MASTER'S THESIS

UIM/2011/7

Bauhaus-Universität Weimar

FAKULTY OF CIVIL ENGINEERING
Chair of Urban Water Management and Sanitation
Prof. Dr.-Ing. Jörg Londong

MASTER'S THESIS
Nr. UIM/2011/7

Editor:	Ms. NIEBEL, Sabine B.Sc.
Date of birth:	11. April 1985
Place of birth:	Jena
Topic:	**Implementation possibilities and institutional aspects of establishing small size wastewater treatment technologies in rural areas in Albania, focusing on constructed wetlands**
Scientific field:	Urban Water Management and Sanitation
First examiner:	Mr. Prof. Dr.-Ing. Jörg Londong
Second examiner:	Mr. Dr.-Ing. Ralf Englert
Supervisor:	Ms. Dipl.-Ing. Martina Winkler (GIZ)
Issue date:	19.12.2011
Deadline:	19.04.2012

Weimar, December 19th 2011

Prof. Dr.-Ing. T. Rabczuk
Examination committee's chairman

1 Problem statement / Background

At the moment the Albanian water sector's situation is not satisfying. Water supply services are only available for less than 80 %, water collection for less than 50 % (1) and wastewater treatment for only 4 % (2) of the population. Actual investments in the wastewater sector mainly focus bigger cities in Albania, not regarding the needs of the rural population.

Additionally, the Albanian water sector is not organized well and the project's contracting is not coordinated centrally. Until today, Albania suffers from a lack of master plans concerning prioritization and implementation of technical solutions and actions in order to improve the water sector (although some plans are being prepared). Knowledge about wastewater treatment facilities is poor, trainings and certification institutions like the German DWA are either non-existent or weak.

Therefore, GIZ intends - in cooperation with its local partner-organizations (MPWT, GDWSS and WRA) - to bring forward a water sector reform, the implementation and establishment of new technologies in Albania and capacity development of key stakeholder. Advice and support are given to institutions and stakeholders relevant for the water sector in order to meet European standards and support Albania to get EU member.

2 Objectives

The thesis intends to give an overview about the local water and wastewater sector in Albania with its actual developments. Special care shall be taken on wastewater handling in rural areas of Albania and the implementation possibilities of small size technologies. The work will deal with the following key aspects:

1) Technology
   - Description of constructed wetlands as a wastewater treatment facility for rural areas, as one of several small size technologies
   - Further assessment of the pilot CW at SOS children's village Tirana on basis of SuSanA Case Study (already existing)
2) Acceptance
   - Survey of the attitude of inhabitants of rural areas as well as decision makers towards the wastewater problematic and the implementation of small size treatment plants in rural areas. Assessment of implementation possibilities of small size technologies, especially constructed wetlands.
3) Institutional frame
   - Identification of key stakeholders and their responsibilities in the field of rural wastewater handling
   - Assessment of rural wastewater sector's structure
   - Determination of establishing processes for the implementation of wastewater projects in rural areas.

3 Time frame

This thesis is going to be written during the winter term 2011/12 (Bauhaus-University Weimar). The necessarily preparations are going to be done at Bauhaus University Weimar and at the GIZ main office in Eschborn (Germany) during October 2011. Additional research and the field studies are going to be done in Tirana (Albania) from November 2011 until February 2012. Afterwards the analysis and write-up is going to be completed in Weimar (Germany) during March and April 2012. Finally this thesis is going to be submitted in April 2012.

4 Advice and agreements

During processing time there have to be at least two examiner consultations. Modifications concerning the task's content have to be made in writing after the examiners had agreed.

The documentation which has to be submitted should consist of:

- master's thesis (3 copies), hardback,
- master's thesis, digital document on CD-ROM (format:.doc and .pdf); one CD-ROM in each hardback copy,
- one poster (format: DIN A0) which demonstrates the thesis' problem statements, approach(es) and results,
- copies of used literature (journals, proceedings) if these are not on the examiners' hands

J. Londong

Weimar, December 19th 2011 Prof. Dr.-Ing. J. Londong

Bauhaus-University Weimar

FACULTY OF CIVIL ENGINEERING

Chair of Urban Water Management and Sanitation

Prof.-Dr. Ing. Jörg London

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Preface

This thesis is the result of an internship at the GIZ – Gesellschaft für Internationale Zusammenarbeit GmbH offices in Eschborn, Germany, and Tirana, Albania, between October 2011 and February 2012. I had the big chance to live in Albania, work in the GIZ office of the "Water Sector Reform" programme and meet and discuss with local and international experts from the water and wastewater sector. For this unique experience I want to thank all the involved persons that made my stay in Tirana and this thesis possible – by supervision, financial or logistical means, help and support.

My sincere thanks is going to Prof.-Dr. Jörg Londong (BU Weimar) and Dr. Ralph Englert (BU Weimar) for the supervision of this thesis, to Hermann J. Plumm (GIZ Albania) who gave me the great chance to write this thesis joining the "Water sector Reform" programme in Albania for several months and to Martina Winker (GIZ Eschborn, Germany) for the excellent supervision of this master thesis.

Further I want to thank the GIZ Ecosan Team in Eschborn for the very good indroduction to GIZ and the whole GIZ team in Tirana, especially the „Water Sector Reform" team Andi Papaproko, Dr. Enkelejda Gjinal, Tina Eisele, Andrea Görtler, Anisa Xhafa and Gezim Xhemrishi, for all the help and support. For support and information, taking me to the sites or giving me insights into their work, I want to thank Kurt Rippinger and Arian Dungu (both CES), Dritan Pistoli (ADF), Lucia Wolfgang and Andrian Vaso (both IC Consulenten), Karlheinz Stransky (IGR), Dr. Jens Nowak (AKUT Umweltschutz), Martin Wafler (Seecon GmbH), Bledar Dollaku (KfW), Wolfgang Frehmuth (ZGF) and Spase Shumka (EuroNatur).

Last but not least, I want to thank my family, my Albanian and my international friends for all the help and support that I got during my stay in Albania and during the preparation of this thesis.

Weimar, April 2012

List of Abbreviations

ADA	Austrian Development Agency
ADF	Albanian Development Fund
ALL	Albanian Lek
ARPAT	Regional Agency for the Environmental Protection of Tuscany
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (German Federal Ministry for Economic Cooperation and Development)
BOD	Biological Oxygen Demand
CARDS	Community Assistance for Reconstruction, Development and Stabilisation (EU tool)
CFU	Colony Forming Units
COD	Chemical Oxygen Demand
CSS	Conventional Sewer System
CW	Constructed Wetland
DCM	Decision of Council of Ministers
DN	Diametre Nominal (pipe diameter)
DWA	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V.
EIB	European Investment Bank
EC	European Commission
EEC	European Economic Community
EU	European Union
EWD	European Wastewater Directive
FC (FZ)	Financial Cooperation (Finanzielle Zusammenarbeit)
GD	General Directorate
GDWA	General Directorate on Water Administration
GDWSS	General Directorate for Water Supply and Sewerage
GEF	Global Environmental Fond
GIZ	Gesellschaft für Internationale Zusammenarbeit GmbH (German International Cooperation), former GTZ until 2011
GoA	Government of Albania
GTZ	Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation), since 2011 referred to as GIZ

HF	Horizontal Filter
IPA	Instrument for Pre-Accession Assistance (EU tool)
JICA	Japan International Cooperation Agency
JV	Joint Venture
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
LGU	Local Government Units
M&B Unit	Monitoring and Benchmarking Programme
MDG	Millennium Development Goal
MoE	Ministry of Environment
MoEFWA	Ministry of Environment, Forestry and Water Administration
MPWTT	Ministry of Public Works, Transportation and Telecommunication
NSDI	National Strategy for Development and Integration
NSSED	National Strategy for Social and Economic Development
O&M	Operation and Maintenance
PE	Population Equivalents
RWSP	Rural Water Supply Programme
SaWe	Sachsen Wasser GmbH
SBS	Small Bore System
SECO	Swiss State Secretariat for Economic Affairs
SS	Settleable Solids
SuSanA	Sustainable Sanitation Alliance
TC	Technical Cooperation
TF	Trickling filter
TL	Team Leader
TN	Total Nitrogen
TOR	Terms of Reference
TSS	Total Suspended Solids
UFAF	Upward Flow Anaerobic Filter
UNDP	United Nations Development Programme
UNDP ART	UNDP Articulating Territorial and Thematic Networks for Human Development

UNECE	United Nations Economic Commission for Europe
VF	Vertical Filter
WB	World Bank
WFD	Water Framework Directive
WHO	World Health Organisation
WRA	Water Regulatory Authority
WSP	Waste Stabilisation Pond
WSS	Water Supply and Sanitation
WSSAA	Water Supply and Sewerage Association of Albania
WW	Wastewater
WWTP	Wastewater Treatment Plant
ZGF	Zoologische Gesellschaft Frankfurt (Frankfurt Zoological Society)

Definitions

Rural areas

Using a definition of (Ertl et al. 2010), rural areas are “settlements up to 5,000 inhabitants with predominant agricultural economy”. This definition suits very well in the Albanian context and the GIZ “Water Sector Reform” programme objectives and will be used in the work.

Small and medium size wastewater treatment technologies

In this work, the term small and medium size wastewater treatment technology refers to technical solutions for wastewater handling in the rural area, ranging from on-site technology for one household up to treatment plants with a capacity of 5,000 population equivalents (PE).

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1 Introduction

1.1 Problem

At the moment, the situation of the water sector in Albania is not satisfying. Water supply services cover less than 80 % of the population, water collection counts less than 50 % (Gjinali et al. 2011) and wastewater (WW) treatment covers only 4 % of population in 2011 (Plumm 2011). Actual investments on the wastewater sector focus mainly on bigger cities in Albania, regardless to the needs of the rural population.

Additionally, the Albanian water sector is not well organised and projects are not centrally coordinated. Until now, Albania has no masterplan for priorisation and implementation of technical solutions and actions to improve the water sector, but such a plan is in preparation now. Knowledge about wastewater treatment facilities is poor, trainings and certification institutions similar to the DWA in Germany (Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V.) are non-existent or weak.

Therefore, GIZ aims in cooperation with its local partner organisations Ministry for Public Works and Transport (MPWT), General Directorate for Water Supply and Sewerage (GDWSS) and Water Regulatory Authority (WRA) for facilitating a water sector reform, for the implementation and establishment of new technologies in Albania and for capacity development of key stakeholders. Advice and support are given to institutions and stakeholders relevant for the water sector in order to meet European standards and support Albania to become a member of the European Union.

1.2 Aim

The thesis will give an overview over the water and wastewater sector in (rural) Albania with its actual developments. Special care shall be taken of wastewater handling in rural areas of Albania and the implementation possibilities of small and medium size technologies. The work will deal with the following key aspects:

1) Technology

Small and medium size technologies for wastewater treatment in rural areas will be described in the technology part with main focus on constructed wetlands. The pilot constructed wetland plant at the SOS children's village in Tirana will be assessed on the basis of the already existing SuSanA Case Study.

2) Site visits and interviews

A survey of the attitude of inhabitants of rural areas as well as decision makers towards the wastewater problematic and the implementation of small and medium size treatment plants in rural areas will be presented. The chapter deals with the assessment of implementation possibilities of small size technology, especially constructed wetlands in rural areas of Albania.

3) Institutional frame

The part "Institutional framework" will present a short overview over the wastewater sector regarding projects in rural areas. Additionally, it will deal with the identification of main stakeholders and their role for the implementation of wastewater projects in rural areas of Albania. The aim is to identify necessary steps that have to be taken and the stakeholders that are involved in the implementation process of small size wastewater treatment technologies.

1.3 Milestones

After preparations at the Bauhaus-University Weimar (Germany) and the GIZ main office in Eschborn (Germany) in October 2011, further research and the field study was carried out in Tirana (Albania) from November 2011 to February 2012. The work is divided into three main parts:

1) Preparation and literature research

   - Literature research on Albanian country context; constructed wetlands in general and in Albania / the Balkan area; challenges of waste water treatment in rural areas of Albania / similar Balkan areas

2) Field study

   - Visit of pilot CW in SOS children's village Tirana and identification of technical challenges; analysis of existing legal framework; consideration of economical aspects (problems and potential); analysis of socio-cultural acceptability (waste water treatment, possibilities of re-use, willingness to pay, income situation, etc.)

   - Interviews with various stakeholders and key informants; data collection from literature; comparison to other countries

3) Interpretation of data, summary and conclusion

1.4 Structure of the document

After a short introduction of the problem and the aim of this thesis in chapter 1, the chapter 2 will describe the methodology that was used to reach the aim. Chapter 3 will give a short overview over the country backgraound and the background information about the Albanian water and wastewater sector in general. The following parts will deal mainly with three main topics Technology, Site visits and Institutional framework.

An overview over small size technologies that can be applicable for rural areas in general and for rural areas of Albania can be found in chapter 4. The following chapter 5 will present more detailed the constructed wetlands as this is one main focus of this work. Experiences already made in Albanian and the Balkan area shall underline why constructed wetlands are a very much liked technology in actual discussions of GIZ about solutions for rural Albania.

Chapter 6 will present very briefly the site visits. More detailed information on the site visits can be found in Appendix C. Recommendations for further investigations will be given at this point.

Chapter 7 presents the institutional framework with the two main papers relevant for the water and the wastewater sector in Albania. These documents are the „National Water Supply and Sewerage Sector Strategy 2011 – 2017“ and the so called „Masterplan“ for the water sector. Examples of already implemented projects will be given – first from the implementation process of the constructed wetland plant for wastewater treatment at the SOS children's village in Tiaran as a pilot project. Then for the drinking water supply project in poor rural areas in the North of Albania. Conclusions for new projects in rural areas of Albania are following. Chapter 8 presents some main ideas for a guideline for rural areas to implement small size wastewater treatment plants and instructions. Chapter 9 summarises the main results of the complete research.

2 Methodology

2.1 Literature research

Different kinds of literature were used for that thesis. Internet pages, books and paper printed documents about Albania, about projects for constructed wetlands and about other small and medium size sanitation in Balkans and worldwide have been used. Additionally, Martina Winker and the GIZ office Tirana provided GIZ intern documents about work done in Albania by GIZ and its consultants. Further documents were gained by contacted people working in the (Albanian) water and wastewater sector.

2.2 Talking with experts

Further information were gained through interviews or e-mail contact with experts from GIZ and other companies or organisations involved in the water and wastewater sector in Albania or small size sanitation projects in other countries. The aim was to get a better insight into actual status of the sector and ongoing processes. The following people have been contacted and contributed with their information to this thesis.

Experts from GIZ:

- Martina Winker from the GIZ office Eschborn, Germany, who was supervisor of this thesis and gave a first overview over the project in Albania and some recent documents
- Herrmann Plumm, Tina Eisele, Andi Papaproko, Enkelejda Gjinali, Andrea Görtler, all working for GIZ for the "Water Sector Reform" programme in Tirana
- Andreas Kanzler (former GIZ senior specialist planner for Albania)

Consultants to GIZ (recent and former consultants):

- Martin Wafler, consultant for the capacity needs assessment
- Joachim Niklas, involved in the pilot plant project at the SOS children's village
- Jens Nowak, consultant for the reconstruction of the CW at SOS children's village, CW expert

Experts from other companies or organisations:

- Kurt Rippinger and Arian Dungu, both CES engineers, working as consultants for the ADF drinking water supply project in rural areas of Albania
- Dritan Pistoli, Evelina Azizaj and Blerda Duro from ADF in Tirana, working on projects in rural areas of Albania
- Bledar Dollaku, KfW coordinator in Tirana, Albania
- Lucia Wolfgang and Andrian Vaso from IC Consultants, working on the water supply part of the Masterplan in Tirana
- Karlheinz Stransky from IGR, working on the wastewater part of the Masterplan in Tirana
- Spase Shumka and Adam Onken form EuroNatur, an organisation that established small size CW in rural areas in Poland

- Edvin Pacara from Living Water Exchange as contact person for information about research plant at Tirana River
- Wolfgang Fremuth form ZGF (Zoologische Gesellschaft Frankfurt), contact person working at the Prespa National Park in Albania

Some of the contacts were established by staff from the GIZ offices in Eschborn and Albania, other people were contacted by own research to get more information about their projects or involvement in the water and wastewater sector.

2.3 Site visits and interviews

To get an idea about the situation in rural Albania and to visit sites, the author took every chance to visit communes and municipalities with GIZ and other companies or organisations. Some of the places were visited by using the chance to accompany other companies on their field trips to keep the costs low and to use already existing contacts. The aim was to get first an overview over the situation in rural areas in Albania and later to point out additional places that should be visited as they seemed to offer good pre-conditions for a selection (e.g. environmental necessity of wastewater treatment). One commune was visited upon the recommendation of the Albanian consultant Enkelejda Gjinali. Two other communes were selected by GIZ water sector reform team (Hermann Plumm, Tina Eisele, Enkelejda Gjinali, Sabine Niebel). Between December 2011 and February 2012, the following eight communes/ municipalities have been visited:

1) Commune Qender
2) Commune Qelez
3) Municipality Shëngjin
4) Commune Hajmel
5) Commune Gurre
6) Commune Hudenisht
7) Municipality Sukth
8) Commune Liqenas

Visit 1) to Qender (December, 7th 2011) and 2) to Qelez (December, 12th 2011) were facilitated by the Consultant Engineers Salzgitter (CES) that are working for the Albanian Development Fund (ADF) in an current ongoing water supply project, financed by the German KfW. CES and ADF already established the contact to 50 villages in the North of Albania and their corresponding commune/municipality what could be used for the site visits. Commune Qender and the village Dober were visited by the help of Tiger Çela (driver abd PR expert of CES) who also translated the interviews. Commune Qelez had to be visited by CES to control the progress of the ongoing water supply project. In this way the author could join the CES team. Translation was done by Arian Dungu, co-team leader of the rural water supply programme (RWSP).

Visit 3) to Shëngjin (December, 13th 2011) was facilitated by Andrian Vaso from IC consulenten who knows the mayor of the municipality and who knew that the area experiences many problems related to the wastewater handling. As the municipality is really interested in finding a solution for their wastewater problems, it was possible to get a short-term appointment. The mayor showed up at the appointment together with two vice mayors and the chief of administration. One vice mayor gave also a tour through the neighbourhood of Ishull Shëngjin and to the school in Ishull Leizhë that would need a solution for the wastewater and the stormwater as well.

Site visits 4) to the communes Hajmel (Januarry, 24th 2012) and 5) to Gurre (January, 25th 2012) were facilitated by Dritan Pistoli from ADF. In the first commune, ADF installed a water supply system a few years ago and had to discuss some organisational questions. The author could join the field trip. In the second commune, a water supply system is under construction now and problems in-between villagers had to be discussed. The author could join again and use the contacts and infrastructure of AFD. In both cases, Dritan Pistoli translated.

Site visit 6) to the commune Hudenisht (January, 27th 2012)was possible thanks to Bledar Dollaku from KfW who had the contacts to the utility of Pogradec and also did the translation. Village visit was done together with GIZ junior expert Tina Eisele.

The site visit 7) to the commune Sukth (February, 7th 2012) was suggested by the GIZ consultant Enkelejda Gjinali. As she had contacts to the water utility, an appointment with the LGU could be arranged through her contacts. The auther went there with GIZ driver Gezim Xhemrishi and former GIZ intern Anisa Aliaj who did the translation.

The site visit 8) to the Prespa National Park and the commune Liqenas (February, 20th 2012) was based on a decision of GIZ water team (Plumm, Eisele, Gjinali, Niebel). Information gained beforehand from Wolfgang Fremuth and Thimaq Lako, both working in the programme for protection of the National Park, showed a need for sanitation systems for environmental reason for the villages close to the Prespa Lake. The village Liqenas was very attractive to visit as it was said to have a piped sewer system. Additionally, information was given about the interest of a school, two restaurants and the headquarter of the National Park to get involved in a sanitation project. The site was visited with GIZ junior expert Tina Eisele and GIZ driver Gezim Xhemrishi.

In most cases, at least one village of the visited municipality/commune was visited to assess the situation. In the two communes Qelez and Hajmel, no appointed village was visited and only interviews with the mayors took place. This was caused by the fact that after talking to the mayors, no urgent need or possibility for any sanitation system was observed.

All visited sites except for the Prespa National Park and village Liqenas could be visited in one day because of mostly shorter distances to Tirana. For the village visits of this work, no special village type was picked on purpose but contacts of other engineers and consultants were used. Unfortunately, no village from the South could be visited what makes the study not completely representative for whole of Albania. But the site visits and interviews still deliver a good insight into the situation of rural areas in Albania.

All translations except at one site visit were done by Albanians from English to Albanian language and vice versa. Only the translation done by Bledar Dollaku was done from German to Albanian language and vice versa.

2.4 Interview guideline

Interview guidelines were prepared by the author of this work in preparation of the interviews with the mayors of municipalities/communes and the inhabitants of visited villages. Prepared questions should cover the current water supply and wastewater situation and the plans considering water supply and wastewater treatment of the municipality/commune. The guideline should help to gather all important information to get an idea of the situation, the problems, needs and wishes of the municipality/commune and its inhabitants. Further questions were asked to figure out the priorities of the commune and if the commune will show commitment to a sanitation project. The interview guideline had to be adapted after every interview as the author recognised that many questions were too specific and the interviews took too much time. The final interview guideline for the communes can be found in Appendix B.1.

The interview guideline for the villagers had to be shortened to the main essential questions about the current situation, problems and need concerning water supply and wastewater handling. People were interviewed on the street and showed only little knowledge about the topic. Therefore, it was not possible to ask more detailed questions. The final interview guideline for the villagers contains only three questions and can be found in the Appendix B.2 together with the old and long version in Appendix B.3.

Additionally, a short checklist to describe the overall situation of the village can be found in Appendix B.4. The village description shall help to understand the actual situation of the village considering the water supply, condition of houses and streets, accessibility of the village, income generation, etc.

2.5 Stakeholder identification and procedures for small size sanitation projects

To identify stakeholders involved in small and medium size wastewater projects, douments about the water sector were studied and interviews about the implementation processes of the CW at SOS children's village and a rural water supply project were done. From these two projects, helpful insights into the process steps and the stakeholders could be gained. Results can be found in chapter 7.2.3 Conclusion for new projects (p. 92).

3 Background information Albania

This chapter will give an introduction into the Albanian country with all its specialities and later in the second part of the chapter give an overview over the Albanian water and wastewater sector. Content will be the present situation of drinking water supply and wastewater handling, financial aspects, involved institutions and donors and relevant laws.

3.1 Background country information

Albania, officially the "Republic of Albania" or "Republika e Shqipërisë" in the Albanian language, is located in Southeast Europe and counts around 2.8 million inhabitants living on 28.7 km² (Wikipedia 2012,a). As it can be seen in Figure 3.1, the neighbouring countries are Montenegro in the Northwest, Kosovo in the Northeast, Macedonia in the East and Greece in the Southeast. In the West, Albania has a coastline of 362 km at the Adriatic Sea (Albtourist 2012). Because of the location in the Mediterranean climate and its beaches, Albania and especially its coastline in the West, are a tourist destination mainly in the summer months.

Figure 3.1: Map of Albania (Nations online 2011)

3.1.1 Climate and nature

Albania shows a mild and typical Mediterranean climate with rainy and cool winters and hot and dry summers (SOS 2012). The temperature in Tirana falls very rarely below 0 °C while mountainous areas, especially in the North, can be covered with a thick layer of snow in the winter and show long periods of coldness. Average minimum temperatures in Tirana are below 2 °C in winter and 17 °C in summer, while maximum average temperatures can reach up to 31 °C in summer (see Figure 3.2). On some hot summer days, temperature can even climb up to some 40 °C.

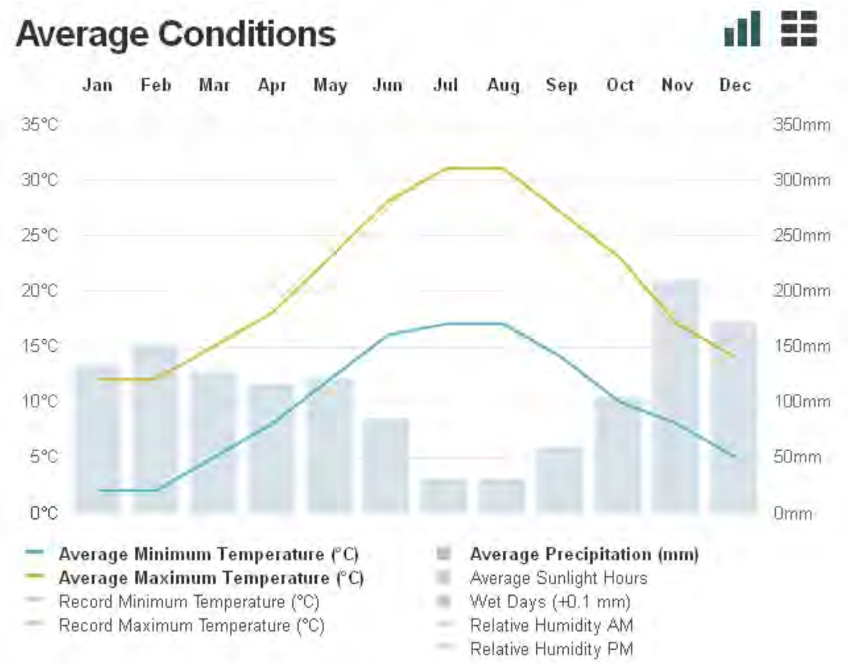

Figure 3.2: Climate conditions in Tirana: Temperature and precipitation (BBC Weather 2012)

While the vegetation at the coastline is the typical Mediterranean one with oleander and laurel trees (SOS 2012), the mountains show a typical alpine flora. According to (Albtourist 2012), "Albania claims distinction for a rich and varied fauna, which is linked with the diversity of geographical landscape and its location on the roads of emigration of birds."

3.1.2 Governmental structure of Albania

Albania is divided into twelve regions (counties or "Qark" in Albanian) that have the same boundaries as the twelve prefectures. According to (Heeb and Wafler 2011,a), the prefectures are representing the Council of Ministries and "monitor the legality of administrative decisions taken by local government and coordinate the activities of state bodies at local level". The twelve regions/prefectures are Berat, Dibër, Durrës, Elbasan, Fier, Gjirokastër, Korçë, Kukës, Lezhë, Shkodër, Tirana and Vlorë.

They all consist of several districts. The 36 districts of Albania are called "Rrethe". Districts are divided into municipalities ("Bashki") or communes ("Kommunë") that refer to cities ("Qytet") or villages ("Fshat"). Municipalities have an urban character and count more than 10,000 inhabitants while communes have a rural character and less than 10,000 inhabitants. Mostly, the cities are agglomerated in the municipalities while most villages belong to communes. Every village has an own village leader who represents the interests of the villagers. According to Enkelejda Gjinali, the term "district" is still in use but the legal entity does not exist any longer due to new laws.

The Figure 3.3 shall show the structure of Albania. Central government refers until the level of regions, local governmental units (LGU) are below that level.

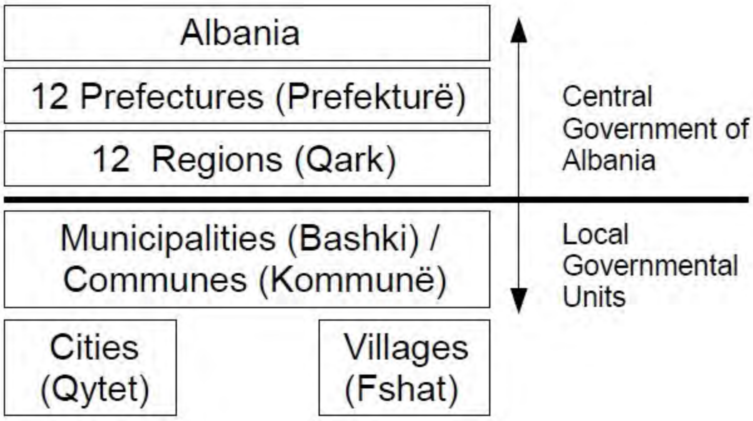

Figure 3.3: Governmental structure of Albania

3.1.3 Population and cultural specialities

Influenced by hundreds of years of foreign occupation, Albania developed a quite unique culture and language. „The Albanian language is entirely distinct from the tongues spoken by the neighbouring nationalities. This language is particularly interesting as the only surviving representative of the so-called Thraco-Illyrian group of languages, which formed the primitive speech of the inhabitants of the Balkan Peninsula ." (Albtourist 2012)

The Government of Albania (GoA) states the ethnical groups in Albania as to 98.6 % Albanians, 1.17 % Greeks and 0.23 % others (Vlachs, Roma, Serbs, Montenegrins, Macedonians, Balkan Egyptians, and Bulgarians). Concerning the religious groups, 70 % Muslims (Sunni and Bektashi), 20 % Albanian Orthodox and 10 % Roman Catholics are estimated (USDS 2011).

Tirana is the biggest city and the capital of Albania with around 420,000 inhabitants and 760,000 for the whole Tirana metro area, many universities and is the "center of the political, economical and cultural life of the country" (Wikipedia 2012,b). According to (CIA 2012,a), urban population counted 52 % of total population in 2010 and the rate of urbanisation lies at 2.3 % annual rate of change (2010-15 est.).

In 2008, around 1 million Albanian people were estimated to live abroad (about 25 % of Albania citizen or 35 % of Albanian workforce) (MPWT 2011). The net migration rate is - 3.33 migrant(s)/1,000 population (2012 est.; country comparison to the world: place 178), what means that Albanians are still leaving the country to live somewhere else in the world. The economic situation is one big driver of this trend. Just as a comparison, the urban population in Germany counts 74 % of total population (2010), rate of urbanisation is 0 % (2010-15 est.) and net migration rate is around + 0.71 migrant(s)/1,000 population (2012 est.; country comparison to the world: place 59) (CIA 2012,b).

The national poverty line is set at 4,891 ALL per person and month, what equals about 48 S$. According to (MPWT 2011), around one quarter of the Albanian population lives below this national poverty line. In the mountainous area, the people are very poor, 45 % of the population in this area lived below poverty level in 2002 (MPWT 2011).

The Human Development Index of Albania is at 0.739, what brings Albania in the world ranking on place 70. Adult literacy counts 95.9 %, what is very close to the German literacy rate of 98.0 %. Average life expectation is 76.9 years, what is as well very close to German life expectancy with 80.4 years (HDI 2011).

3.1.4 Economy

Nowadays, Albania is moving from the model of the closed and centrally planned market towards a modern market-open economy with macroeconomic growth and low and stable inflation. It has to be considered that the GDP, that counted $24.99 billion in 2011, increased also a lot due to the Albanian residents in Greece and Italy (as comparison GDP of Germany: 3.085 trillion US$ (CIA 2012,b)). At the country comparison of the GDP, Albania reaches only place 160 of the world.

Considering the Albanian economy, the composition by sector is the following (CIA 2012,a):

- Agriculture: 20.2 %
- Industry: 19.5 %
- Services: 60.3 % (2011 est.)

The agricultural sector accounts for almost half of the employment but only one fifth of the GDP due to old and inappropriate or missing technical equipment and general inefficiency. Electricity shortages and the electricity cut-offs that come along as well as a bad infrastructure contribute to “Albania’s poor business environment”. Unemployment lies around 13.4 % (2011 est.), but can be estimated even to be more than 30 % due to „preponderance of near-subsistence farming“ (CIA 2012,a).

Albania is trying to catch up with the Western standards very fast, the country changed a lot in the past few years. But still, the country is the poorest one in Europe. (BMZ 2011) states that the “economic development is still being constrained by a lack of legal certainty, poor infrastructure, unresolved ownership issues and organised crime“. The volume of German development cooperation for Albania counted 108.2 million €/year in 2011 (BMZ 2011). “German development cooperation activities in Albania are particularly concerned with drinking water supply, sanitation and waste management, energy and sustainable economic development. These activities are designed to contribute towards poverty reduction as defined in Albania’s National Strategy for Development and Integration 2007-13 (NSDI) and help Albania towards its goal of rapprochement to the EU.“ (BMZ 2011)

3.1.5 Environment

According to the United Nations (UN 2012), Albania “is rich in biological diversity and natural resources” but suffers problems due to “overexploitation and poor management”. Pressing issues are the rapid growth, poor solid waste management, the air quality, deforestation and land degradation. The area under protection is stated to be not sufficient (8.3 % in 2005) to protect the biological diversity (UN 2012).

Efforts of international institutions have been done and still are going on in the field of use of renewable energy resources, drinking water supply, wastewater treatment, biodiversity, climate change, land degradation and sustainable tourism as well as to strengthen legal institutions and human capacity.

3.2 Albanian water and wastewater sector

The following subchapter will give an overview over the water supply and wastewater situation in Albania, including financial aspects, relevant laws and involved stakeholders of the Albanian water and wastewater sector.

3.2.1 Water supply and wastewater situation

The Albanian water and wastewater sector experiences several problems. A policy framework is not completely adapted and the role of sector relevant institutions is often unclear or overlapping. The coordination of the sector is insufficient. Additionally, institutions often lack capacity concerning staff, knowledge and office infrastructure (GTZ 2010,a).

Water utilities are small regional companies that do not cover whole Albania. According to (MPWT 2011), the population under jurisdiction of water supply and/or sewerage companies counts around 2.2 million people in urban areas and around 1 million people in rural areas. In total, they cover only 3.2 million people out of 3.6 million (Gjinali 2011,a). Several communes and village are not under the jurisdiction and have their own supply (MPWT 2011). These numbers do not correspond with actual numbers of inhabitants of Albania (around 2.8 million people), but are the only ones available for the utility coverage rates.

The water consumption in Albania is most often not metered and a general lack of awareness is visible. Companies often work inefficient and fail to “bill and collect consumption-dependent charges” (GTZ 2010,a). Willingness of people to pay for service is very low.

A more detailed background description with all the problems of the Albanian water and wastewater sector can be found in the appraisal report of GIZ consultant Jan Sass from 2010 (Sass 2010: Appraisal Report on the Technical Cooperation Module “Reform of the Water Sector, Albania”. GTZ document 2010).

3.2.2 Water sources and drinking water supply

Albania is a water rich country, shortages occur only in some areas in the summer. Water availability is estimate to be 8,700 m³ per capita per year on average, what is one of the highest in Europe. Mostly, the drinking water is taken from natural springs and groundwater aquifers. Tirana metropolitan area uses also surface water sources (MPWT 2011). In general, the groundwater has “good physical and chemical properties” and is “meeting local standards” (EEA 2010). If surface water is used as drinking water source, the risk exists that the water is polluted. The average water demand is estimated to be 150 l/(p·d) plus additional 20 % through water losses (MPWT 2011).

Only 74 % of the people living in Albania have access to clean drinking water (GTZ 2010,a), (80 % in total, rural population: 56 %, urban population: 88 % (Gjinali 2011,a)). Water supply works on average only 11.1 h/d due to too low pressure through “over-consumption from flat rate billing, illegal connections, and technical losses in the networks” (MPWT 2011). As a result, people install their own pumps and water storages at their houses. Most often, these tanks will not be cleaned (regularly) and can therefore cause health risks.

Non-revenue water due to water losses and “illegal” or “unregistered” connections to supply pipes counted around 1.8 million cubic meters per year in 2010 what equals 63.2 % of the supplied water (water production of 301 l/(p·d) compared to water sales of 110 l/(p·d) (MPWT 2011)).

3.2.3 Wastewater handling

Only 43 % of the population (3 % of rural population and 68 % of urban population) have access to sewerage systems (GTZ 2010,a). Most of the collected water is discharged without any treatment into the next river or channel and ends up in lakes or coastal areas. Also the capital city of Albania, Tirana, has no wastewater treatment plant (WWTP) at the moment and directs all the collected wastewater into the Lana River. In suburban and rural areas that lack a sewer system, the wastewater is collected in septic tanks (EEA 2010) or simple pit holes. Uncontrolled dumping of waste at the river banks (EEA 2010) and broken wastewater pipes leaking into the ground are a risk for pollution of drinking water sources.

Until now, only a few WWTPs have been built and are in operation. The first WWTP in Albania was built in Kavajë in 2005 with the support of German Government via the German development Bank (Kreditanstalt für Wiederaufbau - KfW), treating the wastewater of 25,000 inhabitants (Gjinali 2010). The second plant in operation was built in Pogradec in 2007, also with funding of KfW, serving around 60,000 inhabitants. These two plants are the only ones in operation in Albania by the end of 2011 (Gjinali 2011). The new build and already finished plant in Korçë is expected to start successful operation in 2012 (Dollaku 2011). New plants are in planning or construction phase. Reforms are done to establish 14 WWTPs for the most urbanised areas, aiming to serve around 2.4 million people in the upcoming years. Smaller communities are not considered in that planning (Gjinali 2010).

An overview over the WWTP situation is given in Table 3.1 (p. 13) ((Gjinali 2011,a); (Sass 2010)). When information differed in the two sources, the information from (Sass 2010) is given in braces. The specific costs in €/PE were calculated on the basis of the given numbers. If costs and/or PE in the sources differed, the specific costs are also different. Calculation done with the numbers of (Sass 2010) are given as well in braces. The technology is taken from the report of Heeb and Wafler 2011 (Heeb and Wafler 2011,a). The table includes also some actual information that were gained about some of these plants by interviews with Bledar Dollaku (KfW), Kurt Rippinger (CES) and Karlheinz Stransky (IGR). The abbreviation in braces indicates from which interview partner the given information were obtained (Bledar Dollaku (B.D.), Kurt Rippinger (K.R.), Karlheinz Stransky (K.S.)).

The information compiled in the mentioned Table 3.1 is not always consistent. The reason could be that information is from different dates and planning and costs etc could have changed in the meantime. In general, it shows how difficult it is to get reliable and actual data in Albania.

Even there are several wastewater treatment plants constructed in Albania, only two of them are in use. Reasons are different. Some plants do not have connections to the sewer system what is caused by incorrect planning and missing donor coordination. Sewer system have to be built at the same time to prevent the plant being unused. Donor coordination is necessary if one donor cannot fund both, the WWTP and the canalisation. An other reasons is the missing acceptance of the plants by the municipality or the utility. Both, municipalities/communes and utilities have to be involved in the conceptual and planning phase and in the investment to secure full commitment to them. Additionally, operators have to be involved in the planning phase and trained while operating the plant. Some plants that are constructed in Albania are using the same technology. Therefore, the exchange of experience between the operators would be possible to help improving the processes. Operators could learn from the success and mistakes of each other.

Table 3.1: Overview over wastewater treatment plants in Albania

	Town	Supported by [1)]	Cost	Population (PE)	Specific costs (€/PE)	Status	Technology	Additional information (from K.R., B.D. and K.S.)
1	Kavajë I	KfW	€ 5.0 Mio.	25,000	200 €/PE	In operation	Automatic grit + Anaerobic pond + Trickling filter and Secondary clarifier + Chlorination + Sludge thickener and CWH	Constructed plant is a trickling filter that is in use and is working. (K.S.)
2	Kavajë II (Golem)	IPA	€ 10.0 Mio. (€ 5.0 Mio.)	75,000 (25,000)	133 €/PE (200 €/PE)	Final design	Automatic grit + Anaerobic pond + Trickling filter and Secondary clarifier + Chlorination + Sludge thickener and CWH	
3	Durrës	BB/LUX/ EIB (IPA)	€ 11.1 Mio. (€ 10.5 Mio.)	250,000	45 €/PE (42 €/PE)	Construction	Mechanical and automatic grit + Sand removal + Anoxia zone, aeration basin and secondary clarifier + CHWs, Clorination and Ozon + Thickener and anaerobic digester	Treatment plant was constructed more than two years ago but is not in use. The reason is that a connection to the sewer system is missing (B.D.). According to Karlheinz Stransky, the plant starts already to show damages of the materials (e.g. scraper not made out of high quality steel). (K.S.)
4	Lezhë-Shëngjin	BB/LUX/ EIB (IPA)	€ 4.9 Mio (€ 3.7 Mio)	50,000 (51,000)	98 €/PE (73 €/PE)	construction	Mechanical and automatic grit + Sand removal + Oxidation ditch and CHW + Chlorination + Thickener and CWH sludge	Information is not consistent. According to Bledar Dollaku, the treatment plant in Leizhë has six pumping stations to get the wastewater to the treatment plant. The city is not using it because of the electricity bill that they would have to pay for

								operation. According to Karlheinz Stransky, the plant shall be in use in 2012. The construction of the plant in a lagoon area was expensive. But in his eyes, at least the lagoons could be used as polishing ponds. He stated further, that the utility leader is not satisfied with the constructed plant, but also has no knowledge about it. Therefore the utility would need a training while operation.
5	Sarandë	BB/LUX/ EIB (IPA)	€ 3.8 Mio.	60,000	63 €/PE	construction	Mechanical and automatic grit + Sand removal + Oxidation ditch and CHW, Chlorination + CWH sludge	Project was financed by the World Bank but plant is not in use. (B.D.)
6	Vlorë	CARDS (2006)	€ 2.7 Mio.	150,000	18 €/PE	Completed	Mechanical and automatic grit, sand removal + Anaerobic lagoon	Plant is finished but not in full use as connection pipes are missing (K.R.) Pre-treatment is working, connections for further treatment are missing. Pre-treatment consist of two ponds, screens and grits. The other parts are not in use for more than four years. Instead, the sewer is bypassed and directed into the sea. Reason is that the municipality of Vlorë did not accept the plant. (K.R.)
7	Pogradec	KfW	€ 5.0 Mio.	60,000 (55,000)	83 €/PE (90 €/PE)	In operation	Automatic grid + Anaerobic pond + Trickling filter and 10 pons + CWH and chlorination + Thickener and CWH	In Pogradec, a trickling filter was built. It is working, but treatment basin has algae on the water surface what shows that processes are not working very well. (K.S.)

8	Korçë	EIB/KfW	€ 6.7 Mio. (€ 7.0 Mio.)	90,000 (86,000)	74 €/PE (81 €/PE)	Constructed (probably in use in 2012)	Primary clarifier+ Trickling filter and secondary clarifier + Chlorination + Thickener, anaerobic digester and dry beds	Finished at the end of 2011 and shall be in use at the beginning of 2012. Experts are optimistic that plant will work very well. Canalisation was built parallel to the construction process of the treatment plant. (B.D., K.R., K.S.)
9	Tiranë	JICA	€ 67 Mio.	1,000,000 (850,000)	67 €/PE (79 €/PE)	Final design		A trickling filter is planned. Japanese development bank is financing it. (K.S.)
10	Velipojë	IPA (2007)	?	85,000	?	Design		
11	Orikum	Islamic Bank	?	56,000	?	Design		
12	Shirok-Zogaj	KfW, SECO, ADA	€ 1.0 Mio.	12,000	83 €/PE	Design		
13	Ksamil	IPA	?	12,000	?	Design		
14	Shkoder	KfW, SECO	€ 10.0 Mio.	100,000	100 €/PE	Design		
			€ 127.2 Mio.	2.03 Mio. PE	63 €/PE			

[1)] (KfW) - Kreditanstalt für Wiederaufbau – Germany; (IPA) - Instrument for Pre-Accession Assistance – EU; (BB/LUX/EIB (IPA)) – /European Investment Bank – EU; (CARDS) - Community Assistance for Reconstruction, Development and Stabilisation – EU; (JICA) - Japanese International Cooperation Agency – Japan; (SECO) - State Secretariat for Economic Affairs – Switzerland; (ADA) - Austrian Development Agency - Austria

3.2.4 Financial aspects of the water sector

The following part deals with the financial aspects of the water sector, mostly bringing up numbers for the water supply sector. This is caused by the fact that wastewater treatment nearly does not exist in Albania at the moment (see chapter 1 Introduction). As utilities are partly responsible for drinking water supply and wastewater discharge, the introduction into the financial situation shall help to understand the problematic in Albania and show that most companies do not work cost covering at all. If even the drinking water supply sector reaches mostly bad results, the performance of the wastewater sector will be worse on average.

According to MWPT's sector strategy for 2011 - 2017 (MPWT 2011), the water sector in Albania does not work cost-effective. Low tariffs, low bill collection rates, a high level of non-revenue water and an overall service inefficiency contribute to this actual situation.

To guarantee a reasonable tariff, the Water Regulatory Authority (WRA) has to license the utilities and to approve the tariffs. This is stated in the Law No. 8102 of March 28 1996, but still not all utilities and small suppliers are approved. They are working at the moment without approved tariffs, "far away from the real costs" (Bibolli et al. 2011).

In 2010, the average operation costs per cubic meter water sold counted 42.9 ALL compared to only 38.2 ALL as the average price for cubic meter water sold, what means an average operational loss of 4.7 ALL per cubic meter water sold. This shows that the water sector is not working cost-recovering. The total cost coverage based on revenues counted 66.6 % and only 56.1 % based on current collections. The revenue collection rate was 84.2 % in 2010 (MPWT 2011).

The cost structure of water utilities in 2010 was the following (MPWT 2011):

- Energy costs: 29.4 %
- Personnel cost and social contributions: 30.6 %
- Depreciation costs: 20.6 %
- Other costs (chemicals, maintenance, repairs, etc.): 19.4 %

To be able to provide services, most utilities obtain subsidies at the current situation from the government. These subsidies have been reduced since 2007 and shall be terminated soon. According to the MPTW's strategy paper "National water supply and sewerage service sector strategy 2011 - 2017" (MPWT 2011), the low tariffs cause a "vicious circle" of underfunded service and insufficient investment leading to poor service qualities and therefore to low willingness to pay of customers. Investments in the extension of the water network to new and poor areas could probably reduce illegal connection if investments would be possible. Only some utilities have been able to improve revenue collection rates due to implementation of computer-based billing and accounting systems, debtor follow-up procedures, conduction of public education campaigns and improved customer service activities (MPWT 2011).

Very often it is stated by people working in the water sector, that utilities are not very well structured and employ too many workers what makes their services too cost intensive. This can be underlined by the numbers from the benchmarking report of 2011 (Bibolli et al. 2011), prepared by the Monitoring Unit (MU) at the General Directorate for Water Supply and Sewerage (GDWSS) in English and Albanian language. In general, companies work better and more effective the bigger the area is that they cover and the higher the number of people they serve (less employees per 1,000 connections for water alone or water and sewerage). In addition, the report states that the direct operating cost for water produced is 15.8 ALL/m^3

while direct cost for water sold is 42.9 ALL/m^3. That makes a difference of 27 ALL/m^3 caused by the inefficient work of the utilities and high water losses that count around 63 % (Bibolli et al. 2011).

The benchmarking report gives a brief overview over all the numbers concerning the technical, financial and service aspects. The following Table 3.2 shall present some of the financial performance results.

Table 3.2: Financial performance results of the Albanian water sector (Bibolli et al. 2011)

Direct operating cost of water supply	42 ALL/m^3
Total operating cost of water supply	59 ALL/m^3
Average price of water supply	38 ALL/m^3
Rate of collection	84 %
Ratio of direct operating cost coverage with the revenues	93,00%
Ratio of total direct operating cost coverage with revenues	66 %
Ratio of total cost Water + Sewer (UK) coverage with receipts	56 %
Ratio of total cost Water + Sewer (UK) coverage with subsidies	18 %

In addition, the report points out the five companies with the best performance in 2010 in the following order 1. Korçë, 2. Librazhd, 3. Gramsh, 4. Pogradec and 5. Tirana.

When visiting the UK in Pogradec in January 2012, the director of the utility, Ilirjan Mimini, explained the water tariffs for Pogradec. While families pay 55 ALL/m^3 drinking water and 18 ALL/m^3 wastewater, the business and institutions have to pay 110 ALL/m^3 drinking water and 25 ALL/m^3 wastewater. These numbers seem to be cost covering according to the numbers from the benchmarking report (presented in Table 3.2) and should be counted as a good example for whole Albania. Utilities should learn from the well working utilities and get in exchange with them in order to improve their own performance.

3.2.5 Relevant laws and conventions

As Albania aims to move towards compliance of Albanian law to EU law, following EU Water Directives have to be considered (Blaschke et al. 2011) to be implemented in the Albanian law:

- Water Framework Directive (WFD) (2000/60/EC), October, 23rd 2000
- Drinking Water Directive (98/83/EC), November, 11th 1998
- Urban Wastewater Treatment Directive (91/271/EEC), May, 5th 1991
- Principles of Full Cost Recovery under COM(20000)477

The strategy paper of the Albanian water and sewerage sector (see chapter 7.1.1 National WSS Sector Strategy 2011-2017 and strategy for rural areas) declares the aim to meet EU standards as unrealistic for the sector strategy planning period from 2011 until 2017, but it should be considered for a longer future planning.

Most relevant for the wastewater sector is the mentioned EU Directive (91/271/EEC) that defines the requirements for wastewater treatment before its discharge. Areas with less than 2,000 PE are not considered explicitly in this directive. Threshold values for the discharge of treated wastewater into aquatic system are given. The directive distinguishes between concentration values [in mg/l] and the minimum percentage of reductions [in %] based on the influent load (see Table 3.3). Values are given for BSB, CSB and suspended solids (SS) reduction. For sensible areas with more than 10,000 PE the directive gives also values for the required reduction of Nitrate (N) and Phosphor (P) (EG 1991). Exceptions for discharge with lower treatment quality are defined in the directive as well.

Table 3.3: Requirements for wastewater discharge from EU Directive 91/271/EEC (EG 1991)

Parameter	Concentration [mg/l]	Minimum percentage of reduction [%]
BOD	25 mg/l	70 – 90 %
COD	125 mg/l	75 %
SS	35 mg/l (for > 10,000 PE) 60 mg/l (for 2,000 - 10,000 PE)	90 % (for > 10,000 PE) 70 % (for 2,000 - 10,000 PE)
P_{total}	2 mg/l (for 10,000 - 100,000 PE) 1 mg/l (for > 100,000 PE)	80 %
N_{total}	15 mg/l (for 10,000 - 100,000 PE) 10 mg/l (for > 100,000 PE)	70 – 80 %

The relevant national laws are listed below:

- **Decision of Council of Ministers (DCM) no 228**, 27.05.1992 on the **"Protection of Urban Environment from Pollution and Damage"** (Blaschke et al. 2011) / **Law no 8934**, 05.09.2002 **"On the Environmental Protection"**, that will be replaced in the near future by Albanian Water Resource Law (Heeb and Wafler 2011,a)

- **Law no 8102**, of 28.03.1996 **"On the regulatory framework of the water supply and wastewater disposal and treatment sector"**, amended 12.05.2008, defines functions and competences of the Water Regulatory Authority (WRA) (WRA 1996)

- **Law no 8093**, 21.03.1996 **"On Water Resources"** updated by **Law no 9837**, 03.12.2007 and by **Law no 10137**, 11.05.2009, gives principles of water management and is a step towards the WFD 2000/60/EC (Blaschke et al. 2011)

- **Instruction no 3**, 28.07.2004 of the Ministry of Public Works and Transport (MPWT) on drinking water; about the administration of drinking water (Blaschke et al. 2011)

- **Law no 9115**, 24.07.2003 **"On the Environmental Treatment of Wastewater"** (application of EU Directive 91/271/EEC) (Heeb and Wafler 2011,a)

- **Decision of Council of Ministers (DCM) 177**, 31.03.2005 **"On the allowed norms of liquid discharges and the zoning criteria for the receiving water environments"** contains effluent requirements for the discharge of municipal and industrial wastewater into receiving surface waters. Requirements are oriented at EU Directive 91/271/EEC and depend on size of WWTP and the sensitivity of the area (Gjinali 2010); (Blaschke et al. 2011)

Framework under preparation:

- **Albanian Technical Norms and Standards** in the field of water and sanitation (Heeb and Wafler 2011,a)
- **National Concept on Decentralised Sustainable Sanitation** for Albania, preparation under GIZ WSR programme (Heeb and Wafler 2011,a)
- **National Water Supply and Sewerage Masterplan**, financed by KfW, shall be finished by 2012 (see subchapter 7.1.2 Masterplan for water sector, p.85)

International and regional freshwater conventions signed by Albania according to (WB 2003) and (Lipponen et al. 2011):

- Convention on **Protection and Use of Transboundary Watercourses and International Lakes** (Helsinki, 17.03.1992, signed and ratified)
- Protocol on **Water and Health** (to the Transboundary Watercourses Convention) (London, 17.06. 1999, signed and ratified)
- Convention on **Wetlands** of international importance especially as Waterfowl Habitat (Ramsar, Iran, 02.02.1971, signed and ratified)
- Convention on **Biological Diversity** (Rio de Janeiro, 05.06.1992, ratified)
- Protocol on **Cooperation on Water Management** between AL and ME (concerning Drin River, Shkodra Lake and Bojana River) (signed in 2003)
- Agreement between the Ministry of Tourism and Environment of Montenegro and Ministry of Environment, Forestry and Water Administration of Albania for the **Protection and Sustainable Development of the Shkodra Lake**, establishing a Shkodra Lake Comission (signed in 2008)
- Agreement for the **Protection and Sustainable Development of Lake Ohrid** and its Watershed, establishing the Lake Ohrid Watershed Committee (signed in 2004)
- Agreement between Albania, the former Yugoslavic Republic of Macedonia, Greece and the European Commission on the **Protection and Sustainable Development of the Prespa Park Area** (signed in 2010)
- Agreement between Albania and Greece on the establishment of the permanent **Greek-Albanian Commission on transboundary freshwater issues** (2005)

3.2.6 Main institutions

An overview over the stakeholders of the Albanian water and wastewater sector are given in the report of Martin Wafler and Johannes Heeb "Capacity needs assessment for small and medium size wastewater treatment plants in Albania" (Heeb and Wafler 2011,a). They are divided into 1) Central Governmental Organisations, 2) Local Governmental Units (LGU) and 3) Non-governmental Organisations and International Donor Organisations. At this point, the main stakeholders on the national level shall be briefly introduced. Stakeholders relevant for sanitation projects in the rural areas are described in chapter 7 Presentation of the institutional framework (p. 84).

Table 3.4: Main sector institutions (Sass 2010); (Heeb and Wafler 2011,a);(MPWT 2011)

Sector institution	Responsibility / involvement
Ministry for Public works and Transport (MPTW)	• Drafting sector strategies • Setting of technical standards • Coordination of donors support
General Directorate of Water Supply and Sewerage (GDWSS) and its General Directorate (GD)	• Is part of the MPWT • Management of investment projects • Monitoring of performance • Project on benchmarking and regionalisation
Ministry of Environment, Forestry and Water Administration (MoEFWA) and its General Directorate on Water Administration (GDWA)	• Overall responsibility for water administration (Lipponen et al. 2011) • Standard setting for wastewater discharge • Issuing of construction permits for treatment facilities
Water Regulatory Authority (WRA)	• Ensuring "that water and sewerage service providers deliver the highest achievable quality at a fair price and in financially sustainable manner" (WRA 2012) • Competences regarding tariffs, issuing of license, subsidy policies, standards of service (concerning costs, prices, quality of water) and is reporting to the parliament • Regulation of service providers • Consumer protection
Water Supply and Sewerage Association of Albania (WSSAA)	• Non-profit association of water supply and sewerage professionals • Aim is to „represent the interests of the operating enterprises in the water sector, and to raise the level of professionalism in the sector" (WSSAA 2011)
Regions (Qark)	• Development and implementation of regional policies and the harmonisation of them with national policies
Municipalities and communes	• Owner of water supply and sewerage infrastructure and therefore responsible for the end consumer supply
Utilities	• 100 % owned by local governmental units • Service delivery (drinking water supply, ww discharge + treatment)

3.2.7 Involvement of donor organisations

According to the Albanian water supply and sewerage Masterplan (Blaschke et al. 2011), around 13 different donor organisations are working in Albania. This subchapter presents the main donors of the water and wastewater sector with focus on German cooperation.

3.2.7.1 Gesellschaft für Internationale Zusamenarbeit (GIZ) GmbH

GIZ is the German Development Agency and works since 2003 in Albania. Projects are numerous and include for example tourism and climate change projects. The focus of GIZ lies on water supply and sustainable economic development. At the moment, GIZ runs the "Water Sector Reform" programme in Albania and a programme for support of economy and promotion of employment. For the water and wastewater sector, four programmes could be identified that GIZ run in the past or is still running. These programmes are presented in Tabel 3.5 (p.21) with their title, programme period and the components if they had.

Tabel 3.5: Overview over water sector projects of GIZ/GTZ between 2003 and 2012 in Albania

Year	Number	Name	Components
2003 - 2007	2002.3513.5	"Support to the Commercialisation of Water Supply and Sewerage Enterprises in Albania"	
2008 – 2009/2010/2011	02.3513.5-022.00	"Advice on the decentralisation of the Albanian water supply and sewerage sector"	3 components: (1) Support the decentralisation process of the water and sanitation utilities from central to local government (2) Capacity development of the Association of the Water Supply and Sewerage Association (WSSAA) (3) Rise awareness and acceptance to low cost decentralised sanitation systems
2009 – 2011		"Strengthening the Water Regulatory Authority (WRA)"	

2011 – 2015	PN: 2010.2088.2	"Water Sector Reform"	3 components: (1) Implementation of reforms in the water sector (cooperation institution is MPWT) (2) Capacity development in water supply and sewerage (introduction of operating standards and providing training, target institution is GDWSS) (3) Strengthening regulation in the water sector (WRA)

The actual „Water Sector Reform" programme started in 2011. GIZ is giving advice to the Albanian government on developing and implementing reforms in the water sector. The lead partner is the MPWT with its integrated GDWSS.

GIZ is working with technical and financial instruments to help reaching the goals of the National Strategy for Development and Integration (NSDI) by improvement of water supply, sewerage system and sewerage treatment. Programmes include advise, training, capacity development and awareness creation as well as promotion of locally adapted sanitation systems (GTZ 2010,b).

For more information please refer to the homepage of GIZ (GIZ 2012), available online on following link: http://www.gtz.de/en/themen/25359.htm.

3.2.7.2 Kreditanstalt für Wiederaufbau (KfW)

The German Development Bank, the Kreditanstalt für Wiederaufbau (KfW), is working in Albania since 1992. KfW supports the Albanian government to fight against poverty and to become EU member by financial cooperation (FZ – Finanzielle Zusammenarbeit). The investment in water supply, wastewater treatment systems and the protection of the environment at Ohrid lake and at Shkodra lake as well as at the Adria sum up to 227 million €. Credits for small and medium size businesses to strengthen the economy count 30 million € (KfW 2011).

Since the beginning of 2011, KfW supports the Albanian government to develop an investment plan for the water sector and a consistent financing mechanism to coordinate investments in the sector. This plan is the socalled "Masterplan", that shall be finished in 2012 (see sub-chapter 7.1.2 Masterplan for water sector). Additional studies about water supply and waste water disposal in rural areas are supported by KfW (Dollaku 2011).

KfW financed some wastewater treatment plants and collection systems in Albania. In Korçë a central collection of 88 % of the city's wastewater is constructed and a wastewater treatment plant is finished and shall start operation at the beginning of 2012 (Dollaku 2011). Korçë is the first Albanian city with 24 hours water supply. The project was supported by KfW with 20 million € for canalisation, connection of new parts of the city, the collection system and the WWTP. KfW follows mostly the approach to first install drinking water supply and than the wastewater treatment. Like this, values for water consumption and therefore for the resulting wastewater amount can be determined. In some projects of other donors, wastewater treatment plants have been built but are not in use because of missing water supply or wastewater collection pipes. This shall be avoided by the KfW approach.

At the moment, KfW finances a drinking water supply project for poor villages in the north of Albania, that is executed by the Albanian Development Agency (ADF). A more detailed description of this project is given in subchapter 7.2.2 Example of water supply project of ADF (p. 90).

3.2.7.3 Albanian Development Fund (ADF)

The Albanian Development Fund (ADF) is a public agency that states its mission as to "encourage a sustainable, balanced and cohesive socio-economic development at local and regional level" (ADF 2012). The ADF was established in 1993, based on an agreement between the Albanian Government and the World Bank. Some of the ADF's competences are to manage projects funded by the Albanian Government and/or donor organisations, to give technical support and assistance for projects and to carry out trainings for local institutions (ADF 2012).

At the moment, ADF carries out a drinking water supply project for 50 poor villages in the North of Albania. The project is funded by KfW. As ADF is the main organisation taking care of the rural areas, it has to be a close partner for GIZ for rural sanitation projects. ADF is working on the same level as the GDWSS.

3.2.7.4 Other relevant donors

The **European Union (EU)** supports Albania since 1991. Until now, the financial support counts 1.5 milliard €. In 2003, proceedings about a stabilisation and association agreement (SAA – Stabilisierungs- und Assoziierungsabkommen) began which became effective in April 2009. EU gives support through the Instrument for Pre-Accession Assistance **(IPA)** which contains establishment of institutions, cross-border cooperation, regional development, development of human resources and rural development (BMZ 2011). The IPA instrument is a new funding mechanism of the EU since 2007 to help EU candidates and potential candidates (Albania is a potential candidate) to assist reforms in the countries (Wikipedia 2012,c). According to (WBIF 2012), EU is actually funding a sewerage network for the municipality of Shëngjin together with a big wastewater treatment plant for the area.

Japan started its work in Albania in 1990 „in order to promote democratisation and develop social economic sectors" (JICA 2011). At the moment, the **Japanese International Cooperation Agency (JICA)** is financing the wastewater treatment plant in Tirana with loans („Greater Tirana Sewerage System Improvement Project") (JICA 2011).

World Bank (WB) was already enganged in the development of the „Rural Water Supply and Sanitation Strategy" (RWSS) from 2001 and the „National Water Supply and Sewerage Sector Strategy 2011 – 2017", published in 2011. Now, WB is financing the actual „Masterplan" for the water sector that shall be finished in 2012. For more information about these documents, please refer to chapter 7 Presentation of the institutional framework (p. 84).

Other main donors in the water sector financing wastewater treatment plants for Albania the are European Investment Bank (EIB), the Swiss State Secretariate for Economic Affairs (SECO) and the Austrian Development Agency (ADA). SECO was also financing the water supply in Pogradec, that is in use since 2007 (SECO 2012). ADA is working „towards the incorporation of missing issues regarding small and medium size wastewater treatment plants" (Heeb and Wafler 2011,a) as well as GIZ.

4 Presentation of technologies for rural areas

The following chapter gives an introduction about small size technology for wastewater treatment that is appropriarte especially for rural areas.

4.1 Introduction to small and medium size technologies

Small or medium size technical solutions for wastewater treatment in rural areas are solutions that may include the collection, transport, treatment and disposal or re-use of wastewater and fecal sludge of only a few people, like one family as a single household, up to some hundreds or a few thousand people in a village. For the work of GIZ in Albania, the solutions to be considered shall be possible to implement for a single household up to a number of around 5,000 population equivalents (PE). The preferred number of covered people for one implementation project is between 200 and 2,000 inhabitants, what equals 200 to 2,000 PE.

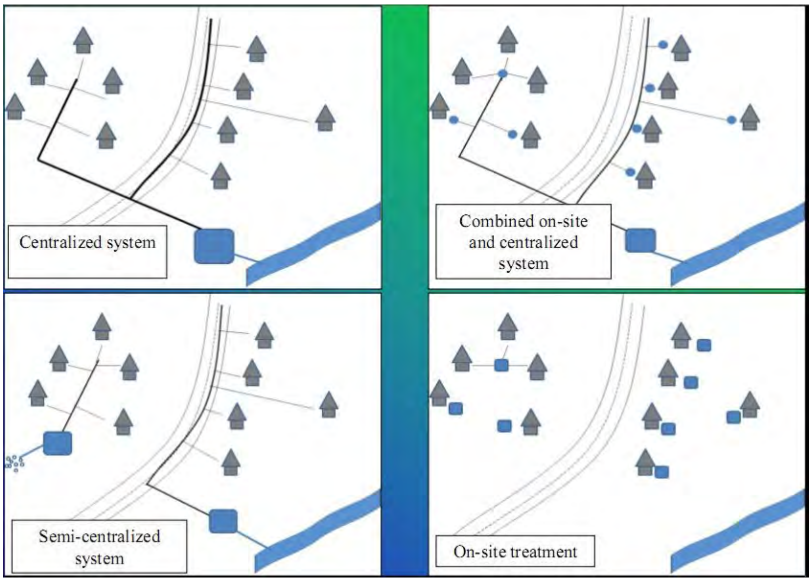

Figure 4.1: Centralised, semi-centralised and on-site wastewater treatment options (Nowak 2011,a)

Figure 4.1 shows the differences between centralised systems and on-site treatment as well as the combinations. While a centralised system collects the wastewater of the whole area (like a village), semi-centralised systems collect wastewater only from a neighbourhood to avoid the construction of a too long sewer system over bigger distances. On-site treatment means that every single house or a group of houses (a cluster) has an own collection and treatment facility. The combination of on-site and centralised system is possible as well, e.g. if every household has a pre-treatment facility and only pre-treated wastewater is collected and directed to a centralised treatment plant.

Toilets can be divided into dry toilets, water-flush toilets and toilets with little use of water (pour-flush) when looking at the use of water. Water and waterless toilets can also be divided into systems with or without urine separation. This chapter deals only with solutions that are based on the use of water as dry toilets are not very common any longer in Albania and not welcomed for new projects (Gjinali 2011,b). As Albania has sufficient water sources, nearly every building has water available inside and therefore also sanitation is mostly based on water consumption. Considering the question of urine diversion, this option is also not included as it seems already too sophisticated. Therefore, only water toilet systems with blackwater production will be considered in the following.

4.1.1 Components of a sanitation system

A sanitation system consists of the following different parts:

1) User interface
2) Collection (and pre-treatment)
3) Transport
4) Treatment
5) Disposal or re-use

These components shall be briefly explained in the following. Sometimes the combination of collection, treatment and disposal without the transport is possible at the same place if on-site solutions are used.

User interface

The user interface is the term for the part of the toilet system with which the user is getting in contact when going to toilet. Toilets can work with and without water and therefore they are referred as to dry toilets, pour-flush and water toilets. The toilet interface can be constructed as a squatting slab or a toilet bowl to sit on. The design will mainly depend on culture and preferences of the users. In Albania, toilet bowls and squatting slabs are both common and in use.

Collection

A storage or settling tank next to the house collects the wastewater and allows the solid particles to settle down in the tank what is a physical pre-treatment. In some collection tanks, like for example the Imhoff tank, physical and biological pre-treatment can take place. If houses are connected to a sewer system, collection tanks are not needed.

Transport

The transport of wastewater to a wastewater treatment plant can be realised by a conventional sewer system (CSS) working by gravity or with pumps. Wastewater can be to an on-site treatment facility next to the house, to a common treatment facility for a group of houses or for the whole village or area. Earthworks to implement a piped sewerage system are cost intensive and can be the most expensive part of a wastewater treatment solution.

Another system is the small bore sewer (SBS) that only receives the “liquid portion of household wastewater for off-site disposal” (Wehrle et al. 2007). Grit, grease and solids are separated from the liquid part by installing an “interceptor tank” in between the household connection and the SBS to allow the solids to settle down. Therefore, the pipes of the SBS can be built with a smaller diameter (DN) than a CSS. Cleaning of the pipes has to take place between every six months and two to three years. SBS can be used in smaller communities with low water discharge and low amount of particles in the wastewater, what to prevent clogging. SBS pipes are not installed as deep as CSS pipes because they do not need to have a minimum flow velocity and the system can therefore save some construction costs. Additionally, SBS requires less space as the pipes are much smaller than CSS pipes and can be used “in the small sneaky streets of a village” (Wehrle et al. 2007). This would be an advantage in very dense settlements where streets are narrow and groundworks are difficult to realise.

Vacuum systems will not be considered in this work as they are too expensive and not that easy to operate.

If a sewer system is not an appropriate solution because of the long distances between the houses, storage or settlement tanks have to be installed at the houses that have to be emptied manually or with a sucking vehicle. The sucking vehicle will bring the wastewater and the faecal sludge to the next treatment plant.

Treatment

Wastewater and sludge have to be treated in a wastewater treatment plant. Wastewater tretment can be distinguished into pre-treatment, primary, secondary and tertiary treatment. Pre-treatment and primary treatment mean physical removal of organic and inorganic solids by sreening and sedimentation. Pre-treatment facilities can also cover biological treatment processes. Some plants can perform pre-treatment and secondary treatment in one unit. Secondary treatment refers to the removal of biological matter by degradation through microorganisms. Tertiary treatment is a final treatment to reduce nutrients and biological matter to reach higher effluent qualities if this is needed.

Wastewater treatment plants can be designed in small scale for a single house or a group of houses (cluster) or much bigger for a whole village or neighbourhood. Depending on the conditions and the local needs (kind of wastewater, quality of effluent, etc.), a wastewater treatment technology has to be selected. Technology can be distinguished into intensive and extensive technology, referring to the area requirements. Extensive treatment technologies need more land than intensive technologies, but have in general lower investment costs, a simpler operation, allow energy savings and require less specialised manpower (IOW 2001). Intensive technologies are activated sludge systems, rotating biological contactors or biofilters. Extensive technologies are for example constructed wetlands (combined with Imhoff tank), aerated ponds or waste stabilisation ponds (Albold and Wendland 2010). Wastewater treatment plants have to include treatment for the liquid phase of the wastewater and the sludge that comes with the wastewater and that is partly produced during the wastewater treatment (primary, secondary and tertiary sludge). Sludge has to be dewatered, stabilised and sanitised.

Disposal and re-use

Treated wastewater should meet standard values for the chemical oxygen demand (COD), the biochemical oxygen demand (BOD), phosphor and nitrogen and some other factors and is mostly discharged into the next water stream, like a river or a lake. An other option can be the infiltration into the ground or the re-use of treated wastewater for non-drinking purpose. Sludge can be incinerated, disposed on landfills or used on agricultural fields. Especially for the use of sludge and the re-use of treated wastewater, the treatment process has to meet hygiene requirements. Standards for wastewater re-use are available in WHO guidelines (“Guidelines for the safe use of wastewater, excreta and greywater”).

4.1.2 General background information of the site to select and design a treatment solution

To select the appropriate technology for wastewater treatment, several aspects have to be considered. These can be the housing density and the amount of households in the village, the number of inhabitants and the average household size, the house design as well as the parameters of the surrounding area. They all will give an idea about the amount of produced wastewater. Geographic and climatic factors influence the selection of technology as the technology has to cope with temperatures or rainfall amounts. To make a decision for a technology, it is very important to gather as much information as possible about the considered area. In the following, the importance of the information shall be explained a bit more in detail:

- **Average household size, number of inhabitants and water consumption:** These numbers will give the **amount of wastewater** that has to be treated.
- **Demographic development:** For the design of a wastewater treatment solution, it is important to know the future population development of the area. The plant should be able to cope with more or less inhabitants in the future or it should be possible to enlarge the plant if more people have to be connected to it. But not only for the technical design, also for the tariff setting the demographic development has to be considered to know how expensive a solution will be for the community or the single household in the upcoming years.
- **Housing density:** If the houses are very dense, collection of wastewater by canalisation and treatment of collected wastewater is suitable. If houses are very scattered, on-site solutions for each house or cluster should be applied. The construction of a canalisation in a housing area that is not very dense is very expensive and not everywhere possible (depending on the underground).
- **Slope of the area:** If the area has a slope, wastewater can be transported by gravity.
- **Land availability:** Land has to be available to construct a treatment facility. If land availability is restricted, intensive technical solutions have to be chosen. If land is available without restrictions, it does not influence the selection of the technology.
- **Temperature:** Biological processes of the wastewater treatment depend on the temperature. The higher the temperature, the faster the biological processes are. If temperature is getting too low, treatment plants have to be insulated or installed underground.
- **Rainfall:** Some technologies are able to cope better with long droughts or heavy rainfalls than others. To give an example, ponds are a good solution to treat rainwater together with the wastewater, while too much rain causes problems for constructed wetland plants.
- **Flooding**: If the area is frequently flooded, water can enter in pits and tanks, if they are not sealed, and pollute the surrounding areas by flushing out the excreta. In countries where dry toilets are applied it is common to build the collection chamber and the superstructure on the ground instead of digging a pit into the ground if flooding occurs.
- **Soil characteristics, permeability:** The characteristics of the ground are important to know how deep for example a tank can be built, if the construction of a canalisation is possible and if the soil has filter characteristics in case that wastewater is seeping into the ground. On the other hand, if pits are built in an area where the soil permeability is below 2.5 mm per hour (e.g. clay) the liquid fraction cannot infiltrate into the ground leading to an overflow of the pit (Ahmed and Rahman 2007). Ground with very low permeability (like clay) is good for the construction of ponds, filter and drying beds as the material can be used as liner making the facility watertight to the underground.
- **Groundwater level:** If wastewater is seeping into the ground, it can enter the groundwater layer and pollute it. This is dangerous especially if people use groundwater for drinking water purpose or if groundwater layer is connected to a close lake or other aquatic systems that will be polluted.

Culture and habits influence the location of the toilet (inside the house or outside), the design of the toilet (squatting slab or toilet bowl with seat) or the use of water for flushing the toilet and doing anal cleansing. It also depends on the culture and habits, if a special treatment facility will be accepted (e.g. if odour occurs) and if re-use of treated wastewater will be accepted. **Participation** of the community in the planning and implementation is necessary to ensure that the facility will be accepted and used. The design has to be accepted by users and operators.

Other aspects for implementing a technology is the **money available** and the **knowledge** of the users and operators. In rural poor areas where the awareness of people is not given, small and medium size solutions should be implemented that can easily be built with local materials and that do not require electricity and a lot of operation and maintenance work. Operation should be appropriate for the **capacity** of the service provider (manpower and knowledge). The use of the facility should be save, simple and easy to understand. The solution should be constructed in a way that an upgrade is possible (see Figure 4.2).

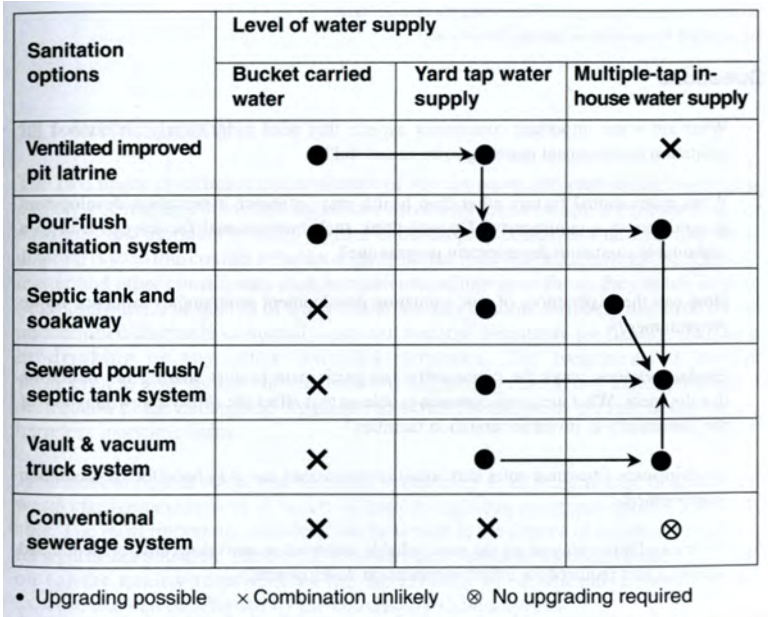

Figure 4.2: Correlation between sanitation option and upgrading possibilities according to the level of water supply (Ahmed and Rahman 2007)

Figure 4.2 shows the correlation between the sanitation options and the level of water supply. Upgrading of the sanitation system is mostly possible when level of water supply raises. When people have no water in the house, toilet systems are based on no or just little water consumption. Whereas water connections in the house allow the use of water-flush toilets with all kinds of water based sanitation systems. It has to be remarked that the figure shows only some sanitation possibilities.

4.2 Technologies presented by assigned consultant of GIZ and technologies already implemented on the Balkan

In November 2011, the Austrian expert Martin Wafler from the company seecon international GmbH gave a workshop in Tirana with the title "Capacity needs assessment for small and medium size wastewater treatment plants in Albania". Together with the workshop came a report with the same name (Heeb and Wafler 2011,a) and the presentation "Overview over selected small and medium size wastewater treatment plants for Albania" (Heeb and Wafler 2011,b), that present selected technologies. These technologies are the following ones:

Wastewater collection:

- **Separate sewer:** In contrast to the conventional sewer, the seperate sewer collects municipal wastewater and surface run-off in seperated systems. Surface run-off is little polluted and needs less treatment than wastewater. It can be re-used for non-drinking purpose. If wastewater treatment plants have to handle only municipal wastewater without the surface run-off, the can be designed smaller.

- **Solid free sewer (SFS):** Transport of pre-treated wastewater due to the use of a pre-treatment tank between household and sewer network allows the construction of sewer networks with smaller diameters. The advantage is, next to the smaller diameters, that pipes can be laid at shallow depths and that they follow the topography. Therefore, the SFS is cheaper than the conventional sewer. Other term in use is **small bore sewer (SBS)**.

Wastewater treatment:

- **Constructed wetlands (CW):** Constructed wetlands are man-made “natural” wastewater treatment systems, working on the basis of physical and biological processes. A more detailed description is given in chapter 5.1 Constructed wetlands in general (p. 51).

- **Anaerobic baffled reactor (ABR):** The ABR is an improved septic tank that contains a series of baffles to increase the contact time what leads to increased treatment performance. ABR can be installed in every type of climate, but lower temperatures will lower the efficiency. Needs a long start-up. The tank is installed underground, what makes it inappropriate for areas with high groundwater table (Tilley et al. 2008).

- **French vertical-flow constructed wetland (French VFCW):** The French VFCW is a special type of constructed wetlands that does not need any pre-treatment.

- **Trickling filter (TF):** A trickling filter is a fixed-bed biological filter where wastewater is sprayed (trickled) on. The filter material offers surface on which microorganisms are growing in a so called biofilm. Pre-treatment is necessary to prevent clogging of the filter. Effluent needs to get clarified as well in settling tanks or ponds as biomass can get flushed out of the filter. Skilled operator and constant energy supply are necessary. The TF can be adapted to cold climate (Tilley et al. 2008).

- **Rotating biological contactors (RBC):** A rotating biological contactor is a fixed-bed reactor with several discs rotating on a horizontal shaft. RBCs are used for secondary treatment after sedimentation (physical pre-treatment). As reactor is rotating, microorganisms on the discs are alternately exposed to wasteater and air, what causes sequenced aerob and anaerob conditions. With this technology, a high removal of biodegradable organic pollutants on a small area is possible, but continuous energy supply is necessary (Heeb and Wafler 2011,b).

- **Waste stabilisation ponds (WSP):** Waste stabilisation ponds are man-made ponds that are lined to the underground. Ponds can be aerobic, facultative and anaerobic. They are most effective if ponds are linked in a series of three ore more ponds and water is lead through in the following order anaerobic – facultative – aerobic pond. The anaerobic pond is important for the removal of solids and BOD, the facultative pond for further BOD removal and the aerobic pond, also polishing pond, for the pathogen removal. WSPs have their highest capacity in warm and sunny climates, but it is also possible to construct them for colder climates (Tilley et al. 2008). In some literature, the term **lagoon** is used for it.

Wastewater disposal:

- **Leach fields:** Leach fields (also **drain fields** or **drainage fileds**) are a wastewater disposal system, connected after a septic tank. The water is drained into the ground by perforated pipes that are laid into the ground. Pipes are normally surrounded by gravel to increase the percolation area (WB 2012). In Germany, disposal of wastewater without biological treatment is not allowed.

- **Forrest irrigation:** Pre-treted wastewater is lead into ditches between trees by gravity due to flooding of the ditches. Microorganisms in the soil take part of the treatment process. According to (Tilley et al. 2008), irrigation can be divided into **drip irrigation** and **surface water irrigation**. Forrest irrigation belongs to the second group and can be used in winter times as well.

Sludge treatment:

- **Dry beds:** Sludge is applied on the drying bed in thin layers to decrease of sludge volume. No stabilistation takes place. Can be used together with (co-)composting. Sludge removal has to be done every 10 – 15 days. Other term is **unplanted sludge drying bed** (see sub-chapter 4.3.5.2 Unplanted drying bed, p. 41).

- **Reed beds:** Similar to unplanted drying beds, but sludge can be applied on the old sludge layers. Dewatering and stabilisation take place. Sludge needs to get removed only every few years. Other term is **planted sludge drying bed** (see sub-chapter 4.3.5.3 Planted drying bed, p. 41)**.**

- **(Co-)Composting:** Controlled aerobic degradation of organic substances that can reduce pathogens. Combination of sludge and biodegradable solid waste is useful for the process as solid waste will give structure and therefore allows air to enter the compost piles. Composting should be done with distance to homes because of odours and flies.

For further information about the presented technologies please refer to the mentioned report and the presentation. According to (Gjinali 2011,b), efforts on dry toilets are not wanted by GIZ Albania, as every household has somehow water in the house. Therefore, this type of sanitation was not considered in the presentation.

A research article about small and medium size wastewater treatment plants in Macedonia describes four plants that are working very well in rural areas of Macedonia (Ertl et al. 2010). Three out of the four were included in the consultants presentation. The four plants are:

- Activated sludge system for 5,000 PE

- Aerated lagoons for 4,000 PE (the same as aerated ponds, technology is included in the presentation of Martin Wafler)

- Trickling filter system for 3,000 PE (technology is included in the presentation of Martin Wafler)

- Constructed wetland for 250 PE (technology is included in the presentation of Martin Wafler)

As Macedonia is a neighbouring Balkan country of Albania and the conditions are very similar (climate, geography, people's mentality, income, etc.), the experience should be used for future projects in Albania. Therefore, the technologies aerated lagoons, trickling filter and constructed wetlands can be considered for further assessment in the Albanian context. Activated sludge systems were not presented by Martin Wafler and will be described briefly in the following chapter together with other small and medium size technologies for rural areas. What has been remarked in that report is that only constructed wetlands were installed for a small community (250 PE), while the other technologies were used for much bigger villages (3,000 – 5,000 PE).

Some of the options presented by Martin Wafler seem to be not very appropriate, for example because of constant energy supply demand, too high complexity or expertise knowledge requirement for operation. To give a bigger range of possibilities to select from, the following sub-chapter 4.3 will give an overview over additional low-cost options that can be used in rural areas.

4.3 Compilation and description of additional small and medium size technology for rural areas

As the pre-selection of technologies of the consultant Martin Wafler was not done in a very transparent way (criteria for selection not obvious or specific enough) and seems to miss other, already established low-cost solutions, an additional presentation of technologies shall be given at this point. To give a complete overview over the idea of sanitation systems, all parts of the system (user interface, collection, (pre-)treatment and discharge/disposal/re-use) shall be considered as well.

4.3.1 User interface: Toilets with use of water

Toilet with the use of water can be pour-flush toilets and water-flush toilets, that shall be both shortly presented.

4.3.1.1 Water-flush toilet

Water-flush toilets (or water closets) are the most common type of toilets in Europe, invented in England at the end of the 18th century and spreading over Europe in the following century (Londong 2008). Also the rural Albanian population is using more and more water flush-toilets. Faeces, urine and most often toilet paper gets flushed away through a drain pipe to for example a septic tank for collection or a centralised sewer system that directes the wastewater to a treatment plant. Depending on the design of the flush, between one or two liters up to twelve liters are flushed away by using the toilet. Water-flush toilets offer a good hygiene and comfort, are easy to use and nearly no odour will occure. But they have the disadvantage that a lot of water is used for transport means and that excreta will be diluted very strong. Therefore, a big amount of wastewater has to be collected and treated.

4.3.1.2 Pour-flush (PF) sanitation technology

The pour-flush toilet is an improvement of the simple pit latrine where odours and insects are controlled by a water seal between toilet bowl or slab and pit (leach pit). After toilet use, a very small amount of water up to three litres is used for flushing. The water is poured in manually by the user. Every normal water-flush toilet can get a pour-flush toilet if water supply breaks down (Spuhler and Wafler 2012). According to (Ahmed and Rahman 2007), between five and ten liters of wastewater from excreta and the flush enter the pit per person and day. Pour-flush toilets can be used in rural and urban areas.

The pour-flush toilet can be constructed in two different ways as a direct or an off-set pour-flush latrine (see Figure 4.3 and Figure 4.4, p.32). The direct pit pour-flush latrine has a pit located directly below the toilet bowl or squatting plate. The water seal makes it an improved version of the dry pit latrine. Off-set pit pour-flush latrines have a pit that is located somewhere else but not directly under the seat or squatting slab. Pit and toilet are connected by a pipe with a diameter of 100 mm (DN 100). Therefore, the toilet can be installed inside the house and no extra superstructure is needed. Toilets inside the house offer more comfort and privacy. A special type of the off-set version is the alternating twin off-set pour-flush latrine. The toilet is connected by a Y-junction with two leach pits, located a bit away from the toilet (off-set) with a pipe of DN 100. The pits are used alternating. When one pit is filled up, excreta is directed into the second pit and content of the first has time to decompose. After 18 - 24 months, the content shall be pathogen-free and can be taken out. After emptying, the pit can be used again (Ahmed and Rahman 2007). The advantages and disadvantages of that toilet type are compiled in Table 4.1 (p.32).

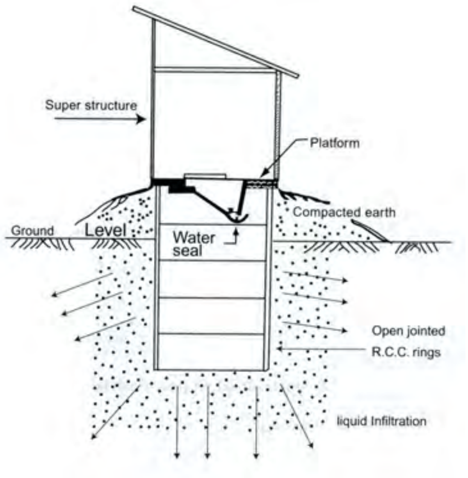

Figure 4.3: Direct pour-flush toilet (Ahmed and Rahman 2007)

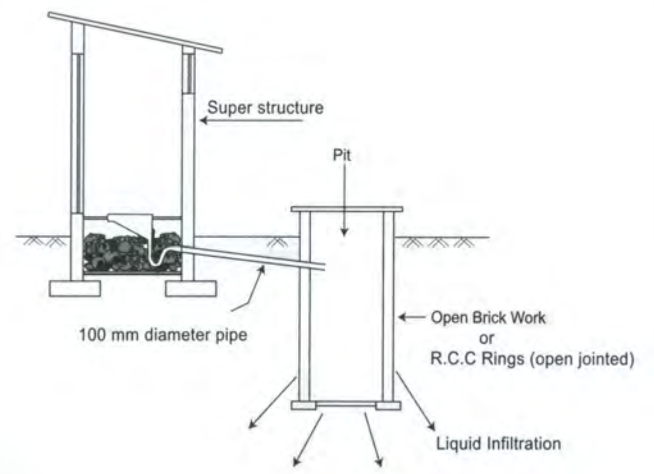

Figure 4.4: Single off-set pour-flush toilet (Ahmed and Rahman 2007)

Table 4.1: Advantages and disadvantages of pour-flush toilets

Advantages	Disadvantages
• Low-cost construction • Low water consumption • Good acceptance as excreta of previous users in not visible • Hygienic as water seal prevents odours and insect breeding • Can be upgraded • Can be located inside the house • Potential resource re-use (nutrients)	• Toilet consumes water • The construction can be difficult and expensive if area has a high groundwater table or the ground is rocky • Pouring water by user can be seen as uncomfortable work in comparison with using a water flush

Many toilets in Albania were flushed by hand when water supply was not connected. This can even be experienced in many schools or in the buildings of the local government. The use of leach pits brings the risk of polluting the water sources. Therefore this toilet can also be used with other sealed collection tanks.

4.3.1.3 Aqua privy

An aqua privy is a small size solution for single households. It consists of the toilet (seat or squatting plate) above a (septic) tank. The toilet is connected to the tank with a long “drop pipe” that ends in the water level of the tank and forms therefore a water seal. As excreta can directly drop into the tank, no flush is needed but helps to keep the pipe clean and prevents clogging (Ahmed and Rahman 2007). The design of an aqua privy is given in Figure 4.5 (p. 33).

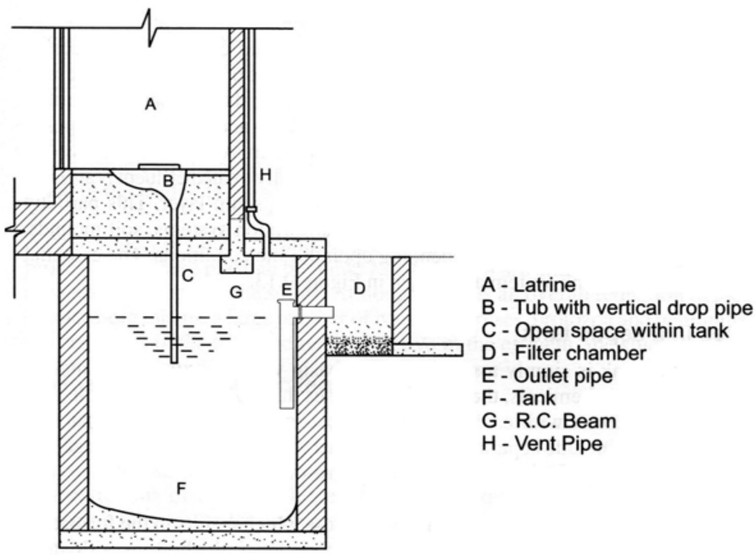

Figure 4.5: Aqua privy (Ahmed and Rahman 2007)

Excreta is falling into the tank where it settles down and degrades anaerobically. Gas can leave the chamber through a ventilation pipe. Solids have to be removed regularly. The effluent of the tank is going to a drainage filed or a soak pit.

Aqua privies cannot be installed in the house and have no advantages compared to the pour-flush toilet that can be built easier and cheaper (Ahmed and Rahman 2007). Thus, the aqua privy is not very recommended and will should not be considered for the Albanian context.

4.3.2 Collection

Collection and storage of excreta and wastewater takes place in more or less developed pits or tanks that will be presented in the following section.

4.3.2.1 Simple pit

A simple pit is dug into the ground beneth a toilet structure in order to collect and store excreta. If the soil is loose, the pit has to be stabilised with bricks. As the organic substances will be degraded under anaerobic conditions, little amounts of biogas will evolve. To get them out of the pit, a ventilaten pipe is used what gives these toilets the name VIP (ventilated improved pit latrine), that are normally water-less toilets. Odours and flies will occure at this toilet and need to be controlled (Halls 2000).

Liquids from the pit will infiltrate into the ground. Soil bacteria can degrade only the organic matter, pollution of the soil and the groundwater will be the consequence. Therefore, pit latrines should not be constructed in areas with high groundwater level, where the pit reaches into the groundwater table or will be close to it. The pit will fill up wth feacal sludge and needs to be emptied from time to time (Halls 2000).

4.3.2.2 Septic tank

A conventional septic tank is a lined on-site collection and storage tank that is implemented underground. It can be used for single houses, clusters or other buildings. Typically, a septic tank should have at least two chambers. Most solids will settle down in the first chamber. The separation baffle between the two chambers and a t-shaped outlet pipe will hold back scum and solids from going out with the effluent (see Figure 4.6) (Tilley et al. 2008).

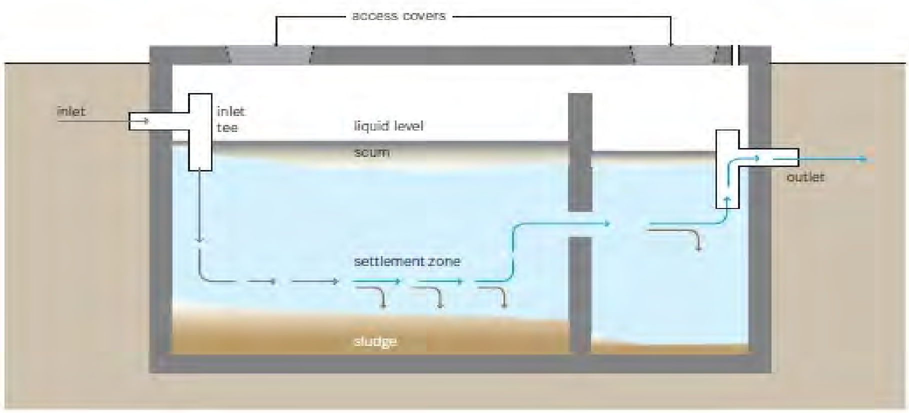

Figure 4.6: Conventional septic tank (Tilley et al. 2008)

It is a physical and biochemical treatment facility where low-rate anaerobic processes take place in the sedimentation basin. The removal capacity of a septic tank can reach 90 - 98 % of settleable solids and 40 - 60 % of BOD_5. Sludge that settles down on the ground of the tank has to be removed from time to time and needs further treatment and disposal (Wehrle et al. 2007).

The septic tank is followed by a disposal facility or a further treatment. Further treatment can be realised on-site or centralised by connection to a sewer system. Septic tanks have a low treatment efficiency. Problems can be the development of odour, ground water pollution if the groundwater level is high and a solid discharge from the tank (Wehrle et al. 2007).

Special modifications of the conventional septic tank are the **baffled septic tank** (see Figure 4.7) and **septic tanks combined with anaerobic filter** (Wehrle et al. 2007). First one is the same as an **anaerobic baffled reactor (ABR)**, presented by Martin Wafler, that can reach a BOD removal of 70 - 95 % (Wehrle et al. 2007). For anaerobic filter please refer to sub-chapter 4.3.4.3 Anaerobic filter, (p. 38).

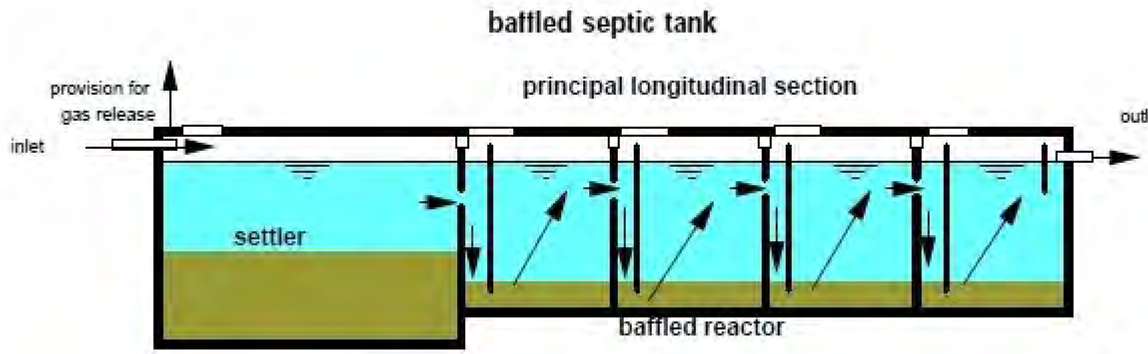

Figure 4.7: Baffled septic tank (Sasse 1998)

4.3.2.3 Imhoff tank

The Imhoff tank is an improvement of the septic tank, that allows sedimentation and sludge stabilisation. The tank has two compartments, that are flown through horizontally. The upper compartment serves for the settling of solids, in the lower compartment the anaerobical stabilisation of the settled solids takes place. The process produces low amounts of biogas, that leave the reactor through vent channels in order not to disturb the settling process (Stauffer 2012). Funnel-shaped walls help to collect settled solids at the bottom. Desludging of the Imhoff tank is possible through water pressure by using a desludging pipe with an outlet below the water level of the tank.

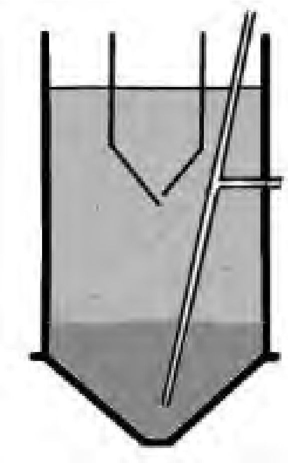

Figure 4.8: Imhoff tank (Stauffer 2012)

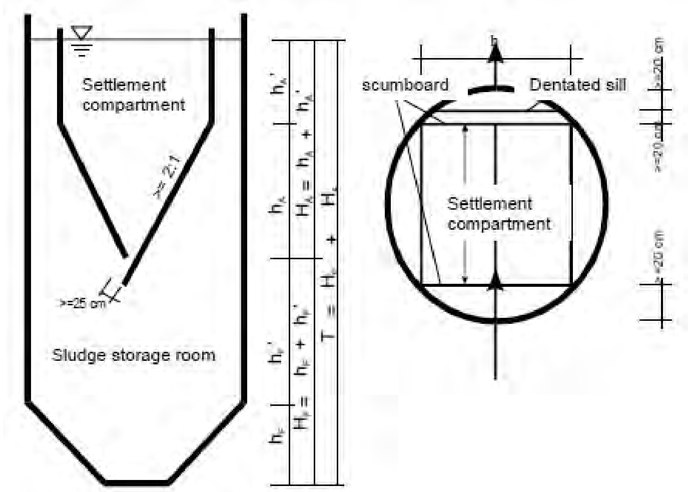

Figure 4.9: Imhoff tank (Nowak 2010,a)

The effluent from the Imhoff tank requires secondary treatment. Imhoff tanks are used preferably when further treatment takes place near residential houses, in open ponds or vertical flow constructed wetlands (Sasse 1998). Imhoff tanks need regular sludge removal to keep effluent quality high. Sludge needs further treatment and disposal.

Imhoff tanks are a low-cost option suitable for small communities or house clusters. As they can be installed underground, they do not require much land. To avoid groundworks, the Imhoff tank can be installed on the ground, but needs to be insulated in colder climates. O&M is simple costs therefore low (Spuhler 2012).

4.3.3 Transport

Transport of wastewater can be realised by sewer system or sucking and transport vehicle and is presented briefly in sub-chapter 4.1.1 Components of a sanitation system (p.25). Vacuum systems are excluded from that work as this technology is too sophisticated for the Albanian context.

4.3.4 (Pre-) Treatment

Treatment of wastewater can be distinguished into pre-treatment, primary, secondary and tertiary treatment. Pre-treatment and primary treatment refer to physical treatment processes while secondary treatment refers to biological treatment processes, where degradable biological matter is used by microorganisms. Pre-treatment can be combined with the primary and secondary treatment in one plant, but most technologies need a separated pre-tretment primary treatment facility where solids can settle down. Tertiary treatment is a final treatment step to improve the effluent quality if necessary.

4.3.4.1 Ponds

Ponds are in some literature also referred as to lagoons and can be distiguished into

- Settling ponds for pre-tretment and
- Waste stabilisation ponds (WSP), aerated ponds, aquaculture ponds and floating plant (macrophyte) ponds for wastewater treatment.

Settling ponds are used for pre-treatment where the settlement of solid particles and their anaerobic digestion takes place. These ponds should have a specific surface area of at least 1.5 m²/PE (Heise and Nowak 2007). As odours can appear they should be located somewhat away from the settlement.

Waste stabilisation ponds (WSP) can be low-cost options for domestic wastewater treatment considering construction and operation and can remove pathogenes very effectively. WSP are artificial water bodies filled with wastewater, that can even be used for settlement and removal of solid particles if there is no pre-treatment installed before (Heise and Nowak 2007). They work with the „natural processes of biodegradation, desinfection by sunlight, and particle settling under gravity" (Choukr-Allah 2011). Improvement of the treatment is possible if several ponds are used in a row. The anaerobic and aerobic treatment in the ponds can reach a BOD removal up to 75 % (Tilley et al. 2008). WSPs are shown in Figure 4.10.

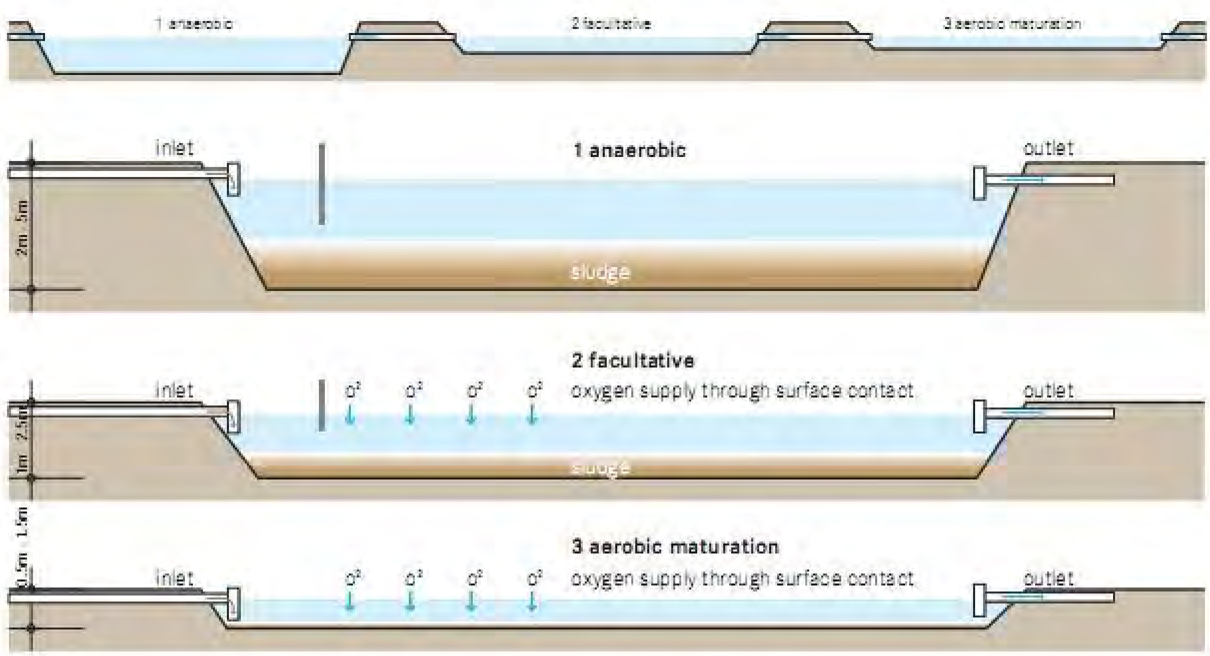

Figure 4.10: Waste stabilisation ponds (WSP) (Tilley et al. 2008)

Stabilisation ponds are an anaerobic treatment facility that can cope with very high loading rates, but also have a large area demand. Therefore, they are only feasible when the price of the land is low.

Some of the advantages of WSPs are the high pathogen reduction, that they can be built with local material, have low operation costs and no electricity demand. Disadvantages are the possible odours that can develop, the large area requirement that can be very expensive, and the need of secondary treatment or appropriate discharge of effluent and sludge (Tilley et al. 2008).

Aerated ponds are open aerated reactors and used for wastewater treatment after mechanical pre-treatment. Wastewater is mixed for aeration and suspension of the organisms to allow deeper ponds and higher organic load. Therefore, they need less area than WSP, but constant electricity supply.

Advantages of aerated ponds are the good resistance against shock loading and high pathogen removal, while disadvantages are the still large area demand, the electricity demand and the need of secondary treatment or appropriate discharge of the effluent (Tilley et al. 2008).

Aquacultural ponds (see Figure 4.11) refer to „controlled cultivation of aquatic plants and animals" (Tilley et al. 2008). Fish eat algae that grow in the nutrient rich water and therefore cleaning of the wastewater takes place. **Floating plant (macrophyte) ponds** (see Figure 4.12) have floating plants that can eliminate the nutrients from the wastewater while roots provide settling surface for bacteria that degrades the organic load of the wastewater. In both types of ponds, the sludge settles down to the ground and has to be removed regularly. Both solutions can be built with local materials, but require a large area. The floating plant pond also requires trained staff for operation (Tilley et al. 2008).

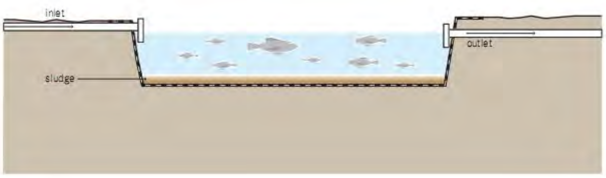

Figure 4.11: Aquaculture pond (Tilley et al. 2008)

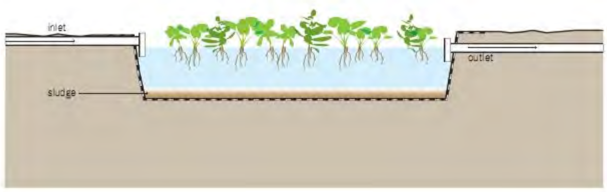

Figure 4.12: Floating plant pond (Tilley et al. 2008)

According to (Choukr-Allah 2011), ponds are used especially in Europe for smaller rural communities (up to 2.000 PE, but also bigger systems are existing) and in warmer climates (the Middle East, Africa, Asia, and Latin America) even for larger population up to 1 million people.

(Nowak 2011,a) gives average values of the area demand for ponds with 10 – 15 m²/PE for biological treatment.

4.3.4.2 Oxidation ditch

An oxidation ditch consists of a ring shaped channel, equipped with mechanical aeration devices, and is used for treatment of pre-treated wastewater (see Figure 4.13, p. 38). Compared with the aerobic pond, this system uses less area but requires more electricity and more complex O&M. Technology can be used for up to 20,000 PE. BOD removal ranges between 85 and 95 % (Wehrle et al. 2007).

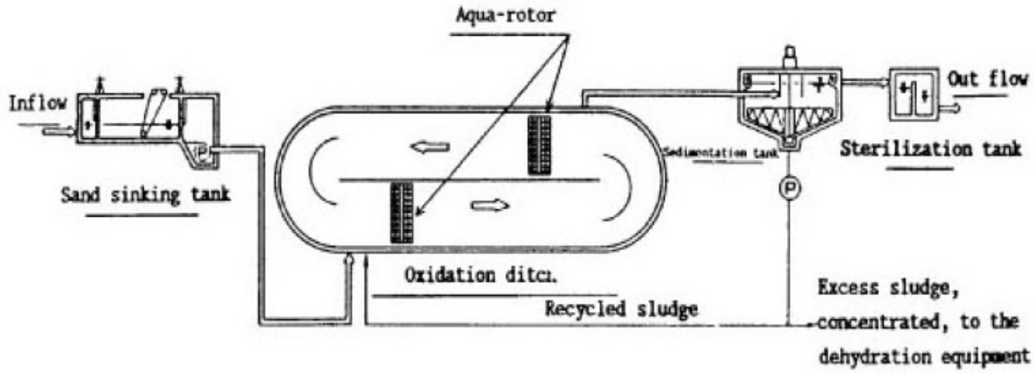

Figure 4.13: Scheme of an oxidation ditch (Wehrle et al. 2007)

4.3.4.3 Anaerobic filter

An anaerobic filter is a fixed bed biological filter that consists of a sedimentation tank or a septic tank followed by one to three filter chambers. Filter material, like gravel, rocks or plastic pieces, provides area for the biological mass to grow on. The filter can be operated up-flow or down-flow. Pre-treatment is necessary to prevent clogging of the filter (Tilley et al. 2008). Figure 4.14 and Figure 4.15 show two different design possibilities for up-flow anaerobic filters.

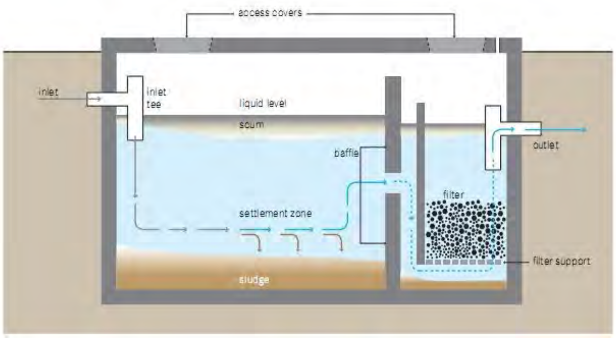

Figure 4.14: Anaerobic filter (Tilley et al. 2008)

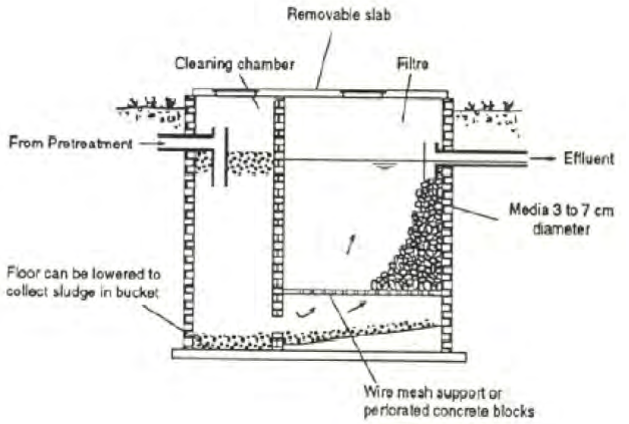

Figure 4.15: Anaerobic filter (UFAF) (Wehrle et al. 2007)

The TSS and BOD removal can reach up to 85 % – 90 %, but ranges typically between 50 % – 80 %. Nitrogen removal is limited up to 15 %. The filter needs up to six months in order to stabilise the biomass to bring full performance. But after this time, no special O&M work is required (Tilley et al. 2008).

The upward-flow anaerobic filter (UFAF) reaches the same BOD_5 removal performance as a septic tank, but the suspended solids (SS) removal is more efficient (Wehrle et al. 2007).

The anaerobic filter can be used in every climate, but is not suitable for areas with high ground water level or areas with frequent flooding. Advantages are the resistance to organic and hydraulic shocks, the moderate costs and the possibility to built the filter with local material. But the long start-up and the expertise knowledge required for the construction are disadvantages. The effluent still needs a secondary treatment.

4.3.4.4 Up-flow anaerobic sludge blanket reactor (UASB)

The UASB reactor (see Figure 4.16) is a reactor with suspended anaerobic sludge in the lower part and a gas-liquid-solid separation in the top. Wastewater enters the lined tank at the bottom through a distribution system and flows upwards. Organic compounds get degraded by microorganisms in the sludge layer. Biogas is produced in this process that can be collected and used to win energy. Gas bubbles flow up and mix the water and sludge (Wehrle et al. 2007). To prevent that microorganisms get flushed out of the reactor they have to get agglomerated. Therefore, granule-forming organisms are preferably agglomerated (Tilley et al. 2008). The outflowing wastewater enters a settling compartment where sludge can settle down and will be brought back into the digestion compartment.

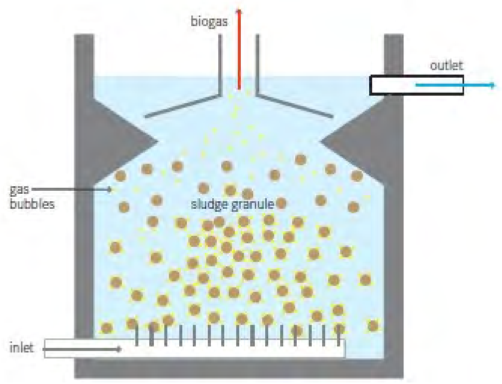

Figure 4.16: UASB reactor (Tilley et al. 2008)

Advantage of the UASB is that the process produces effluent with higher quality than a septic tank (BOD removal around 85 % (Wehrle et al. 2007)), only little land is required and no odours and no flies occur. But an UASB reactor is only appropriate if the area has a constant water and electricity supply. Other disadvantages of this reactor are the difficult construction and maintenance, especially the control of hydraulic and organic loads. And the last main concern is that the UASB is an established technology for industrial wastewater, but the application for domestic wastewater is very new (Tilley et al. 2008). Therefore it is not clear if it is at all an appropriate solution for urban wastewater (in rural areas).

For all the mentioned reasons (constant electricity supply requirement , difficult operation, no or little experience for urban wastewater, etc.), the technology is not appropriate for the rural areas of Albania.

4.3.4.5 Activated sludge

The activated sludge technology consists of several chambers for aeration and settling. The process makes use of mostly aerobic microorganisms to degrade the biological matter in the wastewater. Frequent oxygen supply is necessary to keep aerobic conditions and to keep biomass suspended (Tilley et al. 2008). The flow scheme of the process is shown in Figure 4.17 (p. 40).

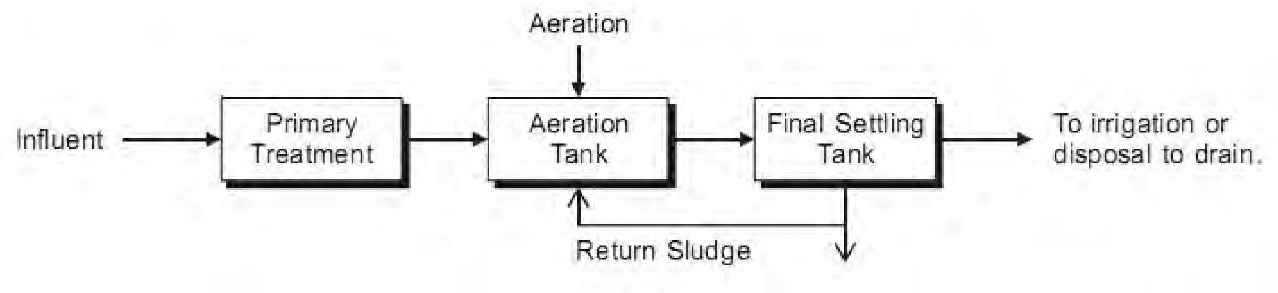

Figure 4.17: Flow scheme of the activated sludge process (Wehrle et al. 2007)

The activated sludge process needs a primary treatment and is combined with tertiary treatment. Advanteges are the high BOD and pathogen removal (up to 99 %), the resistance against shock-loading and the big flow-range at what the plant can be operated. But the process needs very well trained stuff and a constant electricity supply. The process is more appropriate for larger wastewater flows from 10,000 up to 1,000,000 PE (Tilley et al. 2008). Therefore, the technology is not suitable for a GIZ project in rural areas of Albania.

4.3.5 Sludge treatment

4.3.5.1 Sedimentation or thickening pond

Sedimentation or thickening ponds (see Figure 4.18) are simple ponds where sludge can settle down for thickening and dewatering purpose. The total solids (TS) content can be increased up to 14 %. The pond also allows stabilisation of the sludge due to anaerobic processes. The pond has a liquid outlet. Sludge has to be removed monthly and treated regularly. Mechanical sludge removal is possible with frond end loader or special equipment. Sludge thickening in a pond should be combined with on-site drying or composting process for desinfection (Tilley et al. 2008).

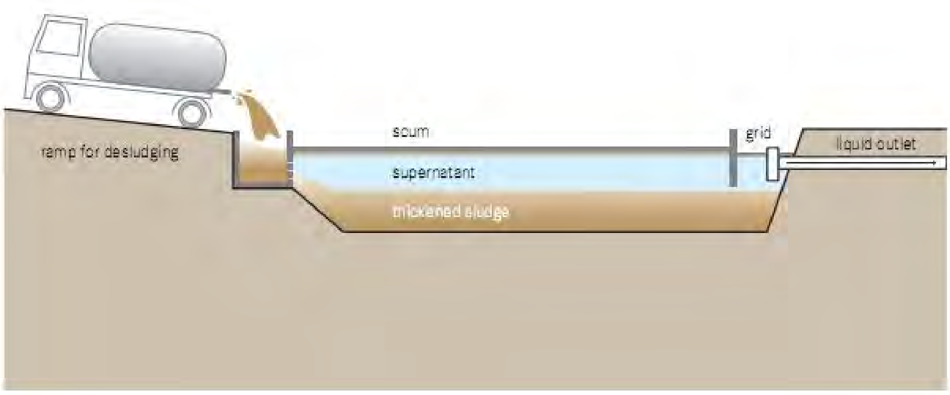

Figure 4.18: Sedimentation or thickening pond (Tilley et al. 2008)

To construct a sedimentation pond, large space is needed far away from settlement as odours and flies will occur. This can be a limiting factor if land is expensive or not available due to geographical conditions. In general, it is a low-cost option without energy requirements for hot and temperate climates without too much rain as rain is not good for the process. Expertise knowledge for design is necessary and proper maintenance is important (Tilley et al. 2008).

4.3.5.2 Unplanted drying bed

An unplanted drying bed (see Figure 4.19) is a man-made drying bed with drainage layer and drainage pipe at the bottom, that collects liquids through the drainage system. The purpose is the dewatering of the sludge. The process reduces the sludge volume by 50 to 80 %. The sludge is not stabilised and needs further treatment (as well as the drained water). For desinfection, co-composting is possible (Tilley et al. 2008).

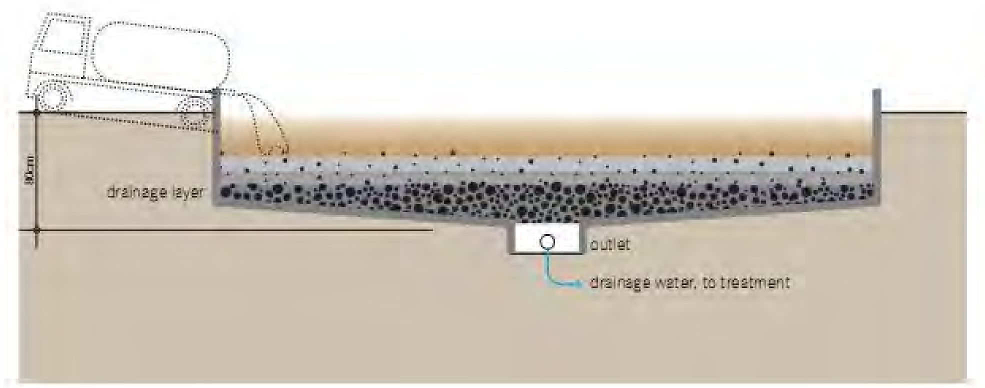

Figure 4.19: Unplanted sludge drying bed (Tilley et al. 2008)

Unplanted sludge drying beds are appropriate for small to medium size communes. Large space is required far away from the houses as odours and flies will occur. Advantages are that it is a low-cost treatment with moderate construction cost and no electricity requirements (Tilley et al. 2008).

4.3.5.3 Planted drying bed

Planted drying beds are similar to unplanted drying beds, but they are constructed with plants and ventilation pipes (see Figure 4.20). The appearance is therefore similar to vertical flow Cws. Roots facilitate the water to get out of the sludge as roots are growing through the sludge. Sludge is applied into a screening chamber, that is installed next to the drying bed. Purpose is the dewatering and stabilisation of the sludge, but no desinfection. Therefore, planted drying beds should be combined with co-composting. Sludge application can take place every three to seven days, sludge removal is necessary after two to three years (Tilley et al. 2008).

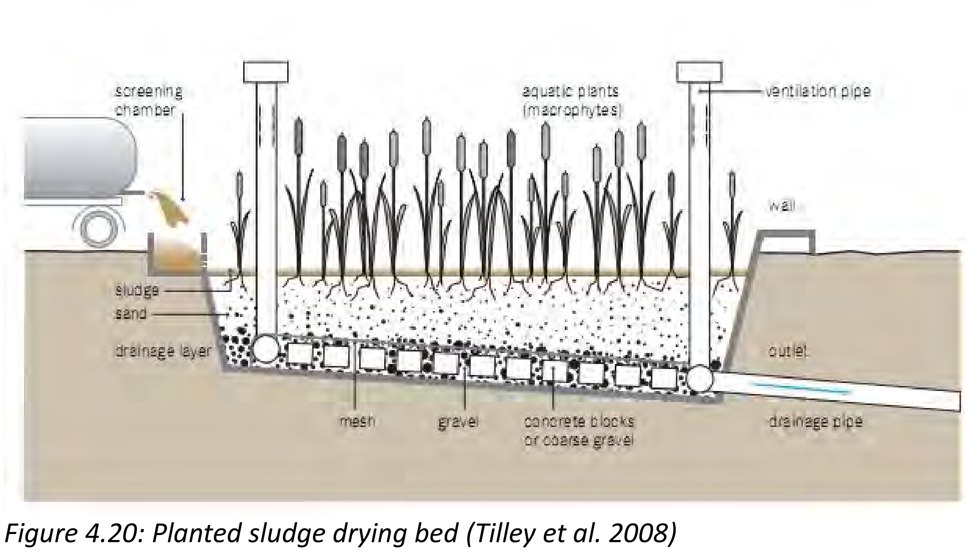

Figure 4.20: Planted sludge drying bed (Tilley et al. 2008)

Planted sludge drying beds are suitable for small to medium size communities. They are a low-cost solution without electricity requirement, but the accessibility by vehicle has to be given. Disadvantage is that the sludge removal has to be done manually and is work intensive. Odours and flies can appear, effluent needs secondary treatment (Tilley et al. 2008).

4.3.6 Discharge

Treated wastewater can be discharged into open water bodies (little rivers or streams, lakes, etc.) or infiltrated into the ground. Infiltration is possible by soak pits or drainage systems. Infiltration uses apsorbtion capacity of the soil and can enrich groundwater sources. The discharge of untreated wastewater bears the risk of pollution of groundwater and surface water bodies.

4.3.6.1 Soak pit

A soak pit, also called soakaway pit or leach pit, is a "covered, porous-walled chamber that allows water to slowly soak into the ground" (Tilley et al. 2008) and is used for the discharge of pre-treated wastewater. The pit is lined with porous material to prevent soil collapsing if it is constructed as an empty pit. Unlined pits are filled with rocks and gravel (see Figure 4.21). The bottom should always be lined with sand and fine gravel. The pit should be between 1.5 m and 4 m deep, and located at least 1.5 m above ground water table, far away from the next drinking water source. The cover slab has to be removable for access to maintain the pit.

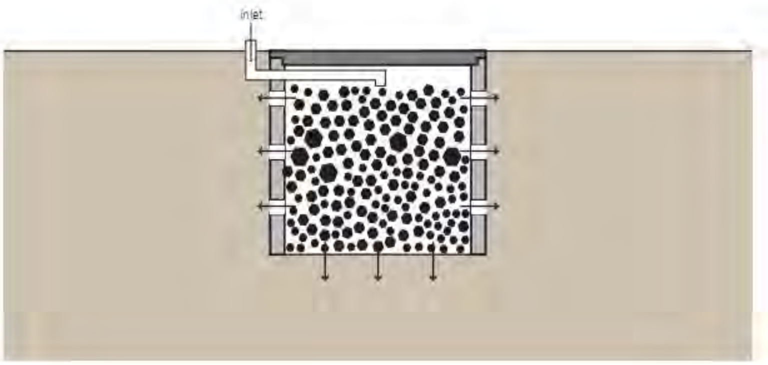

Figure 4.21: Soak pit (Tilley et al. 2008)

Discharged wastewater has to be pre-treated, raw wastewater can cause clogging very easily. The appropriateness of the solution for wastewater discharge depends on the characteristics of the soil that should have sufficient absorptive capacity. Soak pits are not appropriate in areas with flooding and/or high ground water table.

Advantages are the simple construction and the possibility to use locally available materials. As the pit is implemented underground, it is not visible and no odours occur. Therefore, the acceptance is normally very high. It is possible to use such a soak pit between three to five years without maintenance. Soak pits can be used for discharge of wastewater from single households or neighbourhoods. Disadvantage is the possible pollution of the ground and the groundwater (Tilley et al. 2008).

4.3.6.2 Drainage

Different kinds of drainage systems for wastewater discharge to the ground are existing. Wafler already presented the leach field and the forest irrigation (see chapter 4.2, p. 28).

4.4 Summary of presented technologies

This sub-chapter will give a short overview over the purpose of the presented technology, the possible combination of the technologies as well as the appropriateness for rural areas in Albania.

4.4.1 Overview over use of solutions

Table 4.2 presents the use of the above described technologies. It shall be possible to get a fast overview over the purpose that the technology is used for (collection, transport, pre-treatment, treatment, sludge treatment and wastewater discharge). “X” indicates the purpose of the technology. “(X)” for some technologies in the row “sludge treatment” indicates that the technology is not a solution for sludge treatment, but at least some sludge stabilisation takes place. The last row “on-site solution” indicates which of the technical components is suitable for on-site use.

Table 4.2: Overview over the use of wastewater treatment technology

Technology / component	Collection	Transport	Pre-treatment	Treatment	Sludge treatment	WW discharge	On-site solution
Simple pit	X					X	X
Conventional septic tank	X		X	(X)	(X)		X
Anaerobis baffled reactor (ABR) / Baffled septic tank	X		X	(X)	(X)		X
Imhoff tank	X		X	(X)	(X)		X
Conventional sewer system (CSS)		X					
Separate Sewer		X					
Solid free sewer (SFS)/ Small bore sewer (SBS)		X					
Sucking vehicle		X					
Constructed wetlands (CW)				X			X
Trickling Filter (TF)				X			
Rotating biological contactors (RBC)				X			

Ponds /lagoons – **settlement ponds** – **WSP** – **aerated ponds**			X X X	X X X	 (X)		
Oxidation dich				X			
Anaerobic filter				X	(X)		X
UASB				X	(x)		
Activated sludge				X			
Sedimentation/ Thickening pond					X		
Unplanted drying bed					X		
Planted drying bed					X		X
(Co-)Composting					X		X
Irrigation system, drainage, leach fields						X	X
Soak pit						X	X

As presented technologies serve different purposes like collection, transport or treatment, an useful and appropriate combination has to be found for each site. Transport of wastewater and sludge is not necessary if treatment takes place on site. Some common combinations of the presented technologies or wastewater treatment components are the following:

On-site:

- Septic tank + soak pit/ leach field
- Imhoff tank + constructed wetlands + sludge drying beds

Centralised:

- Septic tank + small bore sewer + centralised treatment plant
- Conventional sewer system + centralised treatment plant

4.4.2 Criteria for selecting appropriate technology for rural areas in Albania

According to (Choukr-Allah 2011), the following aspects are infuencing the selection of technology: Performance, reliability, area requirements, capital and construction costs as well as socio-economic issus. These aspects shall be explained more in detail in Table 4.3.

Table 4.3: Aspects that influence the selection of a technology

Aspect	Explanation of the requirement
Performance	• The Efficiency of wastewater treatment should be appropriate to the local needs and conditions. A higher effluent quality is necessary, if water sources can be polluted and if the area is sensitive. • Adaptable to the climate and geographic conditions (temperature, precipitation, underground condidtions) in Albanian lowlands or mountains
Reliability	• Plant should be able to cope with fluctuations of organic and hydraulic loads, stable process. • Simple to operate and maintain, adapted to the operational capacity at the site concerning man-power and skills.
Area requirement	• The availablity of land is a limiting factor concerning the selection of a technology. If land is available, all options can be considered; if land availability is restricted by economical or geographical conditions, solutions with less area demand have to be selected (intensive treatment)
Capital and construction costs	• Low-cost solution considering construction and O&M (€/PE). • Preferably no energy demand (working by gravity) or only low energy consumption.
Socio-economic issues	• Simple to construct; construction with local material and preferably local staff to support local employment. Local companies have to be established and trained (capacity development). • Accepted by population, e.g. water-based solution, no oudour close to the houses. • Water re-use should be possible in areas with water shortages (Albanian coastlines, touristy areas) • No negative side effects of the construction for human and nature (no health risks, avaoid destroying of nature or new streets, etc.)

Additional positive criteria would be that the technology is

- already existing and working in Albania (e.g. constructed wetlands technology) or
- already implemented and working in similar climate and geographic areas (e.g. Waste Stabilisation Ponds).

This would give some experiences for the construction and operation of the plants.

If O&M costs are very low, a higher investment to implement a good technology can be more useful than to implement a cheaper solution to save money. As long as people do not have a treatment plant, they want one. When it is already existent, very probably not all users are going to pay the tariffs. Therefore, it is desirable to keep the O&M costs at a low level.

Willingness to pay is connected to the awareness for environmental and health related issues, sometimes to the income, participation and transparency of processes. A transparent tariff setting is necessary for its acceptance. If 'bad payment' occurs, the authorities need a "legislative framework that allows appropriate measures to reduce them" what means to make people paying their tariffs (Ertl et al. 2010).

From the technology presented in this chapter, already some can be excluded as they are not appropriate for the wastewater treatment of rural areas. These are

- UASB (actually used for industrial wastewater, difficult operation and constant electricity supply required) and
- Activated sludge (for settlements starting from 10,000 PE).

All the other technologies are more or less usable in rural areas, depending on the local needs and characteristics of the area. Table 4.4 (p. 47) is trying to give an overview over the appropriatness of the other technologies concerning different aspects and conditions, that are considered as crucial for the selection of a technology. Some parts of the table are empty when no information about the aspect could be found in the literature.

The table does not show all of the important aspects, for example acceptance is missing and temperatures are not included. First of all, the table would get too long if all the aspects would be included. On the other hand, some correlations will be always the same and will depend on the design.

Occurance of odours and flies are very probable at open treatment components and lower the degree of acceptance by the population. If odours and flies get a problem, depends on the design, the temperatures and the distance to the houses. High temperatures bring more odours and flies than cold temperatures. Therefore, the plants should be located far enough from the houses. On the other hand, higher temperatures speed up the biological treatment processes. In colder climates, treatment units have to be insulated or implemented underground. If treatment components are closed and installed underground, they will not be visible what makes it easier to get them accepted by the population.

The stability of the process is another factor for the technology selection and is partly included in the simple and cheap O&M as mostly stable processes need less O&M.

Table 4.4: Appropriatness of technologies for certain conditions

Criteria / Technology	Range (PE) (common or optimal range)	Good effluent quality	Possible as on-site solution	Simple and cheap O&M	No or low energy requirement	Limited land availability	Treatment of rain possible	Appropriate for areas with flooding	Appropriate for high groundwater level	High soil permea-bility
Simple pit	Household	- -	+ +	+ +	+ +	+ +	- -	- -	- -	+
Conventional septic tank	Household or cluster	+/-	+ +	+ +	+ +	+ +	- -	-	-	n
Anaerobic baffled reactor (ABR)		+/-	+	+ +	+ +	+ +	- -	-	-	n
Imhoff tank		+/-	+	+	+ +	+ +	- -	+/-	+/-	n
Conventional sewer system (CSS)		n	- -	+ +	+ +	+	+	+	+	n
Seperate sewer system		n	- -	+ +	+ +	+	+	+	+	
Solid free/ Small bore sewer (SBS)		n	- -	+ +	+ +	+	+	+	+	
Sucking vehicle		n	+ +	+ +		+/-	-	+	+	n
Waste stabilisation pond	< 2,000 PE	+ +	- -	+ +	+ +	- -	+ +			- -
Aerated pond	< 20,000 PE	+ +	- -	+/-	- -	- -	+ +			- -

Criteria Technology	Range (PE) (common or optimal range)	Good effluent quality	Possible as on-site solution	Simple and cheap O&M	No or low energy requirement	Limited land availability	Treatment of rain possible	Appropriate for areas with flooding	Appropriate for high groundwater level	High soil permea-bility
Oxidation ditch		+ +	- -	-	- -	-	+ +			- -
Constructed wetlands (CW)	< 1,000 PE	+ +	+ +	+ +	+ +	-	-	- -	+/-	- -
Trickling filter (TF)		+ +	- -	-	-	+ +				
Rotating anaerobic contactor (RBC)		+ +	- -	- -	- -	+ +				
Anaerobic filter		+	+	+ +		+		-	-	
Sedimentation/ Thickening pond		n	- -	+/-		- -	- -			- -
Unplanted drying bed		n	+	+/-			- -			- -
Planted drying bed		n	+	+			- -			- -
(Co-)Composting		n		+/-						
Irrigation system, drainage, leach field		+	+	+		+/-	+ +			+

"+" appropriate "+ +" very appropriate "-" not very appropriate "- - " not appropriate/not possible "n" no influence

4.4.3 Conclusion about appropriatness of presented technology

The presentation of the technology does not claim to be complete but shows that there are many different technologies existing depending on the different specialities and requirements of each site where they shall be implemented. The higher the requirements for the treatment of wastewater and feacal sludge are, the more complex the technology gets. It has been noted that the used terms for the technologies can be different in the literature and that some technologies show only little differences. This shows that technologies are adapted to the needs, but not always developed following a certain structure.

Technologies consit of the different components for collection, transport, treatment and discharge or re-use. But in reality, it is not possible to allocate each technology or component to one purpose. Often, the different purposes can be combined in one treatment unit, like collection and pre-treatment or tretment and discharge. In some cases, no transport is needed or pre-treatment and discharge are sufficient for the considered site and no secondary treatment takes place.

As the technology presented by the GIZ hired consultant Martin Wafler shows only a little selection of treatment technologies and its components, this chapter should give a broughter overview over technologies that are in general considered in the literature as low-cost and/or appropriate for rural areas. It was shown that several technologies fulfil different purposes for the wastewater handling and its treatment.

Main criteria against a technology are high investment and O&M costs as well as difficult construction, operation and maintenance. Necessary energy supply can be a criteria for exclusion, depending on the site and the actually needed amount of electricity. Technology without electricity consumption is always preferred.

For areas where no or only little treatment is necessary (remote mountain areas with scattered houses and fresh drinking water from the mountains, without financial means for sanitation projects), the following simple solutions can be considered to prevent uncontrolled open wastwater discharge:

- simple pits
- septic tanks combined with soak pits

In these areas where people often empty their pits themselves, people should get training and information about how to empty their pits savely. In best case, personal protection equipment, like gloves, should be distributed.

Areas, where treatment of wastewater is necessary, the technology selection depends, amongst other things, on the required effluent quality and the available area. In any case, construction and O&M should be low, the operation simple and the processes stable.

On-site solutions for areas with higher effluent requirements can be the implementation of

- septic tanks, that get emptied by sucking vehicles or
- small constructed wetlands for every household or cluster of houses.

Improvements of the septic tank, like the baffled septic tank or the installation of an anaerobic filter are possible.

If a centralised treatment will be planned, constructed wetlands and ponds (combined with pre-treatment) are options that are simple to construct, to operate and maintain and where energy supply is not necessarily required. But both options are extensive ones and have a large area demand. If the energy supply is not a restricting factor, a wide range of intensive treatment technologies is available for the selection. Stable processes with simple O&M requirements are most appropriate.

For the transportation of the wastewater to a centralised treatment plant, the options of conventional sewer, seperated sewer and small bore sewer are given. With the seperated sewer and the small bore sewer it is possible to reduce the amount of wastewater that has to be treated in a wastewater treatment plant. The smaller the plant, the less space it will use and most often the lower the construction costs will be. Therefore, these two options should be assessed in the special cases where a canalisation is planned. Solutions for the seperated rainwater collection and discharge have be found.

5 Learning from already implemented CWs (in Albania and the Balkan region)

As constructed wetlands seem to be a very appropriate solution for on-site wastewater treatment in rural areas in Albania, a more detailed overview over the technology and some practical experiences with CWs from Albania and other (Balkan) countries shall be presented in this chapter. GIZ supported already the construction of one CW at the SOS children's village in Sauk, Tirana, that is working very well. Also other CW plants have been constructed in Albania/the Balkan region and even not all of them are working, experience can be gained from these plants.

5.1 Constructed wetlands in general

Constructed wetlands belong to the small and medium size technologies suitable for on-site and centralised wastewater treatment in rural areas and are referred to as ”natural” systems treating the water by physical and biological processes. First constructed wetlands were built already 40 years ago in Germany, while now being used all over the world (Albold et al. 2011).

A constructed wetland is a man-made filter bed planted with aquatic plants where water is lead through vertically or horizontally and effluent is collected by drainage pipes. Other terms in use for this kind of wastewater treatment facility are “soil filter”, “filter bed” or “reed bed (treatment systems)” (RBTS).

Constructed wetlands can be used for treatment of all kinds of urban and rural wastewater, including domestic and industrial wastewater, rainwater, greywater, highway runoff, etc. (Albold et al. 2011). Most often constructed wetlands are used for secondary treatment after mechanical pre-treatment, but they can also be used for tertiary treatment and sludge treatment. In this paper, CWs are described for domestic wastewater treatment as main biological stage.

The selection of the technology depends on (Regelsberger 2005)

- the local situation,
- the needs and
- its acceptance by the users.

Constructed wetlands can be integrated in the area very well as a natural habitat and offer the possibility to re-use treated wastewater for non-drinking purpose. This can be an advantage in areas with water shortage, e.g. touristy areas at the Albanian coastline in the summer months, but depends on the acceptance of people. A reason that perhaps hinders the implementation of CWs on-site close to houses can be the odours and insects that can develop in the constructed wetland if it is not operated and maintained in a proper way.

5.1.1 Types of constructed wetland

Constructed wetlands are divided into different types, referring to the way the wastewater is passing through the filter bed. Therefore, plants can be distinguished into:

- Horizontal filter (HF) and vertical filter (VF) CW (will be shortly described below)
- Subsurface flow (both HF and VF) and free water flow CW
- Hybrid systems

Figure 5.1 gives an overview over the special kinds of constructed wetlands.

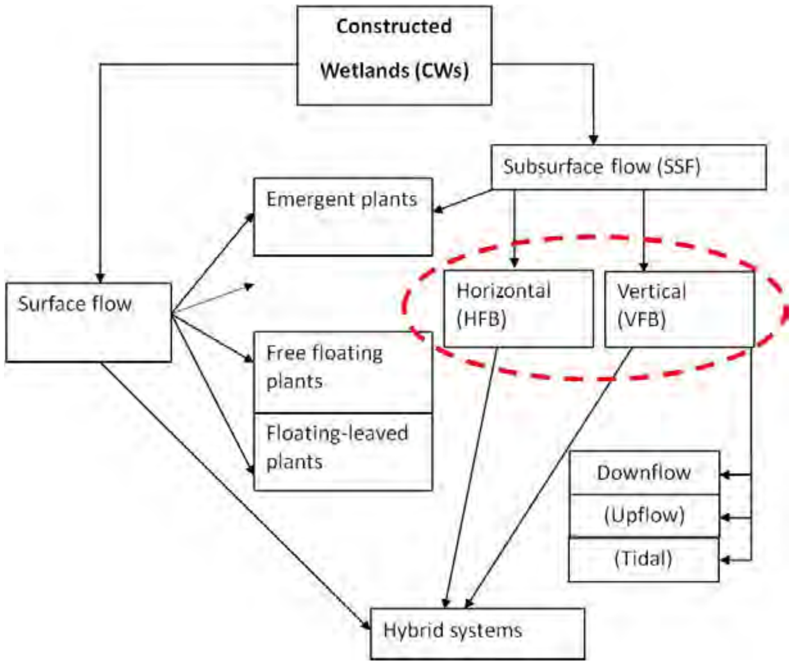

Figure 5.1: Overview over CW types (Nowak n.y.,a)

Vertical filter beds (VF, see Figure 5.2) are fed between one and four times a day. The wastewater should be applied equally on the surface. It is necessary to give enough time until the next feeding so that air can penetrate the filter as well. Therefore, the filter area and the time between the feedings has to be sufficient. VF show only low denitrification. They are normally divided into four parts and always one of the four parts is out of use to recover. Most often VF beds are constructed as they require less space than HF beds (Nowak 2010,a) and save therefore area and costs.

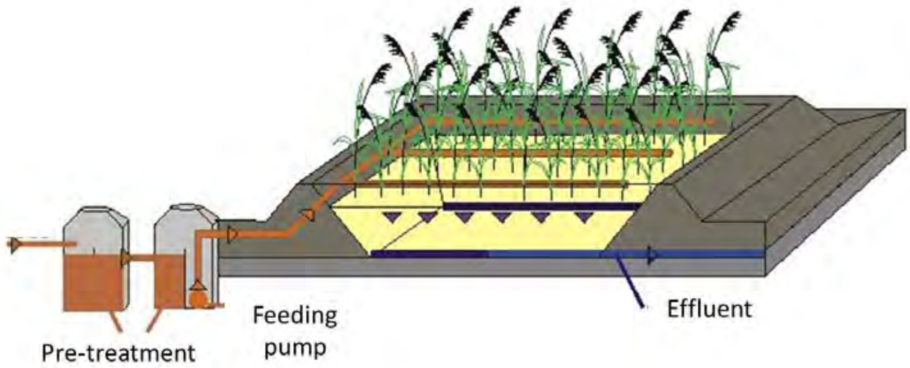

Figure 5.2: Vertical filter bed (Bodenfilter 2012)

Horizontal filter beds (HF, see Figure 5.3, p.53) are fed from the side and water flows horizontally through the filter bed. They should permanently be banked up with water. HF show low nitrification but high denitrification and therefore a high total nitrogen (TN) elimination. HF beds are constructed broader than long in order to have short flow distances because of hydraulic reason and to guarantee at the same time a long retention time to improve the biological process (Nowak 2010,a).

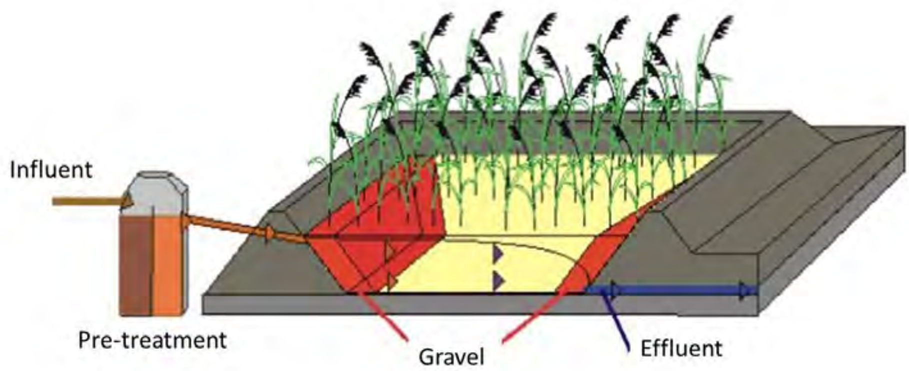

Figure 5.3: Horizontal filter bed (Bodenfilter 2012)

5.1.2 Parts of a constructed wetland

A constructed wetland consists of following parts, from the bottom to the top ((Albold et al. 2011), (Heeb and Wafler 2011,a)):

- Levelling layer
- Impermeable liner (geo-textile layer or clay)
- Drainage (drainage pipes in a gravel layer)
- Biological treatment layer (gravel or sand)
- Cover layer
- Aquatic plants

Pre-treatment is necessary to prevent clogging of the filter beds. An exception is the so called “French System” that works without pre-treatment (Albold et al. 2011). For pre-treatment purpose, following possibilities can be used:

- Settling tanks (two or three-chamber settling tanks; settling of solids and organic matter)
- Imhoff tanks (treatment and reduction of primary sludge by anaerobic stabilisation processes)
- Ponds (need a large space away from the houses as they tend to smell; reduction of COD, BOD, SS and TSS (Regelsberger 2005))
- Raw wastewater filters (solids retain at surface and get mineralised (Nowak 2010,a))

It has to be considered that primary sludge has to be treated regularly. The pre-treatment tank has to be emptied from time to time. Sludge can be applied on a planted or unplanted drying bed or can be transported to another wastewater treatment plant for further treatment. The use in a digester to generate biogas for electricity production is another possibility.

5.1.3 Design Criteria for constructed wetlands

The guidelines for constructed wetlands differ from country to country, depending e.g. on the experiences and the treatment requirements of the country (Regelsberger 2005). To equalise fluctuations, a storage tank (buffer tank) should be used. This will lower the costs if big fluctuations of the produced wastewater amount occur. Usually, constructed wetlands can cope very well with quantitative fluctuations.

In 2010, GIZ hired consultant Jens Nowak wrote a design manual for the construction and use of constructed wetlands in Albania called ”Albanian guidelines for the design and implementation of wastewater treatment plants using constructed wetlands”. This document describes vertical and horizontal flow filter beds with sand as filter medium. According to (Nowak 2010,a), the biggest problem for CWs is the clogging of the filter. For the described types, “soil clogging problems can be avoided by correct calculation, design and construction”, considering the following design criteria (Nowak 2010,a):

- Corresponding design of pre-treatment
- Selection of suitable filter substrates
- Sufficient filter area
- Uniform distribution of sewage
- Vertical flow planted soil filters supplied intermittently and by a hydraulic bore
- Regular rest phases without feeding in vertical flow planted soil filters

As Albania has two very different climate areas - the plain lowland and coastal area and the high mountain regions - design values have to be determined for both areas. While the lowland and coastal areas show high temperatures in summer, the winter is mild. In the mountain regions, summer is mild and winter can bring very low temperatures below the freezing point what requires larger filter areas.

(Nowak 2010,a) adapted the specific values for the necessary filter area for CWs to Albanian climate. He gives design values that are presented in Table 5.1 (p. 55). German design criteria is given as a comparison (Heise and Nowak 2007). The required minimum surface area has to be available in parallel use and not in-line. If several beds are linked in a row, the first filter has to have the required minimum surface (Heise and Nowak 2007).

The filter material can be sand or gravel. The whole filter layer should be constructed with the same material. Filter with decreasing permeability in flow direction did not proof to have advantages but tend to clog easily. Horizontal filter have different material at the inlet and outlet that needs to have higher permeability for drainage purpose. The permeability of the filter material is given by the k_f-value, that should be in the range of 10^{-4} m/s ≤ k_f ≤ $5 \cdot 10^{-3}$ m/s. VF have the drainage layer below the filter layer. HF beds should be constructed with filter material with higher k_f-value because of hydraulic losses while filter material for VF beds should have lower k_f-value to support the even water distribution. Also a cover layer for frost protection or better water distribution can be applied on top of the filter layer (DWA 2007).

Most common vegetation that is planted on the filter bed is “Phragmites australis” (reed), “Typha ssp.” (cattail) and “Scirpus ssc.” (bulrush) (Regelsberger 2005).

Bottom and sides of the filter bed have to be waterproof in order to prevent contamination of the underground and the groundwater. Natural sealing should have a k_f-value < 10^{-7} m/s and be at least 0.3 m thick. Artificial sealing must be “acid-resistant and alkali-proof, frost-persistant, roots and rodent resistant, non toxic, easy to carry and move, and made of recyclable materials” (Regelsberger 2005).

Table 5.1: Design values for constructed wetlands (Nowak 2010,a); (Heise and Nowak 2007)

	Design criteria	Albania		Germany
		lowland	Mountains	
VF	Specific area demand	≥ 1.5 m²/PE	≥ 3.0 m²/PE	≥ 4 m²/PE
	Total area demand			≥16 m²
	Organic load (CSB)			≤ 16 g/(m²d)
	Hydraulic load			≤ 80 mm/d
HF	Specific area demand	≥ 4.0 m²/PE	≥ 8.0 m²/PE	≥ 5 m²/PE
	Total area demand	≥ 16 m²	≥ 32 m²	≥ 20 m²
	Organic load (CSB)			
	Hydraulic load			≤ 40 mm/d
Planted sludge drying bed	Specific area demand	≥ 0.25 m²/PE	≥ 0.4 m²/PE	

One of the main challenges of CWs is the even distribution of wastewater that is dependent on "the cross sections of the pipes, the distance of pipes, the distance of holes and the feeding quantity per interval". To be able to guarantee maintenance works, pipes should be installed above the filter bed (Regelsberger 2005).

5.1.4 Advantages and disadvantages of constructed wetlands

Advantages and disadvantages of constructed are listed in Table 5.2 (p. 56), compiled from the following sources (Regelsberger 2005), (Heeb and Wafler 2011,b) and (Nowak 2011,a).

According to this table, constructed wetlands have many disadvantages but still seem to be a very appropriate solution for rural areas in general and for developing countries. But the actual appropriateness of a CW should be carefully proofed for the concerning site. One of the success factors would be to ensure expertise knowledge for construction, operation and maintenance. Even O&M are kept at a very low level, small mistakes can bring the malfunction of the whole plant. If the plant can work by gravity, no electricity for pumps is needed, what makes it suitable for a country with electricity shortage and power cut-offs like Albania. Dependent on the number of houses connected to a CW and the housing density, CWs can be built for single households as an on-site solution to avoid expensive sewer systems, or as a solutions for a whole village or for community buildings. In general, the smaller the plant is, the easier the equal distribution of the wastewater on the filter bed is. The bigger the plant, the more complicated the distribution gets. According to (Heise and Nowak 2007), CWs are mostly used for settlements with up to 1.000 PE, but the use of the technology is also possible for bigger settlements.

Table 5.2: Advantages and disadvantages of constructed wetlands

Advantages	Disadvantages
• Very efficient in BOD reduction and pathogen elimination • Simple construction, operation and maintenance • Not sensitive to peaks, high ability to tolerate fluctuations in flow (high process stability) • Constructed with local materials • Construction can provide short-term employment for locals • Fitting well into the environment, aesthetic appearance, creating biotopes • Good solution for few PE • Low O&M costs • Low energy demand • No sludge removal necessary, sludge only from pre-treatment • Re-use of treated wastewater is possible	• Large area demand (VF need less area than HF) • Pre-treatment necessary • Requires good knowledge for design and operation. Small mistakes can bring big problems, but only visible after a long time, as plant is quite resistant. According to Jens Nowak, the “plants will work perfect or not at all” • Filter material has to be replaced every eight to 15 years • Need of well working dosing system • Electricity demand if no slope for water transport available • Risk of clogging of the filter material if wrong material used or insufficient pre-treatment • Odour can occur, therefore CW should be located with distance to houses

5.2 Assessment of the pilot CW in SOS children’s village Tirana

This part deals with the pilot constructed wetland at the SOS children's village in Tirana, the design and implementation, problems with operation and resulting reconstructions, the costs as well as the necessary O&M works. The process of implementation and involved stakeholders will be described in detail in subchapter 7.2.1 Example of implementing a CW at SOS children’s village (p. 86).

5.2.1 Project organisation and location of the pilot plant

The constructed wetland for wastewater treatment at the SOS children’s village “Hermann Gmeiner” in Sauk, Tirana, was a project of GIZ (at that time GTZ), Germany, and the General Directorate for Water Supply and Sewerage (GDWSS) of the Ministry of Public Works and Transport (MPWT), Albania. The plant was planned in 2008 by the German Engineer Joachim Niklas from ÖKOTEC GmbH, Germany, and the Albanian Senior Engineer Enkelejda Gjinali. The construction was finished by the end of 2009 and operation started in January 2010. Financing was given by the German Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ - German Federal Ministry for Economic cooperation) via GIZ by 80 % and the MPWT Albania by 20 % of the project costs (Gjinali et al. 2011).

The SOS children's village is one of 155 similar villages worldwide for "orphans or children without proper family structures" (Gjinali n.y.). The village consists of 13 houses, each for five to seven children, one "mother" and occasionally "aunts" as substitutes and is located in Sauk, a suburb of Tirana. On the area of the children's village there is also a school and a nursery with a canteen located, that is attended by external children and children that live in the village. While the city of Tirana has a sewer system, the children's village is not connected to it and needs therefore an own solution for the wastewater collection and treatment. With good access from the capital Tirana, the SOS children's village was chosen by GIZ as the site to build a demonstration constructed wetland. The plant is considered as a model treatment plant for "training, demonstration, research and replication in peri-urban and rural areas of Albania" that protects the environment (Gjinali et al. 2011).

Figure 5.4: Workshop at the SOS children's village in November 2011 (Niebel 2011)

The Figure 5.4 shows participants of a workshop conducted at the SOS children's village Tirana in November 2011. In the background of the picture, houses of the SOS children's village are visible as well as the fence that protects the constructed wetland area.

5.2.2 Design and Technology

The design of the plant was based on the number of around 500 people living and working every day in the village, what was converted to 220 population equivalent (PE) (Gjinali et al. 2011). In general, the village has a low drinking water consumption rate of 16.8 m³/day in winter. In summer, the consumption is even lower due to a lack of water in summer in Albania (Niklas 2008,a). The design for the plant was developed in order to meet the EU standard, achieving a BOD value below 30 mg/l and TSS below 25 mg/l (Niklas 2008,a) (BOD below 30 mg/l equal a reduction of 90 % of the influent load according to the EU Directive 91/271/EEC; values for TSS reduction could not be found in the law). The amount of faecal coliform shall reach a number below 10,000 CFU/100ml. These values can be found in the following Table 5.3 together with some other important values for the dimensioning of the constructed wetland (Niklas 2008,c). The specific area per population equivalent was chosen to be 2,5 m²/PE for the entire filter bed surface areas (VF and HF). Normally, this is not correct as only the area of the first filter bed will count if filter beds are used in a row. Therefore, the specific surface area of the two VF beds would be only 1.5 m².

The old German guideline for constructed wetlands (ATV-A 262) gave a specific area demand for vertical filter beds with 2.5 m², but this value is now changed up to 4 m²/PE in the new guidelines called DWA-A 262

(Engelmann et al. 2006). But since Tirana has a Mediterranean climate with nearly no frost, the bacterial activities will be carried out much faster than in colder climate and therefore the area will be sufficient. The Guideline of Jens Nowak gives the range of 1.5 m^2/PE to 3.0 m^2/PE for Albania, with ≥ 1.5 m^2/PE for lowland and ≥ 3.0 m^2/PE for mountain region (Nowak 2011,a). Also Niklas underlined his design with experiences from Asia and experiences from a constructed wetland plant in Delhi, India, that works with 1 m^2 surface area per PE (Niklas 2008,c) because of the higher temperatures.

Table 5.3: Design parameters of the CW at the SOS children's village Tirana (Niklas 2008,c)

Parameter	Value	Unit
Total population at full occupancy	220	PE
Total WW generation flow rate	16.8	m^3/d
Per capita WW generation rate	76.36	l/(p·d)
Design hydraulic loading	80	l/PE
BOD concentration (estimated)	300	mg/l
Total BOD load	5.04	kg/day
Area of Bed I (Ia + Ib)	330	m^2
Area of bed II	220	m^2
Area per population equivalent	2.5	m^2
Hydraulic load, Bed I	50.91	l/m^2
Hydraulic load, Bed II	76.36	l/m^2
BOD load, Bed I	15.27	g/m^2

Although Niklas gives a design hydraulic loading of 80 l/PE, the calculation of the hydraulic loading of the beds is done with the total WW generation flow rate of 16.8 m^3/d.

The wastewater comes from the toilets, showers and kitchen sinks of the houses, the school, the kindergarten, the administration building and the canteen. The treatment system consists of following parts:

- Existing sewer used for WW collection
- Imhoff tank as pre-treatment tank (All documentations about the constructed wetland plant at the SOS children's village mention a Dortmund tank for the pre-treatment. But as Dortmund tanks are normally used for final clarification of wastewater, it is strongly assumed that an Imhoff tank is in use.)
- Pump chamber for application of WW on the filter beds
- Three filter beds (two-stage filter): two vertical and one horizontal filter bed
- Storage tank for treated WW, with overflow into storm water drain
- Sludge drying bed

An additional settling chamber was added during reconstruction works in 2010. The flow diagram for the wastewater treatment is given in Figure 5.5 (p. 59).

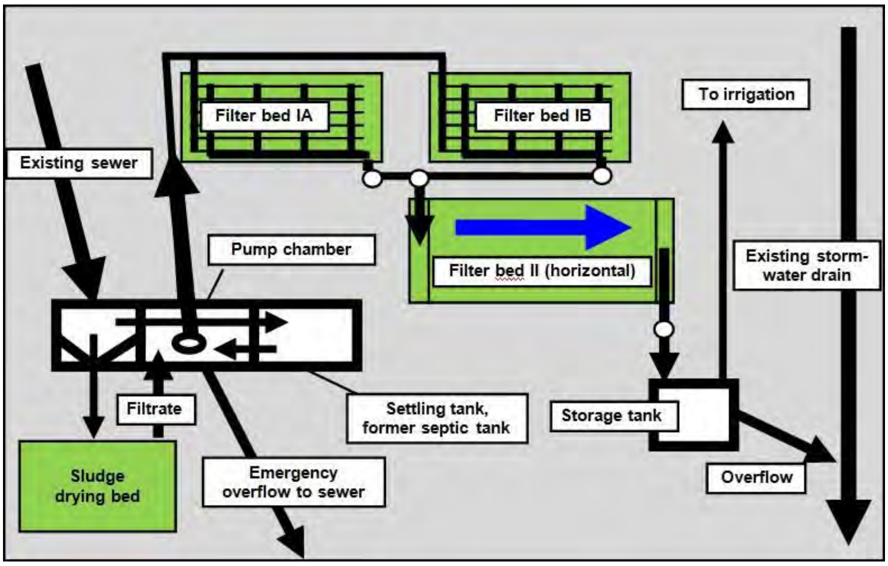

Figure 5.5: Flow diagram of constructed wetland at SOS children's village, Tirana (Gjinali et al. 2011)

The raw wastewater is pre-treated in an Imhoff tank, which is located at the lowest point of the area, next to the pumping chamber and a second settling chamber that is used since first reconstruction. This construction is the result of using the old collection tank by reconstructing it to a Imhoff tank with second settling chamber and pumping chamber between Inhoff tank and settling chamber. Originally this re-use of already existing parts should help saving money.

Figure 5.6: Imhoff tank and settling tank at the constructed wetland plant in November 2011 (Niebel 2011)

The pre-treated water is pumped to one of the two vertical filter beds, which are used alternately in a weekly rhythm. After passing the vertical filter bed, the water flows to the horizontal filter bed. Both stages, vertical and horizontal filters, are planted with aquatic plants. In the horizontal filter the bacterial pollution will be removed and treated wastewater can therefore be reused, e.g. for gardening. The cleaned water is stored in a collection tank next to the filter bed. Sludge from the Imhoff tank is taken out by opening a valve of the sludge pipe and using the physical pressure in the tank to press out the sludge through the pipe. Sludge is distributed evenly on a planted sludge drying bed that is located next to the Imhoff tank. Some of the water in the sludge will evaporate. The other part of the water that is infiltrating the sludge drying bed is collected with a drainage system in the bed and sent back to the Imhoff tank.

As filter material the same sand was used in the horizontal and the vertical filter bed due to the fact that there was no other sand available. Sand came from Tirana and has a size of 0 - 2 mm with a k_f-value of $5 \cdot 10^{-4}$ m/s ≤ k_f ≤ $5 \cdot 10^{-3}$ m/s. To seal the filter bed to the ground, a geo-textile was used. Both vertical filter beds have a surface area of 165 m^2 each and a depth of 0.6 m.

The horizontal filter bed has a surface area of 220 m^2 and contains in addition a 0.6 m wide stripe of gravel at both sides of the filter, one serves as inlet area and the other as outlet area. While the ground of the horizontal filter bed has a slope of 1 %, the surface is horizontal. Therefore the depth varies from 0.6 m to 0.83 m.

The sludge drying bed has a surface area of 72 m^2 with thin sand layers of only 0.15 m, planted with the same plants as the filter beds. Dewatered stabilised sludge has to be removed every three to four years.

Figure 5.7: Horizontal filter bed with only few vegetation in November 2011 (Niebel 2011)

While both vertical filter beds show well growing aquatic plants, on the horizontal filter bed nearly no desired plantation is visible (see Figure 5.7, horizontal filter bed in front of the picture, the two vertical filter beds are on the left and right side of the visitors on the picture). This is caused by the fact that the plants were very small when planted and the roots did not reach the wastewater that was lead through the filter bed with a very low level (Nowak 2011,b). Water level in the horizontal filter is the same as in the shaft between horizontal filter and storage tank, which is determined by an effluent pipe with movable knee-fitting and extension in the shaft.

Photos of the pilot constructed wetland plant at the SOS Children’s village Tirana, including some detailed descriptions, can be found online on the following homepage:

http://www.flickr.com/photos/gtzecosan/sets/72157623262182867/

For further information please refer to the SuSanA document “Case study of sustainable sanitation projects – Wastewater treatment using constructed wetlands Tirana, Albania” (Gjinali et al. 2011).

5.2.3 Necessary operation and maintenance work (O&M)

According to Jens Nowak (Nowak n.y.,b), the necessary time for O&M of the pilot plant in Tirana is assumed to be around two hours per week. The following Table 5.4 lists the necessary O&M tasks together with the information about how often they should be done. At the moment, the work is done by the SOS children’s village technician, who got trained by Joachim Niklas (designer of the plant) and Jens Nowak, both German engineers.

Table 5.4: O&M works for the pilot plant at SOS children's village, compiled from (Nowak n.y.,b)

How often	Task
1x/day	• Control the pump
2x/week	• Drain off the sludge from the Imhoff tank • Open the valve of the sludge pipe in the sludge drying bed until sludge-free water is flowing out • If sludge pipe is clogged regularly, release of sludge every day
1x/week	• Control of distribution pipes in the vertical filter • If necessary cleaning the holes in the distribution pipe • Change distribution of WW to the other vertical filter bed • Make a note in the operator’s handbook • Control water level in the horizontal filter • If necessary change position of knee-fitting pipe in the shaft between horizontal filter and effluent storage tank
1x/month	• Measure sludge level in second settling chamber • Note it in the operator’s handbook • If sludge reaches level of one third of the chamber, it has to be removed • Removal of sludge on the complete ground of the chamber • Removal of old leaves on the filter beds, if necessary
1x/year	• Removal of undesired plantation on filter beds, if necessary

5.2.4 Financial aspects of construction and O&M

The costs for the plant were around 60,000 €. This can be divided into 50,000 € for construction and material, 5,000 € for supervision and training and 3,000 € for documentation and public relations (Gjinali et al. 2011). The cost estimation, that was given by the construction company Gener2 counted only around 40,000 € for the construction works and the material. Analysing the cost estimation, the construction works counted for around 30 % and the material for around 70 %. As O&M is done by the SOS children's village technician, no extra costs arise. The bill of quantities with the cost estimation prepared by the construction company Gener2 is attached in Appendix A.

5.2.5 Problems of the pilot plant and recommendation for reconstruction in 2010

In September 2010, the German engineer Jens Nowak visited the pilot plant in the SOS children's village and proved the well-functioning of the plant. In his report to the GIZ "Reconstruction of Constructed Wetland SOS children's village Tirana" (Nowak 2010,b), he describes the state of the plant in 2010 and the problems that occurred at that time. The document includes also recommendations for reconstruction. The main findings are presented in the following section.

Some of the concrete shafts have holes and are located in a way that rainwater can infiltrate into the sewer system while heavy rainfall. This can cause hydraulic overload and washing-out of sludge from the pre-treatment to the filter, what causes clogging of the filter bed and the distribution pipes. Another reason for clogging could have been the large amount of grease in the influent to the vertical filter.

The old septic tank with three chambers was reconstructed as one Imhoff tank and one pumping chamber, not using the third chamber. This was changed during the re-construction in 2010, to use the third chamber as additional settling chamber because sludge separation in the Imhoff tank was assumed to be insufficient due to the design. The Imhoff tank was built too shallow, only 2.8 m deep, and with an insufficient slope of the funnel, which should be at least 1:1.7. The influent pipe could not be equipped with a knee-fitting as it is usual, as the top of it would have been above the water level. The distance between the water level in the Imhoff tank and the sludge pipe, that should normally be more than 1 m, counted only 0.2 m. The sludge pipe going from the bottom of the Imhoff tank to the sludge drying bed was built with a pipe DN 100 only, instead of at least DN 200. Additionally, the pipe had no valve at the outlet like it was planned. Therefore, the sludge pipe was replaced by a pipe DN 160 (as DN 200 was not available) and a free accessible valve at the end of pipe was recommended. The pipe was built with T-fitting in DN 160.

Because the pre-treatment was not working satisfying and therefore solid matter was in the water that was pumped to the vertical filters, the valves for feeding the vertical beds were clogged and could not be closed completely. This led to a permanent feed flow of wastewater to both vertical filter beds. Additionally, distribution pipes and the holes in the pipes were partly clogged and only the front part of the vertical filter beds was fed with wastewater. Cleaning of both valves for wastewater discharge to the vertical filter beds took place in 2010 in order to be able to close them again.

As some plant roots were growing in some of the shafts, it was recommended to remove them from time to time to avoid the risk of destroying the concrete. To increase the pressure in the distribution pipes in each vertical filter, one distribution pipe was removed and closed. The discharge holes were on top of the distribution pipe and high fountains up to 2 m caused aerosol and smell. For improvement of the plant, they had to be turned so that the holes were on the side and not at the top. Also extra discharge holes with the diameter of 8 mm had to be added on the other site with a distance between the holes of at least 1 m to guarantee an even distribution of the wastewater on the vertical filter bed.

Distribution of wastewater to horizontal filter occurred only in the first meters of the distribution pipe (but can be considered as sufficient for the plant in SOS children's village as it is the second biological stage). The distribution pipe lay on the filter bed, but should normally be dug into the filter material.

The water level in the shaft between horizontal filter and storage tank was below the effluent pipe what showed leakages in the shaft. During re-construction, the shaft between the horizontal filter and the effluent storage tank was equipped with a new effluent pipe deeper in the tank that had a knee fitting and a connected pipe for determining water level by turning it around.

Because the walls had holes the water never reached the planned level in the shaft and therefore also not in the horizontal filter. The soil behind the liner of the HF bed was slipped down because the scarp was constructed too steep (normally it should be ≤ 1:1).

5.2.6 Review of reconstruction in 2011

One year after his first visit and recommendations for reconstruction, Jens Nowak visited the plant again in November 2011. His observations at the constructed wetland plant concerning the functionality were overall positive and most problems that were observed in 2010 had been corrected in the meantime. But still, some problems were existent. The findings of Jens Nowak are recorded in the document "Success of Reconstruction of Constructed Wetland SOS children's village Tirana – 14.11 and 16.11.2011" (Nowak 2011,c) and will be shortly presented in this section.

The sludge removal takes place twice a week, therefore no problems with clogging occurred after reconstruction. Sludge level in the Imhoff tank and the third chamber is measured with electronic device four times a year. As there is no sludge in the pumping chamber any longer, it shows that pre-treatment is working very well now. Due to the better settling of the sludge, valves for wastewater discharge on the two vertical filter beds can be closed completely and no clogging of the vertical filter beds occurs any longer.

Reed plants on the vertical filter beds grow very well and there is no need to remove them. Some trees are growing in vertical filter bed Ia which have to be removed as soon as possible. The aquatic plantation on the horizontal filter bed is not growing very well and a leakage is visible at the influent area. The leakage should be closed and the water level increased until the plants are growing better.

The pipe in the effluent shaft of the horizontal filter is too short and must be made longer to determine the water level (by rotating it). The effluent shaft seems to have leakages because the water level is below the effluent pipe what means that water is not leaving through the pipe as foreseen.

It seems like the liner at the horizontal filter bed was cut off to remove some of the soil behind and is not replaced. Therefore, soil will be washed into the filter bed during rain and it is recommended to repair it. Some rainwater interceptions are still missing above the sludge filter bed and the horizontal filter bed to prevent rainwater running down the hill into the filter beds.

Covers of manholes and shafts are still the same concrete ones, too heavy for one person to move them and already destroyed at some corners. Therefore, manholes are (partly) opened on purpose what can bring mosquito plagues. Lids should be replaced, e.g. by lids out of plastic, metal or wood. Same problems were mentioned by Martina Winker after her visit in October 2011. Mosquitoes occurred due to open water on the filter beds and in the collection tank and caused problems for the children. According to the SOS children'S village technician, the children get regularly ill because of mosquito bites (this information was given by the SOS children's village technician to Martina Winker).

Ianother option to improve the CW plant at the village is to use the treated wastewater for irrigation as it was originally planned. The sludge drying bed is working very well, a secondary filter layer of sludge can be observed. During the site visit in November 2011, Jens Nowak stated that one of the vertical filter beds was clogged in 2010 but is now working very well again. It seems that it could recover without any problems when it was not in use for the time of reconstruction.

5.2.7 Effluent control and results of sampling

The “Water quality control report, June – December 2011” of Zamira Rada and Enkelejda Gjinali (Gjinali and Rada 2011) is still under preparation. First results are given in the report for the period from June until December 2011. Samples were taken on a regular basis every month, starting in June 2011. According to (Gjinali and Rada 2011), the several sampling points are:

1) Influent (S1)
2) Imhoff tank, in (S2)
3) Imhoff tank, out (S2)
4) VF, in (both VF, so in total two samples) (S3 and S4)
5) VF, out (both VF, so in total two samples) (S3 and S4)
6) HF, in (S5)
7) HF, out (S5)
8) Storage tank, in

The sampling point numbers are not as precise as it would be necessary. The influent must be the same as “Imhoff tank, in” and not an own sampling. Sampling point numbers of the filter beds are as well not precise, as the same numbers are used for influent and effluent. But the report gives only one value per sampling point. Therefor it can only be assumend that the value is the one of the effluent of the filter beds.

According to (Gjinali and Rada 2011), the monthly tests show that the plant is working well and reaches the treatment requirement for TSS, COD and BOD_5 given by Albanian and EU law.

Further tests have been done by Jens Nowak. Samples were taken in November 2011 from the effluent of the the pre-treatment, the vertical and the horizontal filter beds and tested in a German laboratory in December 2011. The results were very satisfying and show again that plant is working very well at the end of 2011. Results of the sampling are given in Table 5.5 (p. 64).

Table 5.5: Sampling results November 2011 (Nowak 2011,c)

	Point	pH	COD [mg/l]	N_{total} [mg/l]	NH_4-N [mg/l]	NO_3-N [mg/l]	NO_2-N [mg/l]	P_{total} [mg/l]
Effluent pre-treatment	S2	6.8	254	49.1	39.3	-	-	5.2
Effluent vertical filters	S3, S4	7.1	< 15	41.9	1.76	36.9	0.33	3.5
Effluent horizontal filter	S5	7.4	< 15	29.7	0.66	28.3	0.042	3.4

According to (Nowak 2012), the pilot CW at the SOS children's village is working very well. CSB elimination is very high (percentual reduction around 96 %) and ammonium is nearly completely oxidised (reduction by 98 %), N_{total} is removed partly (by 40 %) and P in small amounts (35 %). Pathogens have not been tested.

The effluent of the constructed wetland at the SOS children's village has a quality that even fulfils German requirements for wastewater treatment plants of that small size and even for bigger ones. German law gives threshold values for CSB and BSB for treatment plants of size I (50 – 500 PE) and size II (500 – 5,000 PE). These values are CSB 150 mg/l (for size I) and 110 mg/l (for size II) and BSB 40 mg/l (for size I) and 25 mg/l (for size II). For treatment plants of size III (5,000 – 50,000 PE), a threshold value for NH_4-N is given as well with 10 mg/l (AbwV 1997).

5.2.8 Lessons learned from the pilot plant

As the SOS children's village is easily accessible from Tirana, the location is well chosen for a pilot demonstration project. The good contacts between Enkelejda Gjinali and the responsible of the village facilitated the process of planning and implementing the plant. Also frequent supervision and quality control could be assured. The constructed wetland plant is now working very well and is delivering good results from the effluent samples. The effluent fulfils even German standards for wastewater treatment plants of that small size and even for bigger ones with higher requirements. The acceptance by the users is high and therefore it is a good example to show how small size wastewater treatment plants are working. Only weak point is that the treated effluent is not collected and re-used as it was foreseen in the planning.

Some problems occurred in the first year but they could mostly be resolved after a first reconstruction guided by Jens Nowak in 2010 and the plant seems to work very well after that process. Biggest problem was the clogging of the vertical filter beds and of the distribution pipes. Therefore, the pre-treatment was improved by using the third chamber of the old septic tank as a settling chamber before water gets pumped on top of the vertical filter beds. After giving the filter beds some time to recover, they could be used again without any problems.

Quite probably the re-use of the former septic tank for pre-treatment was not the best solution. As the treatment plant is located on a hill, the water collection and the pre-treatment could have been installed at a higher level than the filter beds. This would have been a better solution in order to avoid pumping and therefore electricity costs. Therefore, Imhoff tank, settling chamber and pumping chamber should be installed in that order on a higher level than the filter beds.

The plantation of the horizontal filter bed did not grow very well due to the fact that the filter bed had a too low water level inside the filter. When plants were planted, the short roots could not reach the low water level. Therefore, it would have been necessary to flood the filter bed at least in the first weeks after planting.

Some of the shafts are still leaking water and cleaned wastewater is not re-used. This shows that there are still some possibilities to improve the plant. But in general, the whole pilot project is very satisfying. The success was possible due to supervision and reconstruction to adapt the plant to the given conditions. The plant is used for demonstration and trainings purpose to make the technology more known. It has to be seen as a good first step from where it is necessary to move onwards in the next future by constructing more small scale (constructed wetland) treatment plants in Albania.

5.3 Other constructed wetland plants in Albania

Next to the pilot constructed wetland in the SOS children's village in Tirana, some other small and medium size CWs were constructed in Albania and shall be presented in the following part.

5.3.1 CW at school in Narta

The constructed wetland in the elementary school in Narta, Vlorë Region, was the very first pilot CW in Albania (Uruci 2011). Constructed in 2007 or 2008, it is not clear if the plant was ever in operation. According to (Nowak 2010,c), it was in operation until Vlorë got a project for better drinking water supply in 2008 where the school was excluded. According to Martin Wafler, who visited the plant in 2008, it was not in operation in summer and should have been put in operation after the holidays in September 2008 (Heeb and Wafler 2011,a). Following this information it seems that the plant was never in operation. As the school has no water connection any longer, no wastewater is produced that could be treated at the constructed wetland. As a consequence, the plant gets destroyed and even the twice planted reeds did not survive due to the lack of water.

The project was within the UNDP ART Programme, in collaboration with GEF/UNDP and the Albanian Ministry of Environment. Technical assistance was provided by ARPAT (Regional Agency for the Environmental Protection of Tuscany). Further stakeholders involved were the Albanian Ministry of Environment (MoE), the Albanian Ministry for Agriculture, the commune of Qender, the Narta village, the University of Tirana, Faculty of engineering, course of environmental Engineering, the University of Vlorë, the Public Health Department of Vlorë, the CSDS Civil Society Association, the Direction of the Narta Primary School and the Local Economic Development Agency of Vlorë (AULEDA).

The design of the plant was made for 85 PE with a water consumption of 100 l/(p·d) what equals an average flow of 8.5 m^3/d and a BOD of 60 g/(p·d). For pre-treatment, a three-chamber septic tank was installed and water should get pumped to a subsurface horizontal flow filter bed. Effluent should have been drained and brought by gravity to a polishing pond. It was planned to store water in that pond and to use it for irrigation. In addition, a rainwater collection tank was installed on the roof of the school to feed the CW in the summer time to prevent reeds dying because of water shortage (Heeb and Wafler 2011,a).

Figure 5.8: Horizontal filter be at school in Narta (Nowak 2010,c)

Figure 5.9: Polishing pond at school in Narta (Nowak 2010,c)

Jens Nowak visited the plant in September 2010 and noted some problems that should be fixed if the plant will ever be used (again). The septic tank as well as the pumping shaft are not tight and water leaks into the ground. Effluent shaft is filled with stones and has to be emptied. As there are no reeds any longer on the filter bed, they have to be replanted when the CW will be in use again (Nowak 2010,c).

(Uruci 2011) wrote that in "September 2008, Prime Minister Berisha launched the Reform Plan for Water Supply and Sewerage Sector in Albania, which includes recommendations to use the Constructed Wetlands methodologies for the natural depuration of wastewater, adopted in the Municipality of Narta". The example of Narta shows clearly the big mismatch of policy/law and reality and the uncoordinated way of implementing projects to promote new technologies. Urban planning that covers a bigger area and not only a project area is often still missing in Albania. Even so many different stakeholders have been involved the project totally failed.

5.3.2 CW for nutrient reduction Tirana River

In the North of Tirana at the Tirana River a so called constructed wetland for nutrient reduction was constructed in 2009/2010 with the support of the Living Water Exchange and started operation in summer 2010. The plant was built as a research plant, financed by the Global Environmental Fond (GEF) (38,569 US$) and co-financed from the City of Tirana, the Institute for Environmental Policy and others (21,516 US$). Total costs were about 60,085 US$ (LWE 2011).

According to the drawings in the publication (Miho et al. 2010), the plant was constructed as a concrete basin planted with aquatic plants and having an inlet and an outlet pipe. No filter bed and no distribution system are visible. It is not very clear how the plant is working. The picture and the drawing are not very clear. For example, the separation walls have a different hight on the picture and the drawing and it is not obvious where exactly the water is flowing.

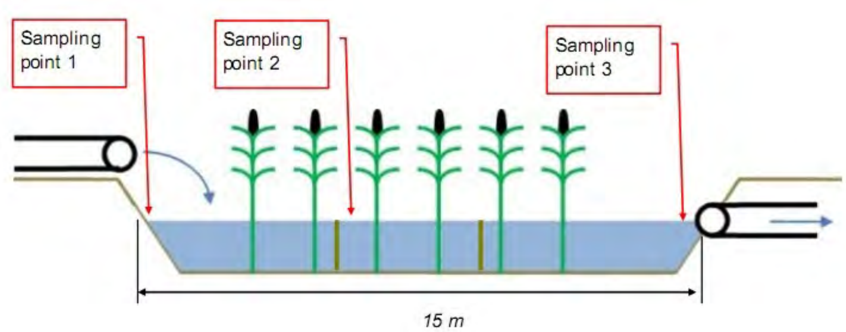

Figure 5.10: Scheme of the research plant at Tirana River (Miho et al. 2010)

The aim of the plant was to reduce nutrients before wastewater and runoff is lead into the Lana River. After a first test it was stated by the operators that the effluent quality is not satisfying because the hydraulic load was too big ((LWE 2011); (Johnson 2011)). Additional information was gained by e-mail with the contact person Edvin Pacara from the Institute for Environmental Policy. He stated that the plant is functioning since summer 2010. Originally, the Institute for Environmental Policy (IEP) and the municipality of Tirana were supposed to be responsible for the plant but after elections and the change of the mayor of Tirana the municipality is not interested in the plant any longer. There is no staff available for maintenance and the research team is doing site visits every three to four months. Last visit was in September 2011, just before the mentioned e-mail contact.

Figure 5.11: Picture of the new constructed research plant at Tirana River (LWE 2011)

Figure 5.12: Construction side of the research plant at Tirana River (LWE 2011)

According to (Gjinali 2011,c), planning and construction of the plant happened without involvement of municipality and other stakeholders. The site is located in a slum area and according to her, the construction happened without official permission (what is doubtable as an official sign of the municipality can be seen on one picture of the project). No values about the amount and the quality of the water discharged into the treatment plant available.

Efforts have been done in February 2012 (03.02.2012) together with GIZ driver Gezim Xhemrishi to visit the site, but the only result of the site visit was the finding that the plant does not exist any longer. The area is now crowded by newly built houses that are constructed illegally. As one family living in the area enlarged their garden, they simply filled up the treatment plant. This was affirmed by several people living and working around when asking them about the plant. During the site visit, the immense pollution of the whole river bank was obvious all along the river. Every kind of household waste was lying on the river bank and swimming in the water.

This case shows how necessary it is to include all the stakeholders and people living around that area where a (pilot) plant is implemented. Only if people have knowledge about the things going on and accept them such a project can be successful. In this case, most people in the area even did not know what was the purpose of the plant and why they should keep it. This ignorance destroyed a little research project with the costs of more than 60,000 US$.

5.3.3 CW at a prision outside Korça

When Martin Wafler visited the utility of Korçë in 2011 with the help of Viola Saliasi, at that time GIZ intern in the "Water Sector Reform" programme, he got the information that there shall be a well-working constructed wetland located at a prison of Korçë.

According to a phone call in December 2011 with Linda Ibrahimllari from the utility in Korçë, the plant is not under the utility and therefore information is rare. It was probably built by a Swiss or Austrian company, but no information available about the operation and maintenance of the plant. According to the Swiss cooperation office in Albania (E-mail contact with SCO in 2012), the plant was built by KfW, but this could not be affirmed by KfW. It was not possible to visit or even just to allocate the plant. This case shows the typical difficulties to get necessary information in the Albanian water and wastewater sector.

5.3.4 Lessons learned from the constructed wetland plants in Albania

The examples of the constructed wetlands implemented in Albania show clearly that the success of a plant depends very strong on the involvement and commitment of all different kind of stakeholders. Projects really have to meet the needs and wishes of the users otherwise they will not be accepted and used. The case of the plant at Tirana River showed that projects will be destroyed if people do not have knowledge about them and do not see the purpose and the need for them. In some cases it can be helpful to give incentives for the users to accept a plant, as it happened in the SOS children's village by reducing the water prices. But this must not be the usual way as projects have to be sustainable also in a financial way to be able to adapt them in other places.

Starting in small places and promoting a pilot plant can help to teach people about the possible technologies and is in general a good start to introduce a technology. The constructed wetland at the SOS children's village in Tirana is a very good pilot project and many people of the water sector know about it. Due to the close location to Tirana it is very easy to access and to take care frequently. But now it is time to move on and implement some new projects, meaning constructed wetlands or other small and medium size technologies for wastewater treatment that are not only pilot plants but that are sustainable in a financial way and can be transferred to other sites. Local companies and specialists needs to be trained for construction, operation, maintenance and supervision of such small scale wastewater treatment facilities.

5.4 Costs of pilot CWs in Albania and other (Balkan) countries

A construction project can be divided into the three main phases of the general conceptual design, the project planning and the project implementation. Costs of the project can be influenced more in the beginning at the conceptual stage than at a later stage. Therefore, special attention should be drawn on defining the aim of the planned sanitation project and its planning phase.

The costs for the implementation of a constructed wetland plant are depending on:

- Price for land
- Price for coarse and sand and its transport
- Price for pipes, geo-textiles, concrete, aquatic plants and other materials needed
- Construction works (staff costs and machines)
- Running costs for O&M (including electricity if pump is needed)

The investment costs include the design and construction, while O&M costs include regular checks, maintenance, self monitoring, electricity costs etc.

To get a rough idea about the costs for the implementation of a constructed wetland for wastewater treatment in Albania, the costs of some CWs constructed in the Balkan area will be presented in the following part. As information about this topic is rare, some average values from other European countries are given as well for comparison. Additionally, it would be necessary to contact producers and construction companies to get first cost-estimations for plants in the range for one household (4 – 5 PE), a cluster of houses (maybe 20 – 30 PE), small villages or a public building, e.g. a school (200 PE) and a whole village (1,000 - 5,000 PE). The price of these ranges would be necessary to be known to compare the implementation of a constructed wetland (or several small scale wetlands as on-site solution) with other options in the rural areas.

5.4.1 Costs of the CW at SOS children's village Tirana, Albania

The investment costs for the pilot CW at the SOS children's village in Tirana were around 50,000 €. As the design was made for 220 PE, the specific costs are around 230 €/PE. Dividing the cost estimation for that plant into labour and material, the labour counted for around 30 % and the material for around 70 % of the total costs. The detailed cost estimation can be found in the bill of quantities, prepared by the construction company Gener2 in Appendix A. Aditional 5,000 € were spent for supervision and traning and 3,000 € for documentation and public relations.

O&M will need around two hours per week. Electricity prices have to be considered, as one pumping station from the pre-treatment to the vertical filter bed was installed. Considering that the area has a big slope, no electricity would have been needed if pre-treatment tank would have been located above the filter beds instead of reconstructing the old collection chamber to use it as Imhoff tank.

5.4.2 Costs of the pilot CW in Vidara, Bulgaria

The municipality of Pravets, Bulgaria, and the non-governmental organisations WECF and EcoWorld2007 of Bulgaria installed a subsurface flow constructed wetland at the home of handicapped people in Vidare, what is a part of the municipality in Pravets. Planning started in 2008, construction took from October 2010 to April 2011. The scope of this case study was to gain information about principles and design of constructed wetlands "especially for small communities in Bulgaria, based on German national guidelines" (Albold et al. 2011).

According to (Albold et al. 2011), the investment costs of the pilot plant in Vidare were 45,000 € plus 10 % for planning and design approval what makes in total 49,500 €. As the plant was built for 60 PE, the specific price is around 620 €/PE. Table 5.6 Below shows the different costs for implementing the plant.

Table 5.6: Costs of the pilot CW in Vidara, Bulgaria (Albold et al. 2011)

Investment costs	
Excavation and piping	12,000 €
Pre-treatment step (concrete)	6,000 €
Soil filter	
Liner (Geotextile and PE foil)	6,000 €
Gravel, sand	7,000 €
Distribution pipes, drainage pipes and fittings	9,500 €
Pumps, including controller and cable	4,500 €
Total investment costs	**45,000** €
Plus planning and design / planning application (getting the approval)	+10 % of the investment costs

According to Claudia Weinreich (SuSanA Forum 2011), one ingeneer involved in the project, O&M costs are mainly caused by the daily and weekly checks done by local staff, electricity costs for pumping and once or twice a year the emptying of the primary sedimentation tank. No information about sludge treatment is available.

5.4.3 Costs of CW in the village Sveti Tomaž, Slovenia

The settlement Sveti Tomaž is located in northeastern Slovenia in the Prlekija region, Municipality of Sveti Tomaž. In 2001, a subsurface flow constructed wetland for 250 inhabitants was built by the Slovenian company Limnos. Until this time, the only wastewater solution for the settlement was the use of individual cesspit systems. he plant is shown in Figure 5.13 and Figure 5.14.

The plant was designed for a daily average flow of 38 m^3/d and covers a surface area of 700 m^2. For pre-treatment, a septic tank is installed. The plant has four successive beds (one filtration bed, two treatment beds and one polishing bed), a sludge drying bed and a lagoon for the storage of treated wastewater. The constructed wetland is operated by gravity, no electrical equippment is necessary (Bodik and Ridderstolpe 2007).

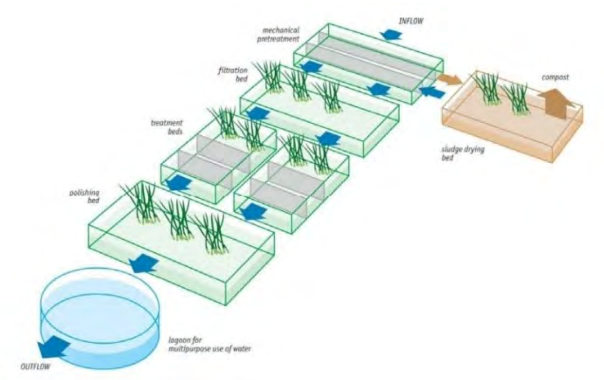

Figure 5.13: Flow diagram of the CW in Sveti Tomaž (Bodik and Ridderstolpe 2007)

Figure 5.14: CW at Sveti Tomaž, Slovenia (Bodik and Ridderstolpe 2007)

The investment costs of 50,000 € for 250 inhabitants (250 PE) lead to specific costs of 200 €/PE. This number is somehow below the construction costs of the SOS children's village in Tirana. Operation costs are given with 200 €/month for the entire plant (Bodik and Ridderstolpe 2007), what is less than 1 € per inhabitant.

5.4.4 Costs of CWs in other countries

Because only three values for costs of constructed wetlands in Balkan countries could be found, other values shall help to get an idea about the (construction) costs of CWs. Therefore, the costs of on-site CWs in Poland and general values for CWs in Germany, Italy and Austria will be presented.

5.4.4.1 Costs of on-site CWs in Poland

Constructed wetlands for treatment of domestic wastewater of single households were introduced in the Narew Region in Northeastern Poland in 2001 with the help of the non-governmental organisation EuroNatur. The original plan of the municipality was to install a centralised wastewater treatment plant. But due to a “spacious settlement structure with numerous isolated farms spread over a large area“, the construction of a sewer system would hve been to complicated and expensive (EuroNatur 2010). New options were required and constructed wetlands seemed to be a good solution. Until 2010, more than 500 households relied on constructed wetlands for the treatment of their wastewater in that region.

For the Polish villages around Sokoly in the province Podlaskie, the constructed wetlands were the best solution. Already existing septic tanks were used for wastewater collection. From the pumping shaft water gets pumped in intervalls onto the filter bed. After passing the filter media, water gets drained and collected. In addition, last unit of the treatment plant is a denitrification pond where water is pumped into through the sludge layer on the ground of the pond. Design was made by the Polish expert Wojtek Halicki, who was working at the university of Vechta (Germany) in the field of wastemanasgement and plant design („Entsorgungs- und Anlagenkonzeptionen“). Construction of the plants were partly supported by students of the university of applied science for agriculture and forestry („Landbau und Landpflege“) Pillnitz, close to Dresden, Germany (Onken 2007).

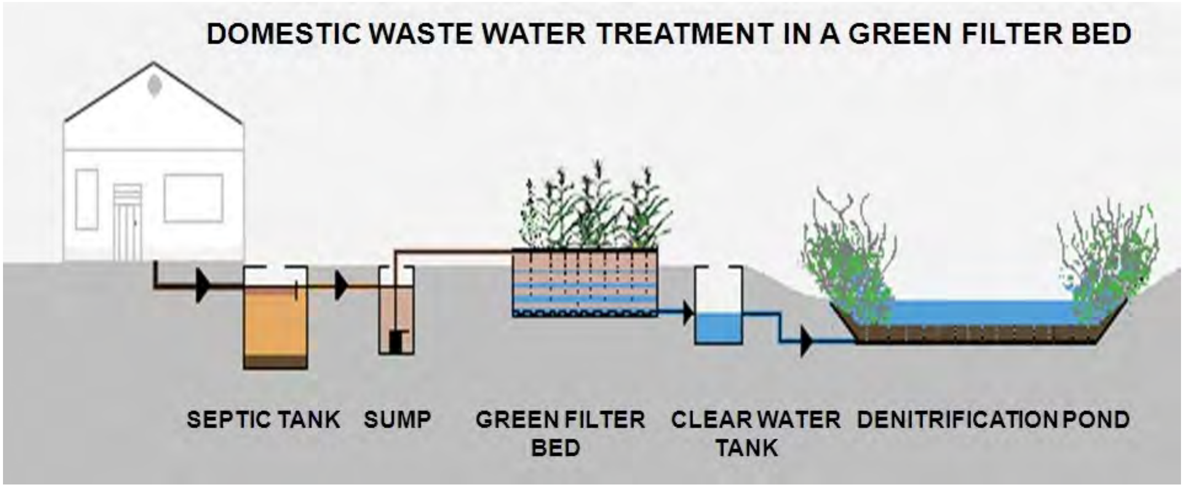

Figure 5.15: Design of small size CWs in Poland (Onken 2007)

The price for the on-site constructed wetlands plants for single households promoted by EuroNatur could be found in a project proposal of the EuroNatur foundation for the Prespapark. In this proposal it is stated that the costs would be 1,000 € per plant for a one household (EuroNatur n.y.). Assuming that four to five people share one household, the specific costs will be between 200 €/PE and 250 €/PE.

5.4.4.2 Costs of CW in Germany, Austria and Italy

Average construction costs for a constructed wetland were found for Germany, Austria and Italy, but unfortunately only for the treatment of greywater. In these countries, the construction costs for vertical-flow beds are given between 75 and 135 €/m². The design criteria is given in the source with 1 – 2 m²/PE and a minimum bed area of 10 m² (Regelsberger 2005). Therefore, the minimum bed area of 10 m² would cause costs between 750 and 1.350 € and could be used for a household of at least five people. With this numbers, the specific costs of 150 – 270 €/PE can be calculated (under the assumption of five people using 10 m² of treatment area).

5.4.5 Conclusion about CWs costs

The given examples for constructed wetlands in Albania, Bulgaria, Slovenia and Poland show specific construction costs ranging from 200 €/PE up to 620 €/PE. But as the plants in Albania, Slovenia and Poland are all below 250 €/PE it can be assumed that this is the average maximum cost for a small size CW. Especially in Poland more than 500 of the on-site CWs for single households have been constructed, so brought experience is existent. The values for Germany, Italy and Austria for greywater treatment with constructed values are in the range of 150 – 270 €/PE and correlate to the findings from the already mentioned plants.

In general it is said that CWs have low O&M costs compared with to treatment plants. If a constructed wetland plant can be operated by gravity, no electrical equipment is necessary and therefore no electricity has to be consumed. O&M costs are only given in the example from Slovenia with a price of 200 €/month for the entire plant that serves 250 inhabitants. This shows the low cost for operating a CW.

In comparison with the specific costs of big size wastewater treatment plants in Albania as given in the Table 3.1 (p.13) in chapter 3.2.3 Wastewater handling, small constructed wetlands have higher construction costs. But as population in rural areas is much lower than in the big cities and huge sewer systems would be needed to connect all the people to one big plant, other solutions have to be implemented. The sewer system is most often to most expensive part of the treatment system. Therefore, constructed wetlands, especially as on-site systems where no sewer at all is needed, is an appropriate technology for rural areas.

5.4.6 Conclusion about CWs for Albania

All in all, constructed wetlands are an appropriate technology for rural areas in general and rural areas in Albania. Experience with CWs is already existend in Albania and the Balkan area. The one pilot plant at the SOS children's village in Tirana is working very well, showing a very good effluent quality.

Constructed wetlands can be a low-cost option, that can be built with local material and providing local emplyment. It seems like the average maximum cost of a small size CW is around 250 €/PE. O&M costs can be kept very low and no electricity is needed if the area has a slope to collect and transport the wastewater to the plant.

Comparing the specific costs of small constructed wetland plant with conventional big size wastewater treatment plants, it seems like CWs are more expensive. But as houses in rural areas are often very scattered and sewerage systems are impossible or too expensive to construct, CWs as on-site facility can be the cheaper and better solution.

It is possible to meet the effluent requirements according to European law using the constructed wetlands technology for urban wastewater treatment. The possibility of re-using treated wastewater makes the technology even more attractive in areas with water shortages, like the Albanian coastline in the summer time.

6 Site visits and interviews with local stakeholders

This chapter will present the pupose and some key findings of the site visits, done by the author between December 2011 and February 2012, as well as the criteria for GIZ to select appropriate sites for the implementation of reference small size wastewater treatment plants.

Originally, one main target of the village visits and the interviews was to get information about the acceptance of villagers of small size wastewater tretment facilities. Detailed questions with main focus on the implementation of constructed wetlands were prepared. But unfortunately, not that many villagers could be interviewed. One reason was the limited time spent in the villages and the language barrier. Additionally, local organisations mentioned that very often NGOs or other organisations come to the villages to interview poeple about their situation. This raises the hope of the people that a project in their village will be implemented, but often nothing happens. Therefore, in some cases it was requested by the contact persons not to ask too many villagers of the visited village in order not to make them waiting for a project if this is not planned for sure planned.

Therefore, the focus of the site visits was changed to the description of the visited village or site, the assessment of the present situation and its problems and one interview with a representative of the LGU, if this was possible.

6.1 Purpose of site visits and interviews

As the GIZ "Water Sector Reform" programme aims at implementing several small or medium size wastewater treatment plants in different rural areas of Albania in 2012, it is necessary to find appropriate places. In the best case, these places should be located in different areas of Albania with different climatic conditions. It is not preferable to select only sites close to Tirana because people from remote communes or municipalities should also have the chance to visit the plants easily.

In order to find appropriate places, it is important to check the visits of rural areas that are already done by former consultants and then to discuss about new places to visit. This is necessary to avoid double work and to avaoid to visit a commune or municipality again where cooperation failed in the past.

In 2008, Martin Wafler from the company Seecon International GmbH was hired as a consultant to do a first study about the wastewater situation in Albania and the possibilities of improving the situation and to raise public awareness (Wafler 2008). In this report he describes the visits of several places to assess their suitability for implementing a pilot plant. The result was the selection of the SOS children's village in Tirana for the implementation of a constructed wetland plant. Several schools were visited as well, but Wafler did not have the chance to talk to the responsible decision makers of the school as it was the time of the summer break. Therefore, he could not recommend any of these schools for a pilot project. Future assessments should consider public holidays and school holidays if stakeholders have to be interviewed. Additionally, Martin Wafler visited the National Park in the Thethi Valley that is an area for hiking tourism. There, he could talk with one family that opened a camping site for tourists and would be interested to join a sanitation project.

In order to find other appropriate places for GIZ to implement small or medium size pilot wastewater treatment facilities, more villages had to be visited and interviews had to be done with local decision makers and inhabitants in order to get an insight into their attitude towards the wastewater problematic. Only if people are aware of the situation and want to have changes, the implementation of a project can be successful. Otherwise, awareness raising has to come first. Therefore, the visits done between December 2011 and February 2012 can be considered as a pre-feasibility study for selecting villages that will be visited again by an expert hired by GIZ. It has to be checked carefully that no sanitation project for the sites is planned in the near future as this would mean that there is no need to investigate on it.

The complete reports about the site visits and the interviews can be found in Appendix C. The village or site descriptions, that are the result of the visits and the interviews, do not include climatic or geological conditions as this was not considered as important for this kind of study. If sites will be selected for a sanitation project, geological and climate data of the area have to be gathered to adapt the technologies to it.

6.2 Criteria for the selection of a site

Criteria for the selection of appropriate sites where a small or medium size wastewater treatment plant can be implemented was discussed between GIZ junior expert Tina Eisele and the author in February 2012. The results as well as further ideas shall be presented at this point. Criteria will be divided into organisational, technical and additional criteria.

Organisational criteria, that must be fullfilled:

- **Only project:** There is no other sanitation project planned for the site at the moment or the next future. It has to be proofed that the site will not be connected to a central wastewater treatment plant located in the surrounding area.
- **Commitment:** The commitment by mayor and inhabitants needs to be given and people want to improve the situation. People are willing to cooperate and to pay local contributions and the tariffs. Good contact between mayor and inhabitants isimportant.
- **Clear rsponsibility:** It has to be clear if a water utility is covering the area or if the service will be under the commune/municipality. Responsibility for operation and maintenance has to be clarified to guarantee that the project will last when the donor leaves the site. Clear commitment to introduce tariffs and collect the bills to cover the costs is necessary.
- **Funds:** Funds for construction have to be available.

Technical criteria, that must or should be fullfilled:

- **Size:** Preferred project size ranges between 200 and 2,000 PE.
- **Density:** If canalisation is required, preferred villages are more or less dense, to keep costs for canalisation low.
- **Land availability:** Land for the construction of a wastewater treatment plant must be available.
- **Slope:** Land has little slope to collect and transport wastewater by gravity.
- **Exististance of sewer:** A sewer system exists already and a wastewater treatment plant can be copnnected to it. This will help to keep the costs low as the most expensive part of a sanitation system will be the sewer system. If no sewer exists, a donor has to be found that covers the costs of a sewer system. No sewer system is neccessary if on-site treatment plants will be implemented.
- **Accessability:** Road access for the construction vehicles is necessary. To ensure the possibility of using the plant for training purpose, the plant should be easy to access by road.

Additional criteria:

- **Needs:** Real need of sanitation system are obvious because of environmental and health concerns.
- **Drinking water supply:** Village or site has already a drinking water supply. Otherwise priorities of inhabitants and the mayor will not be the wastewater situation but the drinking water supply.
- **Different locations of the sites:** Selected sites shall be in different areas of Albania with different climate and geographical conditions. It shall be possible for people from different parts of the country to visit the plants easily. Plants shall show solutions that are adapted to geography and climate.

6.3 Site visits and interviews as pre-feasibility study

Between December 2011 and February 2012, ten different sites have been visited by the author in eight different communes or municipalities. The information about the selection of visited sites is given in chapter 2.3 Site visits and interviews (p. 4). The reports with the description of the villages or sites and the findings from the interviews, that werde done at most of the sites, can be found in Appendix C.

Each village or site description includes information about facilitating organisations and information about translators as well as the problems that occurred when doing the interview. Most often problems were caused by misunderstandings due to English - Albanian translation and the unstructured way of most of the discussions. Often, it was very hard to get the information that was wanted as interview partners started to talk about the topics they wanted to talk about instead of answering consequently the asked questions. In some cases, only the commune was visited but not a special village. In these cases, only the commune is listed below with date of visit. The visited villages and communes/municipalities were:

1) Village Dober, commune Qender (with CES driver and PR expert Tiger Çela), December, 07th 2011

2) Commune Qelez (with CES engineers Kurt Rippinger and Arian Dungu), December, 12th 2011

3) Village Ishull Shëngjin, municipality Shëngjin (with Andrian Vaso, IC Consulenten), December, 13th 2011

4) Commune Hajmel (with ADF Social Inspector Dritan Pistoli), January, 24th 2012

5) Village Mishter, commune Gurre (with ADF Social Inspector Dritan Pistoli), January, 25th 2012

6) Village Lin, commune Hudenisht (with KfW coordinator Bledar Dollaku), January, 27th 2012

7) Villages Perlat, Hamallë and Rrushkall, municipality Sukth (translation by Ansisa Aliaj), February, 7th 2012

8) Prespa National Park and village Liqenas, commune Liqenas (with Wolfgang Fremuth, ZGF), February, 20th 2012

The reports in Appendix C present the several visited villages or sites with their specialties and explain if and how they could be used as a place for implementing a small or medium size wastewater treatment plant. Additionally, results from interviews done with local decision makers and inhabitants are included to show the actual situation and the local needs and wishes as a basis for a project cooperation.

Some pictures of the villages are included in the Appendix C. More photos can be found online on following link:

http://www.flickr.com/photos/gtzecosan/collections/72157627133453606/

6.4 Results of site visits and interviews

Visited sites were mainly located in the North or the center of the country and unfortunately no site was visited in the South of Albania. Most of the visited areas were very different from each other. The site visits covered villages in the plain land at lakes and coastlines as well as villages in the mountains and public and private facilities.

Mostly, the villages in the mountains were very remote and scattered and do not experience big problems with the discharge of wastewater as huses are far away from each other and fresh drinking water is taken from springs in the mountains that have a very good quality. At least this is claimed by the local responsibles. Wastewater seeks into the ground and seems not to affect neighbours if the distance between the houses is sufficient. An example of such scattered houses is given in Figure 6.1 and Figure 6.2.

Figure 6.1: House in the commune Gurre (Niebel 2012)

Figure 6.2: Scattered houses in commune Qelez (Niebel 2011)

In opposite, the areas on the plain land and along lakes or coastlines experience bigger problems concerning wastewater handling. If a village has no public drinking water supply, the water is taken with pumps from private wells and the quality can be very bad. As most often the so called septic tanks are not lined, the wastewater seeks into the ground and may pollute groundwater that is used as drinking water. Distances between toilet pits and wells are often not sufficient to provide absoprtion of pollutants by the soil. If wastewater gets discharged into an open sewer and is not collected in a tank, it poses a health risk to all people and animals around the open sewers. Bad odour occurs in the hot summer time, but even in the winter the black wastewater can smell and will get washed out of the collectors onto streets and fields when it rains. Open sewers of the municipality of Sukth are shown in Figure 6.3 and Figure 6.4 (p.78).

Figure 6.3: Open sewer in Rushkull, Sukth (Niebel 2012)

Figure 6.4: Open sewer going through a private garden in Hamalle, Sukth (Niebel 2012)

The mayors of the different cmunicipalities or communes set different priority to the wastewater collection and treatment, mostly depending on the pressure that the wastewater problematic puts on them. First priority was always the drinking water supply. Other priorities of the villages were the construction of schools and public streets. Often, this is given more priority than a wastewater treatment. Only in some cases, the wastewater seemed to be a pressing issue for the municipality/commune. Especially when water was running free through the villages, when it causes bad odours and pollutes the lake or coastline next to the villages, people see the need of wastewater collection and treatment and the health and environmental risks that occur if this is not done in a proper way. In few cases, the idea of keeping the area attractive for tourists was mentioned. It can be clearly stated that wastewater was more a problem in plain areas that are located close to water bodies and where settlements were more or less dense than in the mountain region.

The visited municipalities or communes showed a different economic situation. It was observed that the better the economic situation seemed to be and the better the infrastructure of the villages was (street access, drinking water supply, etc.), the more importance could be given to wastewater handling by the municipality/commune and its inhabitants.

Another observation made during the site visits was that municipalities and communes showed different levels of organisation and knowledge regarding the different topics of environment and health, communal organisation or funding possibilities. In some communes, a wide knowledge about environmental and health risks was present, but this was not the case everywhere. Also some mayors knew better than others how to present their villages and how to apply for projects and funds. Some communes were very well organised, had good contact with the population or showed up with an urban planner what shows a comprehensive understanding for the future planning of the area.

Unfortunately, only one commune (Liqenas)interview partners brought along a Local Development Plan to the meeting. This plan gives baseline data about the situation of the commune and is required for all communes or municipalities. In places where baseline data is missing (number of inhabitants, amount of water consumed, amount of wastewater produced, etc.), the documentation of the actual situation has to be first priority. Only if the situation is well-known and documented, further plans can be made and implemented successfully.

In general, most people that were interviewed showed interest in getting a solution for their wastewater discharge. At the same time, missing knowledge about the problematic and the technical solutions was very obvious. Therefore, capacity development of the stakeholders is a clear need in rural areas. Local people have to be informed and involved in decision processes and local experts need to get trained.

Figure 6.5: Villagers in Dober (Niebel 2011)

Figure 6.6: Villagers in Gurre (Niebel 2012)

The site visits gave a good insight into the situation of rural areas in Albania and showed needs and wishes of local people. But some information could not be gained in the short time of site visits (e.g. income situation in numbers, distances between the houses in meters, slope of the land) and should be collected if further action in that area is wanted by GIZ. The following information should be gathered in future studies if further action for the area is wanted:

- Number of inhabitants and demographic development
- Information about the specification of the area (geography and climate)
- Information about the road access for construction vehicles
- Distance between houses (land-use plans of the area would be helpful)
- Existence of public drinking water supply and its conditions and the coverage rate
- Location and quality of water source
- Existence of wasetwater collection tanks or sewer system, specification if it is open ore close sewer and its coverage rate
- Effects of wastewater discharge on the inhabitants and the nature
- Coverage by utility; responsibilities for drinking water supply and wastewater discharge and treatment
- Availability of money
- Willingness to cooperate by mayors and local people (commitment)

Table 6.1 (p. 80) will give an overview over the main facts gathered from the site visits for the visited villages or public and private facilities. Fields are empty if information are missing.

Table 6.1: Overview over gathered facts of villages and sites

Village / Commune / facility	Inhabitants/ households/ users / PE	Covered by UK	Water supply (donor)	Wastewater collection	Sewer existing	Commitment of inhabitants and mayor	Clear responsi-bility	Funds available	Area avialbale
Village Dober	1,000 inhabitants (PE)		Yes (ADF/KfW)	Tanks, no rain water collection	No	Yes			
Commune Qelez	13 villages with 2,000 inhabitants (PE)		Partly	Tanks	No	No			
Village Ishull Shëngjin	1,000 inhabitants (PE), 250 houses		No, private wells	Tanks, open rainwater channels	No	Yes			Yes
School Ishull Leizhë	750 students		Yes, but little consumption	Tank, no rain water collection	-	Yes			Yes
Commune Hajmel	5 villages with 6,075 inhabitants (PE)	Yes	4 out of 5 villages have water supply, one village and some unconnected houses have private wells		No	No			
Village Mishter	88 families with at least 5 members per family		Yes (ADF/KfW)		No	Yes			

Village / Commune / facility	Inhabitants/ households/ users / PE	Covered by UK	Water supply (donor)	Wastewater collection	Sewer existing	Commitment of inhabitants and mayor	Clear responsi-bility	Funds available	Area avialbale
Village Lin	1,200 inhabitants (PE)	Maybe in future (Pogradec)	Yes		No	Perhaps			
Villages Perlat, Hamallë and Rrushkall	Perlat: 1,400 inhabitants (PE)	Yes (Durrës)	P: yes (ADF/KfW) H: yes (ADF/KfW) R: No	Partly open sewer channels	Partly open sewers	Yes			Yes
Village Liqenas	1,000 inhabitants (PE), 340 households	No	Yes	Piped sewer system, open rain water channels	Yes	Yes			Yes
Haedquarter (HQ), school (S) and restaurant (R) in the Prespa National Park	PE unclear now	No	HQ: yes, by own well S +R: want to buy water from HQ well	HQ: leaking tank	-	Yes	Yes	Yes	Yes

Results about the acceptance of special wastewater treatment technologies are poor. Knowledge about technical solutions was not given, therefore no detailed questions about solutions, especially the use of constructed wetlands and the wastewatre re-use, were possible. If people were interested in solving their sanitation problems, they wanted to have more solutions presented and would like to participate in decision processes. In general, if problems occured, people were interested in solutions. Otherwise wastewater is not a pressing issue for them.

6.5 Recommended sites for further investigation by GIZ

For this study, ten sites have been visited in total in order to get an overview over the actual situation in rural areas of Albania and to find appropriate places where the implementation of a reference sanitation project would be possible and further investigations by a technical expert could take place.

At the present moment, not all of the necessary information to assess the criteria could be gathered form the site visits. For example, the neighbourhood of Shëngjin seemed to be a very appropriate place to implement a small or medium size wastewater treatment plant. But at the beginning of 2012, it was not clear if a wastewater project for the bigger area of Shëngjin is under planning or not. Tina Eisele from the GIZ office in Tirana got inconsitstent information about this topic by different stakeholders that could not be clarified until hand-in of this thesis. If Ishull Shëngjin will be connected to a big wastewater treatment plant that will treat wastewater of the whole area, no other investigation by GIZ will be necessary.

Based on the visits, some communes could be excluded from further investigations that will be done by the expert Jens Nowak as GIZ consultant in March 2012. The sites to be excluded are commune Qelez and commune Hajmel. First commune does not experience any problems concerning the wastewater situation and is too poor to do something that is not needed. In the second commune, the mayor and the people were not all at interested in improving their situation, even though they experience problems with the drinking water quality.

The other sites are all more or less still interesting for further investigations. But some information are still missing or unclear and need to be gathered. A short summary of findings and reasons for recommendation for further investigation is given in the following for each site.

- **Dober:** Can be recommended for further assessment. Area is in need for sanitation system. But commitment and responsibilities have to be clarified. Village has a good size for a small or medium size WWTP. Scattered houses could be equipped with an on-site solution. Improvement of the wastewater situation in this village would prevent pollution of the very close Shkodra Lake.

- **Ishull Shëngjin:** Would be a very suitable area to implement sewer system and wastewater treatment plant. Area for the construction of a plant is available and commitment of people is strong. People are better situated and could effort the financial local contribution. Area is close to the coastline and therefore action to improve the wastewater situation is necessary. What has to be clarified is the plans for the area to know if neighbourhood will get a connection to another big wastewater treatment plant or not.

- **School in Ishull Leizhë:** Site can be recommended if GIZ wants another project at a school. Problems are obvious and commitment of the responsibles seems to be given.

- **Mishter:** Village has problems with unsealed pits and open sewerage. No infromartion about commitment of the mayor, but in general the village can be recommended for further investigation. People know about their wastewater problems and would like to improve the situation.

- **Lin:** Very dense village close to the Ohrid lake. Therefore, sanitation is an important issue. Village can be recommended for further investigation. The density of the village and the fact that the main street is just recently new constructed can cause problems if a sewer system shall be constructed.

- **Perlat, Hamallë and Rrushkull:** In general, all the three villages would be appropriate for the implementation of a small or medium size wastewater treatment plant. At the moment, the municipality finances open sewers on their own financial means. This shows that the municipality is taking care of the wastewater problematic. Commitment of the municipality and some funding seems to be be available and villages are recommended for further investigation. The municipality employs several urban planners that are looking for solutions for the whole area of the municipality. Perlat has the most preferred number of inhabitants that counts less than 2,000 PE.

- **Liqenas:** Commitment of mayor is given. Village is dense enough for a sewerage system and land for a treatment plant seems to be available, but it needs to be checked if flooding can occur in the area. Village can be highly recommended for further investigation. Another aspect for the selection of the village would be that the area is under protection (Prespa National Park).

- **Headquarter, school and restaurants in the Prespa National Park:** A project for these facilities would have the advantage, that responsibilities are clear or could be clarified and that funding and land will be available. Commitment is ensured, sites can be recommended for further investigation. But site is not a typical rural area to show how sanitation can work in a village. Protection of the park would be a positiv result of a sanitation project.

7 Presentation of the institutional framework

7.1 How to organise the water sector in the future

This sub-chapter presents the main ideas of the National Water and Sewerage Sector Strategy 2011 - 2017 and the so called Masterplan for the sector, that is still not finished.

7.1.1 National WSS Sector Strategy 2011-2017 and strategy for rural areas

In 2001, a "Rural Water Supply and Sanitation Strategy" (RWSS) was prepared with the help of World Bank and got approved in 2003, together witha national strategy paper for the water and wastewater sector, containing the Millennium Development Goal (MDG) number 10 (to half the population without access to water and sanitation). Both documents were approved by the Council of Ministers.

The RWSS paper describes the situation in rural areas and shows the connection between poverty and lack of water supply and sanitation (WSS) services. The paper distinguishes between urban and rural areas, where urban referrs to the municipalities and rural to the communes. This definition was not the best concerning number of population and population density and should be improved in the future. Further the paper states that main emphasis in rural areas is put on water supply and not on piped sewerage systems. The sanitation component is reduced to the protection of the water source (Blaschke et al. 2011). Even though the paper is from 2003, not that much has changed in the priority setting in rural areas, sanitation is still not focussed on by the national institutions.

The National Water Supply and Sanitation Sector Strategy (NWSS) paper was reviewed in 2007 and replaced in 2011, covering the planning period from 2011 to 2017. This actual document contains "a new approach to address sector reforms by defining clear strategic goals" and assigns governmental institutions to elaborate detailed action plans. Goals will be measurable by using performance indicators that can be monitored by the Monitoring and Benchmarking Unit (M&B Unit) of the GDWSS (Blaschke et al. 2011).

The five main objectives of the National WWS Sector Strategy are summarised in the chapter 2 – „Vision, Mission and Priority Objectives" of the strategy paper and are the following (MPWT 2011):

- Expand and improve the quality of water supply and sewerage service.
- Orient the water utilities towards principles of cost control and full cost recovery.
- Improve governance and regulation in the sector.
- Invest in enhancing the capacities of the sector work force.
- Move towards convergence of Albanian law with EU water directives.

The consideration that are relevant for the regulatory or institutional field in order to reach the aims can be summarised as (MPWT 2011):

- Strengthening of the WRA and expanding its activities.
- Strengthening of the GDWA (General Directorate of Water Administration that is included in the MoEFWA).

- Implementation of government decision towards aggregation of water utilities „into few, larger service providers“ in order to realise the „economics of scale“ to increase efficiency (MPWT 2011).
- Establishment of a national training and certification programme for all utilities.

Additionally, the private sector participation is mentioned as a key element of the sector startegy to „bring a more commercial approach to infrastructure provision“ through competition and to reduce political intervention (MPWT 2011). Incentives shall be provided for private companies to get involved in the water sector. In general, the water supply and sanitation (WSS) sector was recognised as important for "economic and social development of the country" (Blaschke et al. 2011) and it can be hoped that the rural areas will be considered more in the future planning.

Even though the paper should address the problems of drinking water supply and wastewater treatment and discharge, the wastewater problems of the rural areas stay neglected.

7.1.2 Masterplan for water sector

The Masterplan for the Albanian water sector has the goal to identify priorities of the sector until 2040 and is financed by KfW. The development of the Masterplan is still going on at the moment. While the company IC Consulenten is working on the water supply part, the wastewater part is covered by the company IGR Engineers. All given information are gathered from the Masterplan Interception report- Final (November 2011, (Blaschke et al. 2011)), meetings with Andrian Vaso from IC (December, 13th 2011) and Karlheinz Stransky from IGR (December, 14th 2011) and a meeting of GIZ and IC Consulenten at the GIZ office (January, 19th 2012) to prepare the prioritisation criteria.

The development of the Masterplan follows several steps or phases. In the 1st phase a baseline report was prepared that gives an overview over the sector issues, namely financial, social and governmental issues. The baseline report was finished in 2011.

The 2nd and 3rd phase are going on in parallel. In the 2nd phase a description of the current situation of infrastructure conditions is prepared. Albania has 58 utilities and is divided in the Masterplan in areas covered by utilities and areas that are not covered (OJ, what stands for „out of jurisdiction“). Data will be transferred into GIS format.

A presentation of future needs is prepared as the 3rd phase. The needs will be figured out by the use of questionnaires. Questionnaires were sent to all utilities and all OJ at the beginning of 2012. The questionnaires for the utilities shall help to collect data for the five main fields drinking water supply, wastewater discharge, financial, social and environmental aspects. Questionnaires for the OJs will be sent to the municipalities/communes and contain less questions. This study shall be finished by mid-February 2012.

In the 4th phase, the development of water demand schemes of Albania and the preparation of a table for prioritisation are targeted, divided into short-term (until 2015), mid-term (until 2020) and long-term (until 2040) actions. In January and February 2012, the consultants that work on the Masterplan met 23 stakeholders of the water sector to ask for their ideas concerning how to set up a scheme to evaluate the necessity of actions and the necessary criteria (e.g. water quality and supply hours, health risks, environmental risks, costs of measure). The prioritisation process consists of (Blaschke et al. 2011):

- Conduction of availability analysis; data collection and verification
- Identification of problem areas and assessment of urgency
- Elaboration and evaluation of competing solutions or projects.

Additionally, it is planned to set up a list of criteria that can change the sequence of the action if necessary and reasonable. This shall help the government to have guiding principles and to stay flexible if necessary.

This Masterplan shall help to organise the water sector in a more structured way and to make decision for investment more transparent. The Masterplan will consider whole Albania and not only some regions what makes it a tool for a comprehensive planning. It directs donor money to the most urgent needed actions and shall help to make the sector more sustainable. Overlapping action can be avoided.

7.2 How communes can start a project

This sub-chapter shall show on two examples how communes can implement small size wastewater projects. Unfortunately, until now not many projects were done in this field in Albania. The one example shows the implementation process of a constructed wetland plant for wastewater treatment at the SOS children's village in Tirana, funded by GIZ and GDWSS. The other example shows the implementation process of the ADF water supply project in rural areas of Northern Albania, financed by KfW. As no wastewater project is done in Albanian villages until now, the process shall help to learn how to proceed for wastewater projects and what stakeholders have to be included in the process.

7.2.1 Example of implementing a CW at SOS children’s village

The constructed wetland plant at the SOS children's village in Sauk, Tirana, is a successful pilot plant for small size wastewater tretment plants in Albania. But as the SOS children's village can be seen as one facility and is not comparable with villages in rural Albania, processes and learnings from the implementation of that plant can not be adopted completely for projects in rural Albanian areas. But still, the project can give some insights into necessary process steps and success factors and will therefore be presented at this point.

7.2.1.1 Process of implementation

The following part describes the process from the idea to the implementation of the constructed wetland at the SOS children’s village in Sauk, a suburb of Tirana. The description shall show how stakeholders have been successfully involved in the planning process and what steps had to be taken by the GTZ. The description is mainly based on two interviews with Enkelejda Gjinali, who was project coordinator for GIZ Albania for seven years and is lecturer at the Politechnical University of Tirana dealing with wastewater and industrial wastewater plants for 17 years, and Andreas Kanzler, who was at this time the senior specialist planner for Albania in the GIZ office in Eschborn, Germany. Some further information about contracts taken from documents or gained while talking with Andi Papaproko, Assistant for the “Water Sector Reform” programme, are marked in the text with the source.

The process from the idea to the implementation of the constructed wetland at the SOS children’s village was taking a long time. Andreas Kanzler had a big interest in the wastewater topic of Albania. He went to Albania three times and started the discussion about implementation of a constructed wetland. His original idea was to implement a technology that allows the reuse of treated wastewater. Parallel to this, Enkelejda Gjinali proposed the **Terms of Reference (TOR)** for the implementation of a low cost technology in Albania to the GIZ in the beginning of 2008 (January – April 2008). The aim was to have a case study and to bring a new technology for wastewater treatment to Albania.

As Albania has mostly sufficient water resources and experiences no big problems concerning the uncontrolled discharge of wastewater, Andreas Kanzler experienced a lack of awareness for the environmental and health issues related to this when he visited the country. To change the situation, he hired the engineer Martin Wafler from the Austrian consultant company seecon GmbH to make a Baseline Study about the wastewater situation in Albania and to propose some suitable technology for the wastewater treatment. The goal was to get a basic idea of the situation and suggestions for improvement and to raise public awareness. While discussing with Martin Wafler the idea to implement a constructed wetland was born. Enkelejda Gjinali got involved in the process with all her enthusiasm about the idea of implementing a constructed wetland as a pilot plant in Albania. With her connections she could promote the process very well.

At this time, GTZ programme officer Andi Papaproko mentioned the unsatisfying wastewater situation in the SOS children's village where he was working before as a teacher. Together with Andreas Kanzler, he visited the village and started negotiations with the regional office of SOS children's village and the head of the SOS children's village in Tirana. The feedback from the village was very positive and GTZ got their support for the idea to implement a small-scale treatment plant at the village. GTZ and SOS children's village shared the concept and clarified the future responsibilities. According to Andreas Kanzler, the good precondition for the process was the already existing contact between Andi Papaproko and the SOS children's village. Another incentive for the children's village to join the project was that a treatment plant could help their good publicity. According to Andi Papaproko, the responsible utility agreed that the SOS children's village will get a lower drinking water supply tariff and that they do not have to pay for the wastewater discharge.

A **"Memorandum of understanding"** was signed by the MPWT and the main office of the SOS children's village Albania as well as a second memorandum between GTZ and the main office of SOS villages to ensure the maintenance after the construction. The Memorandum of Understanding (MoU) includes the financial contributions of the stakeholders (GTZ and SOS), the agreement on the responsibilities of GTZ and SOS and the planning of activities. The memorandum was signed by both sides (GTZ, namely at this time country director Ulrike Gantzer-Sommer, and SOS, namely National director Teuta Shkenza) on July, 24th 2009.

Additionally, a "Local subsidy contract" was concluded between the SOS children's village and the GTZ to ensure and regulate the financial support of GTZ. It was signed by Ismail Beka and Enkelejda Gjinali for GTZ and Teuta Shkenza for SOS as recipient on July, 24th 2009. Additionally, a **special agreement** between the Minister of the MPTW, Sokol Olldashi, and the Deputy Country Director of GTZ was signed August, 31st 2009.

To prepare a feasibility study, the German consultant engineer Joachim Niklas from ÖKOTEC GmbH was hired. Andreas Kanzler knew him already as he designed a constructed wetland at the Philippines for GIZ for 3,000 people that is, according to Andreas Kanzler, still working very well. The design done by Joachim Niklas with the help of a local engineer and the support of Enkelejda Gjinali and was then transferred into CAD by Enkelejda Gjinali. With this **design** a **cost estimation** was done for the constructed wetland plant in Tirana. It was made sure that all materials are local materials.

The investment for the construction of the plant was given by the German government by 80 % through GTZ and by the Albanian Ministry of Public Works and Transport (MPWT) by 20 %. These 20 % cover the taxes which are, according to Enkelejda Gjinali, never paid by donors in Albania. Therefore it was very important to involve the MPWT at this early stage one year before the construction work started, because the ministry had to get the budget approved.

The Environmental permission was signed on June, 11th 2009. Enkelejda Gjinali prepared a second TOR in terms of getting the **construction permission**, since such a plant has never been built before in the country. Many other documents were necessary to get this permission. It was not possible to get further information in the English language about all these documents.

When all permissions were given, the application process **"invitation to quote"** for the tenders was opened by the GIZ main office with assistance of Joachim Niklas and Enkelejda Gjinali. The offer of three companies were compared and finally the construction company Gener2 was selected and the **construction contract** between SOS village Tirana and construction company Gener2 was signed on September, 1st 2009.

For the implementation of the constructed wetland a local structural building company was hired because there was no specialised company in Albania existent that had experience with constructed wetlands. Problems occurred as no specialist was hired in Albania to supervise the construction process. The financial means of GTZ were insufficient to contract a local company for constant supervision. Joachim Niklas came three time during the construction phase to supervise the implementation works. For future projects, Andreas Kanzler suggests to assign a foreign specialist to assist the local construction company if the company has no experience in that field. For this job, he also could imagine to employ an engineering student who has some experiences or is writing a thesis in that field.

At the inauguration day of the constructed wetland at the SOS children's village the SuSanA case study was delivered (Gjinali et al. 2011). Mistakes made in the construction and first operation phase were minimised in the last two years by reconstruction efforts, guided by the German specialist Jens Nowak. The plant delivers now very good results concerning the effluent quality and is working very well as a demonstration project in Albania. The process of planning and implementation shows that different stakeholders have to be included and preparation of the work has to be done very carefully and in advance. Only if all stakeholders feel the commitment to the plant and responsibilities for O&M and reparations or improvements of the plant are clear, the implementation of such a project can be successful.

7.2.1.2 Identification of the main steps of the project

From the process of implementing the constructed wetland at the SOS children's village Tirana, several steps could be identified that have to be done when planning new projects:

- Donor (in this case GIZ (GTZ)/BMZ): preparation of project TOR and identification of appropriate project places and partners
- Beneficiary (in this case SOS children's village Tirana): define problems and think about possible solutions, find donor
- Negotiations and several agreements between donor and beneficiary to clarify aim, funds and responsibilities
- Agreement between beneficiary and utility about tariffs (if utility is covering the area)
- Agreement between MPTW and beneficiary
- Agreement between MPTW and donor (to secure the 20 % tax paid by Albanian MPWT)
- Agreement between donor and MoF
- Preparation of a feasibility study by an engineer, preparation of design and cost estimation
- Application for environmental permission
- Application for construction permission
- Preparation of Invitation to quote for tenders
- Selection of construction company and preparation of construction contract, securing the construction supervision

To ensure the success of the project, it is useful to assure some supervision and monitoring by the donor after the inauguration of a plant like it was done at the SOS children's village due to Enkelejda Ginali's efforts. This should be included for a new planned project.

7.2.1.3 Identification of main stakeholders

The stakeholders that were involved in this constructed wetland project are presented in the following. As GIZ and the SOS children's village are the two main stakeholders, their involvement is splitted in contribution and benefit to show their involvement better.

- GIZ (GTZ)/BMZ as donor:
  - Contribution: planning, coordination, expertise, funding
  - Benefit: Successful demonstration project
- SOS children's village as beneficiary:
  - Contribution: commitment to the plant, providing land for construction, providing O&M
  - Benefit: solution for wastewater problem, reduction of water tariffs, no wastewater fee, good reputation, chance to re-use treated water
- Tirana utility as responsible institution for water supply and wastewater discharge
  - Agreement on lower drinking water tariffs and no wastewater fees
- General Directorate for Water Supply and Sewerage (GDWSS):
  - Preparation all the documents for the SOS children's village and GIZ (GTZ)
- Ministry for Public Works and Transport (MPTW):
  - Signing all the construction papers and financing 20 % of construction costs
- Municipality of Tirana:
  - Issuing the construction permission
- Ministry of Environment (MoE):
  - Issuing the Environmental Permission
- Construction company
  - Construction of the plant
- Water Regulatory Authority (WRA):
  - Application of the tariff termination for the sewerage at SOS children's village

This project gives a good overview over the process of implementation and the involved stakeholders. But as it was a demonstration project in a special surrounding (SOS children's village) and not in a "normal" rural area, it has to be considered that some stakeholders will be different ones in other project. The following part about a water supply project done in villages in northern Albania shows a different situation and therefore different project steps and involved stakeholders.

7.2.2 Example of water supply project of ADF

The following section describes an actual project for drinking water supply co-financed by KfW, implemented by the Albanian Development Fund (ADF) and supported by consultant companies for technical assistance JV Consultant Engineers Salzgitter (CES)/Sachsen Wasser (SaWa). ADF is working in rural Areas of Albania. As there are no wastewater projects done in rural areas of Albania, information from this drinking water project will be used to show the process of implementation projects in these rural areas. Information about the project and the processes are gained from interviews with Kurt Rippinger (TL - RWSP) and Arian Dungu (Co-TL RWSP), both working as engineers at CES, on December, 2nd 2011, December, 12th 2011 and March, 3rd 2012.

7.2.2.1 Process of implementation

The water supply project is covering 50 villages in the rural area of northern Albania. The criteria for selecting the project villages were:

- Villages in the commune are poor, with a proportion of social aid recipients > 20 %
- Villages where gravity water supply is possible
- Costs are below 300 € per person

Following the given criteria, 50 villages in the three project areas Shkoder, Kukes and Diber in the North of Albania were selected.

All LGUs have to prepare a list of priorities that is known by the Qark. ADF is represented all over the country with their local inspectors. Like this, communication between ADF and Qarks is secured. When ADF started the water supply project, the inspectors talked with the Qarks about the necessities of the municiplities/communes. If LGU had declared water supply as a priority the mayor of the municipality/commune could apply for the project to the ADF. The Qark was approving the application before it was sent to the ADF.

To start the project in the villages, inhabitants had to get involved as well. They formed beneficiary groups and declared at public meetings that they pay the local contribution of 2 % of the construction costs, make land and access streets for the construction available and that they will pay the tariffs after water system will run.

Design, construction and supervision were announced and the companies selected. Construction permission were obtained by the Qark, construction works are still going on until June/August 2012.

LGUs are the smallest governmental unit and responsible for the services supply in the villages (like water and electricity supply) and the caretaking of the system. In this project,the local contribution counts 10 % of the construction cost. While the beneficiaries (villagers) pay 2 %, the LGU has to pay 8 % of the construction costs and will be responsible for operation and maintenance. Dependent on their capacity, the LGU is doing the service themselves or they hire a company for doing it. In most of the project villages one or two men do all the service works. CES wrote a manual with the service description and now it depends on the LGU how to organise the work.

The LGU has to be licensed to get the service tariffs approved by the Water Regulatory Authority (WRA). As presently the LGUs within the project area have no license, the tariffs are set without the WRA methodology and only with the approval of the Council of Communes. Mostly prices follow somehow the tariffs of the next bigger city but are set a bit lower. As the process of getting a license and getting the tariffs approved costs extra money, this process has to be done step by step in the future. Unfortunately, most

LGUs are not very interested in actually getting the license. But ADF and CES stay in close contact with the WRA and inform about their project in order to make licensing possible in the future.

7.2.2.2 Identification of the main steps of the project

For this project, the necessary steps were:

- Preparation of list of priorities by LGU and presenting it to the Qark
- Close contact between ADF inspectors and Qark, discussion and information about water supply project
- Funding secured by KfW
- Application of LGU to ADF with approvement of Qark. LGU has to confirm a payment of 10 % of the construction costs as local contribution.
- Involvement of inhabitants and public meetings. Secure local contribution of at least 2 % of the construction costs from villagers.
- Call for tenders and selection of design, construction and supervision companies
- Getting construction permission from Qark
- Secure operation and maintenance by LGU. Manual is prepared by CES and ADF.
- For future: getting license for LGU by WRA

7.2.2.3 Identification of main stakeholders

In the water supply project of ADF, the following stakeholders were involved in the project planning and implementation process:

- Qark:
  - Close contact with ADF, knowledge about the necessities of the communes/municipalities and acting in-between LGU and ADF
  - Approval of the application from LGU to ADF
  - Issuing the construction permission
- LGU:
  - Application for project to ADF by mayor
  - Provision of 10 % of construction costs as local contribution
  - Responsibility for O&M and tariffs (has to get a license in the future)
- Villagers:
  - Formation of beneficiary groups
  - Local contribution by villagers by 2 % of the construction costs

  - Making land and access streets available for construction
  - Confirmation of tariff payment when system starts running
- KfW (donor):
  - Funding of the project
- ADF:
  - Project Executing Agency (PEA) for KfW. ADF and GD are in contact to avoid duplication of projects.
  - Collection of money from the Albanian Governement (GoA), the LGU and banks, in this case KfW
- International Consultants (in this case CES and SaWe):
  - Technical assistance to the ADF
- WRA:
  - At the moment: only communication with ADF/CES and information exchange
  - In future: regulate service providers and protect consumers (issuing license and approving tariffs)
- Private companies:
  - Design, construction and supervision of technical system

7.2.3 Conclusion for new projects

At this point, experiences from already implemented projects shall serve to give an overview over the involved stakeholders and the main steps that have to be taken to implement a wastewater treatment plant in rural areas of Albania. As the implementation of the constructed wetland plant at the SOS children's village in Tirana has a pilot character, the experiences gained from the drinking water supply project of ADF shall be considered as more appropriate for this overview where processes and stakeholders were different in the two projects. The involved stakeholders are presented in Table 7.1 (p. 93) together with their kind of involvement.

Table 7.1: Stakeholders for wastewater treatment projects in rural Albania

Stakeholder	Involvement
Beneficiaries (Commune and its inhabitants)	• Participation in planning process • Local financial contribution • Commitment to project and tariff payment
Region (Qark)	• Facilitation of communication between ADF and LGU (communication of wishes and needs, project approval, application approval) • Issuing of construction permission (gives construction permission for small and medium size projects that are below the national level)
LGU (if not covered by utility)	• Project application to ADF • Local financial contribution • Responsibilities for O&M and tariffs
Utility	• Funding • Responsibilities for O&M and tariffs
ADF (has same function as GDWSS, but for rural areas)	• Execution of project • Coordination with GDWSS • Training
Donor	• Funding of project
Private companies/ international consultants	• Design • Planning • Operation and maintenance • Supervision
WRA	• Regulation of service provider, licensing • Consumer protection

Necessary steps that have to be taken are:

- Identification of problems and prioritisation by LGU and communication with qark.
- Application of LGU to ADF for project, that has to be approved by qark.
- LGU has to secure 10 % of construction costs as local contribution as well as operation and maintenance. Coordination with utility for O&M, if area is covered by utility.
- Organising public meetings with the inhabitants to secure participation of inhabitants. Regular information exchange and discussions between inhabitants and LGU and the village leader to decide on technology. Perhaps organising inhabitants in beneficiary group.
- Agreement between donors and beneficiaries to guarantee the commitment of beneficiaries and clarify their responsibilities.
- Involvement of an engineer for the design of the technical solution. Call for tenders for construction, design and supervision and their selection.
- Application to qark for construction permission.
- Preparation of O&M manual by ADF.
- Tariff approval by WRA.
- Ensure supervision after project implementation finished.

These are the main steps that could be identified from the project examples given before. Every new project can vary from each other a little bit.

8 Development of a guideline for the implementation of small size wastewater treatment plants

The development in Albania, especially in rural areas, is very different and not all municipalities and communes are on the same level of development. To ensure that all municipalities or communes that are interested in improving their sanitary situation, it would be necessary to prepare a guideline to provide knowledge to all local decision makers on how to apply for and implement a wastewater project.

GIZ aims on preparing such a guideline for the implementation of small size wastewater treatment plants in the frame of the "Water Sector Reform" programme in Albania. The present working title of this document is "Guideline for Albanian Communes for the implementation of small-scale treatment plants". The guideline will be made for local decision makers, like the chief of municipality or commune.

The guideline shall help local decision makers to get an overview over technical solutions adapted to the local needs. The guideline could be divided into the three parts of technical aspects, socio-economical aspects and institutional framework.

The technical part has to give an overview over problems that are arising due to inappropriate wastewater handling and should show possible technical solutions.

The socio-economical part should describe how to involve people, how to do awareness raising and training if necessary and how to secure long-term commitment. The importance of local contribution for the construction and for tariff collection to pay for operation, maintenance and reparations needs to be explained to secure the sustainability of a project.

The institutional framework should cover all aspects of the project planning and implementation. Answers have to be given on the questions which stakeholders have to be involved and which steps have to be taken, (like it is done in chapter 7 Presentation of the institutional framework (p.84)). Contacts of experts and construction companies could be provided in this part as well.

The guideline should be detailed enough to get answers for all possible questions, but must not be too long and complicated, otherwise people will not read it. More detailed ideas about the content of the guideline will be given below.

8.1 Technical part

The technical part of the guideline should give a short introduction to small size wastewater treatment plants and should contain the following aspects:

Baseline study of water and wastewater situation and problem identification:

- This part should underline the necessity of having a local development plan with a baseline study of the actual drinking water and wastewater situation, the identified problems and the future planning for the area. Defining the problems (deficits) is the basis to be able to look for suitable solutions.
- Checklists to get important data for the selection and design of a treatment solution should be included (like given in Table 6.1: Overview over gathered facts of villages and sites, p.80 and in chapter 4.1.2 General background information of the site to select and design a treatment solution, p.26)

Presentation of small and medium size sanitation technology:

- The guideline should present technical solutions for rural areas. A pre-selection for different areas would be helpful (e.g. areas along the coastline have different problems and needs than villages in the mountain area). Included should be a presentation of the different components (collection, transport, treatment, discharge) of a sanitation system for on-site and centralised solutions.
- A presentation of at least three small size sanitation systems according to different village types can be helpful, like examples that are given in the following:
  - Mountain area without big treatment needs: pits or septic tanks combined with soak pit
  - Area with higher treatment requirements and dense settlements: centralised treatment, like ponds and constructed wetlands with pre-treatment
  - Areas with higher treatment requirements and scattered houses: on-site solutions, as septic tanks (emptied by sucking vehicle) and on-site constructed wetlands with pre-treatment
  - Areas along the coastline with water shortages: constructed wetlands with pre-treatment

Financial aspects:

- The guideline should give answer about the costs of wastewater treatment technologies and how to keep them low. Costs include design and planning, construction, operation and maintenance as well as depreciation.

8.2 Socio-economical part

The socio-economical part of the guideline should cover all the aspects belonging to people's commitment to a wastewater treatment project and the acceptance of the selected technical solution. The income situation and the real needs of the population have to be considered.

Commitment, acceptance and sustainablility:

- The guideline needs to show the necessity of involving people in the planning and decision making processes. Only if people are committed to the implementation of a wastewater treatment technology, they will use and accept it. This is necessary to make it sustainable and find the solution that is most appropriate to the needs and wishes of the users.
- Construction and other costs have to be adapted to the income situation of the local people. People need to be able to pay the tariffs.
- Ways to establish local involvement should be presented (forming local committee, user groups, etc.).
- Description of the correlation of design and people's acceptance has to be provided (people want to have indoor toilets; solutions installed underground are nearly not visible and therefore easier to be accepted; etc.).
- Guideline can show how the construction phase can bring local employment.

8.3 Institutional part

The institutional part of the guideline shall provide assistance for the planning and implementation process.

Overview over involved stakeholders:

- Presentation of the involved stakeholders and their roles
- Define responsibilities
- Introduction to the role of ADF and contacts to ADF

Design and planning:

- The guideline needs to show how a municipality or commune can plan and implement a small size wastewater projects. Explanations and structure of a TOR should be included. Further questions that needs to be addressed are how to apply for funding, where to find design engineers and construction and supervision companies. Contacts to experts could be provided.
- The guideline needs to give an overview about the permissions that are necessary for the construction of a WWTP.

Operation, maintenance and monitoring:

- Another important aspect of a sanitation project is to guarantee the operation and maintenance. The guideline could provide help to find trained personnel for O&M and to give an overview over the requirements according to the law that have to be fulfilled by the wastewater treatment and discharge. O&M manuals have to be developed for each solution, but should not be included in the guideline.

9 Conclusion

At the present situation, the performance of the Albanian water and wastewater sector is not satisfying. Water supply and wastewater treatment and discharge coverage are low and the sector is not working cost-recovering. Baseline data of the sector is often not available or not consistent. The sector is not very well structured and an overall planning is missing – at least until the Masterplan for the sector will be finnished.

Improvements of the (wastewater) situation focus mainly on the urban areas, while the rural areas lack funding for their development. Even though the Masterplan that is under development now should address the drinking water and wastewater problems, the wastewater treatment, especially in rural areas, is neglected. One component of the GIZ „Water Sector Reform“ programme aims on tackling this problem by implementing some small and medium size wastewater treatment plants in rural areas of Albania as reference sites. This shall help to gain more experience with the technical solutions for wastewater treatment in rural areas of Albania and to promote them. Local experts and companies have to be trained and supported, what could be done with this sites.

Several site visits have been done between November 2011 and February 2012 in order to assess the situation in rural areas of Albania and to get first impressions for the selection of such reference sites. Nearly all the visited sites were very different, with different problems, needs and differences in people's attitude towards the problems concerning the wastewater handling. Environmental and hygiene problems due to inappropriate wastewater discharge occure mainly in dense agglomerations in the low lands, along the coastline and in sensitive areas, like in protected parks and at lakes. In these places, people mostle showed big interest in improving their sanitary situation. People in mountain areas with very scattered houses do not experience such problems and therefore the wastewater handling is not a topic with priority for local people and decision makers. Only in one out of eight visited villages, people were not interested in improving their sanitary solution even though problems were obvious. In such a case, awareness raising and training needs to come first. Technical improvement is only useful if peopel know about their current problems and want to change them for the better. Implementation of technology can only be sustainable if people see the need and accept the technology.

All in all, the village and site visits could not provide sufficient information to already plan a treatment facility, but gave good insight into the current situation of rural areas in Albania. The study can be seen as a good starting point for further assessment of the rural areas and selected villages, that was done in March 2012 by a German expert hired by GIZ. Results of this visit were not available at the the time this report was written. The implementation of reference small size wastewater treatment plants in selected rural areas shall take place in 2012. Depending on the local needs and conditions, several on-site and centralised intensive and extensive technologies for wastewater treatment are available that would be suitable for rural areas.

To support local decision makers of municipalities and communes in their efforts to implement wastewater treatment plants, GIZ aims on publishing a guideline on how to do small size sanitation projects in rural areas. Such a guideline will be a very helpful tool to spread small size sanitation technologies for rural areas as the focus of the central government is not on this topic.

Improvement of the water supply service and especially of the problematic wastewater situation is a goal in order to improve the living standard of the people, to protect the environment, especially in coastal and sensitive areas, and to move towards the implementation of EU laws in oder to prepare Albania for its application for EU membership.

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Selbständigkeitserklärung

Hiermit erkläre ich, dass ich die vorligende Arbeit sebständig und unter Angabe ohne aller verwendeten Quellen geschrieben habe.

Weimar, den 19. April 2012

Sabine Niebel

APPENDIX

APPENDIX A: Bill of quantities for CW at SOS children's village

APPENDIX B: Interview guidelines and check-list for village description

APPENDIX C: Site visits

APPENDIX A

- Bill of quantities for CW at SOS children's village Tirana -

GENER 2
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Important note: The calculation was made for advanced treatment for reuse of the water. The masses are a fairly exact estimate but have to be recalculated with respect to the real conditions. The specifications are preliminary and have to be specified after final approval of the system combination and localisation of the

Pos.Nr	Constructed Wetland 220 Inhabitants	Amount	Unit	Price per Unit		Total
1.	**Craft: Temporary installations at the construction site**					
1.1	*Title: Installation at the construction site including provision and removal of all necessary equipment*		flat rate	(integrated in the other items)		
			Title sum			290,000
			Craft sum			**290,000**
2.	**Craft: Site preparation**					
2.1	***Title:*** *preparation of the terrain surface*					
2.1.1	Removal of topsoil (filterbed, pipes and tanks) layer thickness 10 cm , onsite deposition, height max. 2 m.	65	m³	650		42,250
			Title sum			**42,250**
2.2	***Title:*** *ground water control*			(not applicable)		0
			Title sum			
			Craft sum			
3.	**Craft: Filter bed**					
3.1	***Title:*** *Excavation and earthworks*					
3.1.1	excavation of the construction pit, max. depth 1,5 m, deposition onsite	500	m³	450		225,000
3.1.2	Leveling of soles in the filter bed, set level tolerance +/- 4 cm	550	m²	150		82,500
3.1.3	Forming of embankment surfaces	475	m²	200		

3.1.4	Dam partly surrounding the filter bed max. heigth 1,5 m, dam top width 0,5 m, and filling bottom of filterbed;including compaction	350	m³	450		157,500
3.1.5	Dispersion and leveling of surplus top soil	15.7	m³	400		6,280
3.1.6	Leveling onsite of surplus mineral soil	162		200		32,400
			Title sum			**503,680**
3.2	***Title:*** *sealing between treatment plant and subsoil*					
3.2.1	PE-liner, 1 mm, delivery, installation, welding with 20 cm overlapping	840	m²		950	798,000
3.2.2	Geotextile, 350 g/m², class 4, e.g. Becotex, type 30, as intermeditate layer between drainage layer and filter layer; delivery and welding with 20 cm overlapping	800	m²		350	280,000
3.2.3	Geotextile, 350 g/m², class 4, e.g. Becotex, type 30, as intermeditate layer between liner and mineral soil; delivery and welding with 20 cm overlapping	800	m²		350	280,000
3.2.5	Drainage river gravel 2-8 mm, delivery and installation (altenatively crushed stone)	84	m³		1650	138,600
3.2.6	Filter sand 0-2 mm; 5 * 10-4 < kf < 5 * 10-3; delivery and installation	332	m³		1850	614,200
			Title sum			**2,110,800**
3.3	***Title:*** *Topsoil distribution*					
3.3.1	Topsoil distribution on embankments; thickness 10 cm	300	m³	250		75,000
3.3.2	Topsoil distribution on flat surfaces; thickness 10 cm	175	m³	400		70,000
			Title sum			**145,000**
			Craft sum			**2,759,480**
4.	**Craft: Pipes and tanks**					
4.1	***Title:*** *Excavation work for pipes and tanks*					
4.1.1	Trench excavation for pipes; max 1,0 m depth, 0,6 m width, including shoring measures	15	m³	600		9,000
4.1.2	Installation pit excavation for storage tank, 1,0 m diameter; max. depth 1,8 m;	15	m³	600		9,000

4.1.3	Backfill of pipe trenches; including compacting	15	m³	300		4,500
4.1.4	Backfill of working spaces around tanks; including compacting	3	m³	300		900
4.1.5	Transport of surplus mineral soil	0	m³			0
	Mass balance					
			Title sum			**23,400**
4.2	***Title:*** *Electrical installations*					
4.2.1	Switch board for waste water pump	1	pc	40000		40,000
4.2.2	Pump control Level/Time		pc			
4.2.3	Pump control level		pc			
4.2.4	Submersible sewage pump; delivery and installation in collection tank; including level switch, open-loop control and signal; 60 m³/h at 10 m height difference, including level switch	1	pc	200,000		**200,000**
4.2.5	Submersible sludge pump; 5 m³ at 2 m height difference; delivery and installation of sewage pump in settling tank	0	pc	0		0
4.2.6	Submersible sewage pump; delivery and installation in collection tank; including level switch, open-loop control and signal; 15 m³/h at 10 m height difference	0	pc	0		0
4.2.7	electric wire 5*1,5 mm², delivery and laying	40	m	135		5,400
			Title sum			**245,400**
4.3	***Title:*** *Pipes*					
4.3.1	Waste water pipe diversion during construction; KG-pipes, PVC-HD, diameter 150 mm, including 1 elbow 90 and one elbow 45°;delivery and laying; installation in new opening of septic tank	6	m	2048		12,288
4.3.2	Waste water pipe connection between last manhole and settling tank; KG-pipes, PVC-HD, diameter 150 mm, including 1 elbow 45°;delivery and laying; including installation in new opening in septic tank	1	pc	1300		1,300
	Charging pipe, PE-pressure pipe, diameter 100 mm; delivery and laying	60	m	2048		122,880
4.3.3	PE-pressure pipe diameter 100/100 mm "T"; delivery and laying	1	pc	470		470
4.3.4	PE-pressure pipe, diameter 100 mm, elbow; delivery and laying	3	St.	330		990
4.3.5	PE-pressure pipe diameter 100/65 mm reduction "T"; delivery and laying	8	St.	350		2,800

4.3.6	PE-pressure pipe diameter 100 mm, hand-valve, e.g. Plasson; delivery and laying	3	St.	250		750
4.3.7	Distribution pipe, PE, 65 mm diameter, incuding. Connection elements, with ... (number) Drill holes at 10 mm diameter in 2,0 m distances, oriented downwards onto concrete slabs (Pos.Nr. 4.3.20) delivery and laying	136	m	880		119,680
4.3.8	PE-pressure pipe diameter 65 mm, Endcaps	8	pc	320		2,560
4.3.9	PE-pressure pipe, diameter 100 mm, elbow 45°; delivery and laying	2	pc	410		820
4.3.10	PE (PVC)-infiltration pipes als drainage pipe diameter 100 mm, in filter bed I, e.g. Strabusil VS, delivery and laying	84	m	1230		103,320
4.3.11	PE (PVC)-infiltration and drainage pipe diameter 150 mm, in filter bed II, e.g. Strabusil VS, delivery and laying	18	m	1230		22,140
4.3.12	PVC elbows, 150 mm for infiltration pipe bed II	0	pc	360		0
4.3.13	PVC reduction 150/100 mm for infiltration pipe bed II	4	pc	1236		4,944
4.3.14	PVC "T" 150 mm for in- and outlet bed II	2	pc	460		920
4.3.15	PVC elbows, 100 mm	20	pc	380		7,600
4.3.16	PVC "T", 100 mm	6	pc	900		5,400
4.3.17	Aeration units; PE, diameter 100 mm, 1 m high; e.g.. Strabusil unperforated, incl. vent hats and adjustment piece, or similar	17	pc	2200		37,400
4.3.18	PVC hard waste water pipe, 150 mm between both filter beds I and filter bed II, including watertight fitting into two manholes and 3 watertight transitions through the liner, delivery and laying	30	m	1650		49,500
4.3.19	Outflow pipe from filter bed II; KG-Pipe PVC hard, 150 mm	7	m	1450		10,150
4.3.20	Concrete slabs, 30 x 30 cm delivery and laying, with fixing elements for the distribution pipes	136	pc	75		10,200
4.3.21	PE-pipe, 100 mm, installation of a watertight connection to the sludge drying bed	1	pc	2500		2,500
4.3.22	PE pipe from SDB to Pump Chamber; installation of a backflow barrier 100 mm diameter	1	pc	200		200
			Title sum			518,812
4.4	***Title:*** *Tanks and manholes*					

4.4.1	Conversion of the existing septic tank into a dortmund tank; shaping an inverse cone (alternatively trapezium) by filling with concrete; suface to be smooth; concrete (German specification) C 30/WU (= floor quality, not water permeable)	22	m³	15120		332,640
4.4.2	Conversion of the existing septic tank into a dortmund tank; installation of the sludge bed feeding pipe with valve and elbow (materials are listed in ...) in the tank; the opening has to be in the middle of the cone, 5 cm above the bottom	1	pc	15000		15,000
4.4.3	Conversion of the existing septic tank into a Pump chamber, installation of a PE pipe, 100 mm as inflow from sludge drying bed	1	pc	20000		20,000
4.4.4	Conversion of the existing septic tank; installation of new covers	2	pc	10000		20,000
4.4.5	Water collection tank for reuse; inner measures: 3*3*2,25(high) meters, with one inspection opening; with two openings for the watertight insertion of waste water pipes 150 mm as inflow and overflow; one opening in the ceiling for reuse water pipe 100 mm	1	pc	250000		250,000
4.4.6	Control and outflow manhole precast concrete, diameter 1000 mm, 1,2 m depth	2	pc	41000		82,000
4.4.7	Cylinder for scum layer retention: PVC-Pipe, 400 mm diameter, 500 mm high; installation in Dortmund tank with inox attachments, preferrably to the ceiling, alternatively to the walls.	1	pc	2200		2,200
4.4.8	Emptiying and cleaning of the existing septic tank as preparation for the installations	1	pc	40000		40,000
			Title sum			**761,840**
			Craft sum			**1,549,452**
5.	**Craft: Plantations**					
5.1	***Title:*** *Planting*					
5.1.1	Reed (Phragmites communis), 14-cm-pot, delivery and planting in filterbed, 5 pieces./m²	2750	pc	100		275,000
			Title sum			**275,000**
			Craft sum			**275,000**
	Grand Total					***4,916,182***
	TVSH 20%					983,236
	Shuma					**5,899,418**

APPENDIX B

- Interview guidelines and check-list for village description -

B.1 Interview guideline municipalities/communes

B.2 Interview guideline inhabitants - short version

B.3 Interview guideline inhabitants - long version

B.4 Check-list for village description

Interview with municipalities/communes

Name of municipality/commune (no. of inhabitants):

Location of municipality/commune (district, county):

Name of mayor municipality/commune:

Visited village (no. of inhabitants):

Name of chief of village:

Interview with (name + position):

Date:

1) **Does the municipality / commune/ the selected village have some small-size industries/ enterprises (slaughterhouse, dairy, etc.) ?**
    - What kind?
    - How much water they use?
    - How do they discharge their wastewater?

2) **Does a drinking water supply exist in this municipality/commune?**
    - When was it constructed?
    - How much water do people use?
    - Do people pay for consumption?
    - Does it work cost covering? (does it cover a) O&M, b) O&M + reinvestment or c) full cost (including investments)?)
    - Are there problems with the supply?
    - How many hours per day?
    - Do people store water at home?

3) **What are the plans concerning drinking water supply?**

    (Are there bigger municipalities/communes close by? Is cooperation foreseen?)

4) How does the wastewater situation look like in the villages?

- What kind of toilet do people have?
- Are there collection tanks (septic tanks) installed?
- Does a sewerage system exist? If yes: do people pay for service?
- Where is the wastewater discharged?
- What happens with the sludge?
- Is rainwater separated from wastewater?
- What are the problems (odour, health issues, ecological problems, etc.)?

5) Do people complain about the situation? How do they complain? Is the municipality/commune working together with inhabitants (regular meetings, etc.)?

6) What is the opinion of people in the municipality/commune?

- Do they want to have WWTP?
- Do they know about problems (ecological or health issues)?
- Would they pay for the service?

7) What are the plans concerning wastewater collection + treatment? Can you imagine to re-use treated wastewater?

(Are there bigger municipalities/communes close? Is cooperation foreseen?)

8) Is an own wastewater treatment facility wanted for the villages?

If yes:

- Where could it be built?
- How much money you would pay for it?
- Will the inhabitants have to pay for the service? Will the fee cover a) O&M, b) O&M + reinvestment or c) full cost (including investments)? How will they be charged? (fixed price per person / per household, price by water consumption, etc.)

If no: Why?

9) Other comments:

Thank you!

Interview with inhabitants – short version

Date:

Village:

Name:

1) **What is the actual drinking water and wastewater situation in your village?**

2) **What are the problems?**

3) **What changes would be necessary? What wishes do you have concerning the topic? Preferences for communal or single household solutions?**

Thank you!

Interview with inhabitants – long version

Date:

Village:

Name:

1) **What is the actual drinking water and wastewater situation in your village?**
   - Drinking water (what is water used for?):
   - Wastewater:

2) **What are the problems?**
   - Concerning drinking water supply:
   - Concerning wastewater disposal:

3) **What would be necessary to improve? What wishes do you have concerning the topic?**

4) **Do you pay service fees for water supply or wastewater discharge? How much? (Is water metered?)**
   - If yes: How is the price calculated? How much do you pay (per person/per m^2/...)?
   - Would you pay for sanitation service? How much could you pay per month?

5) **Do you know the constructed wetland plant at the SOS children's village in Tirana?**

6) **Could you imagine to re-use treated wastewater? (For toilet flush/ heating/ climatisation/ gardening/ etc.)**

Thank you!

Description of village

Date of visit:

Name of village:

Location:

Number of inhabitants:

Number of people per household (Ø):

Number of houses:

(+ description of houses)

Income situation:

Does the village has some small-scale businesses (shops, restaurants, slaughterhouse, dairy, etc.)?

Is land available for construction of a WWTP? (plain land, slope > 1 % necessary for discharge by gravity)

How is land used?

How does the actual water supply and sanitary situation look like?

Is (drinking) water available? Where is the source of that water located? Amount of consumption? Metering of consumption?

What is water used for?

How is the village accessible (street quality, snow in winter, access to next big city, public bus connection, etc.)?

Additional information:

APPENDIX C

- Site visits -

C.1 Commune Qender

C.2 Commune Qelez

C.3 Municipality Shëngjin

C.4 Commune Hajmel

C.5 Commune Gurre

C.6 Commune Hudenisht

C.7 Municipality Sukth

C.8 Commune Liqenas

1 Site visit 1: Village Dober (commune Qender)

Name of village: *Dober*

Location of village: *north of Albania, close to Shkodra lake*

Number of inhabitants: *around 1,000 inhabitants*

Name of chief of village: *Met Rexhaj*

Interview with: *Isa Ramaj (chief of communes)*

Date: *07.12.2011*

Dober is a village in the north of Albania (commune Qender, district Malesi e Madhë, county Shkodra) with approximately 1,000 inhabitants and located directly at the Shkodra lake. The village is part of the current ADF water supply project for rural areas in northern Albania, financed by KfW, and was visited the 07.12.2011 with CES driver and PR expert Tiger Çela, who translated the interviews with Isa Ramaj, mayor of communes, and four villagers in the streets of Dober.

1.1 Village description

The village Dober has approximately 1,000 inhabitants with around four to five people per family. Therefore, the number of houses is around 200 to 250. Most houses were small but seemed to be in a good shape. Also some very big and new houses could be seen during the village visit. Most houses were surrounded by land, with a well in the yard and some animals (chicken, cows, etc.). Those buildings were far apart from each other, while other houses, located directly at the street, had only little yards in between.

Figure C.1: House in Dober sourrounded by farm land (Niebel 2011)

Figure C.2: Houses in Dober, located closer to the main village street (Niebel 2011)

Regarding the income situation, no numbers could be given, but it was stated by the mayor of communes that the village is a little richer than the surrounding villages. People are hard working on the agricultural fields and keep some animals. According to Kurt Rippinger from CES, Dober is the village with the best financial situation among the six project villages (Dober, Kalldrun, Jobice, Sterbeq, Kamice and Flake) in the area. People produce so many vegetables that they even can export them.

All the six villages are growing fast and have a positive population development. The region is important for environmental protection as it is close to the Shkodra lake.

The access to the village by road is quite good, with even some asphaltic street parts in the village. Only some streets were more or less paths out of clay and mud.

Figure C.3: Asphalt street in Dober (Niebel 2011)

Figure C.4: Houses in Dober (Niebel 2011)

1.2 Water supply situation

According to the mayor of communes, Isa Ramaj, in all surrounding rural areas the water is taken from wells for irrigation and non-drinking purpose but sometimes it can happen that people drink the water. To get drinking water, people go by car or minibus to the next bigger city Koplic and buy bottled water or fill big canisters with drinking water at public or private taps without paying for it. This drinking water comes from the mountains and is said to be clean.

According to what was observed at the village visit, it seems that every house has an own well, equipped with a pump and a storage on the roof so that people have water in the house. Toilets are most often constructed inside the house and built as water-flush toilets.

At the moment, construction works for the ADF drinking water supply project are ongoing. After finishing construction works, people will have a drinking water supply within the house and the consumed water will be metered and sold with consumption-oriented tariffs.

To join the the water supply project, the village had to apply at the ADF. When CES did the feasibility study in the village, people were invited to public meetings and stated that they want the project and that they are willing to pay local contribution and the tariff for the consumed water. However, when they actually had to pay (before construction), they said that they do not trust the project as many organisations have been there already in the past without accomplishment. Isa Ramaj argued that people cannot be blamed for that reaction because often in the past nothing happened after aid organisations had done their investigations.

The total investment cost of the project for the the six villages was 1.2 million ALL. 2 % of that amount had to be paid by the beneficiaries and 8 % by the commune as a local contribution. As the commune did not have enough financial means, Isa Ramaj applied for support at the government. Water supply will get tariffs proved by the regulatory authority and houses will be equipped with water meters. That will be something very new in rural areas in Albania and can hopefully prevent wasting the drinking water and support a reasonable consumption.

1.3 Wastewater situation

According to the information of Isa Ramaj, houses have mainly pit latrines and are only sometimes equipped with septic tanks. Wastewater is not treated at the moment. Health problems are not recorded, if people have problems they do not show it.

However Isa Ramaj admited, that people have the mentality to always complain. Most people are interested in the topic of wastewater treatment, but there are also people that do not mind about the water and wastewater situation and having a pit latrine close to the well. Normally people want water and wastewater service, but they do not want to pay for it. Isa Ramaj thinks that wastewater handling will get more important in the future, when drinking water supply is established.

Figure C. 5: Ongoing construction works for the water supply project of ADF (Niebel 2011)

Concerning the institutional way for applying for a wastewater project, Isa Ramaj stated that in general, most villagers and the village chiefs would know how to proceed, if they are interested. They would start an initiative themselves. If responsible institutions and NGOs would give them options and information, Isa Ramaj could get feedback from the villagers regarding their needs. But people need technical training and information about technical possibilities first.

The villages plan on priorities and wastewater is included but related on the availability of money. There will be no design if no secure investment is given. Isa Ramaj stated that he would find a way to get the money from the commune or the government for the local contribution if an organisation would plan a sanitation project for the villages. When asking for financial contribution by villagers, no specific amount could be mentioned only the information that costs for a wastewater project must be below the water project (2 % out of 1.2 million ALL for the water supply project equal 24,000 ALL of local contribution by villagers). To construct a wastewater treatment system, no free land owned by the commune would be available. Land is in private ownership and it must be negotiated with the owner. But since land is used for agriculture, it would be very expensive.

1.4 Interview with villagers

Some inhabitants of the village Dober were interviewed at the street to get their feedback on the sanitary situation. The answers cannot be considered representative as only four people were interviewed and three out of the four were teachers. Teachers can be seen as a group that is aware of actual problems. But at least it gives an insight on people's opinion.

Figure C.6: Interview with inhabitants of Dober (Niebel 2011)

Concerning the current situation for water supply and sanitation, the answers were the same as the ones obtained by the mayor of communes Isa Ramaj. The water for non-drinking purpose is taken from wells and drinking water is taken from other sources. People think that with the introduction of water meters people will consume less water as there is a big misuse of water at the moment.

According to these villagers, people in the area do not experience health problems. They stated that they are teachers and therefore would be the first ones getting the information from the children about infections. In general, people use septic tanks or pits for wastewater storage and discharge, but they would like to have a wastewater treatment facility as well, because of ecological reason. But first of all, the people want to get more information about the technologies. As long as people get informed adequately, they will be willing to make decisions and to cooperate. One man mentioned that ADF set up public hearings and that all stakeholders came to the meetings. This feedback can be seen as a positive sign that people are aware what is going on and that they want to participate in the process.

Further on, the interviewed people said that their village has the capacity to pay for service, because it is a hard working village and therefore the income situation is better than in the surrounding villages. But when asked if they would contribution by work, they stated that they prefer to work than to pay.

1.5 Conclusion of village visit

The village is located very close to the Shkodra lake and people extract ground water for non-drinking purpose. The discharge of wastewater into the ground by using unlined pits is a risk for the nature and human health especially when people use extracted water for drinking purpose. It can be assumed that the groundwater and the lake are polluted by discharged wastewater.

Only some houses of the village are located close to the street, some are quite away from the street and the other houses. Therefore it has to be proofed if wastewater treatment should rather be installed on-site at every house or group of houses or if a canalisation for treating the wastewater of the whole village, e.g. with a constructed wetland, would be an appropriate solution.

If canalisation will be too expensive, the best solution would be on-site treatment. This can be realised by septic tanks for several houses that are emptied regularly by a sucking vehicle or a small constructed wetland for a single house or a cluster of several houses. Sharing a septic tank or a small treatment facility by several families would lower the costs per household however shared facilities are often a problem because people start to argue about the cost sharing and the responsibilities for operation and maintenance.

To find the most appropriate solution for the village, it would be necessary to get plans of the village and to figure out the costs for each solution. This would mean the costs of constructing septic tanks or small constructed wetlands for single houses or groups of houses, costs for a sewer system to connect all households to one treatment plant and the construction cost for one bigger treatment plant, e.g. a constructed wetland. Also it has to be clarified if space for a constructed wetland is available and how much it would cost.

After talking with the mayor of communes and some villagers it seems like a wastewater project would be possible and very welcome in the village of Dober. Although the amount of interviewed people was not representative, interviews gave a good insight. People stated that they want to have wastewater treatment for ecological reason and that they are interested in getting more information about technical solutions. They really want to get involved in the process. People stated that they would contribute to a project either by financial means or preferably by work, if possible.

All in all, as the village counts 1,000 inhabitants and environmental and health risks are obvious, action should be taken in that area. Houses are not too scattered and access to them is very good. As people and mayor of communes seem to be interested and willing to cooperate and even financial means can probably be made available, the village seems to be a suitable village to install a small wastewater treatment plant. But before planning, the commitment and the responsibilities for operation and maintenance (O&M) have to be clarified as well as the commitment for paying local contribution and tariffs.

In the future, drinking water supply projects and wastewater treatment projects should cooperate closer. As it could be seen during the village visit in Dober, the construction works for the water supply network were ongoing at that the moment of the visit. In case of the decisions for a wastewater treatment facility for the whole village connected by a sewer system the construction works for a sewer system could have been combined with the water supply construction works to avoid the unnecessary double work and to minimise costs.

2 Site visit 2: Commune Qelez

Name of village: *Water reservoir in Bushat*

Commune Qelez, district Puke, Qark Shkodra

Location of village: *north of Albania, in the district of Puke*

Number of inhabitants: *13 villages with approximately 2,800 inhabitants*

Name of mayor:

Interview with (name + position):

Date: *12.12.2011*

The commune Qelez (district Puke, county Shkodra) was visited with Kurt Rippinger and Arian Dungu from CES at the 12.12.2011, as ADF and CES implement a water supply system in one of the villages which is called Bushat. The village is part of the ADF water supply project for rural areas in Northern Albania, financed by KfW. Information about the area was given by Kurt Rippinger and Arian Dungu, translation of the CES interview with the mayor of communes was done by Arian Dungu. Population of that village was not interviewed as wastewater treatment is not a topic for the village in the near future.

2.1 Village description

The commune is located in the north of Albania and consits of 13 villages with approximately 2,800 inhabitants in total. Both, villages and single houses are very scattered in the mountainous area. What could be seen during the site visit was that the commune has a building of the communal government (the LGU), some shops and a health center.

Figure C.7: Scattered houses in the commune Qelez (Niebel 2011)

People are very poor and live on livestock (chicken, cows and sheep) and agriculture. The population is stagnant at the moment, but a population growth is expected if the access street to the commune will be renewed with asphalt. At the moment, the only access street to the villages is already improved in the last years but still in bad condition and the way to reach the villages takes a long time. The way is sandy and rocky and water that is running down the mountains flows on some streets over a so called Irish fjord. During and after heavy rainfall it is possible that the villages cannot be reached for one or two days as access road can be partly flooded. A public bus to the next bigger cities is leaving the villages in the morning and returns in the afternoon. There is also one bus connection to Tirana.

Figure C.8: Access road to commune Quelez (Niebel 2011)

The village is located in an area where landslide is a problem, as the soil is mostly sandy and consist of small rocks. Some areas show nearly no vegetation to stabilise the soil.

2.2 Water supply and sanitation situation

Qelez is a poor commune that has problems with the water supply, not all buildings have water connections. Sometimes people in the upper mountains deny access to water to the population in the lower areas, even there is no general water shortage in the area. In general, the villages have enough water, but not at the right place. Money for pipes is missing. Even a school for 380 pupils has no water supply.

Concerning the wastewater situation, the commune does not experience any problems. Drinking water is taken from mountain springs and as houses are very scattered the wastewater does not affect other people down the mountain. Excreta from toilets is flushed into pit holes (people call it septic tank but tanks are not lined). Pit holes are next to the house and connected with short pipes. If people could affort longer pipes pipes the pits are located farther away from the house. The holes are emptied manually, as there is no possibility to access them by sucking vehicle. This work is done by the house owners themselves. The content of the hole is mixed with other material and then used as fertiliser on the agricultural used land. Some trenches for rainwater and irrigation are existing in the villages.

Figure C.9: School for 380 students in commune Qelez has no water supply (Niebel 2012)

The commune has prepared a feasibility study that prioritises the needs. Wastewater handling and solid waste management are included, as it is stated by the law, but there is no hurry for projects, because there is not even enough money for other projects that are considered more important.

2.3 Conclusion of village visit

The villages of the commune Qelez are located very far from each other and also the houses of the different villages are very scattered. As people take drinking water from sources in the mountains there is no risk to pollute the drinking water by wastewater discharge. If information is correct that people discharge their wastewater into unlined pits it is at least guaranteed that the water is not running down the hill on the surface but infiltrated into the ground. It can be assumed that the discharge of liquid into the ground is a save solution as soil can absorb the pollution before water reaches any groundwater source. As the villages are very poor and do not have money for any action, the situation will not be changed in the near future. The reuse of excreta that is collected in the pit is a very good solution as the soil does not seem to be very fertile. To prevent health risks for people that empty the pits, special training and education should be implemented. Also gloves and protection material for the pit emptiers would be a helpful measure to prevent contact with faeces as an infection source.

3 Site visit 3: Neighbourhood and school of commune Shëngjin

The neighbourhood of Ishull Shëngjin (municipality Shëngjin, district Lezhë, county Lezhë) was visited the 13.12.2011 together and with the help of Andrian Vaso from IC Consulenten, who had contact to the mayor of the municipality, translated the interviews and explained the situation in the village.

Thanks to Andrian Vaso, an interview was arranged with the mayor of the municipality of Shëngjin, Salvador Kacaj, his vice mayors Vat Gjeloj and Kanto Noloi as well as the chief of administration, Augustin Gjini. Following the interview, a neighbourhood of Ishull Shëngjin and a school in Ishull Leizhë was be visited together with Vat Gjeloj who gave additional information.

The visited municipality Shëngjin is located around 70 km north of Tirana, belongs to the Lezhë district and is part of the UNDP climate change project. The area of the municipality is mostly catholic/christian conservative, and a catholic mayor won the last elections. This has to be considered as the local government consists mostly out of democrats (Vaso 2011).

The municipality is very easy to reach by a main road from Tirana. Houses in the neighbourhood were mainly in a very good condition. Andrian Vaso added that the income situation is quite good as bigger cities are close and the area is frequented by many tourists what improves the income situation.

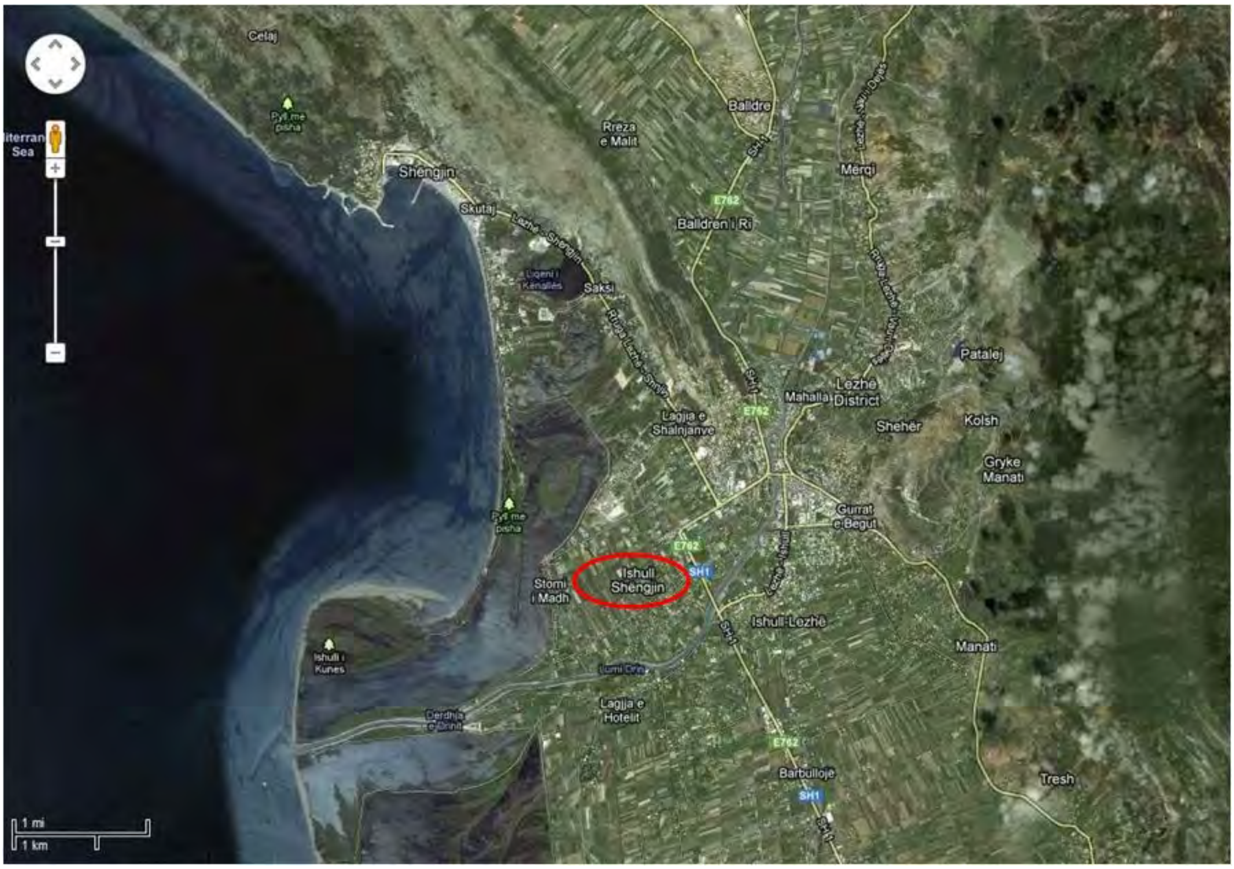

Figure C.10: Map of the area where Ishull Shëngjin is located (Google maps 2011)

3.1 Site visit at neighbourhood of Ishull Shëngjin

The visited neighbourhood of Ishull Shëngjin (see Figure C.11, p.10) is a very dense area with family houses and little gardens in between. Most houses seem to be in very good condition. The village is located close to Shëngjin town and the lagoons at the Albanian coastline. The neighbourhood counts more than 1,000 inhabitants with an average of five persons per family, what will give a number of around 250 houses.

Figure C.11: Neighbourhood of Ishull Shëngjin in December 2011 (Niebel 2011)

3.1.1 Water supply situation

Municipality Shëngjin: The water supply covers the whole area of the municipality of Shëngjin, but due to electricity cuts there is often no water supply. Shëngjin is a touristy area where the capacity of the water supply is overused in the summer. In winter time, the regular population of the town counts 8,000 inhabitants, in summer the daily number of inhabitants and visitors can reach 100,000 people. More than 5,000 apartments are occupied during the summer. This tourist overload causes water shortage.

The water supply was constructed more than 30 years ago and is in a bad condition, very deteriorated. People have mostly water meters and pay the water tariff. In Ishull Lezhë an upgraded water supply is still under construction. The O&M is done by the water utility.

Ishull Shëngjin: According to Vat Gjeloj, the drinking water and wastewater situation is complicated. During the rainy season, wastewater and drinking water gets mixed up as no sewer system exists in the village. Drinking water is coming from Barbulloj, the same source as for Shëngjin, Leizhë and the other surrounding villages. Barbulloj is part of the Shëngjin municipality. Normally the neighbourhood had a good service quality with good water quality and sufficient pump capacity as it had its own direct connection pipes. Now the pipe system is connected to the reservoir of the Shëngjin town and therefore to a bigger area which lowered the service level. Therefore people now suffer problems connected to water quality and the supply duration that did not occur before.

At the moment, people pay fixed tariffs. According to Vat Gjeloj, each family is charged 1,150 ALL per month, based on the assumption of five people per household. (Assuming that a family consist of five persons and every person has a water consumption of 150 l/day, the price per m^3 water consumed is around 51 ALL.) This tariff is said to be a little bit too high compared to the national level and the local income situation. As comparison, the average price in Albania is about 38 ALL/m^3 (Bibolli et al. 2011). An upgraded water supply system with water meters at the houses is constructed but not in operation because the connection pipe to the water reservoir is not built yet.

3.1.2 Wastewater situation

Municipality Shëngjin: For the area of Shëngjin town, a big wastewater treatment plant is constructed by financial means of World Bank and the Albanian Government, that is paying the VAT, and will start to work in 2012. Main problems of the municipality are experienced in the two villages Ishull Leizhë (IL) and Ishull Shëngjin (IS) where wastewater flows through the villages without any regulation. Big problems exist for the highschool in Ishull Leizhë where pupils get ill regularly. They even intervene with their own money to improve the water supply situation. Because the infrastructure is old, wastewater pipes are broken and wastewater leaks into the ground and therefore also into the groundwater layer what causes health problems, especially in the summer.

Ishull Shëngjin: Some houses have septic tanks, but as the commune owns sucking vehicles with only 12 m hoses, not all tanks can be accessed by them. On average, emptying of the tank is necessary every second year. One sucking vehicle has the capacity to empty five to ten pits and costs around 10,000 ALL. This makes a price of around 500 to 1,000 ALL per family and year.

The commune has only two vehicles what is said to be not sufficient. Therefore, some people use the service of private companies, where the tariff of service is assumed to be higher than for the communal service. If even the private vehicles have no access, people have to empty tanks manually.

Figure C.12: Rain water channel of Ishull Shëngjin is only partly covered with wooden plates (Niebel 2011)

Figure C.13: Rain water channel in the village Ishull Shëngjin (Niebel 2011)

The neighbourhood has a 300 m long rainwater channel (see Figure C.12 and Figure C.13) that is mostly covered by concrete slabs or wooden covers. Maintenance of that channel is done regularly. At the day of the site visit the channel was free of solids that could have blocked it. The channel is a remaining part of the former irrigation system for the agricultural use of the land where now houses are built on. It is unclear how much water is collected in that channel, as streets are out of clay and little stones and rainwater seems to stay to a big part on the unfortified land of the village. In general, Vat Gjeloj remarked that rainwater is partly even a bigger problem than wastewater in the village and has to be considered when a wastewater treatment system will be implemented.

3.1.3 Future projects and people's contribution

People in the village are very interested in getting a wastewater system as they experience different problems concerning that topic. As many people connect their houses to the former precipitation channels that are used now for rain water collection, wastewater flows through the village and causes stench and health problems. Especially in the dry summer, the smell is very strong and in the rainy season there is a high risk that wastewater gets flushed out of the channels and ends up on the street.

People from that area complain often about the situation. According to a restaurant owner that was interviewed on that topic, the wastewater problematic is one of the main issues of the village that the villagers have been bringing up to the commune again and again. One of the rainwater channels is located in front of the restaurant and neighbouring houses are charging in their wastewater. The restaurant owner is experiencing the bed smell very often. But she underlined that she is not only speaking as a business owner of the village, but also as a citizen of the area. It can also be considered as unfair that some households pay for the construction of a tank and a regular emptying while other households simply discharge their wastewater into the channels and do not pay for anything.

According to the vice mayor and the restaurant owner, the mayor of the municipality is coming regularly to the village to talk with the inhabitants about their problems. Additionally, he organises public meetings for the inhabitants to talk with them about their needs and to get the feedback for future planning. This indicates a good cooperation with the inhabitants in this municipality.

The area is a very dense area where a sewer system for all the houses would be a very suitable solution to get the wastewater out of the village. One approach to secure the local contribution could be that the main sewerage collection pipes are constructed by donors on the public ways and the house connections from these pipes are done by the inhabitants on their own expenses. According to Vat Gjeloj, the villagers can afford it, and according to Andrian Vaso, this is an approach that worked already very well in other projects. As costs for connection to the main pipe are lower when the construction works are ongoing and higher when they are done at a later stage, it can be assumed that most people will connect their houses when main pipe is laid into the soil.

The municipality has already been thinking about places to construct a small or medium size wastewater treatment facility. Salvador Kaçaj stated in the interview that three potential places for a plant are available in the village that belong to the municipality and can be defined in the territorial adjustment of the municipality. When visiting the neighbourhood, Vat Gjeloj showed one of these mentioned areas. The site is located next to a big street behind a bridge and is at the moment used a dumping site that needs to be cleaned up (see Figure C.14, p.C.13). In the past, rain water collection channels ended up in this area as the village has a slope towards that place. As water can flow by gravity to this point, it would be a suitable place for a treatment facility for the whole neighbourhood. A little distance to the next houses is given, so options with less odour development would be preferable at this place.

Figure C.14: Possible area for a wastewater treatment plant (Niebel 2011)

Salvador Kaçai stated that the municipality knows about technologies and that they got a lot of training in connection with the new built wastewater treatment plant in the last months. According to Salvador Kaçai, they also know about small size technologies and do not need more training, which is questionable as noone in the area ever operated a (small size) treatment plant. But at least it shows that trainings without the actual use of a facility are not wanted any longer. If further training will be done in this area, it must be in combination with running a plant.

Salvador Kaçai has been visiting the constructed wetland plant at the SOS children's village in Tirana but has no knowledge in detail about the plant. As the municipality of Shëngjin experiences a water shortcut in the summer, re-use of water for certain purposes is a welcomed option. This would be possible if a constructed wetland is used for wastewater treatment.

The municipality is looking for donors to implement a small size plant and will contribute with the land. When asked if they could also contribute financially, Kaçai stated, that it would be possible in case of certain conditions agreed between donor and municipality. Concerning the institutional work, Salvador Kaçai stated that he deals every day with all these papers, so he knows very well the procedures. The municipality just recently applied successful to one Swiss found and will receive 50,000 € to build a stop-shop.

3.2 Site visit at school in Ishull Lezhë

The school in Ishull Lezhë is attended by more than 750 students and includes a kindergarten, a middle school and a highschool. This school is the only highschool for the whole commune. Pupils attend the school in two shifts. The school is located in a very dense neighbourhood.

The problems at the school include rainwater management and the sanitation situation. According to the mayor of the municipality, Salvador Kaçaj, the pupils get ill very often due to these problems. During the site visit at the school it has been remarked that classrooms are very cold and children attend classes in thick jackets in the winter time. Some windows are broken and in the school it is generally very cold in the winter months.

Figure C.15: School yard in Ishull Lezhë (Niebel 2011)

Figure C.16: School yard in Ishull Lezhë (Niebel 2011)

3.2.1 Rainwater problems at the school

The backyard of the school in Ishull Leizhë is partly flooded during rainy season and kids play in the flooded areas. The “septic tank” of the school toilets was already improved in the last years. The construction was raised a little higher to prevent rainwater flowing into the tank. But as the concrete tank cover has many defects, rainwater can still enter the tank. Also wastewater from the tank can be flushed out through these openings. There is a rainwater trench on one side of the tank that is connected to a bigger rainwater channel next to the school along the road. But both, channel and trench, are blocked and do not work properly. While the trench on the school yard is blocked by soil and vegetation, the rainwater channel at the street is nearly completely blocked by waste (see Figure C.17).

Figure C.17: Rain water trench at the school yard and the rainwater channel next to the yard, both blocked with waste (Niebel 2011)

3.2.2 Wastewater and sanitation situation at the school

The school has toilets for boys and girls that are located next to each other on the end of the school building on the ground floor. There are three separated squatting toilets for girls which were constructed as water-flush squatting toilets but not connected to the water supply any longer. Next to the toilet cabins, a big open vessel is placed that is filled up with water from time to time by a pump and a connection pipe. The pump is locked in a separate toilet room next to the three girls toilets and this toilet is used only by teachers. To flush the toilet, water can be taken out of the big vessel with a plastic bucket. It is not clear if smaller girls are able to do this. This handling means also less privacy for the users. At the toilet no paper was available.

The boys toilets are in a very bad condition, worse than the girls toilets. All three toilets for boys are constructed as water-flush squatting toilets, but not connected to any water supply. Two toilets had no doors, which means no privacy for the user. Toilet paper was not available and also no water for flushing the toilets could be observed. The windows at the boys toilet were all broken.

Figure C.18: School toilet girls (Niebel 2011)

Figure C.19: school toilet boys with broken door (Niebel 2011)

Figure C.20: Hand washing facility at the girls toilet (Niebel 2011)

Washing hands was possible at the girls toilet in a second big open vessel filled with water. Soap was lying in the window next to the vessel. No information available about how often the water was changed. Towels were not available.

The sewage from the toilets is leads into a “septic tank” that has an overflow pipe into the rainwater drainage and is emptied frequently by the commune. Because it was obvious that rain water can enter the tank, it is assumed that a lot of the liquid (urine and water) and perhaps some faeces from the tank are flushed out into the rainwater channel through the overflow pipe. Maintenance of the toilets and the tank is done regularly.

According to Vat Gjeloj, who has been director of the school in the past for several years, the number of toilets is not sufficient and the school would like to increase the number and locate the boys and girls toilets on opposite ends of the school building to separate them better. Some preparations for the upgrade are already planned or done. They want to install a second water pump to assure the water supply to the toilets.

Figure C.21: Vat Gjeloj explains the situation of the school while standing on the "septic tank" (Niebel 2011)

Figure C.22: space between concrete cover of the septic tank allows rainwater to flow into the tank (Niebel 2011)

3.2.3 Conclusion of site visit of the municipality of Shëngjin

The municipality of Shëngjin with its neighbourhood and the school is very easy to access and therefore a good place for a small size wastewater treatment plant for training purpose. The municipality is also located close to the coastline at the lagoons what makes it an area important for environmental protection. A wastewater treatment facility would be a good contribution to protect the environment in such a sensible area. The lagoons could be used as ponds for tertiary treatment.

The neighbourhood experiences a lot of problems concerning the wastewater situation and people complain about it and ask frequently for a solution. The municipality experiences water shortages in the summer as the area is a very touristy area with high peaks of inhabitants and visitors in the summer months. Therefore, the re-use of treated wastewater would be a welcomed option. Further on, the municipality already has some ideas about where to place a small size treatment plant for the presented neighbourhood. The potential areas belong to the municipality and can be used in the future for wastewater treatment purpose.

The municipality seems to have a very good communication with the villagers and guarantees regular open meetings. As the mayor showed up at the meeting with three other representatives, it is a clear sign that the municipality took the meeting serious and wants to have wastewater projects in their area. All the representatives showed the willingness to do something to improve the situation. Also inhabitants seemed to be willing to change the situation and they have the money to contribute for their part. All in all, the neighbourhood of Ishull Shëngjin can be recommended for some further investigation and action. What needs to be clarified now are the clear commitment of the people for paying tariffs and the responsibilities for O&M in the future.

The school in Ishull Leizhë showed a very bad sanitation situation. There would be a big need for action. It was said that people spent already private money to improve the situation. This shows clear commitment and the will to change the situation and to participate in the process. It can be assumed that parents would support a project at the school. Like this, also the school could be recommended for further investigation. The only point that would speak against it is the fact that Albania has already two constructed wetland plants at school (of which only one is in use), but still no small or medium size treatment facility for villages or neighbourhoods. Therefore, priority should be set on implementing a small size sanitation technology for villages.

4 Site visit 4: Commune Hajmel

Date: *24.01.2012*

Commune: *Hajmel (consists of five villages with 6,075 inhabitants in total)*

Mayor of commune: *Leke Bibaj*

Mobil: 0672637022

Phone: 026560008

kommunahajmel@gmail.com

Villages: *Hajmel and Nënshat*

Commune was visited with Dritan Pistoli, the Social Inspector of ADF, who explained the situation in the commune and translated the interview. The commune consists of five villages with 6,075 inhabitants in total and has four water supply systems. The village Nënshat is part of an old ADF project for drinking water supply, financed by German KfW. The system was finished in 2006 and works by gravity and is therefore easy to handle. The other three water supply systems of the commune work with pumps.

The commune is covered by an utility, but it was stated by Dritan Pistoli that the service of the utility is not that well. After finishing the water supply project in Nënshat, the project was handed over to the commune that wants to run the service for that village themselves. According to the mayor of the commune, Leke Bibaj, the commune can take care of the people's welfare better that the utility, as the chief of the utility is not very linked to the area and can change every few years.

One of the problems of the water utility is that they employ too many workers and therefore the service is very expensive. A reform of the structure is recommended. For three villages of 600 families in total, the utility employs nine workers, what means one worker for 70 families. The service of Nënshat is under the commune that employs two workers (one full-time, one part-time) for 400 families with around 2,100 people. This shows that the commune works more effective and cost saving than the utility and should be supported.

The problem is that the commune has no license and runs the service illegally without tariffs approved by the WRA. According to Dritan Pistoli, the two solutions for this problem would be to join the existing shareholder company (utility) or to create an own shareholder company in order to get the necessary license. The main purpose of visiting the commune was to talk with the mayor of communes about the two options and the future strategy. Additionally, there was the chance to talk with the mayor of communes about the sanitary situation in the commune and the general attitude of people towards that topic.

In general, what could be seen in the commune without visiting all villages, streets and houses seemed to be in a good quality. Next to the LGU building two schools were observed (a primary and a highschool).

The interview with the mayor of the commune, Leke Bibaj, was facilitated by Dritan Pistoli from ADF, who translated from Albanian into English. As only the main content was translated, many details got lost. Sometimes Dritan Pistoli had to discuss even a long time with Leke Bibaj to clarify the given information. It seemed that expressions were not used in a clear way and that many misunderstandings occurred. Missing knowledge about technology was another problem. As an example, the mayor insisted on the term "septic tank", even he explained that the villagers have only pits that are lined with bricks what is not a septic tank. Additionally, it was hard to get the requested information, as the mayor talked about the topic in the way he wanted, what was quite unstructured. Questions had to be repeated several times to get an answer that was not always satisfying. It was nearly impossible to get any numbers related to the water consumption (amount of produced water, amount of used water, etc.).

Figure C.23: Houses in commune Hajmel (Niebel 2012)

4.1 Drinking water supply

According to the mayor of the commune, Leke Bibaj, the water service for the village of Nënshat shall stay under the commune. There is enough fresh water available, Leke Bibaj stated the number of 5 l/s for the water production. To measure the water production and consumption, the commune plans to buy four water meters this year. One will be installed in the storage tank and the other three will be installed in the three main lines that bring the water into the villages. Villagers have already water meters in their house. In summer time, all the available water (5 l/s) is used for drinking purpose, the household and for irrigation. The average consumption in summer days was said to be around 1000 l/(family·day) while water consumption in the winter goes down to 500 l/(family·day). The tariff for water supply was increased this year from 20 ALL/m^3 to 35 ALL/m^3.

To check if the numbers of water production and consumption are corresponding, they can be transferred into m^3/d. The calculations show that the given numbers are reasonable.

- Calculation of water production per day:

  5 l/s = 0.005 m^3/s = 18 m^3/h = 432 m^3/d

- Calculation of water consumption in summer:

  1000 l/(family·d) x 400 families = 400 m^3/d

Around 150 families in the village Dheu Lehtë have pumps to get water but no public water supply system. Additionally 100 families from the other villages have wells as well to get their drinking water. The utility covers them only in theory.

It was stated that the water taken from the wells has a very poor quality and can contain sand and green particles. But people do not complain about this as they are used to the situation. The mayor mentioned first a health risk due to a white substance that also destroys kettles and washing machines. When he got told that calcium carbonate is bearing no health risk and can “only” be a problem in machines, he changed the topic and mentioned the green particles concerning the health risks. This shows clearly that people have often no idea about the topic and do not know what exact risks polluted drinking water can bear.

4.2 Wastewater situation

Concerning the wastewater problematic, Leke Bibaj said that 70 % of the inhabitants are in risk because of the wastewater. All the families have “septic tanks” (pits with stone lining, without use of concrete) that are located not more than 25 m away from wells were drinking water is taken from. Wells are around 6 m deep. They are used in the villages for own water supply where the communal drinking water supply is out of service. Animals that graze next to the wells decrease the water quality in addition to the pollution risk due to close pits.

Leke Bibaj was not very interested in a change of the situation as it is not a priority of the commune. The commune gets 80.000 €/year from the central government for their projects that is mainly used for roads and school investments. He already submitted proposals concerning road construction. To get feedback from the inhabitants and secure their participation, the mayor sets up meetings at least twice a year.

When leaving the LGU building, Leke Bibaj showed the school on the other side of a very nice green square that seems to be the center of the village where the LGU building is located. He would like to move the LGU offices into the school that should be big enough for both purposes. Additionally he wants to invest in an irrigation system for the green square, but he does not want to think about a water treatment facility with re-use of cleaned wastewater as he thinks it will be to costly. This shows that he – as a local decision maker – decides things with only having a feeling about it and no clear facts or numbers. The technical knowledge is missing.

Figure C.24: LGU building of the commune Hajmel (Niebel 2012)

Figure C.25: Green square and school in front of the LGU building (Niebel 2012)

4.3 Results of talking with inhabitants of the commune

Several men were asked at the same time on the green square in front of the LGU building about the drinking water and wastewater situation in the area. One of them was the chief of villages of the village Dheu Lehtë. They stated that all houses get water from wells with their own pumps. All of them are afraid of the water quality because pits are located within a small distance to the wells, but no health problems occur. The water quality was never checked. They also added that they accept the situation as it is now. All these information show a mix of being used to the situation, having no idea how to change it and the missing motivation of people to do some efforts to improve their drinking water and wastewater situation. Further efforts of donors for technical assistance should be accompanied by educational and awareness raising measures.

Figure C.26: Talking to inhabitants of the commune Hajmel (Niebel 2012)

4.4 Conclusion of visit and interviews

Unfortunately, houses and wells of the villages could not be visited due to limited time. According to the interviews with the mayor of communes and a few inhabitants of the villages, problems with drinking water supply and sanitation occur in the area. Drinking water supply does not cover the whole area and water from wells is polluted, partly due to unlined toilet pits. It was the first time that people were not complaining and seemed to accept the bad situation what was quite surprising. The priorities of the commune are not the improvement of the sanitary situation. The mayor seemed quite uninterested in the topic and beliefs that every action towards better sanitation would be too expensive and cannot be done with the limited budget of the commune. It seemed that knowledge about solutions was very little. The presentation of low-cost solutions and awareness rising for environmental and health problems concerning the drinking water and sanitation system in the population would be necessary before any other technical step can be taken. Otherwise projects will not find the commitment and acceptance of the commune and the inhabitants.

5 Site visit 5: Village Mishter (commune Gurre)

Date: *25.01.2012*

Commune: *Gurre*

Mayor of commune: *Mustafa Celani*

Villages: *Mishter (commune consist of six villages in total)*

Chief of village: *Sami Kadiu*

Commune was visited the 25.01.2012 together with Dritan Pistoli, the Social Inspector of ADF, who explained the situation in the commune and translated the interview. The village Mishter is part of the current ADF project for drinking water supply for rural areas in Northern Albania, financed by KfW. The village was visited by ADF because construction works were stopped due to social problems that had to be discussed with the mayor and the villagers.

Figure C.27: Commune Gurre (Niebel 2012)

Figure C.28: Commune Gurre (Niebel 2011)

The commune has a school and a kindergarten that can be reached by public bus. There are also public buses to the next bigger cities. The building of the LGU has no own toilet, people are send to the health center (Figure C.29) next door that has a toilet with squatting slab. At the moment of the visit there was no water at the tap for hand washing due to problems with pipes and the weather.

Figure C.29: Health center of the commune Gurre (Niebel 2012)

The village Mishter was located on the mountain with a very big slope. All houses get somehow water and have indoor water toilets. Only a few houses could be visited but seemed to be in a really good condition. Distance between houses ranged between only a few meters and some 50 meters or more. Some donkeys for personal transport could be seen. The land in the village is limited and therefore some people moved down the mountain to have more land for agricultural use. The road access was very bad, as ways consist mainly of little stones, rocks, clay and mud and nearly cannot be used by car after rain.

Due to limited time of the mayor of the commune, Mustafa Celani, no interview with him about the watewater situation was possible. Dritan Pistoli discussed with him the water project and gave explanation about the situation for the water supply in the commune. The upper part of the village was visited where discussions with inhabitants took place. Starting with a few men standing at one main square of the village in front of two houses, the discussion grew bigger as more and more people (young and old, men and women) joined while the one hour of discussion. At the end some questions concerning the wastewater problematic could be asked to some inhabitants that showed examples of bad wastewater handling. The involved villagers were mainly women. Figure C.30 shows the inhabitants of Mishter during the discussion.

Figure C.30: Lively discussion in the village Mishter about the drinking water project (Niebel 2012)

5.1 Actual water situation

Information about water supply situation was gained from the mayor of the commune, Mustafa Celani, and Dritan Pistoli from ADF. Drinking water comes from the mountains and has a good quality. The source is located close to the village. At the moment the village has some main public pipes with two or three public taps were people get water for free. After finishing the water supply project, people will have water supply in their house.

The village is divided into two parts. One part is located up the hill with 78 families (every family has at least five members), the second part is located far away down the hill and consists of five houses with 10 families. People move down the mountain as there is land for agricultural use available. The problem that occurs for the water supply project is that people up the hill do not want to share the water with people that live down the hill. The water is used for drinking purpose, in the household and for agriculture. While there is enough water available in the winter, the summer could bring some shortages. According to Dritan Pistoli, the solution would be the installation of a storage tank that stores water in the night and assures the consumption while day time. But people in the upper part of the village do not believe in the solution. For ADF it is clear that the water supply runs only if all people of the entire village will get the service. Dritan Pistoli beliefs that talking to the people can change their attitude and help to solve the problem.

Figure C.31: House in village Mishter (Niebel 2012)

Figure C.32: Houses in village Mishter (Niebel 2012)

When visiting the village, Dritan Pistoli explained that people get their drinking water through personal pipes in their garden or collect water from springs that arrive in the garden. Therefore it can be polluted through households that are located above. This is not corresponding to the information gained at the office of the mayor of communes.

5.2 Sanitary situation

After a long discussion about the water supply in the village, Dritan Pistoli changed the topic to the wastewater problematic. He explained later that people were really confused why he asked about that topic and did not want to talk with him about it. But when asking more questions and giving some information in the questions, people got the point and understood the importance of the questions and started to talk about the sanitary situation. After he was asking some questions to mainly female inhabitants of the village, they were willing to show some examples of bad sanitation.

Villagers stated that problems mainly occur in the rainy season. Several houses share one pit down the hill that is not covered properly (see Figure C.33, p.C.25). When it rains, the pits fill up with rainwater and wastewater flows down the hill on streets and backyards of houses that are located below.

Figure C.33: Shared pit of several families without proper cover fills up while rain (Niebel 2012)

Another example presented by the villagers showed the free discharge from one house with a little trench through the garden, ending up at the backyard of the neighbour. Situation is shown in Figure C.34 and Figure C.35.

Figure C.34: Free wastewater discharge in the garden (Niebel 2012)

Figure C.35: Free wastewater discharge (Niebel 2012)

The free discharge and the flooded pits pollute fields, streets and backyards below and can affect the water sources of the families living below. According to Dritan Pistoli, wastewater also ends up in the little rivers down the mountain that flow into the Mati River. This statement is doubtful as the distance to the little rivers is quite far and absorption by the soil will probably prevent this.

5.3 Conclusion of visit

The village has problems with wastewater handling that should be addressed in the future. Unfortunately it was not possible to speak with the mayor of the commune about it, but Dritan Pistoli stated that it is not a priority of the commune, that they prefer to invest in education and other projects. The discussion in the village about the water supply showed that people are interested and join discussions to fight for their interest. The involvement of people in that village for a sanitation project can be assumed to be strong. People know the problems. But they need more education and training according to sanitation and to help to improve their situation. Solutions that have to be found would be on-site solutions for single households and common solutions for several houses that are located close to each other. The mountain shows a big slope and discharge by gravity is possible. A simple improvement of the situation would be the constructing of simple leakage pits for every house or a group of close houses and a proper sealing and cover of these pits, preventing rain water to flow in. In that way, water would be discharged in a controlled way into the ground and would not pollute streets, gardens and backyards. As drinking water will be distributed by pipes from sources in the mountains, the discharge of the wastewater into the ground will not affect the drinking water quality. Distance to the river should be big enough that soil can filter the pollution from the wastewater without bringing lots of pollutants into the river.

6 Site visit 6: Village Lin (commune Hudenisht)

Viallge: *Lin*

Commune: *Hudenisht*

District: *Pogradec*

County: *Korce*

Date: *27.01.2012*

The village Lin at the Ohrid Lake (commune Hudenisht, district Pogradec, county Korçë) was visited the 27.01.2012 with Bledar Dollaku from KfW who could give some information about the village and translations when necessary.

Figure C.36: Village Lin at the Ohrid lake (Wikipedia 2012)

6.1 Village description

The village Lin is located directly at the shoreline of the Ohrid Lake, close to the main street from Elbasan to Pogradec. The village is stretched along the coastline as the mountains start just a few meters behind. According to Ilirjan Mimini, director of the utility of Pogradec, Lin has around 1,200 inhabitants. The village has a mosque, an orthodox church, a primary and a high school (Wikipedia 2012) as well as two hotels, at least one restaurant and two little shops that could be observed during the village visit.

Typical stone brick houses are built next to each other and the village is very dense with small streets and paths. The main street was just renewed recently and is in a very good condition. Animals like goats, sheep, dogs or chicken are walking through the village and pollute the ways with excreta. The livestock is living in the houses or next door.

Figure C.37: Animals are walking through the main street of village Lin (Niebel 2012)

6.2 Drinking water supply and sanitation situation

All houses get water from a source in the mountains that produces around 2 l/s (Dollaku 2012).

Lin is located 25 km away from Pogradec. This distance is too big to connect the village Lin with the wastewater treatment plant of Pogradec. Therefore an own solution for the wastewater problematic would be necessary. Asking the staff of the restaurant, he stated that people are afraid of swimming in a polluted lake and do not want that their children come in contact with uncontrolled discharged wastewater. For that reason all houses would have septic tanks that are built out of concrete with an average volume of 9 m^3 and get emptied by sucking vehicles. This would mean that a tank of a family of four people and an average consumption of 100 l/d would be filled in less than a month. Therefore the information is doubtful and should be proofed at future visits. If tanks are emptied less frequently, it should be checked if only wastewater from toilets is flushed into them or if they are not water tight, leaking into the ground.

Figure C.38: New built main street in the village Lin (Niebel 2012)

Figure C.39: Muddy path through village Lin (Niebel 2012)

The village has some rainwater channels that end in the lake and that were used for wastewater as well. But now it is unclear if they are still used for wastewater discharge. On some yards water ran out of pipes and small hoses where it was not clear if it was drinking water or wastewater. Acoording to Bledar Dollaku (2012), in the last summers the village suffered a bad smell as wastewater ran open through the village and into the lake.

Figure C.40: Rain water channel in village Lin (Niebel 2012)

Figure C.41: Private water discharge into rain water channel (Niebel 2012)

Figure C.42: Rain water channel in Lin (Niebel 2012)

Figure C.43: Discharged water runs directly into the lake (Niebel 2012)

6.3 Conclusion of the village visit

The village Lin suffered at least in the last years the smell and hygiene problems due to the bad wastewater handling. It is not clear if wastewater is still discharged into the rainwater channels and if all houses actually have water sealed septic tanks. Additionally, the area of the lake is very sensitive what makes wastewater treatment an important issue. If houses do not have water sealed tanks, a solution for the sanitation situation should be found as soon as possible.

Existing tanks have to be proofed if they are water dense or leaking into the ground. As the village is very dense, the construction of a sewer system would be worthwhile. But it will be difficult to construct it as the main street is very new and houses are perhaps even too dense to access the streets by construction vehicles. It seems that space for constructing a wastewater treatment plant would be available at the end of the village. If a treatment facility will be constructed, it is important that people do not throw livestock manure and straw into the sewer system to prevent a biological overload. People should be educated how to compost manure and straw if space is available in their backyards. Otherwise the commune could collect that organic waste for composting or co-fermentation in case an anaerobic digester will be planned in the future for the region (like it is constructed in Durrës). If the construction of a sewer system with a treatment facility for the whole village is not possible, at least the “septic tanks” should be sealed to be water tight and emptied frequently to prevent wastewater leaking into the ground and entering the sensitive lake area.

7 Site visit 7: Villages Perlat, Hamallë and Rrushkull (municipality Sukth)

Date:	*07.02.2012*
Village:	*Perlat (1,400 inhabitants)*
Mayor of municipality:	*Sherif Fortuzi (M +355 68 20 20 756)*
Technical expert of the water utility Durrës:	*Arif Osmani (M +355 66 20 90 204)*

Interview with:

- *Fatri Petku, Urban planner for the municipality (M +355 68 26 55 288, fpetku@yahoo.com)*
- *Besnik Kryezin, Urbanistic Inspector for municipality (M +355 69 21 64 863)*
- *Another representative of the municipality*

Visit of the village Perlat (municipality Sukth, county Durrës) was done on the advice of Enkelejda Gjinali at 07.02.2012 to check if it can be a suitable site for the implementation of a small size sanitation systems. Additionally, the two villages Ruschkull and Hamallë were visited spontaneously. The interview was translated by the former GIZ intern Anisa Aliaj. Unfortunately, due to Albanian – English translation, some information seemed to get lost and the discussion was quite unstructured as many people discussed about the questions asked. The following description is based on information given by the interview partners and additional observations from village visit.

The interview took place in the building of the LGU and was done with Fatri Petku, one out of four urban planners or the municipality, the urbanistic inspector Besnik Kryezin and one other representative of the municipality. It was stated that the municipality has already four urban planners but will hire another one in the near future.

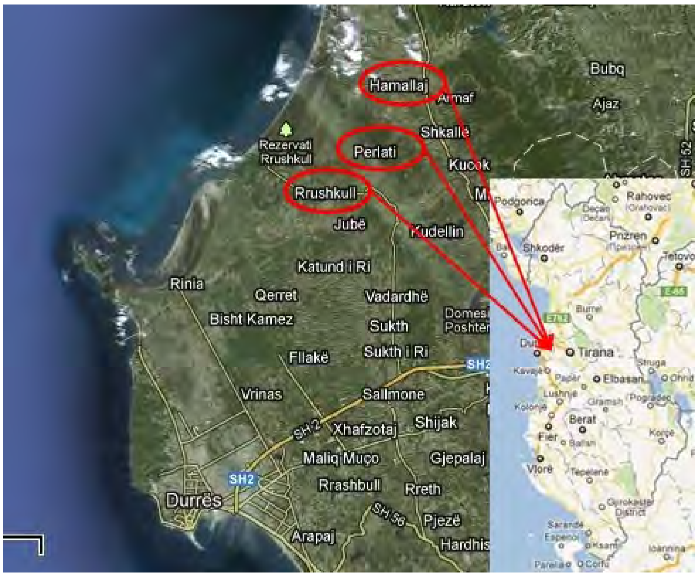

Figure C.44: Map of the Sukth area with the villages Perlat, Rrushkull and Hamallë (Google maps 2012)

When asked about the sanitary situation of the village Perlat (1,4000 inhabitants), the interview partners did not understand why only Perlat was chosen to be visited by GIZ. In their opinion, there are two other villages that are close to the coastline and would need more urgent a solution for the wastewater handling. These two villages are Hamallë (with 4,300 inhabitants) and Rrushkull (with 3,400 inhabitants). For this reason, information about all the three villages was obtained. Figure C.44 (p.C.31) shows the location of the villages on the map.

In the opinion of the municipality, the best option for the future would even be to connect the sewer system of the three villages and to install one wastewater treatment plant for all of them and later on to connect all the villages of the municipality if this is possible. The municipality exists of five villages and one city:

- Perlat (1,400 inhabitants)
- Hamallë (4,300 inhabitants)
- Rrushkull (3,400 inhabitants)
- Kull (2,700 inhabitants)
- Vadar (4,300 inhabitants)
- New Sukth (Sukth i ri) (10,000 inhabitants)

7.1 Drinking water supply

Perlat: The village Perlat belongs to the municipality Sukth and is covered by the water utility of Durrës. A water supply system exists already, but as it is in a bad condition the utility wants to renew the pipes and the reservoir completely in the next four months (February to May 2012) with their own financial means. No other information about drinking water supply and tariffs were available for Perlat.

Figure C.45: Part of village Perlat that is located on hilly area (Niebel 2012)

Hamallë: Hamallë has a drinking water supply system that was constructed in 2009 and financed by ADF. All families of the village are connected to the drinking water supply system but have no water meters. The whole village has a consumption of about 300 m^3/d, water supply works between two and three hours per day only. Therefore, people use storage tanks. The tariff is set for a household with 2 people at 600 ALL/month, for a household with 4 people at 900 ALL/month and for a household with 6 people at 1,200 ALL/month. This is equal to 300 ALL/(person· month) in a household of two people, 225 ALL/(person·month) in a four people household and 200 ALL/(person·month) in a household of six people. The water is bought from the water utility of Durrës and the price covers only the operation and maintenance and no reinvestment. The drinking water has a very good quality and comes from two wells in Fushe Kuqë that have a depth of 48 m and 54 m. Water quality is controlled, supplied water gets chlorinated.

According to the just mentioned information about the water consumption of the village and the prices per family, the following calculations shall show the consumption per person and the corresponding water prices per m^3:

- Water consumption per person and day:

  300 m^3/d / 4,300 persons = 70 l/(p·d)

- Water consumption per person and month:

  70 l/(p·d) x 30 d/month = 2,100 l = 2.1 m^3/(p·month)

- Average price per m^3 water:

  2 persons household: 300 ALL/(p·month) / 2.1 m^3/(p·month) = 140 ALL/m^3

  4 persons household: 225 ALL/(p·month) / 2.1 m^3/(p·month) = 110 ALL/m^3

  6 persons household: 200 ALL/(p·month) / 2.1 m^3/(p·month) = 95 ALL/m^3

As even the lowest price of 95 ALL/m^3 water consumed would be much higher than the average tariff in Albania, it is assumed that people consume more water than the municipality stated.

Rushkull: Rushkull has no public water supply at all, people get their water with pumps from their own wells. The most urgent priority for Rushkull is to get water supply and not a wastewater treatment.

7.2 Wastewater and sanitation situation

In the visited area, houses have toilets based on water consumption and it was assumed that they are mainly installed in the house. All the new built houses have water toilets inside the house. The responsibility for the wastewater handling belongs to the municipality.

Perlat: 60 % - 70 % of the houses in Perlat are connected by pipes from the houses to open sewerage channels that finally end up in a little river. The system was constructed between 2004 and 2010 by the municipality with their own financial means. Responsible planners divide the channels into primary, secondary and tertiary channels. As channels are open, the village experiences problems with odour especially in the summer. The houses that are not connected to the sewer system have „septic tanks“ that do not match standards and are very likely to leak into the ground. Tanks are emptied manually and sludge is partly used in the gardens. People know about the health risks but have no other choice as sucking vehicles are too expensive. For the municipality it is important to firts connect all the houses to the (open) canalisation and plan a wastewater treatment facility later on.

Figure C.46: Village Perlat, main streets is mostly damaged (Niebel 2012)

Figure C.47: Houses and agricultural land in Perlat (Niebel 2012)

Figure C.48: Village center of Perlat (Niebel 2012)

Figure C.49: Village center of Perlat, source (Niebel 2012)

Rrushkull: The village Rrushkull is covered by 30 % - 40 % with an open canalisation system that was financed by the municipality. During the village visit, some concrete pipes for wastewater collection could be seen next to a main street. But in the more rural area of the village paths were unfortified and big open sewer were constructed next to them. People discharge their wastewater into them with little pipes going through the concrete or stone walls that are surrounding their yard. The wastewater had a black colour and seemed to be very polluted. Some of these sewer ditches were at least half to one meter wide and had to be crossed with little wooden "bridges". Animals that run free in the village will get in contact with this wastewater. It also puts risk on little children getting in contact easily with it or even to fall into.

Figure C.50: Concrete wastewater pipe in Rrushkull (Niebel 2012)

Figure C.51: Open sewer next to the street in Rrushkull (Niebel 2012)

Figure C.52: Open sewer for rainwater and wastewater collection in Rrushkull (Niebel 2012)

Figure C.53: Pipes from the private yard lead wastewater into the open sewer in Rrushkull (Niebel 2012)

Hamallë: For Hamallë no information about the sewer system could be gained in the interview. But the village visit showed the same open sewer ditches in Hamallë as in Rrushkull. In some cases, the collection ditches even cross a private backyard and have only a little distance to the houses. It was a problem nearly anywhere in the three villages, that waste was dumped uncontrolled in the sewer system.

Figure C.54: Wastewater collector in Hamallë (Niebel 2012)

Figure C.55: Wastewater collector in a private yard behind the house in Hamallë (Niebel 2012)

Figure C.56: Open sewer in Hamallë (Niebel 2012)

Figure C.57: Black wastewater in the open sewer in Hamallë (Niebel 2012)

The wastewater of Perlat is discharged into one collector that is also used by other villages and a chicken farm located between the villages. The collector ends in the sea. The discharge of Hamallë ends up directly in the sea. Rainwater is collected as well in the open channels. One of the main collectors goes along a main road. The collectors look very bad, are partly full of waste and smell bad even in the winter what could be experienced during the village visit. It is assumed that in the rainy season wastewater also gets flushed out of the collection channels.

Figure C.58: Waste in and around the open sewer at Hamallë (Niebel 2012)

Figure C.59: Solid waste in the trenches at Hamallë (Niebel 2012)

7.3 Additional information

While Perlat was located on a very hilly area, the village Rrushkull was partly on plain area and partly on hilly area. The village Hamallë has only plain area with very little slope. All villages have an own kindergarten, school and ambulance, some little shops and small restaurants or bars. Rrushkull even has a petrol station and two churches, one of them looked very new and was in a very well condition.

Figure C.60: Ambulance in Perlat (Niebel 2012)

Figure C.61: School in Perlat (Niebel 2012)

It was said in the interview that the villages are very poor and no small-scale business exists. Only a few people live on agriculture, others work in Durrës for construction companies and another part lives only from the money that their children send them when they are working abroad. During the village visit it could be seen that many new houses are built or are under construction at the moment. While Perlat had mainly family houses, especially in Rrushkull big blocks and old ruins could be seen. Houses in Perlat were also more scattered than in Rrushkull.

Figure C.62: Village Hamallë (Niebel 2012)

Figure C.63: Blocks in Hamallë (Niebel 2012)

Especially in Rrushkull, many houses had a concrete or stone wall around their yards with some little pipes in the wall to let the wastewater (and probably the rainwater) out of the yard into the open sewer. Animals were kept in all the three villages and land around houses was used for agricultural purpose. The access to the villages is good, but some of the main asphalt roads had many holes.

Concerning the cooperation between municipality and villagers, the interview partner stated that people give complaints and feedback to the chief of villages and this person is in contact with the representatives of the municipality. Two old people were asked on the street in Rrushkull about the wastewater problematic. They see the problems of the existing solution and would like to cooperate with organisations that want to improve the actual situation.

Figure C.64: Villagers in Rrushkull (Niebel 2012)

7.4 Conclusion of village visit

All the three villages Perlat, Rrushkull and Hamallë are big enough for implementing a small or medium size wastewater treatment plant. The access streets to the villages are good and therefore the area would be suitable for implementing a facility for demonstration and training purpose as it is easy to reach from surrounding areas. Further on, the area is located close to the sea and a project would help to prevent more pollution of the coastline.

Houses in Perlat are partly very scattered what makes it difficult to connect them all to a sewer system. But as land has a big slope, collection by gravity is possible. According to the interview, the houses are connected to the open sewer with pipes for their wastewater, but this could not be proofed during the village visit. In the other two villages, Ruskull and Hamellë, the houses are more or less dense and only some are far away from the other what makes it easier to connect them with a sewer system. In these two villages the problems with the open sewer or missing sewer were more obvious than in Perlat.

All three villages are very close to each other and sometimes it was hard to distinguish to which village the individual houses belong, solutions should be found for each single village as the amount of people would be a little bit too high for one small size treatment facility (more than 5,000 PE) and a sewer system too long and complex and therefore also very expensive.

As the municipality already constructed open sewers and wants to increase the coverage rate of these sewers in the future with their own money, it shows their awareness and interest as well as the fact that they have some money to spend on that issue. Even open sewers are not a good solution as they are smelly, water can get flushed out and people and livestock are at constant risk of having contact with the sewerage, it can be seen as a beginning. Already constructed ditches could be used for the implementation of sewerage pipes in the future. If a donor for a closed sewerage system can be found, the area is suitable for the implementation of a small size wastewater treatment plant.

The interview was hold with one of four urban planners of the municipality and the municipality will even hire one more urban planner in the next weeks. This shows clearly that they want to have solutions for the whole region and not only for single villages, that they make plans for the region. This is a very good approach. It also seems like there are structures to ensure the participation of the villagers. As the municipality takes care of the water and wastewater situation of the villages, it can be assumed that the commitment to a wastewater project would be strong and that responsibility for O&M could be fixed very easily. Also financial means seem to be available, but they are limited. Therefore, the whole area is worth to have more investigation done by a technical specialist to find possible solutions. The responsible people underlined that they are waiting for a response by GIZ if any cooperation is possible what shows the clear interest.

8 Site visit 8: Prespa National Park and village Liqenas (commune Liqenas)

Date: *20.02.2012*

Visited commune: *Liqenas / Prespa National Park*

Interview with: *Edmond Temelko, Mayor of commune Liqenas*

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T +389 70 588 937

etemelko@hotmail.com

Visiting team: Tina Eisele, Ralf Peveling, Sabine Niebel, Wolfgang Fremuth (ZGF Frankfurt), Thimak Lako and one person from the Team of the Transboundary Biosphere Reserve Prespa – Support to the National Park

The visit of the Prespa National Park (under natural protection since the year 2000) and the commune of Liqenas was decided by the GIZ office of the "Water Sector Reform" Programme in order to identify implementation possibilities of small-scale sanitation system. The area was chosen to be visited as environmental protection is an important issue there and was discussed beforehand with the contact person Wolfgang Fremuth from the German ZGF Frankfurt. The information gained showed the interest and implementation possibilities for sanitation systems for the village as well as for three buildings in the National Park, namely a restaurant, a school and the building of the headquarter of the "Transboundary Biosphere Reserve Prespa – Support to the National Park" Programme.

The Prespa National Park is located around the small and the big Prespa Lake that are part of Albania, Greece and Macedonia. The park and the lake are habitat for many different animals and the lake is used for fishery. In Albania, 68 fishermen are registered. The ground is mostly Karstic and water can flow easily between Ohrid and Prespa Lake. Average temperatures in the area are between 1 °C and 25 °C, while in January the minimum temperature can drop below - 15 °C. When visiting the village, the fields around the lake were covered with snow.

The interview took place in the building of the commune in the village Liqenas. The mayor lives in Macedonia but came for the meeting and with all visitors for the village visit. Questions were answered in a clear and straight way. Translation from Macedonian to English was done by Thimaq Lako from the Transboundary Biosphere Reserve Programme.

The mayor also gave printed versions of the Local Development Plan of Liqenas to the visiting team, containing an Albanian version and a shorter English version. This document contains information e.g. about the villages, climate and nature, water sources, problems concerning drinking water supply, sanitation system and waste management. (Kommuna Liqenas 2008)

8.1 Description of the commune Liqenas

The commune Liqenas consists of the nine villages Liqenas, Diellas, Goricë e vogël, Goricë e madhe, Lajthizë, Zaroshkë, Cerje, Kallamas and Gollomboç and is located in the Korça Qark, close to the Prespa Lake. Close to the Greek and Macedonian borders, the inhabitants of the commune are a Macedonian orthodox minority, speaking the Macedonian language. The population of the commune counts around 4,600 inhabitants in 163 families (Kommuna Liqenas 2008).

Houses in the village are old traditional stone houses, sometimes in very bad condition, and new built houses in very good condition, mostly for one or two households. Houses are located very dense on the hill with only little gardens around – if they have gardens at all. The street of the village is just partly fortified and rainwater runs through the mud. Donkeys were seen frequently next to the houses on the street, also some chicken were running around in the gardens. The village hosts (at least) the local government building, a church, a school and a health center, at least one little shop and a restaurant.

Figure C.65: Main street in village Liqenas (Niebel 2012)

Figure C.66: Houses in the village Liqenas (Niebel 2012)

8.1.1 Drinking water supply of Liqenas

Four villages get water from the lake, only three villages (Kalamas, Liqenas and Lethis) have piped water supply. The pumping system reaches 800 m into the lake and water (apparently) gets chlorinated before distribution. People use the tab water as drinking water. The water of Liqenas is taken from wells and from the lake. Liqenas has around 1,000 inhabitants in 340 households. But in the summer time, the area is visited by many day trippers and the village can hold up to 2,000 people during the day. As the spring does not have sufficient water in the summer time, water from the lake is used as well. The "solution" that Liqenas found last summer for the summer time was to implement a supply schedule and to fill up first the tanks with drinking water from the wells and afterwards to pump water for non-drinking purpose from the lake into the system. It was said that the drinking water supply system was financed by ADF/KfW. Also Goricë e vogël gets water from the lake and from wells.

According to the Local Development Plan Liqenas (2008), only one village called Lajthizia gets its drinking water just from a spring as many drinking water sources in the mountains were drying out in the last years. Therefore, all the other villages get their water partly from the lake. In some villages, the amount of supplied water does not cover the basic needs and 84 % of the population is dissatisfied or very dissatisfied with the water supply. The Local Development Plan also mentions the uncontrolled dumping of waste due to missing collection in most villages as a reason of environmental pollution affecting the (drinking) water quality.

8.1.2 Wastewater situation and rainwater dischargein village Liqenas

In the commune of Liqenas, only two villages have piped wastewater collection. In the village Liqenas, all houses except three are connected to the sewer that ends in a three-chamber collection tank below the village close to the lake where physical treatment takes place. From there, water leaks into the ground and enters the lake. The lake is strongly polluted and smells especially in the summer time. People do not go swimming in the lake. Eutrophication occurs in the summer and causes problems for the fish population and for the drinking water abstraction.

Rain water is collected in a few open collection channels going through the village in between the houses. They are partly polluted with garbage and direct the water down the hill into the lake. Most probably these channels are some of the little streams mentioned in the Local Development Plan of Liqenas that are alive in winter during rainfall and snow melting.

The area between the village and the lake where the three-chamber collection tank is located was visited with Edmond Temelko. Some parts of the area are at the moment used by villagers for gardening but belong to the commune and could be used for a wastewater treatment facility, if the space is sufficient. It was said that flooding of the area can occur rarely, less than every ten years, but this has to be clarified. It was also not clear until what point of the area the water would reach in case of flooding. According to Wolfgang Fremuth, the lake shows at the moment (February 2012) the highest level in the last six years.

Figure C.67: Three-chamber collection tank for the wastewater of village Liqenas (Niebel 2012)

Figure C.68: Rain water collection channel in the village Liqenas (Niebel 2012)

8.1.3 Future planning and communication in the commune of Liqenas

The commune is very interested in implementing water supply and wastewater treatment for all the villages but has not enough money to do so. A new urban planning law gives the Council of Communes more rights. But also an approved masterplan for urban planning of the commune is now necessary to get construction permissions and to implement new projects. The masterplan has to be approved by the Council of Communes and is very expensive, information was given that it would cost around 80,000 € what is not possible for the commune with their small budget. But the implementation of a wastewater treatment would be possible if it is declared as an “upgrading” or “modification” of the already existing wastewater collection system.

The drinking water supply and wastewater treatment are topics that are coming up again and again and are discussed in every election period. The communication between villagers and the commune is very good and happens through formal and informal ways. As the population is a minority in a remote area, people are very close to each other and most of them have somehow family relationships to each other.

8.1.4 Conclusion of village visit in Liqenas

The village Liqenas seems to be a suitable village for the implementation of a wastewater treatment pilot project. People of the area seem to be very interested and know about the need of a wastewater collection and treatment in order to keep the lake free of pollution to have clean drinking water and a healthy fish population as some people depend on fishery for living. People do not swim in the lake at the moment because the water is polluted, smells in the summer and contains lots of algae.

As the village has already wastewater collection pipes for nearly all houses, no investment has to be done concerning the wastewater collection to implement a small-scale treatment plant. This would be a big advantage for that village. But some open questions still have to be clarified before a decision can be taken if the village can serve as a pilot project area. It is important to figure out who can operate and maintain such a wastewater plant and in whose responsibility this would lie. To make a plant sustainable and to be able to repair and maintain it, a tariff has to be applied. To get the acceptance of people for this tariff, awareness rising should be done among the population starting before the construction. The amount of produced wastewater has to be determined. The three-chamber tank should be inspected in order to figure out if a reconstruction of it for pre-treatment use or a completely new constructed pre-treatment would be more appropriate. It has also to be discussed what will happen to the three houses that are not connected to the sewer. If construction work is possible, the connection of them to the sewer could be best option. Other options might be the construction of septic tanks that will be emptied by sucking vehicles that bring the content to the small-scale treatment plant.

8.2 Visit of headquarter building, school and restaurant in the Prespa National Park

All the three facilities - headquarter, school and two restaurants - are very interested in having a wastewater collection and treatment together for all the three of them or as single solutions. Wolfgang Fremuth showed the headquarter building with the water flush toilets, the location of the two-chamber pit and the location of a new drilled drinking water well. Water is taken from the ground and comes from the lake. The restaurant and the school want to buy water from that well in the future.

The headquarter building was used in the past as a forest watch station and is now reconstructed in order to be used as an office building. Equipped with a central heating system using a pellet oven, modern windows and insulation it shall serve as a good example of a low energy building. In the next time, a solar panel will be added to the building as problems with the electricity supply hamper the work in the offices.

Figure C.69: The headquarter building at the Prespa National Park (Niebel 2012)

8.2.1 Water supply and wastewater situation

The building has a water flush toilet and a shower on the ground floor. A kitchen shall be installed in the future. The toilet was originally designed as a dry toilet with two unsealed chambers and two holes for the toilet seats, but equipped with two water flush ceramic toilet bowls and flush. The design with two toilet holes in one room is a typical design for a two-chambers alternating toilet, where one hole can be closed for a while (mostly one year) to allow organic material to be decomposed with only one chamber being in use. Liquids are going into the ground as pits are not sealed to the ground. Wolfgang Fremuth mentioned that as the chambers were made airtight, biogas production in the chambers can cause explosion risk. A ventilation pipe for the tank is installed/needs to be installed therefore. There is no information available about the filling-up of the tanks that are in use for more than ten years now without being emptied.

Space for implementing a small treatment plant would be available close to the building (but also close to the well) or - if treatment together with school and restaurant wastewater is wanted – down the hill on the yard of the restaurant. The owner of the restaurant already offered land for that purpose.

All the three facilities – headquarter, school and the restaurants – will produce wastewater with higher faeces and urine content than normal household wastewater as grey water production will be low (from showers etc.). The design of a treatment facility should consider this specialty. It is also important to determine the numbers of people using the three facilities, the seasonal fluctuation and the amount of the produced wastewater during the year. Combining the wastewater treatment of the school and the restaurant could have the advantage to attenuate seasonal fluctuations as the school is closed in summer times (meaning no wastewater production) while the restaurant is more used in the summer period. If the connection of the headquarter building is an appropriate option depends on the price of the piping and the wastewater production in the building. Wolfgang Fremuth mentioned that in the near future construction works will be done in the street in front of the building down the hill and that therefore pipes could be easily dug at this time to connect the building to the other two facilities. Additionally, Wolfgang Fremuth expressed the wish of finding a solution that could be enlarged in the future if the headquarter will be visited more often or other buildings will be added.

If GIZ will decide to send an expert and make a design for a solution, the Reservation Project would fund the construction of a treatment plant. But first of all it has to be clarified who would be responsible of operation and maintenance of the facility in the future. Local responsible have to be identified, best would be to train a company or the Korçe utility but they are quite far away. That topic is very important as the "Transboundary Biosphere Reserve Prespa" project team can easily change in the next years. For sure, the sludge management and care-taking of the facility are a topic that has to be resolved before further decisions will be taken.

8.2.2 Conclusion for the headquarter, restaurants and school

A big advantage of the headquarter concerning the implementation of a small-scale treatment plant would be that the funding is already clear. But first of all it has to be clear who will be responsible for the plant in the future.

For a possible design, the wastewater amount produced during the year by the headquarter building, the school and the restaurant has to be determined. The distance between the tree buildings and possible places to implement a treatment facility have to be identified. Information about the site work in front of the headquarter building and the possibility of using the situation to dig pipes have to be gathered. The owner of the restaurant as well as the director of the school have to be included in further discussions to get more information about their wishes, needs and possibilities to support a project. With all of these information a decision about a combined treatment facility or a small on-site solution only for the headquarter building would be possible.

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