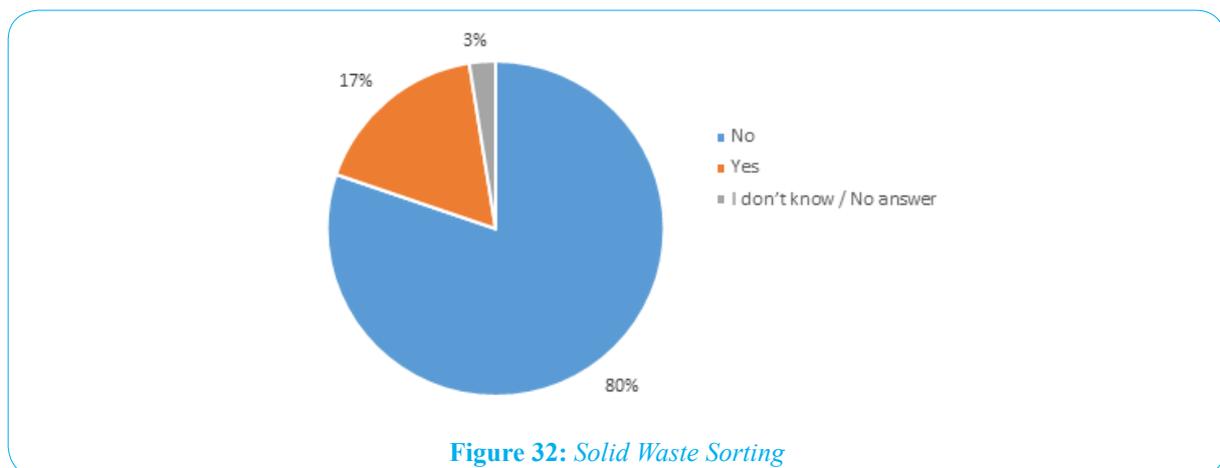
Usually alongside of streets there were some collection points operated by Kabul Municipality; some people took their solid waste there depending on the distance. KURP Project constructed two public spaces within the neighborhood for solid waste collection, but not operated well by the Municipality. Due to water scarcity, local people removed one of those collection points and constructed a public well. The public well currently is dry and useless.

The last solid waste collection method was door-to-door collection which was organized and paid by the community itself. Workers who were hired to collect the solid waste took the garbage to the collection points managed by Kabul Municipality.



Figure 31: Solid Waste Management

Recycle and Reuse: 80 percent of households did nothing in terms of recycle or reuse of their solid waste while 17 percent recycled or reused their solid waste for different purposes.



Households usually sort out their solid waste to sell some parts, use as fuel or for animals feeding. Households mentioned to odor and dislike as the main reasons for not sorting their solid wastes. As you see in Figure 30, some people were sorting out some solid waste for animal feeding, selling or fuel as well.

Frequency of Collection: Regarding frequency of solid waste collection, 50 percent of households mentioned to daily collection following with 20 percent mentioned to 2-3 times per week and 19 percent mentioned to 4-5 times per week.

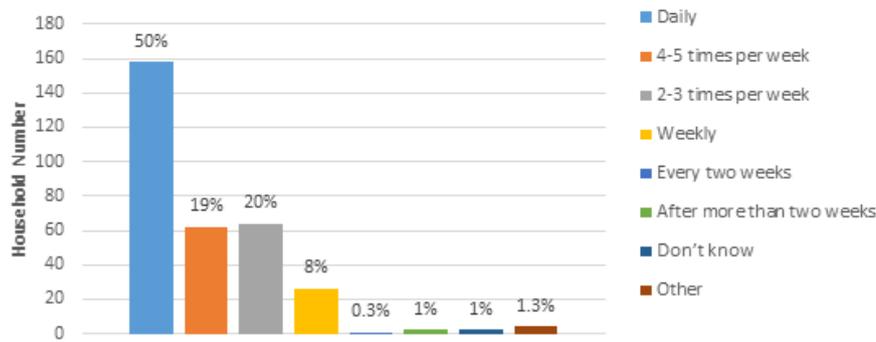


Figure 33: Frequency of Collection

Disparity in frequency of collection had two main reasons: Kabul Municipality does not have a proper and strict collection schedule while local people had their own collection schedule based on their needs and affordability of paying to hired collectors within the neighborhood.

Medical waste: According to the survey, 46 percent of households have seen syringes in the garbage.

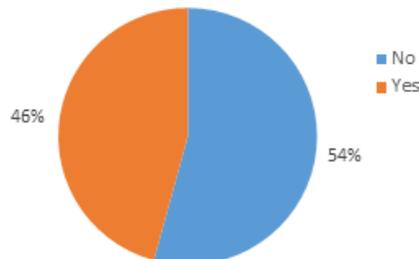


Figure 34: Presence Of Medical Waste In Garbage

There were many clinics and drugstores across the city, but there is no a proper solid waste management in place to collect their waste. Above that, people don't have a good level of awareness in this regards. These are the two main reasons led to such kind of risky practices.

3-8- Health Issues

To understand the health condition within the neighborhood, three questions including health condition in winter, summer and also preventive measures were asked. The households were allowed in this section to provide several answers to each question. In wintertime, 66 percent experienced cold following with 55 percent cough. Cough with fever and jaundice were the next major health problems in the area with 16 percent.

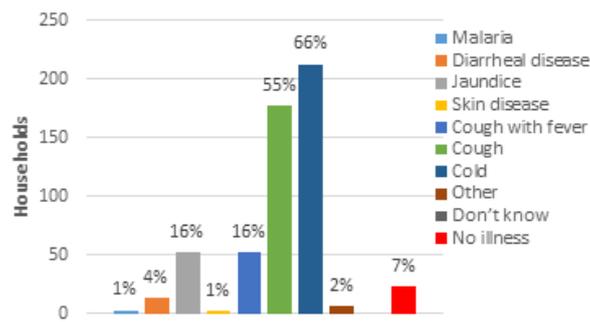


Figure 35: Health Condition-Winter

In summertime, the health condition was different: 40 percent of households experienced diarrheal disease following with 32 percent had no illness and 17 percent cold, cough and fever.

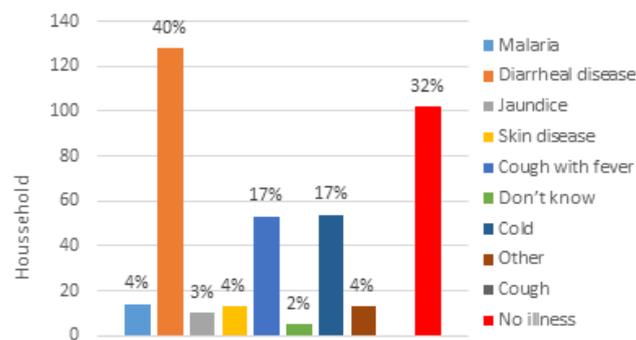


Figure 36: Health Condition-Summer

During summer time diarrheal and water-borne disease are the major challenges. Low-quality water, lack of hygiene, lack access to enough water for cleanliness and low public awareness could be the main reasons.

Preventive Measures: When the households were asked about their preventive measures, 60 percent mentioned to “following doctors’ advices, following with eating clean food and drinking safe water with 34 and 27 percent. The next answer with 23 percent was “keeping the environment clean.”

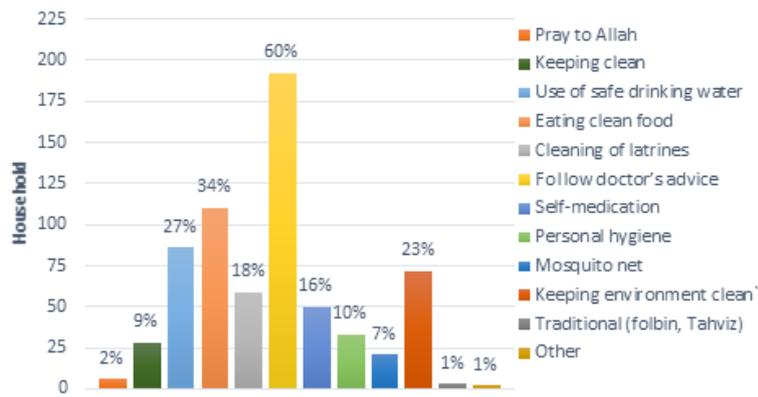


Figure 37: Diseases Preventing Measure

According to the last question, the level of awareness is high, but results of the survey show that translation of this knowledge into practice was not successful. That is why the rate of hygiene-related disease were high in the neighborhood.

3-9- Financial Issues

In terms of financial issues, several questions including salary scale, environmental fees and willingness to pay were asked. 44 percent of households were receiving between 0-10,000 Afghani (Afs) which was the largest portion in this graph, following with 40 percent with 10,000-20,000 Afs and 10 percent with salary scale of 30,000-40,000 Afs per month.

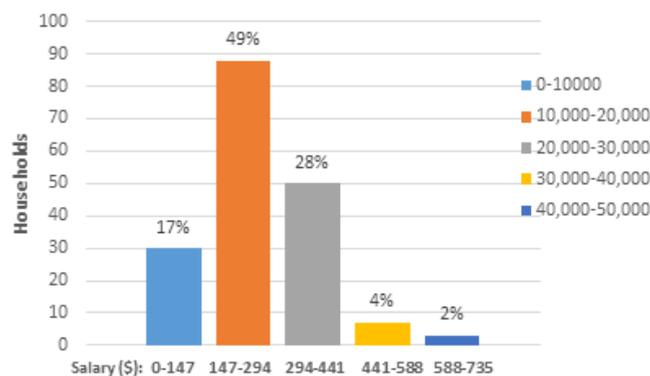


Figure 38: Monthly Income

Considering Afghanistan GDP per capita which was 413 \$, the salary scale within the neighborhood was low: while 44 percent of population in the best scenario received half of the average GDP, the next 40 percent again in maximum received almost 400 \$ per month.

Environmental Fee: 67 percent of households had to pay for different kind of environmental services, mostly collection of solid waste and emptying of toilets.

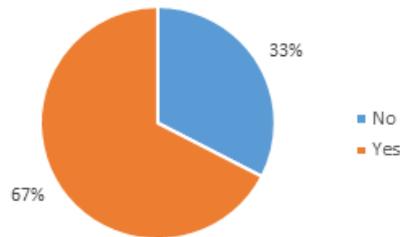


Figure 39: Paying Environmental Fees

Willingness to pay: The interviewees were asked if they were willing to pay more for environmental services in case of necessity. While 67 percent would like to pay more if needed, 33 percent didn't want to pay more.

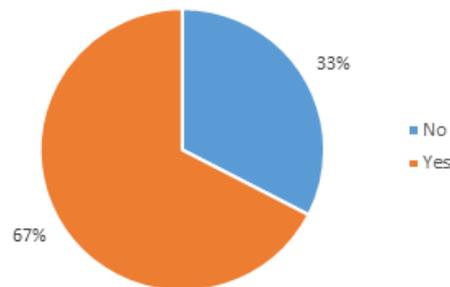


Figure 40: Willingness to Pay

KURP is a community based upgrading project which looks to involve local people in different ways. At the early stages, the project authorities asked people for financial contribution to make sure the sustainability of the project and raising the feel of ownership among the locals. Collecting money from people at operation and maintenance stage should also consider at the beginning. If people feel that they are paying to run and manage their own project alongside the government, the financial contribution would be much higher.

3-10- Sanitation satisfaction

In terms of satisfaction, 82 percent of households were satisfied more or less, while 14 percent were not satisfied with the existing situation.

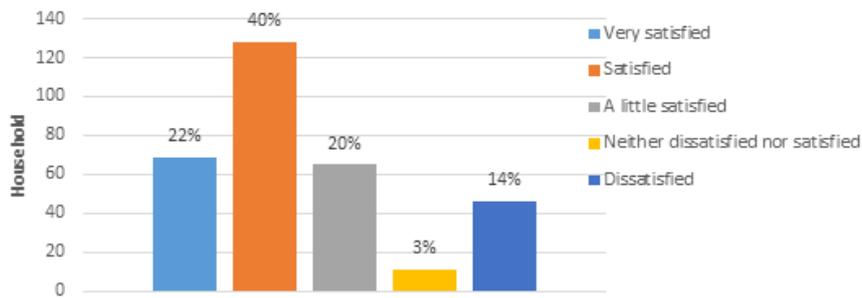


Figure 41: Sanitation Satisfaction

As mentioned, 82 percent of people are satisfied, but this satisfaction is generally about the initiative and the whole Project/idea. They appreciated the project's activities, but still they are expecting more works to do or if possible some modifications in implemented project.

Satisfaction with Current Operation and Maintenance: When the households were asked about the level of satisfaction with current sanitation operation and maintenance, 16 percent were not satisfied.

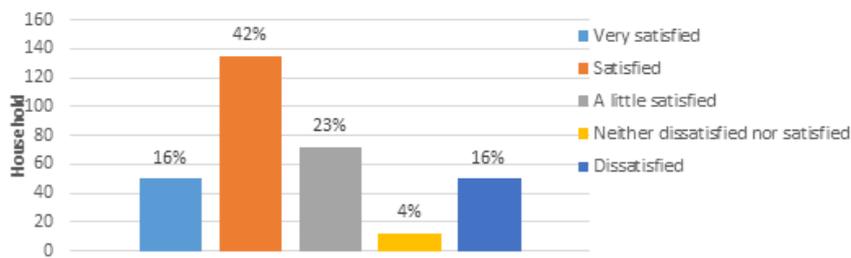


Figure 42: Satisfaction with Operation and Maintenance

In terms of current operation and maintenance except water services, local people were directly in charged. They decided how to manage their solid wastes in different zones, or how to deal with their wastewater based on the available options. The level of satisfaction was high, simply because they are on their own and try to do their best. To sum up, this satisfaction does not mean they are not keen for any improvement, but shows they keep their expectation level within the available options and current possibilities.

3-11- Urban Previous Setting

The households were asked about their previous place of living, 44 percent had rural background while 27 percent were living in Kabul and 18 percent were abroad.

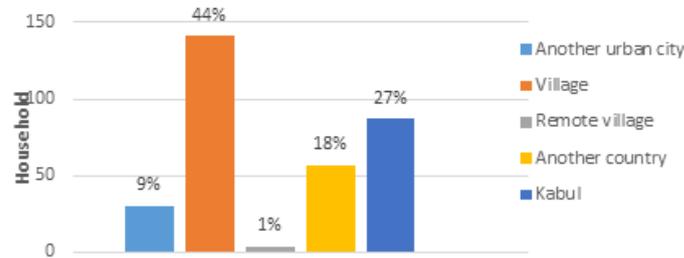


Figure 43: Previous Setting

The households were also asked about the collective action within the community and 54 percent believed that there was communal action within the neighborhood.

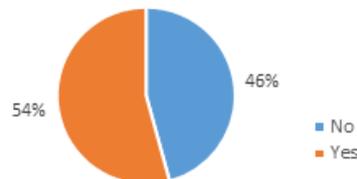


Figure 44: Collective Practices

Following that the interviewees answered that in which level they could rely on their neighbors. 75 percent believed they could always rely on their neighbors while 20 percent think they could rely on their neighbors only sometimes.

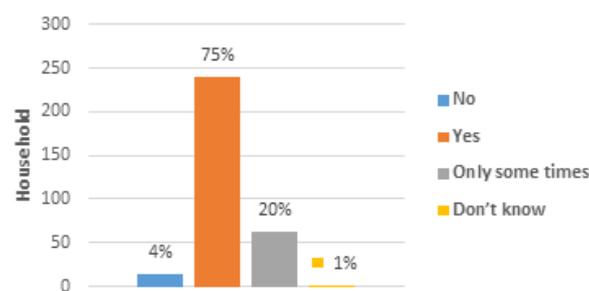


Figure 45: Community Cooperation

3-12- Observation Checklist

This section covers the surveyors' observation about the sanitation condition within the households and their surrounding environment. An observation checklist developed and provided for each surveyor to fill after each interview.

General Appearance: The first section of this checklist were questions about general appearance of the interviewees. The surveyors should note down his/her own impressions: If the interviewee has clean dress, washed hands, good finger-nail conditions and clean hair in the first sight. If every thing is very clean, good, acceptable or not good. As you see in Figure 45, 50 percent were in average range while 36 percent were in good condition. In terms of fingernail conditions and handwashing practices, the observation results were very similar.

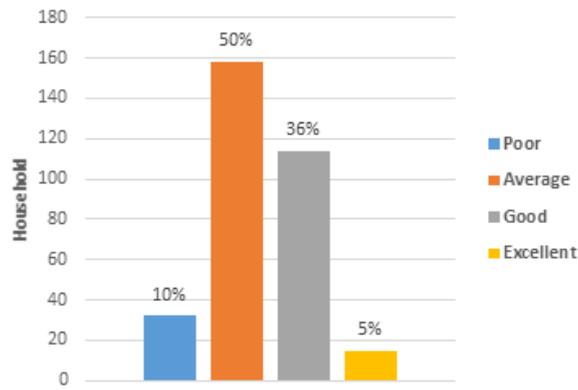


Figure 46: General Appearance

Food storage: the surveyors also asked if possible to have a look inside the kitchens and note down their observations when they were out of the houses.

They should look different hygienic practices such as if food was stored covered and off-ground or in a refrigerator, etc.

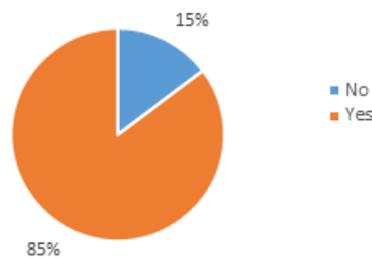


Figure 47: Hygienically Food-storage

The other observation at this part was general condition in the kitchen: if the devices in a kitchen were clean, the general condition was considered good.

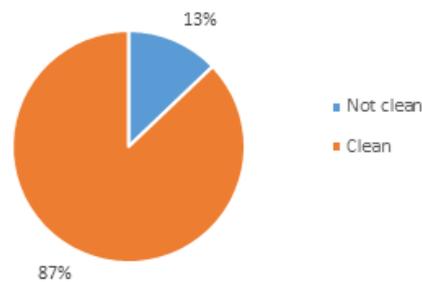


Figure 48: *Kitchen Hygiene Condition*

General Hygiene: Observers had also looked at the general hygiene condition within the houses and surrounding neighborhood to see if generally the environment was clean. There should be no dumping waste around, solid waste should be contained, no stagnant water or odor and the drainage should not be blocked or overflowed. The results were as follow:

72 percent mentioned to good general hygiene while 28 percent mentioned to bad conditions and in terms of cleanliness of the environment, 77 percent mentioned to good condition.

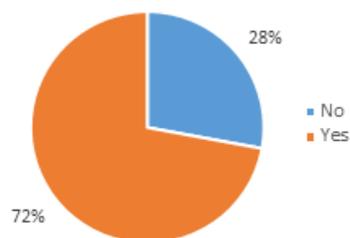


Figure 49: *General Hygiene*

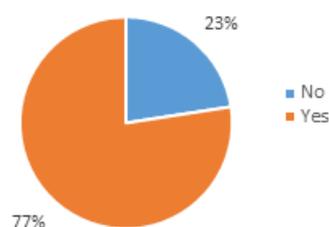


Figure 50: *Cleanliness of Vicinity*

Handwashing facilities: another question in observation checklist regarding hygiene was about presence of handwashing facilities near the latrines; In 45 percent of observation there was handwashing facilities inside or near the latrine while in 55 percent there was no such kind of facilities inside or near the latrine.

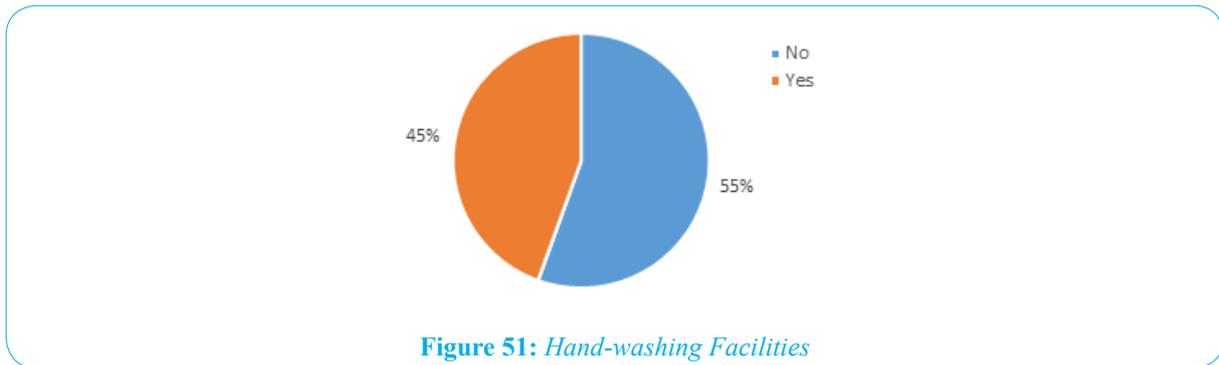


Figure 51: *Hand-washing Facilities*

Lack of handwashing facilities inside or near the toilets is an important factor for public health protection. In respect to dry toilets, handwashing facilities cannot be installed inside the toilet. To have a well-operated system, we need to avoid introducing water into the system. In addition, due to difficulty of proper operation of a dry toilet usually the inside atmosphere is not so pleasant to stay long. In addition, as the last point, dry toilet is usually constructed where households cannot afford a water-based system and immediate hand-washing facility.

Another point is the type of water provision inside the compounds. Most of the households have a tap in their yards. They use the tap for different purposes including water collection, washing the dishes, clothes and their hands. According to the observations, many houses have big yards and water tap is not close to the toilet, but still convenient to use it after visiting the toilets.

Availability of handwashing facilities only at 45 percent of the houses is not equal with the percentage of handwashing practice necessarily. However, according to the interviewees only 42 percent of them cited handwashing practice after visiting toilet.

As a conclusion, it is difficult to say an exact percent for handwashing practice based on the survey and observations. However, the low percentage of the practice is obvious, and beside any kind of physical intervention, public awareness in terms of hygiene at neighborhood and schools is necessary.



Figure 52: Handwashing Facilities

House type: The last question in the observation checklist was the type of dwelling. 52 percent of households are living in shared compounds while 45 percent live in single houses.

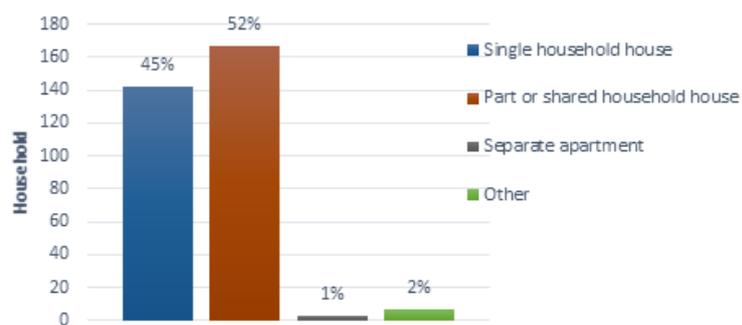


Figure 53: House Type

More than half of the compounds include two households. In many cases one of the household was tenant and more vulnerable. One of the purposes of upgrading projects is improving of livelihood within a community. Therefore taking some measures to avoid increasing of the rent after upgrading could help to achieve projects' targets.

3-13- Focus Group Discussions

To conduct FGDs, the arrangement has been made with the representatives and elderly people in a mosque placed in the neighborhood. Finally on August 9th, separate FGDs for females and males in Imam Reza Mosque were held. During the FGDs several specific questions were asked, but the main trend was only facilitating of the sessions to let the participants discuss openly about all related issues. To have more concrete results, another female FGD on August 29th, 2015 in another venue was also held.

Methodology

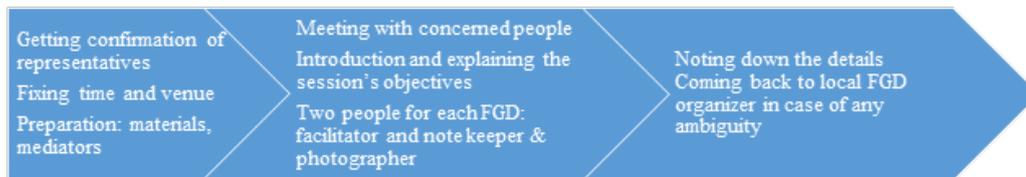


Figure 54: FGDs methodology

Table 1: Male Focus Group Discussion-Site no. 1

No	Date & Time	Venue of FGD	Neighborhood
	August 9, 2015 3:00 PM	Imam Reza Mosque	Itefaq
	Agenda of the meeting/Major Points of Discussion: More clarification about sanitation intervention in the area and get impression about the implemented project within the neighborhood during a discussion with men. Following questions were discussed in the FGD. The correspondent collective answers and important points noted down.		
	What was shura's role in the upgrading project from the early stages of planning to operation and maintenance? There was a council established by KURP project which is not working any more. But during the upgrading the shura was working as a link between our community and the authorities. This is a big neighborhood with many disparities and currently we have three representatives in the area upgraded by KURP.		
	How are the environmental sanitation infrastructures in your neighborhood? Are you satisfied with this level of sanitation provision? What other alternatives you had and why did you choose this? In terms of upgrading components locals are satisfied with road pavements and drainage channels, but their drinking water problems have not been solved despite water provision in the area. Latrine improvement was not also successful: households within the neighborhood are interested in water-based systems and septic technology.		

	<p>How implemented project impact socio-economic aspects of local people especially women, children and elderly people in your Gozar?</p> <p>It was a good initiative and we appreciate it. Before the upgrading transportation was a big problem, people had more problems in terms of water supply and stagnant water, and flooding was a big issue. Although the situation is better now, but still major problems existed.</p>
	<p>What is the community's role for operation and maintenance of implemented environmental sanitation services? And how the community performs its responsibility?</p> <p>First of all, there is no cooperation between government service provider and local people. In-charged persons on behalf of the government are not responsive and reliable.</p> <p>There are some collective action at neighborhood level to keep clean the area, follow up some official works at government and ask for a water supply project in the neighborhood, specially where we face this problem.</p>
	<p>How do you evaluate the upgrading project? Was it a successful or failed project? Why?</p> <p>It was a very good initiative, and solved some problems within the neighborhood. But we are still facing with many challenges specially regarding water supply, and sanitation.</p>
	<p>What is your definition of sustainability in projects? How can we achieve it?</p> <p>Sustainable project is for people and with their cooperation. There is no corruption and based on people's need.</p>

Other Raised points	<ul style="list-style-type: none"> • In terms of latrine improvement people were not satisfied. They preferred water-based systems. But due to lack of enough budget and priority of water supply for locals, sanitation improvement was not priority and the main request by the locals. • There was a trash point constructed by KURP, but people converted it to a public well due to water scarcity. But the well is dry now. • Water supply still a big problem due to improper design, population increasing, providing connection out side of the neighborhood and corruption. • Some drainage has problems and there is leakage into walls. • Many locals are willing to ask from private companies to provide them water. They are expensive, but more reliable. • Roads are paved and local people don't want to destroy their roads with laying down new water distribution network although water shortages is a big problem. • During winter time due to electricity shortage, water services get much worse. • Usually nobody from government come to give us the water bill and ask for the fee. • The level of water problem is different within the neighborhood, but central part of the area has much more problem.
---------------------	---

Table 2: Female Focus Group Discussion-Site no. 1

No	Date & Time	Venue of FGD	Neighborhood
	August 9, 2015 3:00 PM	Imam Reza Mosque	Itefaq
	Agenda of the meeting/Major Points of Discussion More clarification about sanitation intervention in the area, and also getting impression on the implemented project within the neighborhood during a discussion with men living in the community. Following questions were discussed in the FGD. The correspondent collective answers and important points noted down.		
	What was shura's role in the upgrading project from the early stages of planning to operation and maintenance? Local people were not aware of the shura established for the Kurp Project. But they had another shura currently consisted of only men and they gather when it is needed. If something should be done within the neighborhood, the current shura take the initiative.		
	How are the environmental sanitation infrastructures in your neighborhood? Are you satisfied with this level of sanitation provision? What other alternatives you had and why did you choose this? Drainage channels is fine but solid waste management, water supply services and improved latrines have many problems and sometimes useless. There was no options for us, but we preferred to have water supply due to its priority in the community though it doesn't work well.		
	How implemented project impact socio-economic aspects of local people especially women, children and elderly people in your Gozar? Now we pay less money for transportation, and need less time to keep clean our home.		
	What is the community's role for operation and maintenance of implemented environmental sanitation services? And how the community performs its responsibility? Everything was done through the shura which was consisted of the community representatives. If they decided to do something, the whole neighborhood would do it. But due to the size of KURP upgrading area, the neighborhood had three different parts with three representatives and shuras. There meetings with people and shuras belong to different parts.		
	How do you evaluate the upgrading project? Was it a successful or failed project? Why? In terms of road pavement and drainage channels, it was successful. However, other environmental sanitation components don't work properly.		
	What is your definition of sustainability in sanitation projects? How can we achieve it? If people are satisfied and convenient with a service, they use it in a proper way.		
Other Raised points	<ul style="list-style-type: none"> • They were not satisfied with their toilets because of odor and unhygienic conditions and in case of long term loans were ready to construct new toilets. • Local trash point which was constructed by KURP was useless and someone was hired to collect the garbage and take it to the main street where municipality collected the waste. • People were satisfied with their drainage system except one who had a yard lower than the street level. • After KURP water supply project local wells got dry and Kurp project was the only source of water for local people though their system didn't not work properly. They couldn't provide water to people more than one or two hours per day. Households collected water during that time and used it. The time of distribution was not even scheduled and locals didn't know when time they had access to water. • People asked at least there should be a determined time for water distribution. They mentioned that " it is difficult to wait whole the day for water." • Many new comers and changes in the neighborhood who didn't know well about the history of the upgrading project well. • It seems during the project design and implementation, authorities had not considered the population increasing. 		

Table 3: Male Focus Group Discussion-Site no. 1

Date	Time	Venue of FGD	Neighborhood
	August 29, 2015 Time: 2:30 PM	Shenakht Educaiton Center	Itefaq
<p>Agenda of the meeting/Major Points of Discussion</p> <p>The first women FGD was not very productive and participation was low. The other reason to hold the second FGD was to talk about the sanitation problems in other parts of the neighborhood. In additon, there was a chance to hold another Females FGD.</p>			
<p>What was shura's role in the upgrading project from the early stages of planning to operation and maintenance?</p> <p>According to the participants there was no shura, but households had a representative who managed collective works and if needed community meetings.</p>			
<p>How are the environmental sanitation infrastructures in your neighborhood? Are you satisfied with this level of sanitation provision? What other alternatives you had and why did you choose this?</p> <p>There were some sanitation facilities, but still there were operation and maintenace problems. The general situation comparing to the past was much better, but the project had not achieved its goal completely.</p> <p>In terms of alternatives, there was no many options. KURP authorities came to us and asked about our main problems to discuss. They did not have enough budget and we asked them to provide us water and pave the road as the first priorities.</p>			
<p>How implemented project impact socio-economic aspects of local people especially women, children and elderly people in your Gozar?</p> <p>In the past households and specially women and children had to stay at long que to collect water. Transportation cost was very high due to muddy streets. In summer time dust and air pollution was everywhere. Though there was some problems but the situation after Kurp was much better.</p>			
<p>What is the community's role for operation and maintenance of implemented environmental sanitation services? And how the community performs its responsibility?</p> <ul style="list-style-type: none"> • In terms of water supply community had not specific role, everything was managed by the government. But the community was ready to pat the bills on time. • Main drainage channels were operated by municipality and minor streams & channels were operated by locals. There was no collective action to clean the drainage and everybody was in charge of its own immediate environment. • Regarding solid waste, municipality had some collection points across the main street. Kabul Municipality only collect solid waste from those points and households sometimes from far away areas should bring their waste to the collection points. • Some areas had a hired person to collect their solid waste door to door and take it to the collection points. • In terms of wastewater and fecal sludge each household was individually responsible to manage its fecal sludge. 			
<p>How do you evaluate the upgrading project? Was it a successful or failed project? Why?</p> <p>Road pavement component was successful. Drainage construction was almost successful but in terms of wastewater, water supply and solid waste management there were many problems.</p>			
<p>What is your definition of sustainability in sanitation projects? How can we achieve it?</p> <p>“If there is cooperation between locals and authorities and people within a community can work collectively, there is a good chance of sustainability.”</p>			

Other raised points	<ul style="list-style-type: none"> • Drainage channel was not big enough for crowded areas. In the main street of the neighborhood there was public bath which discharged its wastewater into the public drain which caused many problem. • Also municipality's staff clean the street and throw away the soil and dust into the channel & make a layer of mud in the drainage channel. • In some part of the public drain there was stagnant water. • There was no enough trash points in the area. There was no public tap or well in the area which was needed. Despite current water network in the area, still public well & tap was necessary. • Water availability due to KURP project was better, but due to power shortcoming especially in wintertime, access to water was also a big problem, no power was meant no water as well. Access to water is not permanent...people had water only during the day and in winter time even less. They had to store water for night time. • Last winter for more than one month we had no power and consequently no water. • People had to restore water sometimes even for one or two weeks which made the water unhygienic. • Affordability was also a big issue, the water price was 6 Afs/ m³, but later changed to 12 and now 25. In many cases water price in informal area is several times higher than formal neighborhoods. • At this area people usually don't have their own well due to water scarcity....most of private wells don't have water any more. • There was no enough trash point in the area. In addition, municipality did not collect the waste on regular basis. That is why many households were using their dry wells as trash point: the wells were deep enough and there was no odor. • In terms of toilets the doors, which were installed from the outside, improved the situation from outside but no change inside the yard. Also it is really difficult to find people/companies to collect sludge of traditional toilets. The area was unplanned and difficult to find an address, also there was no much demand for night soil. • Most of people who had septic or cesspit also couldn't afford to pay for vacuum trucks. The service charge was too high comparing to households' income.
---------------------	---



Male FGD



Female FGD

Figure 55: FGD in Site No. 1

4- Findings of the household survey in site no. 2

4-1- General Information

Gender and age: As you see in the Figure 56, the majority of respondents, 59 percent, were female. According to Figure 57, the average age of the respondents was 36.

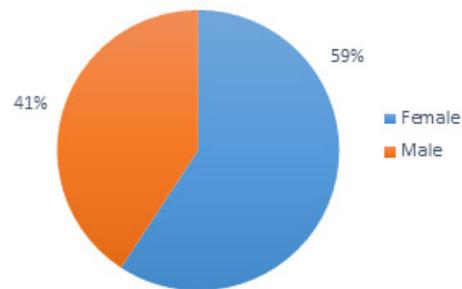


Figure 56: Gender of Respondents

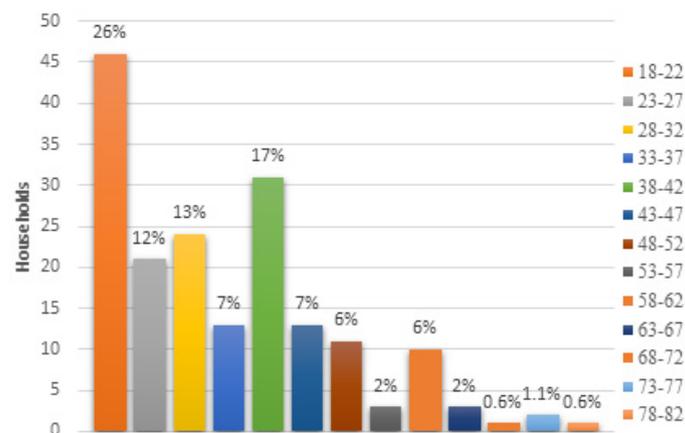


Figure 57: Distribution of Respondents' Age

The percentage of interviewed women was higher than interviewed men, which was logic due to the unavailability of men during the day. In daytime men mostly are on work and women were mostly housekeeper and at homes.

Education level of interviewees: Despite mostly simple enough questions to be answered by all beyond 18 years old in each household, the education level of the interviewees was asked. As you see 34 percent don't have formal education and following that 30 percent have primary education.

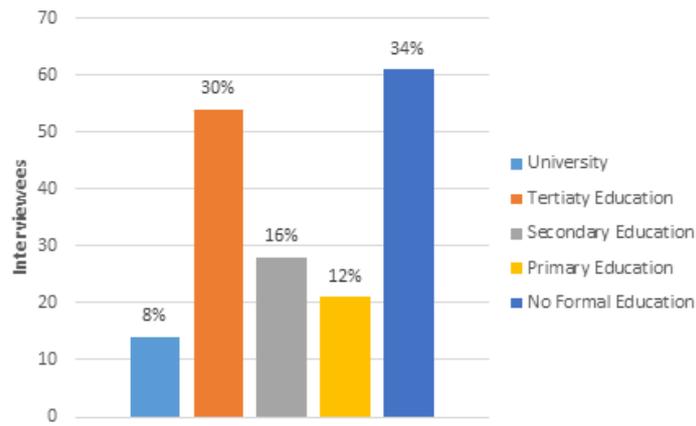


Figure 58: Level of Formal Education

4-2- Household Information

Head of family and family members: According to below figures, the percentage of family head among interviewees were 29 percent and almost 70 percent of households were 6-10 members that is a normal range for an Afghan family. Based on the survey results in average each household had eight members.

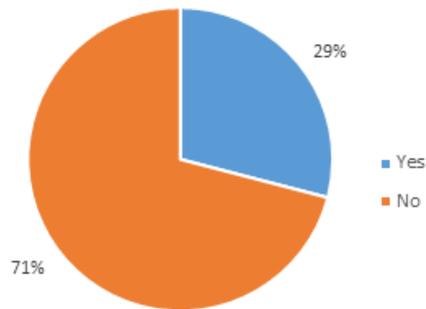


Figure 59: Family Head

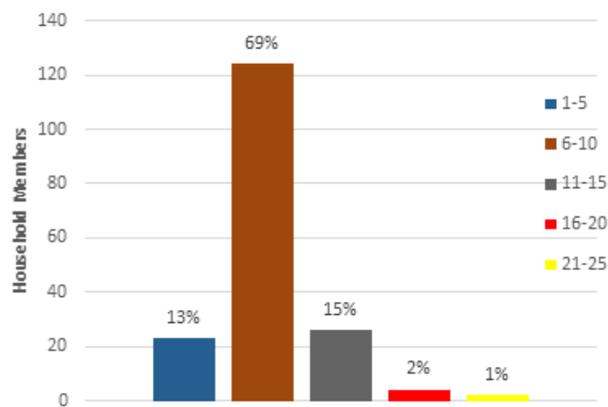


Figure 60: Household Members

Land tenure: Dehghouchak is a hilly area and access to enough space was not always possible. More than 70 percent of the interviewees were property owners and they didn't have tenants.

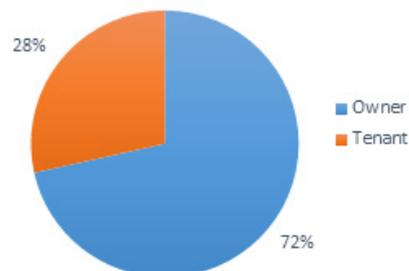


Figure 61: *Landlord versus Tenant*

Due to hilly characteristic of the neighborhood, there was no enough space to have tenant, leave alone that usually tenants prefer to stay in a flat area; land ownership within the neighborhood is higher than the average in Kabul City.

4-3- Water

Source of water: In terms of access to water for sanitation, washing and drinking purposes 87 percent of people had water tap in their yards providing by the government. The percentage was same in different seasons and according to the survey, there was no major water problem.

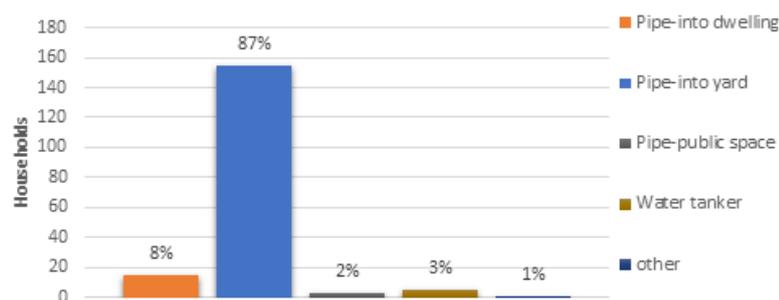
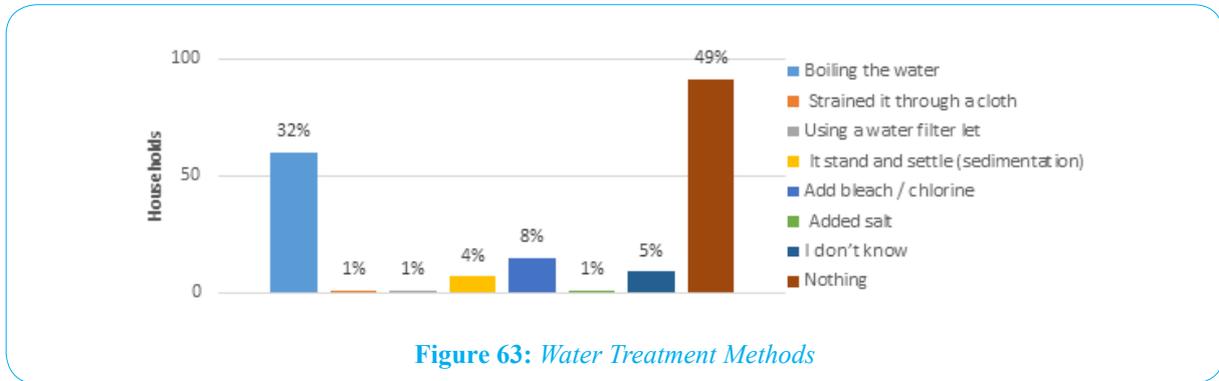


Figure 62: *Water Source*

Almost all the households had access to pipe water within the neighborhood. About four percent who had no access to the pipe water within their compound were still able to collect water from public tap or mosque, which was free, and in walking distance.

Treatment method: Regarding water quality according to below figure, 32 percent of households boiled the water for further treatment. But still quite a big number had no more treatment more than what AUWSSC did.

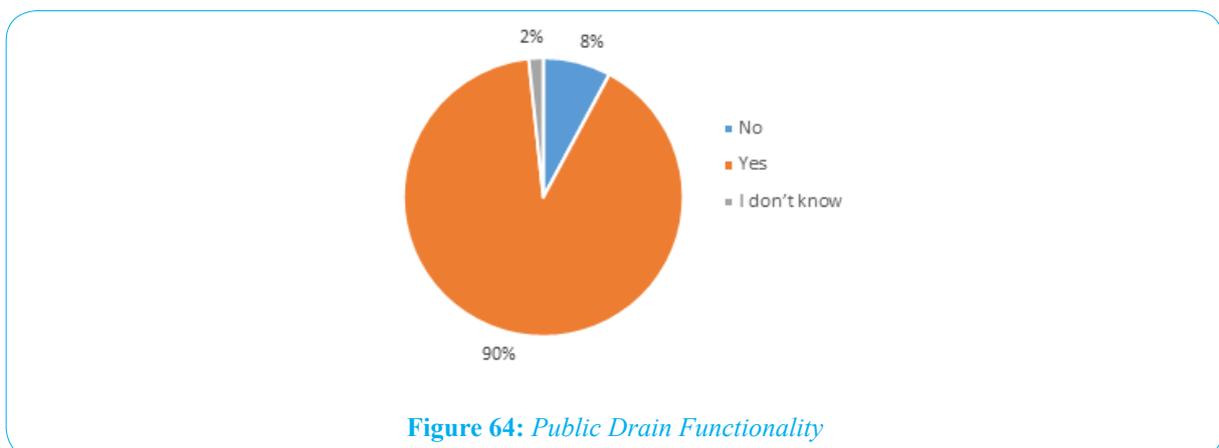


It seems the main concern in terms of water was its quality and people especially during warm seasons tried to boil the water; but still 52 percent of people washed their food, fruits and vegetables with the water.

4-4- Drainage System

Three questions regarding drainage system were asked. The questions covers functionality, problems of stagnant water and flooding in the area.

Drainage condition: According to three next graphs, 90 percent of households believe there was no problem with functionality of their drainage system while 30 percent were complaining about stagnant water in the neighborhood and 22 percent were affected by flooding problems in rainy seasons.



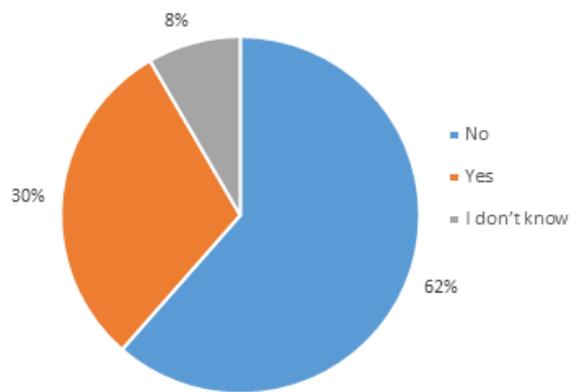


Figure 65: *Stagnant Water in the Neighborhood*

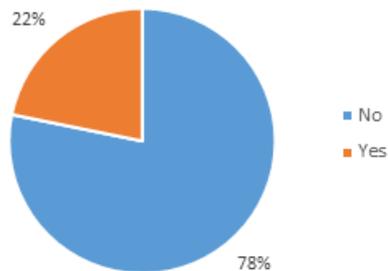


Figure 66: *Flooding in the Area*

It seems there were some problems with functionality of public drain but mostly due to below reasons:

- Lack of proper solid waste management, which blocked many canals, and during rainy seasons in lower areas within the neighborhood could cause flooding. During direct observation within the area, lack of proper solid waste management was observed.
- Households in the area discharged their black water and greywater into the drainage system. It created severe health and dysfunctionality problems.
- There was no proper operation and maintenance in place; there were many blockage due to the solid waste and high amount of wastewater in the channel.
- The public drain was connected to a main canal located in a congested street that was full in many time with solid waste. This situation also affected the functionality of the public drain.



Box 4: Drainage System

In site two, the public drain is usually used for all kind of domestic wastewater disposal while the majority of the households use water-based system.

Lack of proper solid waste management and drainage maintenance block the public drain. Above that covered public drain, make difficult operation and maintenance of the drainage system.

At the end, the public drain is located in a congested street without proper maintenance that makes the situation worse.



4-5- Sanitation Management

This section has nine questions about sanitation issues in the neighborhood.

User interface: The first question is asking about the user interface in each household. 63 percent of the households are using flush toilet, and 37 percent rely on dry toilet; among this 37 percent, 20 percent are not improved latrines.

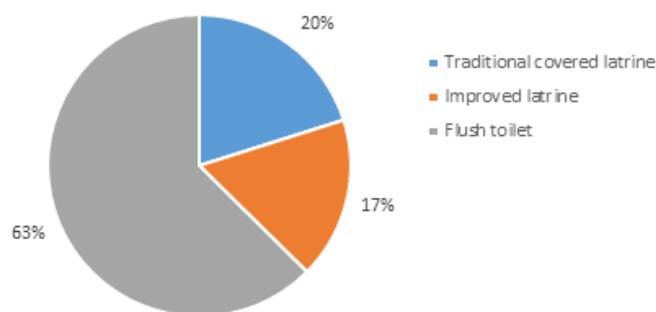


Figure 67: User Interface in the Neighborhood

Site two is an old and historical site, and some houses are constructed below the street level. Therefore, the number of unimproved toilets either no improvement during the project or facing some damages after the upgrading is high.

The survey results show that currently 63 percent of the households use flush toilets; according to a survey by the KURP project in an adjacent neighborhood which is hilly area and very similar to our case study, 88 percent of the households had traditional toilets before the upgrading (SMEC International, 2008).

Above that during KURP project in the site, only dry toilets were improved. Therefore almost all the houses with water-based toilets, have converted their traditional toilets to a wet system. In the area there is only one communal septic tank constructed by KURP, which covers only 13 houses.

Final disposal: depending on the technology, manual and mechanical emptying is available and usually provided by the private sector. When the households were asked about the final disposal of their wastewater or night soil, 60 percent of residents did not have any idea.

29 percent discharged their wastewater directly into the drainage channels. 10 percent think their wastewater is taken for further treatment and one percent, who have dry toilet, mentioned to agricultural areas. It should be noted that many households were not willing to mention that their blackwater was discharged into the drainage system directly. Above that due to difficulty of the night soil disposal, many households with dry system, dispose their night soils using the rainy weather opportunity. The rainwater washed away down the night soils, which created many problems in the downhill especially in the downtown.

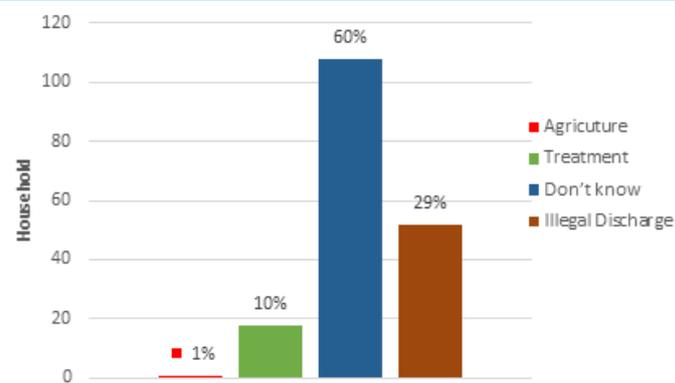


Figure 68: Final Disposal

During the Kurp project, there was no plan to consider the whole sanitation chain. They focused mainly on household level and dry toilet improvement. Households were not really aware of the final destination of waste. There was no guarantee even for further the treatment after waste collection by the service providers.

Toilet sharing: Answering to “how many people within your compound share the toilet?” 31 percent answered 2-7 persons and 50 percent of interviewees answered 8-13 persons are using one toilet. But among 13 percent of residents 14-19 people shared one toilet and six percent were 20-25 people with a shared toilet.

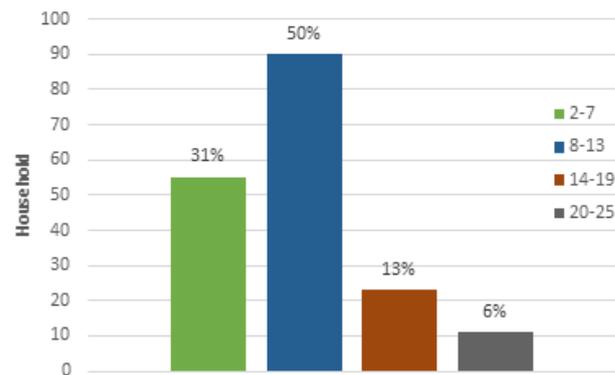


Figure 69: Toilet Sharing In the Area

Usually in the old houses there is only one toilet within each housing compound and all the households use the same toilet. It is noteworthy that 41 percent of households live in a shared house or apartment, which means they share most probably their toilet as well.

According to JMP¹, shared toilets cannot be considered improved (Rifat Hossain 2015). But despite sharing, many of these toilets are also in good conditions. In fact, only people who know each other, live in the same compound use the toilet. They also share responsibility to clean it.

Fecal sludge collection: 69 percent of households mentioned not emptying their toilet facilities, while 21 percent has mentioned to private sector and two percent to Kabul Municipality. Four percent of people didn't know about it.

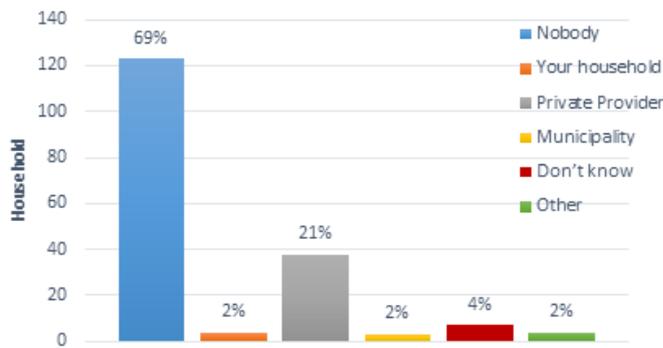


Figure 70: Fecal Sludge Collection

Usually there was no possibility for the households who used dry toilets to dispose their fecal matters on the streets. Such kind of practice was not allowed. Usually people with dry toilet took the dry feces by animal cart to agricultural areas. But due to difficulty of the night soil disposal and also low demand by the farmers, many households with dry system, dispose their night soils using the rainy weather opportunity. The rainwater washes away down the night soils, which creates many problems in the downhill especially in the downtown.

¹ Joint Monitoring Program (UNICEF & WHO)

69 percent of the respondents mentioned to ‘nobody empty their toilet facilities.’ Most probably they had connected their facilities to the public drains which was neither legal nor easy to say it. 13 housing compounds relied on the communal septic tank, but according to the community’s representative sometimes the overflow of the septic tank discharged into the public drain.

Frequency of emptying: 64 percent of households didn’t know how often their toilets get emptied while 15 percent mentioned to direct discharge to the drainage channels.

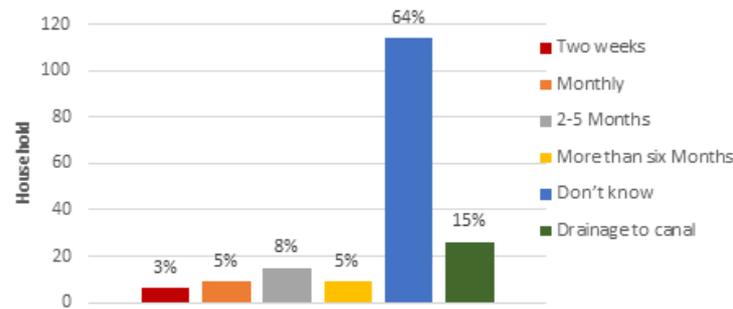


Figure 71: Frequency of Emptying Containment

Most of the households within the neighborhoods were using flush toilets; they connected their facilities to the public drains, communal septic tank or in few cases to individual septic tanks or soak pits. In few cases, there are individual septic tanks or soak wells. However, due to the rocky ground in the area and difficulty of excavation, it is very rare. In some parts of the neighborhood, it is difficult to be connected to the public drains or the street is higher than the housing units and the households have to rely on dry system. Discharging wastewater into the public drain is not legally allowed and many households are not willing to talk about their connections.

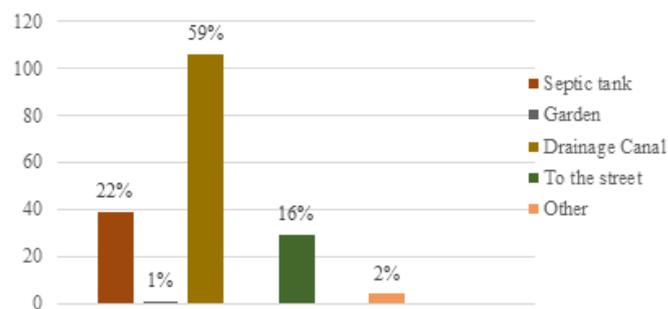


Figure 72: Discharge of Greywater

Greywater discharge: In terms of greywater, almost 60 percent of households discharge their greywater without treatment in the drainage system while 22 percent use septic tank and 16 percent discharge it on the streets. Discharging greywater into the streets or public drains without treatment is a normal practice in many part of the city. If households have the possibility, they usually do it; in site two about 59 percent of the households discharge their greywater in the streets. Most of the remaining households most probably are not able to use the public drains easily for that purpose.

Sanitation satisfaction: Mostly people are satisfied with their sanitation facilities, 76 percent, and their reasons for that is cleanliness and convenience while unsatisfied households have mentioned to dirty condition, fly and odor.

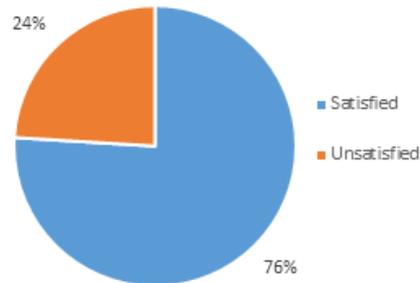


Figure 73: Level of Satisfaction

The reasons mentioned for the lack of satisfaction show that most probably the households with dry toilets are not satisfied with it. Dirty condition, fly and odor usually is the case with improper maintenance of dry toilet.

User preference: in terms of user preference almost 90 percent prefer water-based system and specifically flush toilet while only five percent are interested in dehydrate and six percent in traditional system.

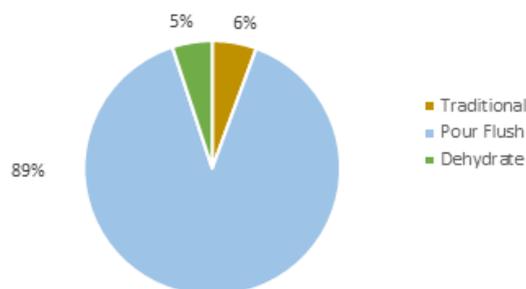


Figure 74: User Preference Technology

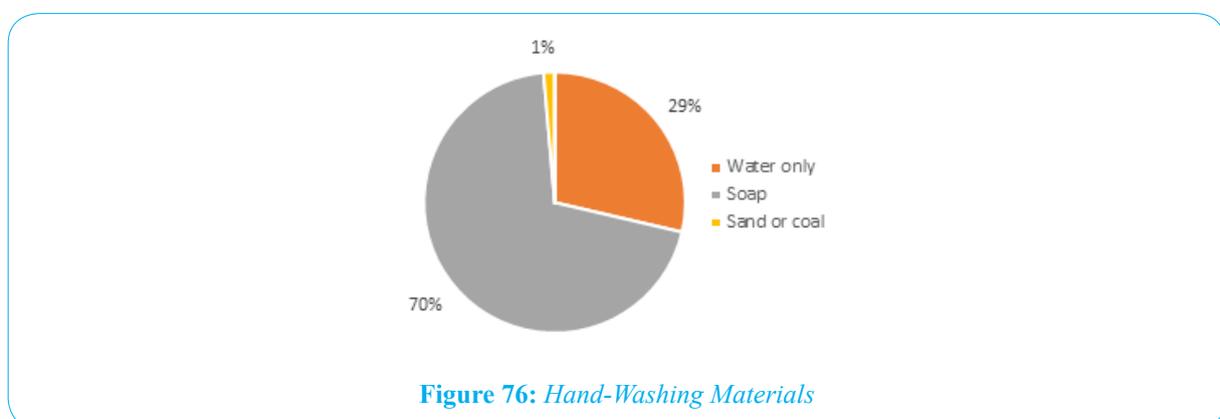
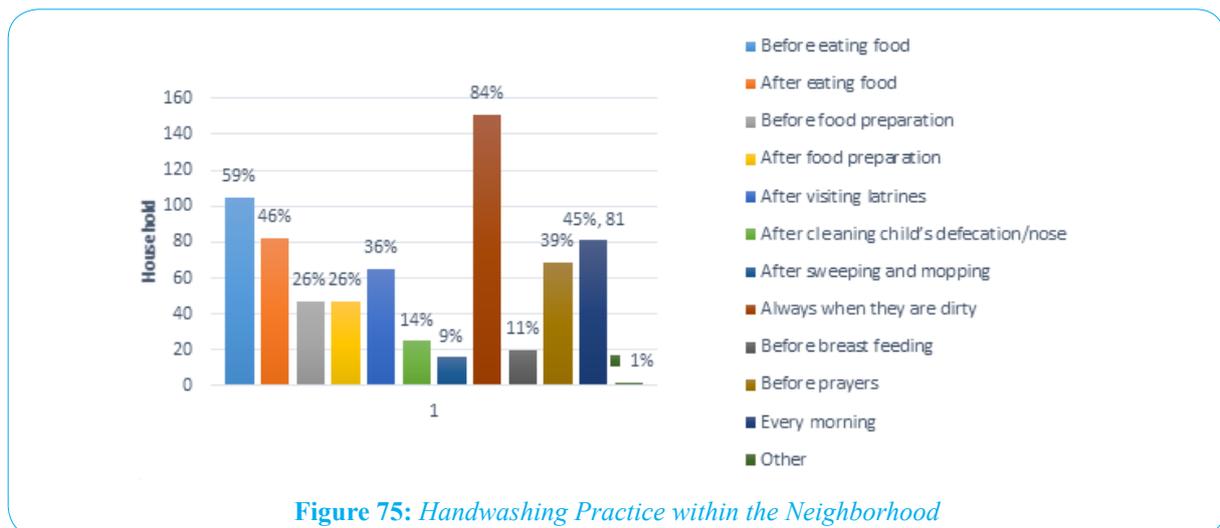
Since the upgrading project there has been a big change in sanitation practice in the area. But still considering user preference which is almost 90 percent, the current percentage of water-based system is low. The reason which has forced some households to stay with dry system is lack of possibility for connection to the drainage system, otherwise most of the households are interested in water-based system.

4-6- Hygiene

Although practice does not always correlate with the knowledge, during this subject and some others we are trying to make a link between hygiene awareness and practice.

Handwashing practice: For this question, interviewees were allowed to choose several answers. As you see, the highest percentage is 84 percent which shows handwashing practice when it is needed. But at the same time only 36 percent mentioned to handwashing practice after visiting toilet which is needed or only 59 percent have mentioned to handwashing practice before eating which shows probably quite a big number are not aware of importance of handwashing after visiting toilet or before eating.

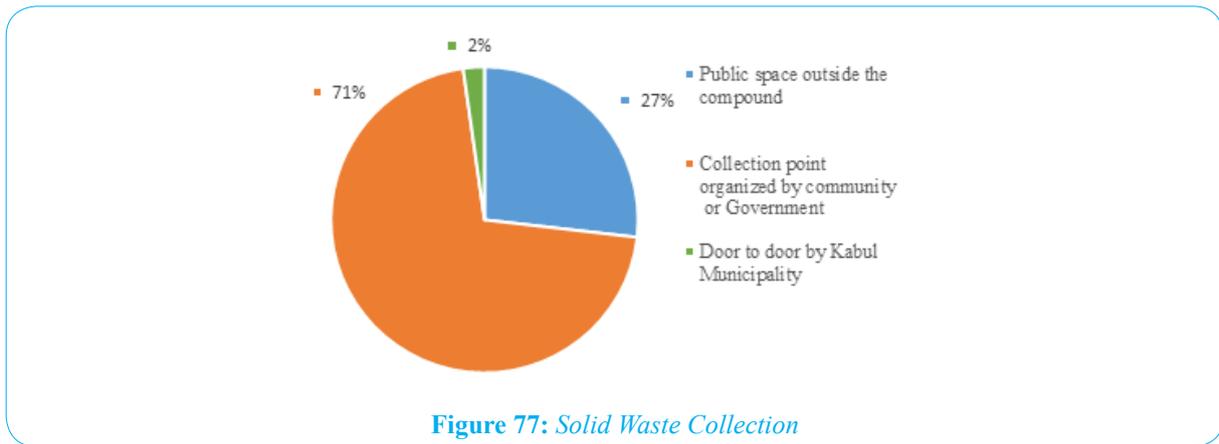
Handwashing material: 70 percent mentioned to soap and 29 percent to only water.



Personal hygiene is a very important part for sanitation improvement, and should be considered in different studies. Hygiene has usually two main aspects: awareness of personal hygiene, and possibility of putting the knowledge into practice. To increase the above-mentioned percentages working on both aspects are needed.

4-7- Solid Waste Management

Solid waste collection in the neighborhood: 71 percent use collection point allocated to solid waste, and 27 percent use public space in the neighborhood while two percent have access to door to door collection.



There was no door-to-door collection by Kabul Municipality within the neighborhood, but some shops and houses located in the main street have the chance to get collected their solid waste by the municipality. There were some open spaces within the neighborhood, which was used for solid waste disposal although not legally allowed. Kurp project constructed a trash point in the neighborhood that was used by the locals although it was not in a good condition.

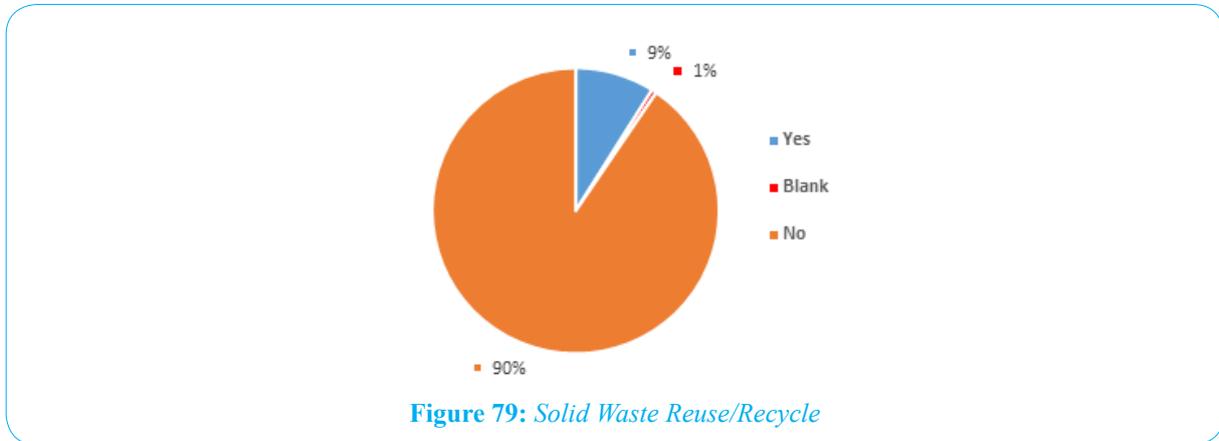


Figure 78: Solid waste Management

There was a collection system established by KURP project: the community had hired several people who were collecting the waste and receiving their salaries on a monthly basis from the community. The collection system didn't work longer in all parts of the neighborhood. Above that some households, mostly without collection system, disposed their solid waste in open spaces which mostly led to clogging of the public drains.

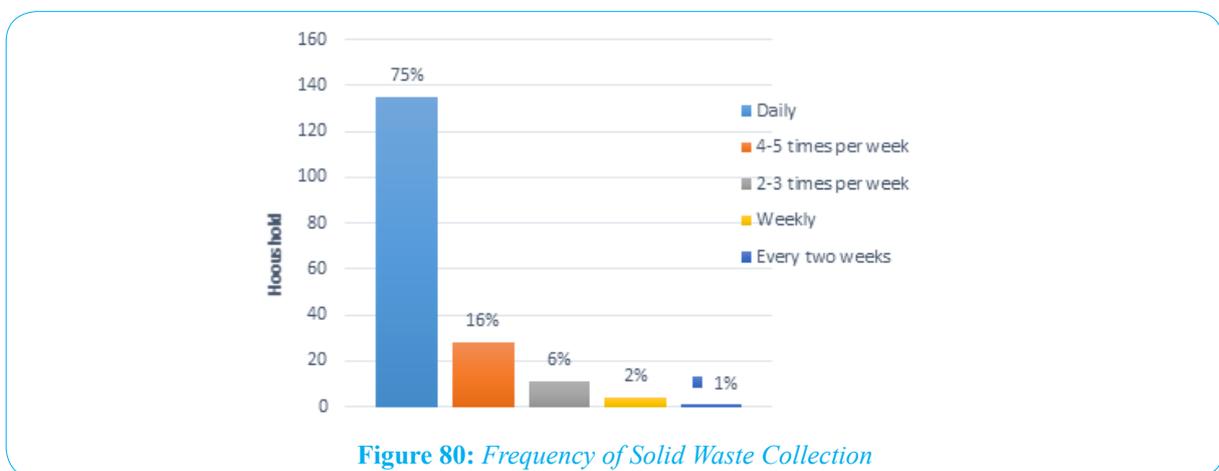
Kabul Municipality has put big garbage bins usually across the main streets, and its workers don't go through the neighborhoods to collect the waste door to door.

Reuse or recycle: nine percent of the interviewees reuse or recycle their solid waste mostly as fuel, animal food or sell them. Some interviewees who don't like any kind of re-use or recycle mentioned to odor problem and dislike to deal with garbage as the reasons.



In terms of re-use and re-cycle, 90 percent of people don't re-use or re-cycle their waste. They mentioned odor and dirtiness as the main reasons. Nine percent re-use or re-cycle the waste mostly as burning materials, food for animal or for selling.

Frequency of collection: 75 percent of households mentioned to every day solid waste collection, and 16 percent to 4-5 times collection per week.



Medical waste: And finally as the last question in this part, 25 percent of interviewees mentioned to presence of syringes and needles in the solid waste in the area.

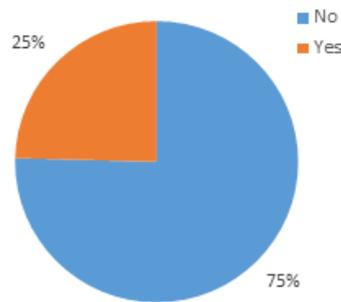


Figure 81: Medical Waste in the Garbage

Existence of medical waste like syringes and needles in solid waste which is in direct contact with children within the neighborhood shows comparing to waste water people have less awareness about unseen danger of improper management of solid waste.

4-8- Health Issues

To understand sanitation-related health problems, three questions regarding health issues in different seasons and preventive measures were asked. Interviewees were allowed here to provide several answers to each question. Occasions with percent of zero were ignored here.

Health issues-summer: in summer time 30 percent are affected by diarrhea, and cold is the second health problem with 26 percent, while cough with fever follows with 18 percent. 42 percent of people mentioned to no illness during the warm season.

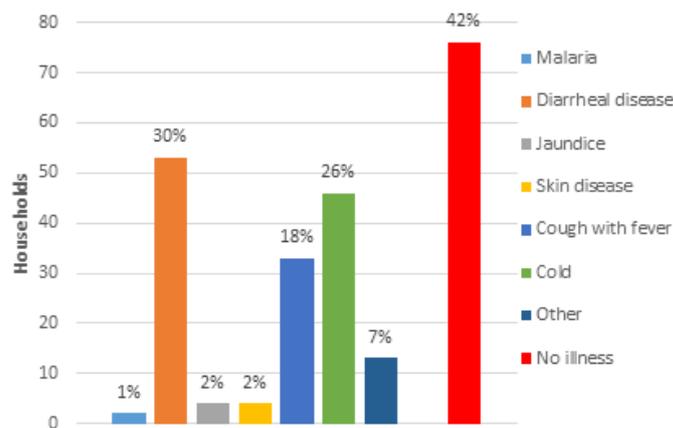


Figure 82: Health Problems in summer

Health issues-winter: In cold season the health situation is a little bit different; 46 percent mentioned to cold, following 36 percent to cough and nine percent no illness.

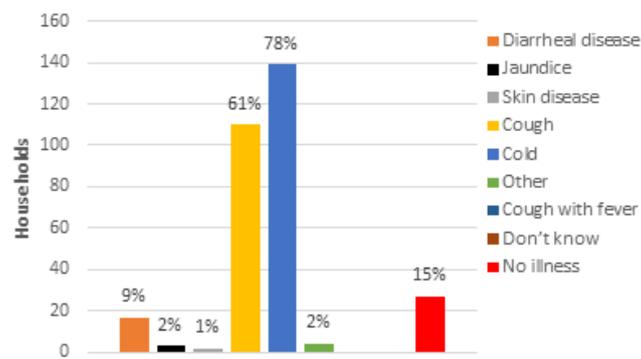


Figure 83: Health Condition - winter

Preventive measures and treatment: 27 percent mentioned to medical treatment by an expert, following 18 percent using of safe drinking water, and 16 percent has mentioned to mosquito net to prevent diseases.

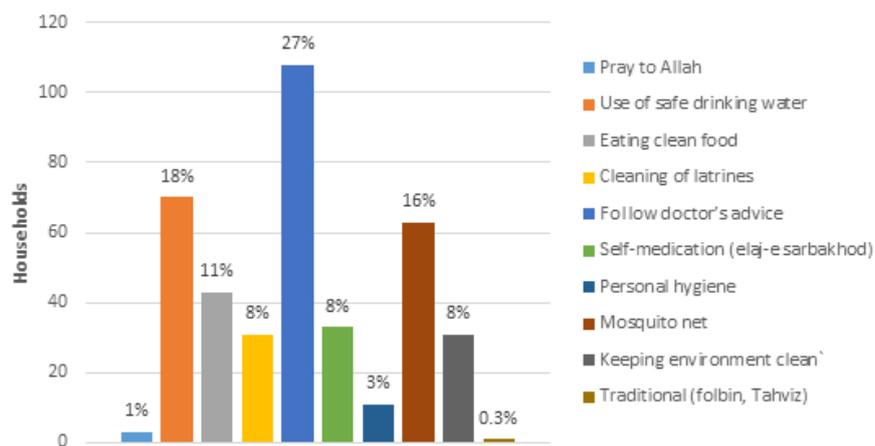


Figure 84: Healthcare Measures

The local community face with less illness during the warm seasons; 33 percent reported no illness in this period. But in terms of waterborne diseases, we have more cases in warm seasons. Respondents have mentioned to Diarrheal disease in winter time 6 percent while in summer time it is 23 percent. To understand the main reason behind the high rate of diarrheal disease, water sampling and health investigation in the area is needed which was beyond the scope of this survey.

According to KURP Report, the rate of Diarrheal disease before the project implementation was almost 9 percent (SMEC International, 2008) in autumn in similar neighborhoods. But still there is a high rate especially in hot seasons which shows the low impact of project in the neighborhood in terms of health improvement.

The other major problem in winter and summer time is cough. There are several reasons behind this problem including air pollution. Improper management of dry toilets and solid waste management contribute to the air pollution.

The percentage of diarrheal diseases in winter is six, but in summer time is 23 percent. Comparing to the rate of diarrheal diseases before the project implementation which is nine percent in autumn 2007, there is no significant changes which shows the low impact of the sanitation intervention at least in terms of water-borne diseases (SMEC International, 2008).

4-9- Financial Issues

In terms of financial issues five questions were asked. The first question was about salary scale. Almost half of the households receive 10,000-20,000 Afs per month. The second largest group receive 20,000-30,000 Afs per month.

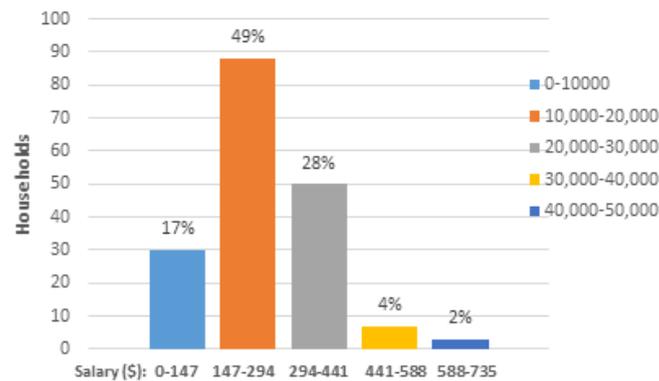


Figure 85: Salary Scale

Comparing Afghanistan GDP per capita which is 413 \$, the monthly salary scale within the neighborhood is acceptable and locals can afford their sanitation cost.¹

Service fee: in the neighborhood, 71 percent of population pay nothing for sanitation services, if we do not consider the money paid for water consumption.

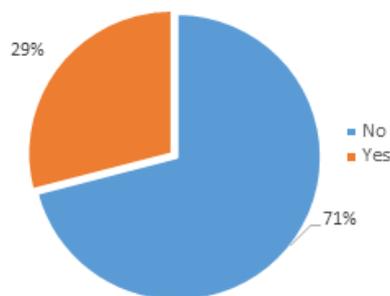


Figure 86: Financial Contribution

¹ <http://www.tradingeconomics.com/afghanistan/gdp-per-capita>

The basic rate for water consumption in the neighborhood is 25 Afs per cubic meter, but there is tariff structure in place which increases the rate in case of high consumption. Although many people don't pay for solid waste collection or wastewater discharge, they have to pay sometimes to municipality labors to collect the solid waste or clean the public drains.

In terms of night soil collection fee, households should pay in average 700 Afs and to get emptied their septic tanks or soak pits the charge is about 2000 Afs per household.

Local government has not been involved much in sanitation provision so far and the community is used to pay for environmental sanitation services. Above that comparing sanitation fees against households income, paying for sanitation services at least for regular operation and maintenance looks possible.

Willingness to pay: People were asked about their willingness to pay more for sanitation cost if needed. 40 percent of households don't want to pay more, but 60 percent are willing to contribute more if needed.

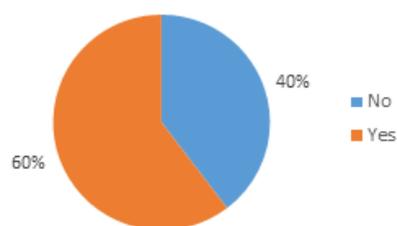


Figure 87: *Willingness to Pay*

Current percent of willingness to pay is not so much comparing with households' income and the reason could be the satisfaction of households regarding current environmental sanitation. The main driver behind this satisfaction would be convenience; despite many potential danger associated with the current sanitation practice within the neighborhood, still most of the respondents are satisfied and don't see any need for more investment.

4-10- Satisfaction

General environmental sanitation: almost 72 percent of population are satisfied with current situation dividing in three main categories including 42 percent satisfied, 25 percent very satisfied and 15 percent a little satisfied, while 17 percent are dissatisfied.

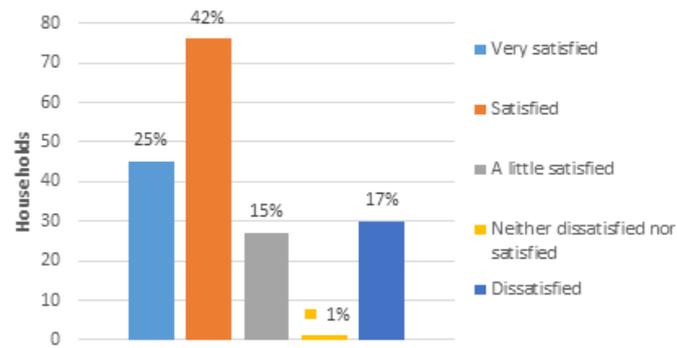


Figure 88: Satisfaction level

Operation and maintenance: The second question was asked about their satisfaction with current operation and maintenance in the neighborhood: 22 percent very satisfied, 38 percent satisfied, 18 percent little satisfied and 20 percent dissatisfied.

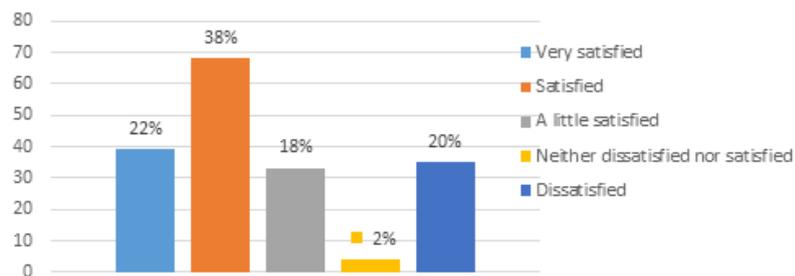


Figure 89: Satisfaction with Operation and Maintenance

In terms of satisfaction 82 percent of households are satisfied with the current environmental sanitation services. But 78 percent think current operation and maintenance is fine. The high level of satisfaction despite high percentage of direct wastewater connection into the public drain and also some other mismanagements show convenience is an important driving factor in sanitation. It also shows households are not aware enough about the environmental dangers caused by this kind of sanitation practices.

4-11- Urban Previous Setting

In terms of urban living culture, three questions were asked from the interviewees. The first question was asking their previous setting.

Previous setting: 75 percent have been in Kabul City while 11 percent came from another country and nine percent from rural areas.

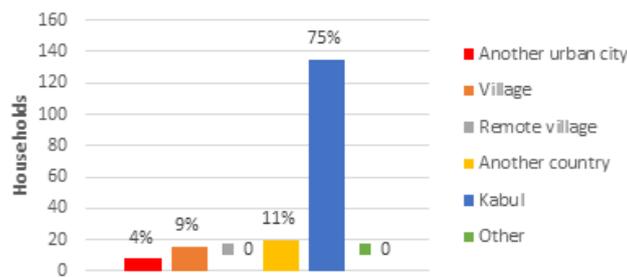


Figure 90: Previous Living Location

Community action: Respondents also asked about any community action to keep clean the neighborhood; 37 percent answered there is no any community action while 63 percent mentioned to existence of a collective action for environmental purposes.

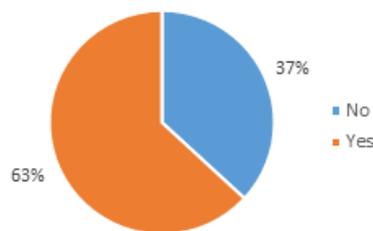


Figure 91: Community Action

Reliability of neighbors on each other: 71 percent believe that neighbors can rely on each other for support, friendship and knowledge of events while 12 percent do not believe in reliability of their neighbors and 16 percent think it is not always.

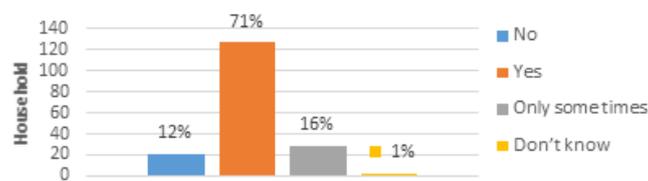


Figure 92: Community Cooperation

4-12- Observation Checklist

General appearance: The surveyors should note down his/her own impression: If the interviewee has clean dress, washed hands, good finger-nail conditions and clean hair in the first sight. If every thing is very clean, good, acceptable or not good. 49 percent of the interviewees were in an average range, following 34 percent with good condition and seven percent with excellent condition while 11 percent were poor.

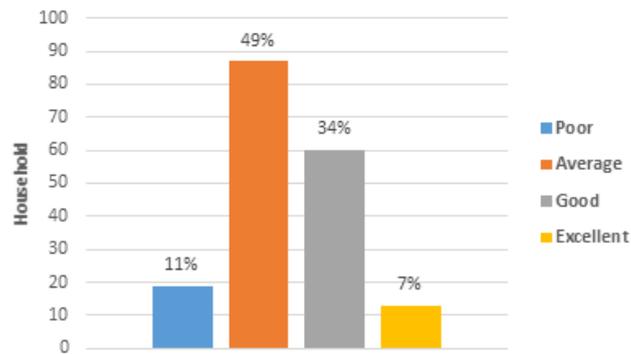


Figure 93: General Appearance

Food-storage condition: 60 percent of the households stored their food hygienically which means clean, off-ground and covered. And in 55 percent the kitchens were in a good condition.

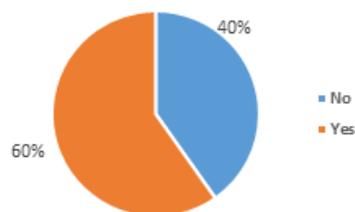


Figure 94: Food-Storage Condition

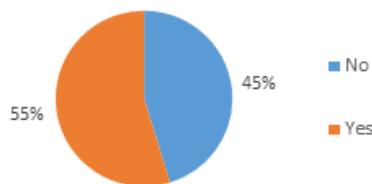


Figure 95: Kitchen Condition

Regarding general appearance, fingernail and handwashing practice almost 90 percent looks average or good, which shows a high level of personal hygiene within the area. But in terms of hygiene condition in the kitchens and keeping food in a clean place the percentage is about 60 percent which is not so high.

General hygiene: according to the survey results, cleanliness is totally 69 percent while 31 percent noted down no clean, and regarding the cleanliness of the surrounding neighborhood 47 percent mentioned to cleanliness of the surrounding area out of the compound.

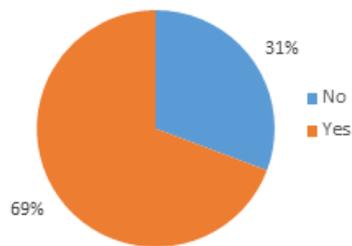


Figure 96: *General Hygiene*

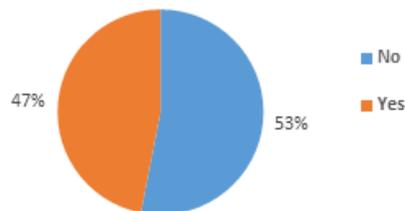


Figure 97: *Cleanliness Of The Neighborhood*

People have more attention to keep clean within their compound comparing the area surrounding, that is why while the percentage of cleanliness in the house is 56 percent, it is 47 percent for the surrounding areas; it means there is no strict obligation or consensus between the communities to cooperate and keep the neighborhood clean.

Handwashing facilities near the latrine: 52 percent of people have no hand-washing facilities near the latrine which is too high, and justify the low percentage of households who mentioned to hand-wash practice after visiting toilets.

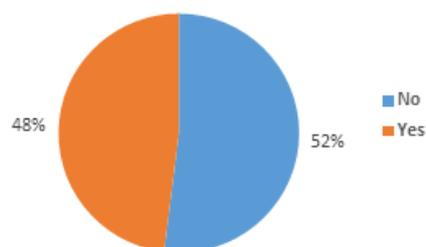


Figure 98: *Hand-Washing Facilities near the Latrine*

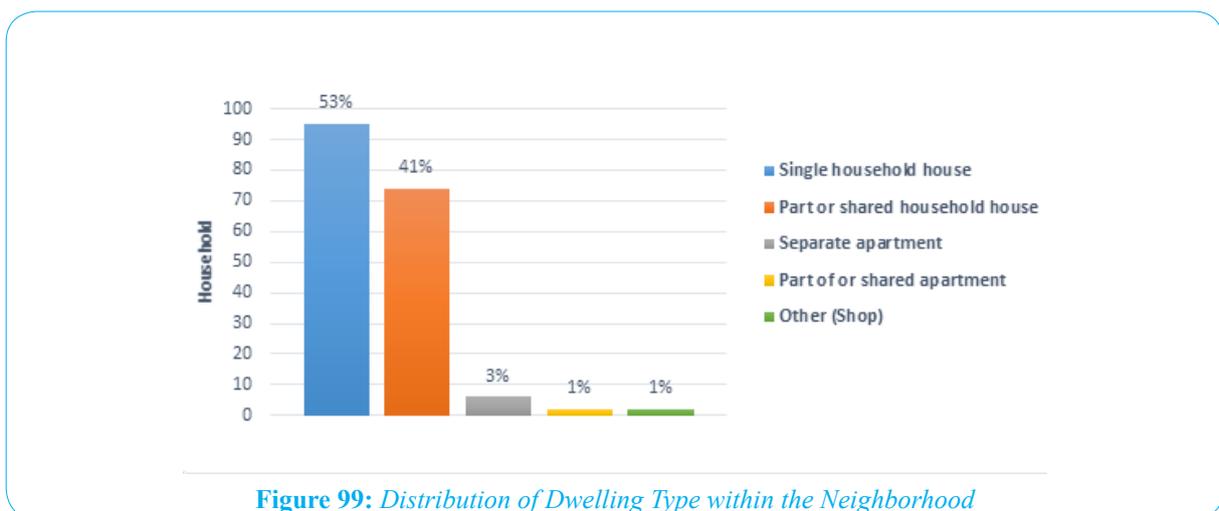
Many households have only one pipe in their yards where the toilet is usually located. Therefore installing another tap in the yard near the toilet does not look so necessary for them. A high percentage allocated to lack of handwashing facilities near the toilet, but it does not necessarily correlate with lack of handwashing practice after visiting the toilet.

The other aspect of this discussion is:

48 percent of people have handwashing facilities near the toilet, which makes so convenient the handwashing practice after visiting toilet. This percentage is almost same with the percentage before starting the project (SMEC International, 2008). In the other hand the low percentage of mentioning to “hand-wash practice after visiting toilet” and no more progress to have such facilities near the latrine after several years show “*without public awareness and only with providing sanitation services is really difficult to achieve a considerable progress.*”

The level of hygiene knowledge could be increased by awareness through media specially TVs which are widely available nowadays in big cities like Kabul. Children in schools also could take the hygiene messages to their homes and share it with their relatives.

Dwelling type: 53 percent of interviewees have single house following 41 percent have shared household and three percent live in separate apartment.



About 41 percent of houses are shared between two households; it could be the owner and his/her tenant or all landlords. While upgrading projects improve the general condition within a neighborhood, it could also lead to asking more money by the landlords from their tenants who are already in a lower standard of living. In the other hand if the overall impact of sanitation intervention is not positive in the area, upgrading project neither decrease the cost of living nor cost of health issues for the most vulnerable part of a community.

It seems important to think about tenants conditions during a sanitation intervention and after that to avoid of putting unaffordable situation on them.

At the end, although people are slightly different with respect to gauge of standards, using the observation checklist there is an expectation to get an impression about the overall hygiene condition within the households and even consider some kind of cross checking between what has been said and practiced.

4-13- Focus Group Discussions

To conduct FGDs in the second site, arrangement has been made with its representative. Finally by August 24th, FGD for female and by September 20th, 2015 the FGDs for males were held. During the FGDs several specific questions were asked, but the main trend was only facilitating the sessions to let the participants discuss openly about all related issues. To conduct the FGDs same methodology as the first site was followed.

Table 4: Male Focus Group Discussion-Site no. 2

No	Time & Date	Venue of FGD	Neighborhood
	9:00 AM Sep 20 th 2015	Representative's office in the neighborhood	Dehghouchak (Site no 2)
	<p>Agenda of the meeting/Major Points of Discussion: More clarification about sanitation intervention in the area and get impression about the implemented project within the neighborhood during a discussion with men living in the community.</p>		
	<p>What was shura's role in the upgrading project from the early stages of planning to operation and maintenance? A council established by the KURP project, it does not work in the same way anymore. But still the community has its previous representative, and handle all works at the community level and talk with people whenever needed.</p>		
	<p>How are the environmental sanitation infrastructures in your neighborhood? Are you satisfied with this level of sanitation provision? What other alternatives you had and why did you choose this? Totally participants are satisfied with the current sanitation provision, before the start of the project they were insisting on water-based sanitation system. There was a plan to construct six septic tanks, but due to rocky and hard ground it was not possible. That is why finally people accepted to improve their dry toilets.</p>		
	<p>How implemented project impact socio-economic aspects of local people especially women, children and elderly people in your Gozar? "Before project implementation we were facing with many problems, we did not have enough water and had to buy or send our children to collect water. Waking through the neighborhood especially in rainy season was so difficult and we had many difficulties to get our toilets empty."</p>		
	<p>What is the community's role for operation and maintenance of implemented environmental sanitation services? And how the community performs its responsibility? There is a communal septic tank and based on need people who are connected to the septic tank collect money for desludging. Also in some part there is solid waste collection system for door to door collection for monthly charge of 100 Afs. Sometimes people within the neighborhood clean the public drain.</p>		
	<p>How do you evaluate the upgrading project? Was it a successful or failed project? Why?</p> <ul style="list-style-type: none"> • Participants are satisfied with the project, but they think there are some technical problems with design and construction; the public drain is not big and deep enough. • There should more coordination between different service provider agencies, for example when road pavement was finished AUWSSC start water supply project and damaged some parts of newly paved roads. Considering their satisfaction they think still there is room for more improvement. 		
	<p>How can we have a long run and sustainable project? Projects should be designed precisely and by experienced experts, and municipality should help local people for better operation and maintenance.</p>		

Raised points	<ul style="list-style-type: none"> • One of the reason they mentioned regarding direct discharge to the public drain was hilly and narrow streets which are inaccessible for vehicles to collect waste water. • They also mentioned to population increasing in the neighborhood while there is no enough space for all. • Some people were complaining about the covered channels which is difficult to clean while others mentioned there is possibility to open the channels in some parts and clean it; this was new point for some participants. • Some people mentioned to lack of sanitation for commercial areas surrounded the neighborhood which cause major problem in terms of hygiene. There are some public water pipes, but not located very well. • During rainy seasons dry toilets in steep areas wash away toward houses located on lower areas. • Some people who live on hilly areas where slope is more 30 percent are complaining about their problems even for a simple walking leave alone dealing with garbage, water or dry feces. Authorities are planning to prevent citizens of occupying areas with high slop and relocate current residents. There is some recommendations by international agencies to relocate all households who are leaving on areas with more than 30 percent slope (RECS International & Yachiyo Engineering Co., 2011).
---------------	--

Table 5: Female Focus Group Discussion-Site no. 2

No	Time & Date	Venue of FGD	Neighborhood
	9:30 AM August 24 th 2015	Individual house in the neighborhood	Dehghouchak (Site no 2)
	<p>Agenda of the meeting/Major Points of Discussion: More clarification about sanitation intervention in the area and get impression about the implemented project within the neighborhood during a discussion with women living in the community.</p>		
	<p>What was shura's role in the upgrading project from the early stages of planning to operation and maintenance? Community has a representative and incase of any issue people contact him. Communal meeting is need-based and usually consist of respected people within the neighborhood.</p>		
	<p>How are the environmental sanitation infrastructures in your neighborhood? Are you satisfied with this level of sanitation provision? What other alternatives you had and why did you choose this? They are satisfied with current implemented project, but they think drainage channels should be wider and deeper to avoid of stagnant water.</p>		
	<p>How implemented project impact socio-economic aspects of local people especially women, children and elderly people in your Gozar? "Before the project we had to spend more time for cleaning, but always facing with pollution. We needed to allocate time for water collection.</p>		
	<p>What is the community's role for operation and maintenance of implemented environmental sanitation services? And how the community performs its responsibility?</p> <ul style="list-style-type: none"> • There should be cooperation between community members and people should always pay their sanitation fees. • Municipality should help us to keep clean our environment in terms of solid waste and we are ready to pay them. 		
	<p>How do you evaluate the upgrading project? Was it a successful or failed project? Why? Yes, we are satisfied 80 percent of the project and feel more comfortable, but there should be improvement in public drain. Currently drainage channels are not deep enough; so after a while and due to some blockage we have storm water and wastewater overflowing on the streets.</p>		

	<p>How can we have a long run and sustainable project? People should work as a community together and pay the sanitation bills.</p>
Raised points	<ul style="list-style-type: none"> • Water supply is very good and now most of sanitation facilities are water-based. • We don't have any solid waste collection system currently, but in the past there was a door to door collection system based on a monthly payment about 2 \$ per month. But people didn't pay and the system collapsed. Now each family take care of its own garbage usually throwing away somewhere. • There is no negative impacts by the project, but drainage should be modified.



Figure 100: FGDs at Site no. 2

5- Fecal Sludge Management

5-1- The Diagrams

Many households in Kabul like many others developing cities are using on-site sanitation technologies. Many housing compounds are rely on dry toilets which produce dry feces and the remaining households are usually use water based technologies adjacent with soak pit or septic tank. Therefore fecal sludge management is an important issue in Kabul despite lack of enough attention to it by the authorities (Please see figures 101 & 102).

In targeted study areas, households are using on-site sanitation. Even in site no. 2 where there is offsite sanitation, the main reason is lack access to on site treatment facilities. In fact there is no offsite treatment and the households only discharge their wastewater in the public drain.

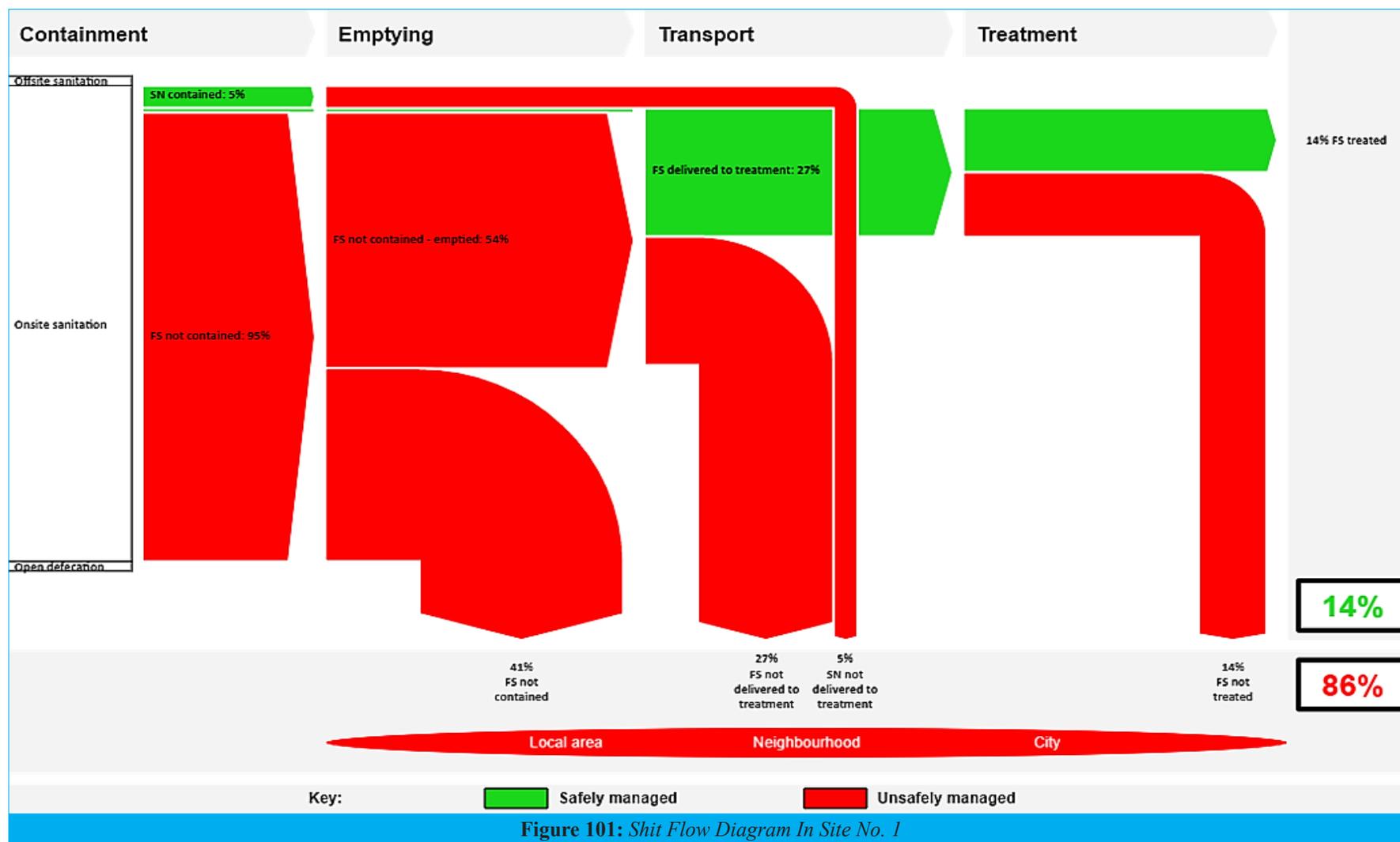
Below Shit Flow Diagrams (SFD) were developed based on a direct observation and household survey conducted in targeted study areas in summer 2015. The numbers and percentages are extracted from the questionnaire or estimated based on FGDs, interviews or site investigation. All SFD initiative materials are available from SuSanA website¹.

5-2- General Information

The shit flow diagrams were created through field based study in Kabul. Implemented methodology was similar to the developed documents by Susana, Manual for SFD Promotion Initiative (SuSanA, 2015).

During the study two sites were investigated: Site no.1 which is a flat area, and site no 2., a hilly area. The flat area located in western Kabul, district 13. The hilly area located in Kabul downtown and includes 70 percent mountainous and 30 percent semi-mountainous areas (KURP, 2007b). For further information about each site please see its related chapters in this report.

¹ www.sfd.susana.org



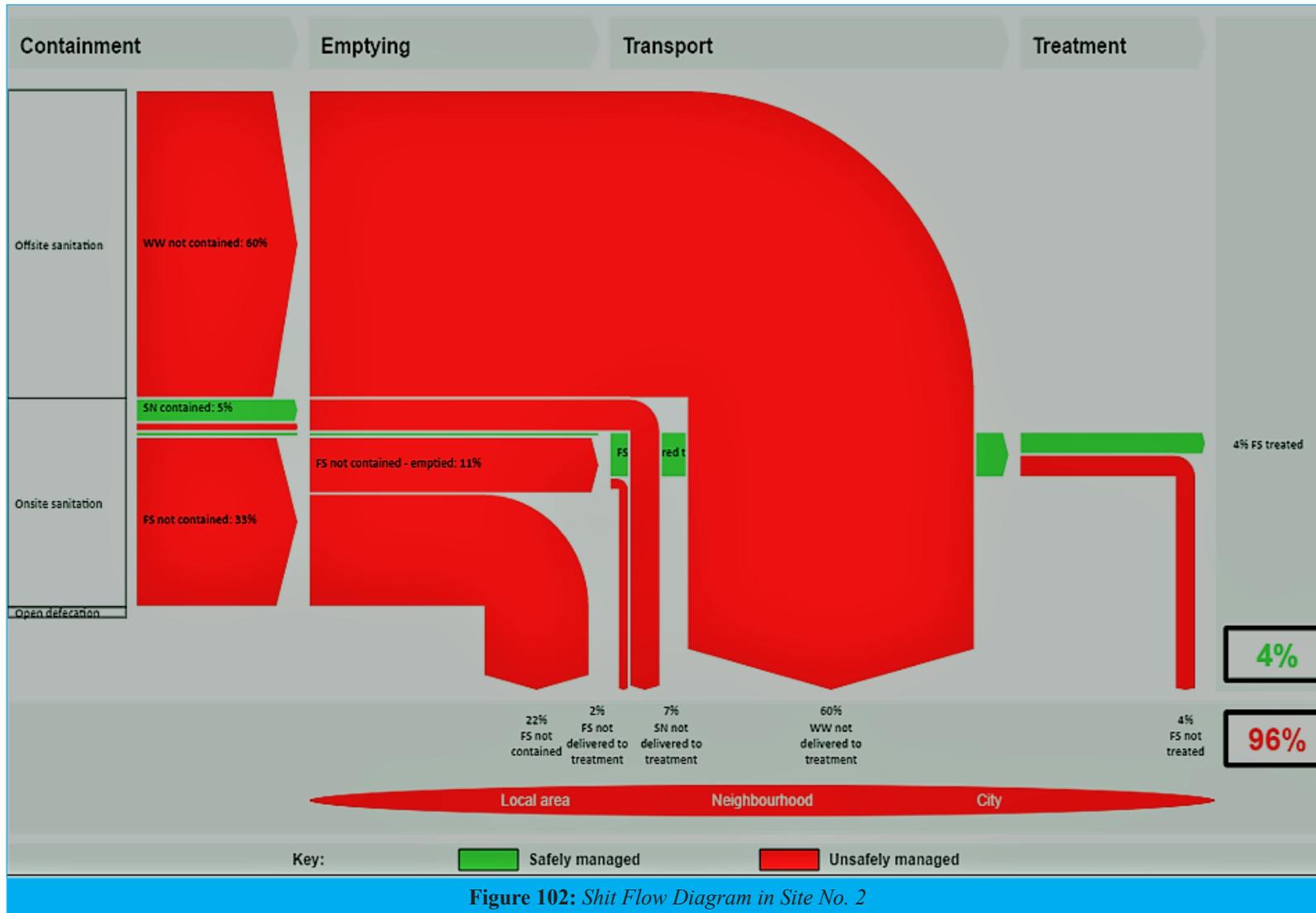


Figure 102: Shit Flow Diagram in Site No. 2

5-3- Service Delivery Context

The current Afghanistan Urban Water Supply and Sewerage Policy was developed by 2005. The policy covering differing subjects including basic definitions, principles, social, institutional and financial issues. A new policy is under development, but has not been approved yet (MUDA, 2005a).

Before 2005 there was an authority under ministry of urban development affairs (MUDA) responsible for management of urban water supply and sewerage at different levels including policy, regulation and implementation. By September 2005 an institutional development plan was approved by the ministry of urban development affairs to divide the responsibilities between different organizations (MUDA, 2005b).

The development is under progress but too slow; still the policy level and regulation issues are managed by MUDA, but for implementation purposes Afghanistan Urban Water supply and Sewerage Corporation (AUWSSC) is in charge. Due to priority of water supply for Afghan government and donors, AUWSSC is mainly involved in water provision. AUWSSC is mainly focused on planned areas which accommodates about 30 percent of Kabul's population. Therefore sanitation is usually underestimated and dealt as the second priority following water supply.

Afghan households In most city areas are relied on on-site sanitation. but in terms of fecal sludge management and on-site sanitation there is no proper legal structure in place and existing policy and regulation mainly focus on sewerage system, not mentioning the reality on ground.

Monitoring of access to safe drinking water and improved sanitation is usually done by WHO & UNICEF Joint Monitoring Program (JMP) in cooperation by Afghan organizations or independently by Afghanistan Central Statistic Organization (CSO).

5-4- Results

In site no. 1: There are two kinds of system within the neighborhood including dry toilet and pour flush toilets but all are on-site sanitation system which means the percentage of offsite system is zero and not mentioned here.

In terms of containment, the technology does not ensure safe level of protection from excreta in almost 95 percent: In all dry toilets, urine discharge into the public drains. In water-based system where households use soak pits, which is the most case here, infiltration of untreated wastewater into the ground is a big concern.

According to the SFD Manual containment is defined as “For Onsite Sanitation, it includes a) the User Interface, b) the Onsite Sanitation Technology that the User Interface Discharges to and c) the second stage technology (if anything) that the Onsite Sanitation technology is then connected to soak pit,....(SuSanA, 2015).

Emptying service in the neighborhood is provided by private sector mechanically or manually. According to locals, demand for night soil is getting less and difficult to find farmers interested in night soil collection. In case of water-based system households call vacuum trucks for sludge disposal.

Soak pit as the most popular technology is unlined and does not need emptying in short term. It takes usually several years to get full.

According to the related shit flow diagram, 14 percent of influent get treated. About 70 percent of fecal sludge does not go for treatment including the whole fecal sludge from dry toilets. Totally only 14 percent of fecal sludge is managed safely and 86 percent remains without treatment which leads to pollution at different level (Please see figure 101).

In site no. 2: only 4 percent of fecal sludge is managed safely. In terms of sanitation technology 63 percent of households are relied on water-based system and most of them are connected to the public drain while there is no treatment after discharge into the public drain.

Emptying service in the neighborhood is provided by private sector either mechanically or manually, but access to some parts of the neighborhood is not possible for vacuum trucks due to mountainous characteristic of the site study or narrow streets. We are facing with this problem at the both sites, but more challenges in site no 2.

Regarding on-site sanitation which is 40 percent in the area and mainly dry toilet, only four percent has the chance of treatment and the remaining part is disposed directly to the environment, or in the best scenario applied on agricultural lands without proper treatment.

5-5- Conclusion

The reason behind this low percentage of safe management first of all is lack access to treatment; the products of traditional toilets is applied directly on agricultural lands, if not dumping somewhere. There is no any specific fecal sludge treatment plant in Kabul. Dealing with fecal sludge not even considered in legal documents.

In terms of fecal sludge collected by vacuum trucks, there is no any guarantee for delivering to Kabul wastewater treatment plant; further more if the wastewater is delivered to the treatment plant, no guarantee for a proper treatment due to many deficiencies in the treatment plant; Currently only sedimentation phase before biological treatment was running in the treatment plant and the effluent without chlorination is discharging to the Kabul River.

6- Lessons Learnt

Considering whole issues before conducting a survey is difficult. Some challenges appear unexpectedly and could face the survey with difficulties. It is always good to consider those issues for the future surveys and avoid them as much as possible. Below is a list of issues that most of them are not directly linked with the survey, but affect it.

- **New Political Structure**

After the presidential election many changes in political and technical positions are occurring. During my interview planning some positions were vacant or managing by acting director. Beside that even authorities who were in charged directly were not sure if they stay longer or not. This kind of situation sometimes makes difficult to get an appointment or conducting a productive interview.

- **Low capacity and Interest among some officials**

Some authorities are not interested or qualified enough to answers technical questions or provide relevant answers to the questions. There are several reasons behind this problem: Corruption and lack of proper recruitment system, unstable political situation, lack of clear legal documents and low range of salary could be the main reasons.

- **Low capacity and Interest at informal level**

Usually service providers at informal area are informal organizations and people. They are mostly uneducated and don't have enough skills to run the business while formal private companies and experts are involved in formal projects running by donors and Afghan Government.

Due to nature of sanitation practices and activities which considered illegal even by involved private sector, they are not willing to participate in an interview or meeting to talk about it. Furthermore during my household survey within the site many households were not satisfied to talk about specific issues; as an example they know direct connection to the public drain is not legal, and they prefer to skip that point.

- **Security Issues**

Due to security situation in Kabul, conducting a survey close to high profile areas like ministries is difficult. For example due to security reasons getting a permission to conduct the survey in the site no2 took me almost three weeks while there was no such difficulties in site no 1.

- **Left-behind Populations**

Usually authorities in developing countries try to ignore informal settlements firstly, but after a while this neglecting doesn't work longer; after that informal areas are the second priority after the planned areas. That is why many people in informal settlements are disappointed about the positive results of interviews and household surveys. They think many surveys have been conducted but the output is considerably less.

- **Cultural Issues**

Conducting the female FGDs in a conservative society, for male surveyor, is difficult: a group of surveyors including male and specially trained females are necessary.

- **Using Local Expert**

Using local experts who have worked in similar situation would speed up the survey so much. In many case there is no need for trial and error or learning by doing. Local people are also feel more comfortable to talk about their problems.

7- Conclusion and Recommendations

The findings analyzed and described above pave the way for a more general conclusion. It seems considering below points would help us for a better sanitation planning in future for similar cases.

- **Community-based data collection**

Governments' reports about upgrading projects usually rely on number of toilet improvements, water connections and meters of drain construction: exploring KURP reports show only the number of improved latrines, constructed communal septic tank and other sanitation services. But community-based data collection provides us more accurate data in terms of quality, quantity and productivity of implemented projects.

- **Result-based monitoring indicators**

There are some useful criteria for indicator selection developed by different international and national organizations like WHO, UNICEF or Afghanistan CSO (Rifat Hossain, 2015). Result-based indicators will help us to understand whether the implemented projects have improved the situation or not. These indicators should be developed at the early stages of a project, used to plan the sanitation and for later monitoring. In this way we are able to understand the level of impact and efficiency precisely.

In KURP project there are some indicators for monitoring, but they are not comprehensive enough or result-based; the indicators are some pre-set numbers like toilets that should be improved and so on. And at the end only checking if the project has achieved the numbers or not (SMEC International, 2008).

Developing some indicators like the percentage of water-borne diseases before and after project implementation or water sampling would help us to know exact changes occurred on the ground.

- **Long term participatory approach toward sanitation provision**

Usually implementers are doing their business as usual and do not consider different aspects of a sustainable and integrated sanitation provision. In the other hand focusing much on hardware part could lead to ignorance of other important factors for a successful project; continuous communication and exchange between implementers, aid providers and research-based institutes looks necessary. In targeted study areas councils were established and many social works have been done (Kurp, 2007a).

However, it was only at the early stages to start the physical work as soon as possible. This council is not existed anymore and locals are complaining regarding lack of cooperation between authorities and people.

- **Considering the whole sanitation chain**

In KURP project, like many others, there is much focus on sanitation at household level and not considering the whole sanitation chain. Households don't know what happen to the fecal sludge after collection or the wastewater which is discharged directly to the public drains. Simply there was no consideration beyond the household level.

- **Considering whole forms of wastewater**

To overcome the challenge not only we need to know what happens beyond the household level, but also we should consider the whole kind of domestic wastewater produced in a community and its interlinkage with other components of environmental sanitation. Greywater is an important part of domestic wastewater, which discharges mainly without any treatment to the environment; in Kurp project there was no plan for greywater (A.Tanguay et al., 2010).

- **Feasibility study before implementation**

During KURP project there was an insist on improving dry toilets without considering its feasibility in the contexts. Eco-san toilet is not possible without closing the nutrient loop and considering the whole functional elements within the sanitation chain; there are many doubts about its proper function in a congested informal settlements within the city. Before introducing a technology, developing a comprehensive feasibility study is important.

- **Context-based sustainability indicators**

KURP was an upgrading project with defined criteria for general sustainability, but not specific criteria for sustainable sanitation. To achieve sustainability level in a sanitation project, we need to design context-based indicators for sustainability criteria at the early stage of sanitation planning and use them through all steps from planning to operation and maintenance.

Using SuSanA's sustainability criteria and developing their related indicators in the field would be useful (SuSanA, 2008).

- **User preference**

User preference to implement a specific kind of technology is a key for sustainability of the project. We need to know how far we can go in term of convincing locals to choose a technology or ignore it, otherwise our intervention could lead to waste of investment in long run. The households survey show majority of locals are not satisfied with the introduced technology, and that is one of the main reason behind the failure of the system.

There was a KAP by the project authorities before start the project, but no questions in terms of user preference.

- **Co-management at community level**

Sanitation interventions in informal settlements are mostly engaged with a level of decentralization. But this decentralization does not mean “shifting of management from government to the local people. In terms of wastewater or solid waste management, the authorities do nothing within the neighborhood while in case of water supply, controlling of every thing is done by the government and people are asking for more involvement. There should be a kind of co-management between local government and the community to handle the issues.

- **City-wide sanitation provision**

Although decentralized systems are standing on their own, but at the end there should be a link with city-wide sanitation which is not possible without a holistic approach and macro management

by authorities. At this level the role of municipality and sanitation planners at the early stages and later steps are very important. For sustainability of a project, we need to integrate local facilities with city-wide sanitation.

- **Mismanagement and lack of transparency**

Households especially during FGDs were complaining about the price of water, water quality and service provision. They also mentioned to lack of transparency in the management system. Lack of transparency and trust could lead to many problem between service providers and users; cooperation between operators and users are vital for running a sustainable system.

- **Local solutions for local challenges**

Upgrading projects in Kabul follow a typical methodology without considering the situation: As an example, Kabul City is facing with many problems during rainy seasons in terms of flooding. At the same time, some areas suffers from water scarcity. Based on the current method of upgrading, pavement of streets usually includes a thick layer of cement which doesn't allow any on-site infiltration. To reduce the flooding problem and recharge the only Kabul's water resource, the onsite infiltration should be promoted; such kind of initiatives should be taken for different sanitation improvement activities.

- **Fecal sludge management**

Either dry toilets or water-based technology, households are relied on on-site sanitation in targeted study areas. Fecal sludge is becoming an important challenge not only for the sites but also for the whole Kabul informal settlements while there is no even required legal documents in place.

- **Sanitation zoning**

Big neighborhoods have many disparities and could be divided into several sanitation zones where each zone has its own problems and solutions. Site no. 2 is a small area with 179 housing units. It has one representative in Kabul Municipality and coordination among them does not look very difficult: they know each other for a long time, geographical condition within the whole area is similar, and they are facing with similar environmental issues. But in site no. 1 due to its scale we have different sanitation problems. Even after project implementation the sanitation problems are different. In central part of the neighborhood the main problem is water scarcity while in eastern part public drain is a major challenge. The area has three different representatives. Collective work in such a big and inhomogeneous area is difficult comparing to a homogenous neighborhood.

Considering complexity of sanitation provision in informal settlements, it is important to choose upgrading sites based on proper criteria including physical and social homogeneity.

Household Survey Annexes

1. Key Informant Interviews (KIIs)
2. Focus Group Discussion (FGD) with Service Providers
3. Household Questionnaire

1- Key Informant Interviews (KIIs)

As a part of field study and also cross-checking with findings of households survey key informant interviews were conducted. KIIs also helped us to collect information about the overall situation in Kabul. To choose the stockholders two points were considered: their influence and their interest to the sanitation issue in Kabul City.

For each stakeholder related questions were designed and asked during the interview. According to the interviewees' position and background the questions have covered policy & legislation, service delivery, planning and investment. At below table you can find the list of interviewees and a concise of each interview.

Table 6: Key Informant Interview List

No	Name	Organization	Position	Main Point
1	Mr. Mohammadi	MUDA	Deputy Minister	Groundwater is the only source of drinking water in Kabul which is polluting by soak pits, and other unsafe technologies. Water scarcity specially at unplanned areas, even for drinking purposes, is becoming a big challenge.
2	Mr. Qasim Salehi		Water & Sanitation Director	MUDA is developing an updated policy considering actual situation on ground like FSM, Informal settlements and decentralization.
3	Ms. Fatema Jafari		Advisor	Due to emergency situation in Kabul, a wastewater committee according to an official order by economic council of ministers has been established. The committee has responsibility to find solution for sanitation problems.
4	Mr. Baheer	AUWSSC	Director	The main priority is water supply provision, but still we are in progress to establish sanitation department and include it in our future projects.
5	Mr. Masoomyar		Manager	The level of groundwater has been dropping down and we need to think about other resource alternative.
6	Eng. Qaisari	Kabul Municipality	Makroyan Operation and Maintenance Director	580,000 cubic meter wastewater is monthly inlet of Kabul WWTP, and currently without chlorination disposed into Kabul River.
7	Mr. Habibi		Sanitation Director	We are collecting 200 ton fecal sludge per day while is not our responsibility. Kabul Municipality collect 5000 ton solid waste on daily basis.
8	Mr. Vali		KBL WWTP Officer	There is only physical process (sedimentation) in the treatment plant and the effluent discharges directly to Kabul River.
9	Mr. Nawabi		KURP Director	KMDP is focused on road pavement and drainage in unplanned area while in the last phase they had latrine improvement component and water supply as well.

10	Mr. Malikyar	NEPA	Deputy	NEPA as a policy maker has responsibility to develop environmental standards, policy and regulation while monitors and controls environmental pollutions.
11	Mr. Noor	BORDA	Advisor	Household sanitation systems comprise dry toilets or water-based flushing systems that are either connected to on-site collection/soakage units, localized sewage management system, or simply discharge directly into the environment.
12	Ms. Mirzaei		Monitoring & Evaluation Officer	BORDA-Afghanistan currently has assigned some staffs to work on fecal sludge management.
13	Service Provider 1	NA	NA	During last 15 years people are using more and more soak pits because of convenience and affordability factors.
14	Service Provider 2			We are using animal cart to collect fecal sludge and use it for agricultural purposes. Many vacuum trucks come to our agricultural land paying money and discharge their waste which fertilize our land.

2- Focus Group Discussion (FGD) With Service Providers

Sanitation service providers have not yet any official trade union registered under Afghanistan Chamber of Commerce and Industries (ACCI). But still there was possibility to have a FGD with some private companies and vacuum-truck owners. The FGD was not very structured with specific questions. Participants were free to share their concerns regarding sanitation condition in Kabul. They discussed about their activities, sanitation situation and their estimation about percentages of different sanitation technologies used in Kabul City.

Table 7: FGD with Service Providers

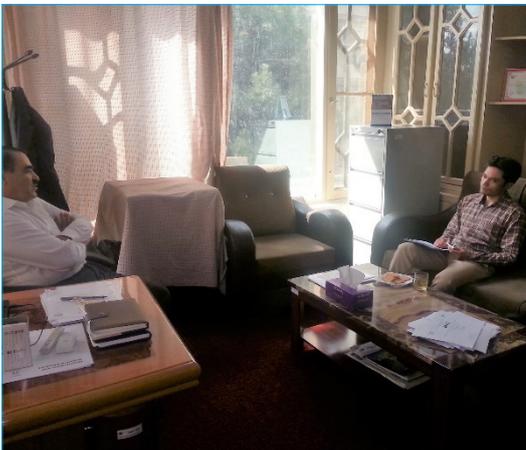
	Date & Time	Venue
	7/9/2015, 9:00 AM	
	<p>Agenda: FGD with private companies and service providers to get impression about the situation on ground.</p>	
	<p>Most important points raised during the FGD:</p> <p>The percentages of different technology according to the participants:</p> <ul style="list-style-type: none"> - Cesspit: 60 percent - Dry toilet: 28 percent - Septic (Holding tank): 9 percent - Sewer system: 2 percent <p>Septic is only for black water usually and 10 m³ is enough for 10 people and six months duration; septic tanks or holding tanks are completely sealed without infiltration and used for black water.</p> <p>Many multi-story buildings are discharged directly to the surface drainage systems, and even some vacuum trucks are doing this practice some times.</p> <p>Currently cesspits are developing so fast. The level of depth depends on groundwater level and in Kabul is 6 m, but in cities like Mazar, it is even 20 meter due to low level of groundwater.</p> <p>Cesspits are discharged by vacuum trucks as well after several years.</p>	



Mr. Habibi, Head of Sanitation, Kabul Municipality



Mr. Ahamdi, Urban Deputy Minister, MUDA



Mr. Nawabi, Head of KURP



Mr. Malikyar, Deputy director general, NEPA



Mr. Baheer, head of AUWSSC



FGD with private service providers

Figure 103: KIIs and FGD

3- Household Questionnaire

Informed Consent Speech

Hello, my name is _____ and work with _____ located in _____.

This survey is conducted to collect required data from this community residence and helps us to understand sanitation situation in your neighborhood. Same survey is conducting to another Kabul's informal areas and provides us useful data to work on sanitation improvement within our city.

If you don't mind, I would like you to participate and answer some questions on water, food, hygiene and sanitation.

We formulated our questions in a way to collect our data within one hour and we are not interested in any particular answers, just in the answers that really represent your opinion.

Do you agree to take part at this survey and give consent for me to start?

0. Interviewer Name:	0.1 Date:
0.2 Gozar:	0.3 House Identification Code:
Verbal Informed Consent Taken: (Tick)	

Firstly I would like to ask some general questions about you and the people in your household and then our specific questions will be started. Are ready to begin?

Respondent Details:
Your name:
Your age: 18-23 23- 28 28-32 32- 40 40+
Are you married? 0. No 1. Yes
Do you have children? 0. No 1. Yes
If yes, how many children? -----
Years of formal education? >5 8-12 >12 University Graduate

Household Details
Are you landlord? 0. No 1. Yes
Are you the head of the family? 0. No 1. Yes
Is the head of the family male or female? 0. Male 1. Female
How many people live in this house for all or most of the time?
How many people in the family are male and over or under 18, and female over or under 18?
1. Males over 18:
2. Males under 18:
3. Females over 18:
4. Females under 18:
How many children in the family are under five years old? -----

1. Water

We want to ask you few questions about the water you use in your household.

W1.	What are the current sources of water which your household uses for cooking, washing, bathing and sanitation?					
Current Source	summer	winter	summer	winter	winter	summer
Drinking, cooking	Drinking, cooking	Bathing and Washing clothes	Bathing and Washing clothes	Sanitation		
Shallow open well – public						
Shallow open well –compound						
Hand-pump-public						
Hand pump- compound						
Bored well- hand pump						

Bored well-motorized					
Piped-into dwelling					
Piped-into yard					
Piped-public space					
Water tanker					

W2.	By what means does your house hold store drinking water? (Multiple answer possible)	
	Storage Type	
	1. Storage connected to home plumbing	
	2. Storage <u>not</u> connected to home plumbing	
	3. Jerry cans	
	4. Buckets	
	5. Other (specify)	
	6. Don't store	
	7. Don't know	

W3.	During the last two weeks has your household treated the household drinking water to make it safer to drink?	
	0. No (go to question 4)	1. Yes (go to A)
	A. What did your household do to make drinking water safe to drink? (multiple answer possible)	
	0. Boiled the water	
	1. Strained it through a cloth	
	2. used a water filter	
	3. let it stand and settle (sedimentation)	
	4. add bleach / chlorine	
	5. added salt	
	6. other (specify)	
	7. I don't know	

W4.	Is the public drain (Joi) in your neighborhood currently functional?
	No 1. Yes 2. Don't know

W5.	Is your neighborhood affected by puddles of stagnant water?
	0. No 1. Yes 2. During rainy season only 3. Don't know

W6.	W9. Do you have any problem regarding flooding in rainy seasons?
------------	--

The next section is few questions about the food you are eating in your household.

2. Food

F1.	How do you prepare your fresh fruits and vegetable before eating it? (Multiple answers is possible)
------------	---

	Fresh fruit / veg.	Remarks
1. Wash		
2. Boil		
3. Soak in water and salt / Chlorine / Potassium		
4. Cook		
5. Other (specify)		

F2. What cooking fuel do you usually use? (One answer for each season)		
Fuel	Summer	Winter
1. Wood		
2. Charcoal		
3. Kerosene or oil		
4. Coal		
5. LPG (bottled Gas)		
6. Biomass like animal dung, grass, straw...		
7. Electricity		
8. Paper, plastic, waste (specify)		
9. Don't know		

Next questions are about personal hygiene, we are done with food and water.

3. Hygiene

P1. When do you wash your hands? (Multiple answers is possible)	
1. Before eating food	
2. After eating food	
3. Before food preparation	
4. After food preparation	
5. After visiting latrines	
6. After cleaning child's defecation / nose	
7. After sweeping and mopping	
8. Always when they are dirty	
9. Before breast feeding	
10. Before prayers	
11. Every morning	
12. Other (specify)	

P2. What do you use to wash your hands? (Multiple answers is possible)	
1. Cloth	
2. Water only	
3. Soap	
4. Sand or coal	
5. Other (specify)	

P3. How often do you and other people in your household bathe?		
	Summer	Winter
1. Daily		
2. 2-3 weekly		
3. Weekly		
4. Monthly		
5. Other (specify)		

Now we are going to continue our questions with sanitation. Are you ready?

4. Sanitation

S1. What type of toilet facility does your household use?		
	Type of toilet facility	How many people share it?
1. Sahraei (open area in the compound)		
2. Traditional covered latrine		
3. Improved latrine		
4. Flush latrine		
5. Other (specify)		

S2. Who empties the toilet facility within your compound / or neighborhood?	
1. Nobody	
2. Your household	
3. NGOs	
4. Private Provider	
5. Municipality	
6. Other (specify)	
7. Don't know	

S3. How often does it get emptied?	
1. 2 weeks	
2. Monthly	
3. 2-5 Months	
4. > 6 Months	
5. Don't know	

S4. Where does the night soil/ wastewater get taken to?	

S5. How many people share the toilet facility with your household?	

S6.	Where is the Greywater (Waste water generated from wash-hand basin, shower and bath) from your home discharged?
1.	Septic tank
2.	Pit
3.	Garden
4.	Drainage Canal
5.	Outside the compound
6.	To the street
7.	Other (specify)
8.	Don't know

S7. Are you satisfied with the toilet you are using? Why?

S8. Are you washer or wiper?

S9. If you might select, which type of sanitation facility you would prefer?
(Here due to different treatment options & end products there should be an explanation to the interviewee)





5. Environmental Hygiene and Solid waste

E1.	Where do you keep your solid waste?
1.	Covered container inside house
2.	Un-Covered container inside house
3.	Container outside house
4.	Plastic bag
5.	Wheel barrow
6.	In the yard or courtyard
7.	On the street

8. Other (specify)	
9. Don't know	

E2. How is the domestic/ solid waste of your house collected?	
1. Dispose in a public space outside the compound	
2. Collection point organized by community or Government	
3. Door to door collection by Kabul Municipality	
4. Other (specify)	
5. Don't know	

E3. Do you sort, recycle or compost your solid waste? Why?	
---	--

E4. How often is the domestic waste of your house collected?	
1. Daily	
2. 4-5 times per week	
3. 2-3 times per week	
4. Weekly	
5. Every two weeks	
6. After more than two weeks	
7. Don't know	

E5. Have you ever seen or heard about syringes or needles being disposed in the garbage in your Gozar? 0. No 1. Yes	
---	--

6. Health

Now we would like to ask you some questions about health issues and the way your family take care about it.

H1. I want to ask you about some of the regular health issues in your family? (Don't give the list of disease to respondents, but when she / he mentions, ask about its season, <u>treatment</u> and number of affected people)			
Illness	Summer	Winter	Remarks
0. Malaria			
1. Diarrheal disease			
2. Jaundice			
3. Skin disease			
4. Cough with fever			
5. Other (specify)			
6. No illness			
7. Don't know			

H2.	How do you usually prevent/treat your family from getting the above disease? (Multiple answer possible)	
0.	Pray to Allah	
1.	Keeping clean	
2.	Use of safe drinking water	
3.	Eating clean food	
4.	Cleaning of latrines	
5.	Follow doctor's advice	
6.	Self-medication (elaj-e sarbakhod)	
7.	Washing hands, personal hygiene	
8.	Mosquito net	
9.	Keeping environment clean`	
10.	Traditional healing (folbin, tahviz...)	
11.	Other (specify)	

7. Financial issues

F1. How much is your monthly income? (If not cleared; ask tentative monthly expenses)

F2. Are you paying for operation and maintenance of existing environmental sanitation services in your neighborhood?
 0. Yes 1. No
 If yes, Is there any unit price? Please specify
 Water: wastewater: SW: Dry toilet:

F3. If it is needed to pay more, are you willing to increase your financial contribution?
 0. Yes 1. No

8. Satisfaction

Sat1.	How satisfied are you with existing environmental sanitation condition in your Gozar?	
0.	Very satisfied	
1.	Satisfied	
2.	A little satisfied	
3.	Neither dissatisfied nor satisfied	
4.	Dissatisfied	

Sat 2.	Are you satisfied with current operation and maintenance in your Gozar?	
0.	Very satisfied	
1.	Satisfied	
2.	A little satisfied	
3.	Neither dissatisfied nor satisfied	
4.	Dissatisfied	

9. Urban living

U1.	What sort of setting were you in before Kabul?
0.	Another urban city
1.	Village
2.	Remote village
3.	Another country
4.	Other (specify)

U2.	Is there any community action or systems to clean streets and neighborhood? 0. No 1. Yes If yes, do you participate? 0. No 1. Yes
------------	--

U3.	Do your neighbors rely on each other for support, friendship, knowledge of events? 0. No 1. Yes 2. Only sometimes 3. Don't know
------------	--

Ask the interviewee if he/she is satisfied to continue with the orange-coded questions, otherwise stop the interview.

At the end I would like to thank you for the time and information.

Observation checklist

When you are done with interview ask the respondent if you could see the latrine and kitchen, and to avoid offences fill in the boxes when you leave the house. If you don't feel comfortable to ask for observation, take as many observations as possible.

0.1 Personal hygiene of interviewee					
	Poor	Average	Good	Excellent	Comment (Why is it?)
1.	General appearance				
2.	Condition of fingernails				
3.	Hand-washing practice				

02. Food and Water			
	Yes	No	Comment
0.	Is there a water container?		
1.	Is food stored hygienically? (covered, off-ground)		
2.	Can you see clean equipment in the kitchen?		

03. Environmental Hygiene			
	Yes	No	Comment
1. Is the inside of the house generally clean?			
2. Is the solid waste in the house contained? (in a bag, covered)			
3. Is the outside of the house clean? (yard, street)			
4. Is there hand-washing equipment (soap, tap...) near the latrine?			

04. Which of the following best describes the dwelling?	
1. Single household house	
2. Part or shared household house	
3. Separate apartment	
4. Part of or shared apartment	
5. Temporary shelter	
6. Other (specify)	

References

- A.Tanguay, G., Rajaonson, J., Lefebvre, J. F., & Lanoie, P. (2010). Measuring the sustainability of cities: An analysis of the use of local indicators. *Ecological Indicators*, 10(2), 407-418.
- Jaramillo, C. (2009). *Cultural Heritage Management Plan*. MUDA. Kabul.
- Kurp. (2007a). Community Consultation Manual. MUDA. Retrieved from
- KURP. (2007b). Cooperation for reconstruction of Afghanistan. Ministry of Urban Development. Retrieved from
- MUDA. (2005a). Urban Water Supply and Sewerage Policy.
- MUDA. (2005b). Urban Water Supply and Sewerage Sector.
- RECS International, & Yachiyo Engineering Co. (2011). Draft Kabul City Master Plan. Kabul, Afghanistan. Retrieved Oct. 26, 2019 from http://pdf.usaid.gov/pdf_docs/PA00JMMJ.pdf
- Rifat Hossain, Tom S. (2015). Proposed indicator framework for monitoring SDG targets on drinking-water, sanitation, hygiene and wastewater.
- SMEC International. (2008). Kabul Urban Reconstruction Project: Knowledge, Attitude & Practice Survey, Hygiene & Sanitation in Kabul, Afghanistan. MUDH.
- SuSanA. (2008). Vision Document. Retrieved May 12, 2016 from <http://www.susana.org/lang-en/sustainable-sanitation/156-introduction-of-sustainable-sanitation/267-vision-document>
- SuSanA. (2015). SFD Promotion Initiative. Retrieved Oct 7, 2016 from <http://www.susana.org/en/sfd>

