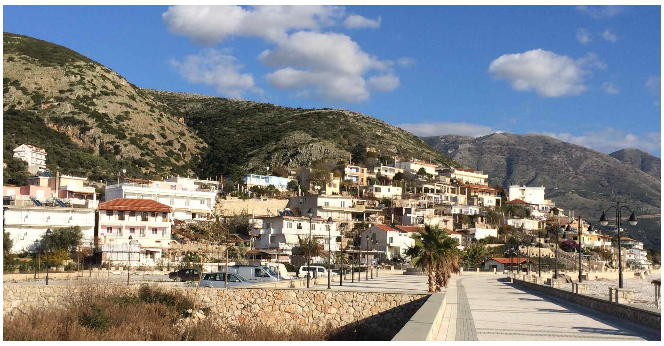
Feasibility Study for the Promotion of Sustainable Tourism at Albania´s Mediterranean Coast



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1. Executive summary

The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) in Germany finances this study as part of its "Environmental Technologies Export Initiative" programme. Project partner are CUTEC and Goduni International. The desired project concerns the drafting of a feasibility study for an ecologically sustainable tourism industry in Albania, taking one location as a real example. The section of the village Qeparo near Himare, which is adjacent to the beachfront, is selected for the conduct of this study on sustainable tourism development.

The existing situation is described for the village Qeparo starting with basic information on the location, the climate and the tourism industry. The energy situation is dominated by the overall importance of mineral oil in the national primary energy consumption. The sector electricity is nearly complete renewable due to the high reliance on hydropower in Albania. Important is an overview on the political objectives in general for Albania and in the context for this study.

Energy demand and environmental infrastructure are the main areas of interest for this study. Both sectors are analysed with the reference towards the local context. Energy demand in the area is defined as energy for the buildings and the inhabitants. A reference resp. model building is defined with two storeys and altogether 6 rooms for the bed&breakfast tourism. The total number of buildings is set to 80 for the eco-village concept. According to the tourist statistics an occupancy model is developed, which considers a high season in summer, a transition period and a winter season. Together with the basic energy demand for heating and cooling in the different periods an expected energy demand for the tourism activities is calculated. The results show for the model building a demand for heating of 4,000 kWh and a demand for cooling of 7,000 kWh. Besides heating and cooling energy is required for hot water, for lighting and for all other services in the house (cooking, washing etc.). It is assumed that all demand is serviced with electricity. Then, the model building needs 18,800 kW per year.

Tourists produce more waste per head compared to the local resident population. Due to the seasonal fluctuation in tourist arrivals and length of stay, waste generation fluctuates as well. For the pilot area it is estimated, that the total waste volume accounts to some 232 tons per year. Out of this, nearly 55% is produced during the two month of high season. For further analysis the portion of the waste, which is of biological origin, is also estimated with some 87,8 t per year.

Fresh water is needed for a wide spectrum of applications. Most of the fresh water ends up as waste water. Based on similar estimations on specific consumption and occupancy it is calculated, that the total waste water volume in one year sums up to 35,000 m^3 for the whole pilot area. Presently, waste water is collected in individual septic tanks. However, environmental problems are being reported and are widely known.

The definition of sustainable tourism offers a wide array of different aspects. In the context of this study the sectors energy, waste and water are considered as essential and are analysed in detail for the pilot area. An introduction into the state-of-the art is given before detailed considerations are discussed. Experiences from worldwide activities are presented and recommendations given, in which areas activities can reduce energy consumption, minimise waste generation and save water resources.

Next is the discussion of technologies with a possible impact on the situation at Qeparo. The buildings can be better insulated (wall, window, roof) to save heating and cooling energy. Effects are there, but the payback on energy alone seems to be limited. The present energy supply may be changed towards more modernized concepts like reverses cycle units or centralized cooling and heating units. Also combined heat and power plants offer an alternative eventually including a chiller (tri-generation). In this case, fuels must be supplied, either of fossil or renewable origin. Direct renewable resources can be utilized for hot water production as solar thermal or for electricity production via photovoltaic. Also wind offers opportunities at least in some regions of Albania. Least, organic waste and / or wastewater may be turned into biogas using anaerobic fermentation.

In waste management, separation of the waste streams brings opportunities for recycling and energy production. The situation on waste water is more complex. A treatment of waste water is essential for the eco-village. This can be organised individually at building level with improved septic tank operations or more centrally employing micro-treatment plants. The utilization of grey water is considered a good alternative and may improve the quality of the wastewater for consecutive energy production.

Out of the theoretical solutions described above, a number of possible measures is identified and discussed in detail. For each of the options the design parameters are presented and investments cost plus operational costs calculated. Also the savings are given in energy units and monetary values.

The recommendations sum up the discussion and prioritise a set of measures in energy, waste and water. These mentioned projects should be realized first in order to reach an acceptable level of sustainability. Other measures can follow after successful implementation of the first set of activities. The recommendations are:

- Improvement of building envelope,
- Good housekeeping measures on energy,
- Solar thermal energy supply,
- Reverse cooling / heating units,
- Grey water system installation,
- Waste separation at source,
- PV on public places and one central location,
- Waste collection of biowaste ,
- Centralized waste water collection and biogas production.

The overall investment costs including allowance for planning and engineering are estimated with 1.7 Mio. € for all measures excluding the building envelope, which needs 2.56 Mio. € alone for the total 80 buildings in the eco-village. Some other measures are planned only with a specified percentage of the total potential to be realized during the first phase of the investment.

2. Introduction

On October 1, 2016 an application by the Department of Energy System Analysis of CUTEC was approved by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) as part of its "Environmental Technologies Export Initiative" sponsorship programme. Project partner besides CUTEC is Goduni International. The project concerns the drafting of a feasibility study for an ecologically sustainable tourism industry in Albania. A project location will be selected where the necessary measures for an ecologically sustainable tourism industry will be modelled. The results of the study can then be applied as a blueprint for other locations. In consultation with the Ministry and the local administration, the town of Himare has been chosen to be a model for the development of an "eco village". CUTEC will primarily be concerned with the necessary infrastructure for energy supply, waste disposal and waste water treatment. The example of the planned "Eco Village Tourism Himare" project is intended to demonstrate the technical and organisational possibilities for creating a sustainable infrastructure. Energy supply is seen from the perspective of the individual building need´s plus a chance to utilize local resources for energy production. This includes also, for example, waste collection and recycling stations and organic waste separation. In terms of waste water, the project goals include avoiding waste water production, utilising grey water and analyse alternative treatment options. In all areas, the systems are not yet established to an extent that would be necessary for a sustainable analysis. Consequently, if the tourism sector were to be expanded without implementing appropriate measures there would be a risk of severe environmental pollution by tourists on this part of the Mediterranean coast.

While „eco tourism solutions“ are being promoted successfully in many countries, conventional tourism and the use of fossil fuels continue to be used for the hotels, bed & breakfast villas, private homes and businesses or to supply fuel for transportation and power generators are still dominant in the Albanian tourism infrastructure. Despite technological advances, rapid economic growth - wherein the tourism industry contributes about 6 % directly and about 22 % indirectly to the Gross Domestic Product (GDP) of Albania - will require more and more energy accompanied by increase in scarcity of fossil resources and changed mindset of the future tourists. In order to face this great challenge, the Albanian Government decided in 2015 to change the system and to promote an ecological sustainable tourism in Albania. To do so the Government considers the use of renewable energy resources and above all, the most potential source of natural energy, the sun, photovoltaic systems in combination with the treatment of waste, wastewater in order to reduce also the greenhouse gases and the pollution of water, earth and air. The use of these combined resources has to be provided by the communities and the Central Government.

In the new strategy adopted in 2014 the Albanian Government considered the fulfillment of long-term energy needs via the use of solar energy, as a necessary solution. In accordance to that the potential is huge and unexploited. Solar technologies are an effective solution and economical, with the increase of energy price. They consist of a low maintenance technology, flexibility in installation, inexhaustible source of energy and predictable financial return. For these reasons, four cities in Albania have been granted specific projects that address this issue - one of them is the "Eco Village Tourism Himare-Qeparo“ and the important one is "Eco City Tirane“ which is an ongoing pilot project. The pilot project in Tirana shall enable and verify the effectiveness in the apply of renewable energy solutions - setting solar panels on buildings and street lights - and the neighborhood shall aim to be fully supplied with electricity and produce an surplus of electricity that will be exported to the grid. Whereas the other project „Eco Village Tourism Himare“ is a study and the subsequent solution that shall analyze and verify the effectiveness of a combined „waste-wastewater-energy-state-of-the-art solution", which later on can be rolled out in Albania. These projects shall serve as models for other cities that would like to apply these technological innovations.

In terms of emissions and pollution this project has not only a local importance but also national and international for the whole „Adriatic Sea“ Region at least. According to the Ministry of Urban Development it addresses one of the most important issues of the moment in Albania, which is electricity, ground water, sea and air pollution in combination with the aim to enhance the quality in the tourism industry and the transformation towards ecological and luxury tourism, like Eco Island Krk or Eco Villages in Montenegro. The use of renewable energy resources through innovative technology is being applied more extensive in the world and should also be the same in Albania.

During the execution of the study an analysis is made on the framework condition in the village of Qeparo with respect to energy demand and supply, waste situation and waste water reality. It is also important to enlighten the political background in terms of laws and regulations. The chapter 3 puts local energy demand, local infrastructure and socioeconomic condition into the local perspective.

The following chapter 4 reports on the state-of-the-art for the different technical aspects of sustainable tourism development in the field of energy, waste and waste water. This analysis is necessary to define possible options and solutions for the selected “eco village”.

Consequently, in chapter 5 one can find a selection of the different measures, which offer a solution in one of the defined environmental fields. Investment, operational costs and benefits are calculated and discussed in detail for the individual measures.

Finally, the chapter 6 identifies a recommendation for that number of measures, which are favored as being viable and technically feasible under the present framework conditions. The recommendation show a difference between options for the individual building resp. the individual owner and the option for a centralized approach for the total area of the village.

3. Description and analysis of existing situation

3.1. General framework

3.1.1. Situation at Himare/Qeparo

The village of Himare-Qeparo (coming from ancient Greek meaning „garden“) is located in the South of Albania between Vlore and Sarande. Albania has a coastline of Adriatic and Ionian Sea of 450 km, which largely lies between these two large cities. Sarande and Himare are part of the region that has been declared as a “UNESCO World Heritage” site. Qeparo is a small village belonging to the town of Himare and lying a few kilometers south of Himare (see in figure 1). Himare counts some 12,000 to 13,000 inhabitants according to a recent study (Studim 2012). In winter resp. during the low season the number of inhabitants drops to 6,000 (Himare 2017).

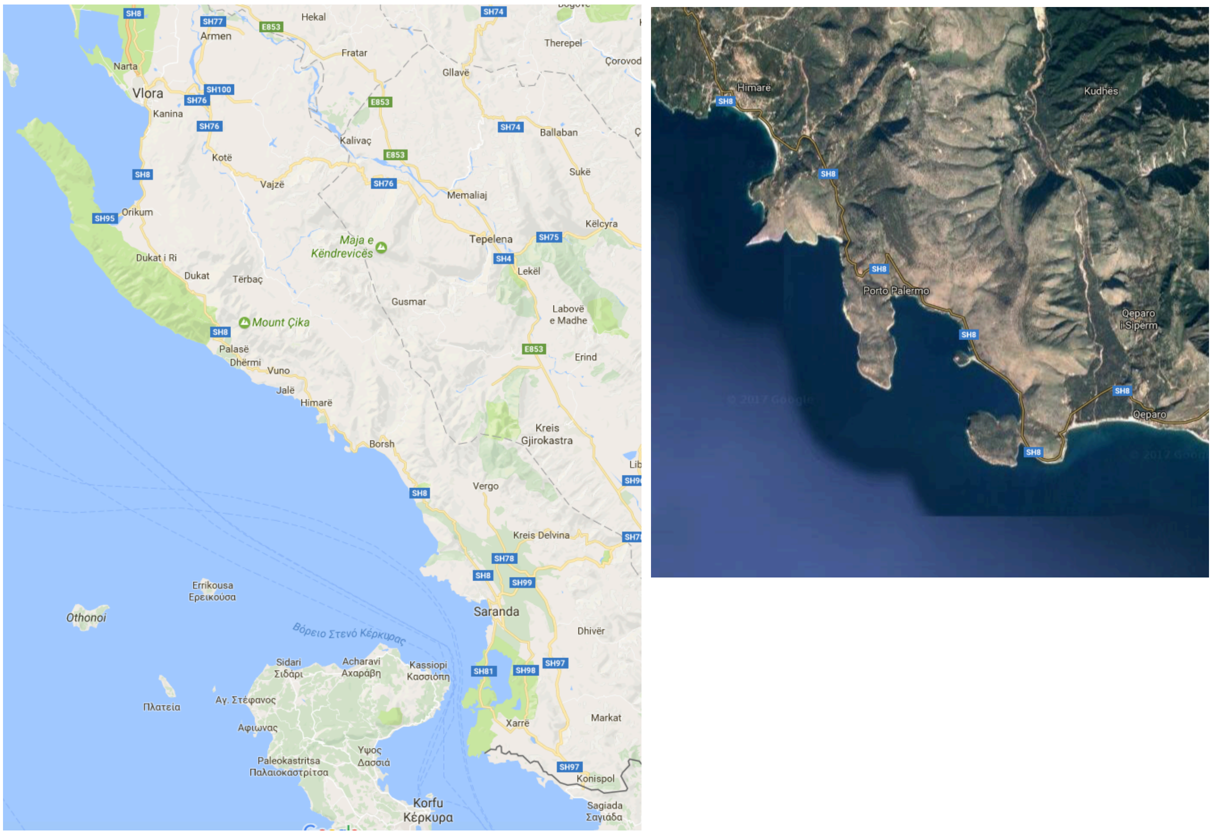

Figure 3-1: Himare and Qeparo on the Albanian coast (Google 2017)

Qeparo is close to the Greek Island of Corfu with an area of 2.200 m^2 being about 350 m above sea level with its old village part in the mountain and about 40 m above sea level with its new village next to the sea. It has about 1.767 inhabitants and 442 houses. Qeparo is part of the Himare Municipality and counts for about 12% of its inhabitants. The population is mostly bi-lingual speaking, Albanian and Greek, due to the Greek culture and tradition of this part of Albania. The most inhabitants of Qeparo are Greek-orthodox dedicated to Saint Demetrus. The average life expectations in the region are about 71,4 year (68,5 year for men and 74,3 for women).

The climate of Qeparo is similar to Corfu, a typical Mediterranean climate with hot, dry summers of 25 to 37 °C and cold winters with 10 to 12 °C. The average annual rainfall is about

1,189 mm. The driest and hottest month is July with 37 °C and 14 mm of rain. The coldest and rainy month is December with an average of 10 °C and 197 mm of rain. The fact of 300 sunny days per year justifies that solar energy becomes an element of the plans towards ecological sustainable tourism. The quality of the ground and land is relatively low given to the chalky and granite mountains. This fact has lead to the fragmentation of the land and to limited agriculture activities even though the parameters are quite good. Some geographic and geological data show the coast site of Himare-Qeparo being mounting with pebbles - coarse sand in smaller bays and beautiful rural-natural landscape.

For the time being the tourists can visit Himare-Qeparo only by car (motorbike or bike) rather coming from Saranda, a touristic city at the same coast in the south of Albania having a port and direct line to the Greek island of Corfu (Corfu-Saranda is a 20-30 Min. trip by ship and attracts many tourists staying at Corfu to get over for one or some days) or coming form Vlora, also a touristic city at the same coast more south-west in the direction of Tirana. Coming from both directions there is only one road that can be used and lead all the transit through Himare-Qeparo. This situation creates a kind of „promotion“ for the beautiful site of Qeparo but it also does have a flip site of creating traffic jam in peak season - which impact the pollution as well. It would be more effective to improve the maritime, air and road infrastructure. Himare-Qeparo has 1 stationary health center, 8 ambulances and 3 doctors in its own territory. The next hospitals and health institution are located in Sarande (53 km) or Vlore (100 km).

3.1.2. Tourism industry

The virgin coast and traditional housing architecture of Himare-Qeparo is the key asset of the tourism in this region, which attracts many local and foreign tourists. Qeparo has some hotels, bed & breakfast villas (B&B villas), a camping site, restaurants, cafes and water sport schools.

According to a study (Studim 2012) the total number of tourists in the Himare region reaches 25,000 per year. The main season lasts only for 50 days. Average stay is 10 days. This gives roughly an additional population of 5,000 people during the 10-day stay. With above calculation it reaches 20,000 inhabitants during the high season. Updates by the city of Himare calculate 8,000 additional tourists during the peak season (10 day stay) on average in some 400 hostels. This source estimates total tourists with 40,000 per year (Himare 2017).

Most of the tourists of Qeparo are coming from Albania and also from abroad. About 35% of the foreign tourists are coming from Kosovo, another 25% from Italy, 8% from Poland and 8% from Germany and France staying for 15-20 days in the summer or transition season. The local tourists are mostly coming from Tirane and Durres.

The tourism industry contributes with about 6% directly and with 22% indirectly to the GDP of Albania which has a GDP of 10.6 billion € according to the World Bank 2015 report (WB 2015). The projection for 2025 continues on that path. The industry exists of more than 300 registered hotels and employs more than 180,000 people, which are about 15% of the total workforce existing of 1.2 Mio. people. The employment is expecting to further improve at a level of 220,000 people employed by 2025. In the last years the industry could generate about 140 Mio. €, which is a growth of 1,6 % compared to the last years. The projection for 2025 indicates a growth of 3,6% at 203 Mio. €.

The foreign tourists are very important for the Albanian tourism since they contribute directly to the development of the tourism and also shaping it through their higher financial means and expectations. The number of foreign tourists visiting Albania has increased more that six times in the last 10 years. In 2008 about 1.4 Mio. tourists have been registered to visit Albania while in 2015 Albania registered more than 6.0 Mio. tourists. Over 70% of the foreign tourists in 2012 have reached Albania via “border crossing” by car or bus. The other part reached Albania via “air” by plane and via “maritime” by ship or boat. Most of the foreign tourists are coming from Italy, Kosovo, Macedonia, Montenegro, Greece and other European Countries and also from US or China.

To meet the expectations of the target tourists and improve its attractiveness the Albanian Government took a set of measures to transform the tourism from mass tourism into more exclusive climatic and cultural tourism. Part of this approach is also the study and pilot project „Eco Village Himare-Qeparo“. To meet its goals further developments are vital. The clustering of the tourists in:

- “Maritime tourists“ - tourists coming by sea from abroad,
- “Air tourists“ - tourists coming by plane from abroad,
- “Local tourists“ - tourists moving by car / public transportation locally,
- “Border crossing tourists“ - tourists moving by car / public transportation from abroad

is a good first step, but each of this cluster needs a strategy behind to shape its future more effectively. The Albanian Government is still working on these issues.

3.1.3. Political objectives

The overall objective is the financial and technical support of projects promoting bioclimatic cities and tourism in Albania, independent in terms of own production of electricity and ecological sound in terms of applying state-of-the-art solutions to reduce the emissions, water and ground pollution and the costs for waste water and solid waste treatment in the future. This project will provide technical and economic development of the area and increase the standard of living for its citizens and all the tourists through the use of combined water, waste and energy solutions.

The main goal of this project is to promote an ecological sustainable tourism and to attract much more high-end climate and culture sensitive tourists for the Albanian Esmeralda Coast, which is one of the most beautiful in the region, next to the Greek Island of Korfu.

This project will provide capacity and technical support and coordination for the implementation of the strategy in an expanded framework of cooperation between international, national and local institutions and stakeholders.

Instrument and methods of how the availability of natural source of solar energy, waste and water can be combined and transform the communities which often lack the necessary knowledge and expertise to do it itself and how the existing funds can be accessed.

Thanks to the water and renewable solar energy availability in Albania, such projects obtain a great benefit for income generation and local development without increasing emissions of carbon dioxide in the air.

Last but not least the project shall increase the awareness of residents, tourists and institutions to use these intelligent solutions more consciously and to anticipate.

In support of National General Plan and projects of public spaces revitalization that make up one of the ministry's strategies, will be proposed four pilot projects in different cities of Albania. Promoting bioclimatic cities supplied with energy by using photovoltaic systems and the application of "intelligent lighting, waste water and waste treatments used for cooling and heating“ concepts that support healthy living in greener sites.

The pilot project shall focus on three main aspects:

1. the „*ecological heating & cooling*“ (waste & water treatment for heating & cooling solutions),
2. the „*traditional landscape reconstruction*“ (measures to reconstruct the facade of the villas of the village fitting into the cultural landscape of Himare and its traditional architecture) and
3. the "*intelligent lighting*" in private and public spaces or areas and placements provided with state-of-the-art systems in buildings.

In a later phase the smarter mobility solutions shall be added to the strategy. The discussion reveals the following options for parts in this study:

1. Reducing the waste and wastewater amounts in the B&B villas;
2. Reducing the electricity consumption of conventional energy sources in the B&B villas;
3. Reducing carbon dioxide emissions in the air;
4. Raising the living standard of local residents and tourists in the B&B villas;
5. Promoting tourism with zero impact on the environment.

This project has already ben integrated with the strategy of the Albanian Ministry of Urban Development about the revitalization of private and urban spaces, improve of the waste, water and energy building consumption, businesses, and increase the sustainability of livelihoods.

The targets where this project will be applied are residents, tourists, businesses, financial institutions and interest groups in the area where the project shall be implemented. Disclosure of information and the creation of online information sites will create a huge impact in a wider public about the benefits of applying technologies that use renewable sources of energy.

The Albanian Ministry of Urban Development and Tourism and more specifically the Directory of Territory Development and also the local Authorities of Himare (City Counsel and Municipality of Himare and Qepero) supported very actively in the application phase of the project and during this study as well. For the further steps the Ministry and the local Authorities plan to co-finance the implementation of the project through governmental subsidy and investments from the private sector (owners of the B&B villas in the area) if the results of the study are reasonable and emphasize to do so. The other part of the implementation financing shall be provided by international donors - e.g. German Ministry for Environment, Climate Protection, Construction and Nuclear Safety (BMUB), the EU Commission or/and United Nations or Green Climate Fund. This support will attract more private and social engagement during the implementation, which will end up in a successful implementation increase ecological sustainability for the region, improve the life quality, reduce impacts on environment level and reduce electricity consumption in the area.

The supporting team of the Albanian Ministry for Urban Development of this project is:

- Mrs. Eglantina Gjermeni, Minister;
- Mr. Gjon Radovani, Vice Minister;
- Mr. Eduard Ostrosi, Director of IPA Projects Integration & Monitoring and Coordination of Foreign Investments
- Mr. Nertil Jole, Director of Territory Development Directory.

3.1.4. Energy and renewable energy

The national energy situation in Albania is dominated by import of liquid petroleum products and the production of electricity with hydropower. Some power is imported from neighbouring countries. Energy demand for transport is satisfied from petroleum products. National energy reserves are identified. Petroleum and natural gas including some coal deposits would enable a self-sustained energy supply for Albania (Bele 2014). However, the processing capacity of petroleum products is limited, natural gas is supplied only to industry and the coal deposits are regarded as not profitable. In figure 3-2 the national primary energy supply is dominated by oil products. Second largest supplier is hydropower, followed by biomass mainly for traditional heating demand (IEA 2017).

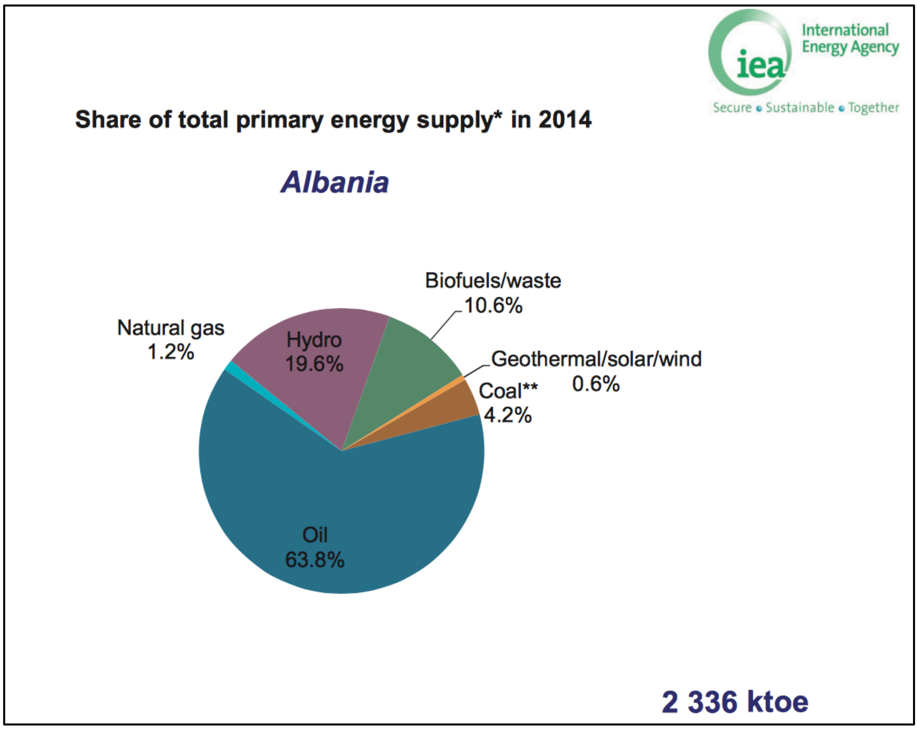

Figure 3-2: National primary energy statistics (IEA 2017)

The renewable energy sector is dominated by hydropower. In 2015 installed capacity in hydropower was 1,798 MW with a production of 5,895 GWh (NANR 2016). Final energy consumption for heating and cooling is dominated by biomass (214 ktoe in 2015) and small contributions of solar energy (12.4 ktoe). The biodiesel production und use is very limited with 33 ktoe in the year 2015.

According to EBRD, KFW and GIZ Albania has good resources for solar, wind and biomass, but those sources remain largely undeveloped (BMWi 2016). KfW is very engaged in the energy sector, notably power transmission and dam safety also in the region of Sarande and Vlore. The KfW is also the lead agency in the water and wastewater sector where Albania has very significant investment needs.

According to the latest research data published by GIZ Albania, the coastal city of Himara can save up to 13,000 € in energy costs annually following an initial investment of 60,000 €.

The Ministry of Energy and Industry is responsible for the Laws and regulations in the sector of energy generation, supply and demand for the conventional and also for the renewable energy sources in Albania.

In 2015 the Albanian Parliament adopted a new Electricity Law compliant with the „Third Energy Package" recommended by the Energy Community. According to the EBRD evaluations, the importance of the law goes far beyond formal compliance with EU legislation, as it constitutes a decisive step forward on the long path of energy reforms in Albania, for which it lays a solid foundation.

Few of the most important Laws on Energy and Renewables in Albania:

- Law no. 9072/2003, "On electric energy sector", Official Journal no. 53/2003, (as amended);
- The Renewable Energy Law Law no. 138/2013 adopted in 2013 - Official Journal no. 83/2013 (commitment to improve the country's renewable energy sources (RES) regulation) the implementation of legislation still a challenge. The national Renewable Energy Action Plan under way;
- Regulation of Energy Regulatory Entity, "On the certification of renewable energy";
- Adaptation of the New Power Sector Law in compliance with the 3rd EU Energy Market package on 30 April 2015, shall also trigger amendments of the Renewable energy law.
- The Energy Efficiency Law in compliance with the EU Acquis is under revision;
- The First National Energy Efficiency Plan (NEEAP) adopted in 2011, and the second NEEAP is being prepared.

The key challenge in the sector in Albania is the development of a solid grid infrastructure and distribution and supply of energy, a reduction in losses and an enhanced role for private sector operators, improved country's electricity production which still is highly weather dependent. Albania still is not connected to any major gas supply network and does not have a proper national network either. The Trans-Adriatic Pipeline, which is expected to come online after 2020 and will pass through Albania, could be a game changer in that regard, by making Albania a key exit point for gas to Italy and the South Eastern European region. In addition, private companies have already shown interest in the Albanian market's potential. However, such project would need to be supported by a well-planned gasification strategy.

3.1.5. Legal framework of the Albanian government - relevant for this project

Introduction

The partner of this project in Albania and the main beneficiary of this study is the Ministry of Urban Development and Tourism - an institution established by the Decision no. 944, dated 09.10.2013, in support to Article 100 of the Constitution and paragraph 2 of Article 5 of Law no. 90/2012 "On the organization and functioning of the state administration", proposed by the Prime Minister. The institution designs and implements policies aimed at the modernization of the legal framework in the following areas:

- The issue of planning and urban development, land management and sustainable development of the territory control.
- The issue of housing.
- The issue of legalization and integration of areas and informal settlements.
- The issue of waste in relation to spatial planning.
- The issue of sustainable tourism development.

The Ministry of Urban Development and Tourism is responsible for the design and implementation of the legal framework, strategies and policies. There are a set of directives and by-laws associated with the Laws for Tourism of May 2007 and its strategy and national plan - setting standards, monitoring measures and regulations for the tourism sector. The decision body for major impacts with national interest has been identified to be the Council of Ministers, while other decisions are in the responsibility of the Ministry and Local Authorities. Each Local Authority has a local strategy and local implementation plan which derives from the national counterparts.

The Territory Development Directory is part of the National General Planning and its work has been focused on the realization of some of the initiatives in planning as Integrated Intersectional Plan of Tirana-Durres area and Integrated Intersectional Plan of the Coast that are being worked toward finalization.

The Document of General National Plan aims to define the vision through the development of the national development strategy, establishing relations between the goals and objectives of sustainable development.

The IIP coast is creating opportunities and conditions for the qualitative development of tourism, especially the elite tourism, providing opportunities to ensure high standards in the field of tourism and increase revenue through its own industry.

The IIP Tirana-Durres is investing in the creation of an important segment of the national economy and building a similar economic zone model across the country. It aims to implement an European economic model of national importance.

As a result of the experience created by the above projects and many other projects, this directory has the ability and experience needed to successfully meet the realization of the proposed projects.

Himare / Qeparo has also been identified as a „disadvantaged area“ (according to the list approved by Instruction No 3 of 10/02/2011 issued by the Ministry of agriculture, food and consumer protection). For these areas the Government has issued several programs to provide assistance to the Authorities.

Waste management

The Ministry of Environment, Forests and Water Administration is responsible for the legal and regulatory framework for waste management in Albania. It has the responsibility of drafting policies and legislation on waste management and the responsibility for inspections and control concerning the implementation of the law. Other collaborating authorities in this field are the Ministry of Public Works, Transport and Telecommunication, the Ministry of Health, the Ministry of Economy, Trade and Energy, and Ministry of Agriculture, Food and Consumer Protection. The National Waste Management Plan was compiled in consultation with key government stakeholders and the community sector waste industry. It was based on the results of extensive technical assistance projects. According to the published EBRD Strategy for Albania 2015 the Law on Integrated Waste Management has been amended in October 2013 but the law is not fully in line with the EU acquis. However, the Bank aims to extend its engagement in municipal and environmental infrastructure potentially to water, wastewater and solid waste to help improve the infrastructure in country.

The Waste Management in the Republic of Albania is primarily based on the following laws:

- Law no. 8094 dated 21.03.1996 "On public disposal of waste" (the „Waste Disposal Law");

- Law 10 463 dated 22.09.2011 "On integrated waste management", as amended (the "Waste Management Law“), which transposes the Waste Framework Directive (2008/98/EC).
- Law No. 10440/2011 “On the environmental impact assessment”, Official Journal no. 101/2011;
- Law no. 10448/2011 “On environmental protection”, Official Journal no. 89/2011, (as amended by Law no. 31/2013);
- DCM no. 99/2005, “On the approval of the Albanian catalogue of waste classification”, Official Journal no. 15/2005, (as amended by DCM no. 579/2014).

Several other legal acts have been drafted during the last years, which fully transpose appropriate EU Directives and are planned to be approved by the government in due time, as a legal package.

According to the legislation, municipalities and communities are responsible for the organization, management and supervision of waste management within the perimeter of their administrative territory. In cases, where waste management activities are carried out by private sector operators, municipalities/communities retain control and supervision of implementation of the terms and conditions of the service agreement for provision of such services.

Albanian law follows the "polluter pays principle” for costs related to waste management. In particular, costs should be borne by the original waste producer. Following disposal, waste becomes public property (i.e. property of the municipality in case of Himare).

The Municipalities and Communes are fully responsible for the waste management tax system, including determining the types and levels of the tax, and rules of collection and administration. While the guidance and rule taxes for Waste Management has been specified by Law No. 9632 dated 30.10.2006 "On Local Taxes" Chapter VII, Article 35 and Law No. 8652 dated 31.07.2000 "On the organization and functioning of local government".

The Government of the Republic of Albania initiated in 2016 the establishment of an Integrated Solid Waste Management (ISWM) Project in the region of Vlora (local authority responsibility for Himare/Qeparo. The distance between Vlore and Himare/Qeparo is about 80 km) based on the National Waste Strategy, the National Waste Management Plan and a Feasibility Study carried out in 2014/2015. The project included as investment measures:

- a new regional sanitary landfill,
- a sorting plant for mostly pre-sorted recyclables,
- a composting plant for pre-sorted organic waste,
- collection and transport equipment for municipal solid waste,
- and the closure and rehabilitation of major existing dump sites.

The implementation of the Project will be supported by consultancy services in two areas. An Implementation Consultant (IC) will support the Authorities in planning, tendering and supervising the construction of the new sanitary landfill, the adjoining facilities and the closure of the existing dump sites including the provision of mobile equipment for collection and transport, the equipment for operating the landfill, as well as in general project implementation tasks. In addition, an Institutional Consultant, will support the Vlora and Selenica municipalities in the areas of organisational and institutional development, financial management, public relation and the implementation of pilot projects inter alia for separation at source for recyclables and organic waste.

Water and waste water

The Ministry of Agriculture, Rural Development and Water Administration (MARDWA) is responsible for Laws, policies and regulations for Water Management in Albania. The most important Law and regulations has been adopted in 2011 as below. The focus of this law includes socially acceptable tariffs, the licensing of all service providers, and performance reviews of the service providers based on reliable operations data. Several key elements of EU Water Framework Directive are part of the strategy, such as the obligation to provide a comprehensive supply and the cost recovery principle.

According to the Albania Progress Report published by the European Commission (EC) in October 2014, there are only five functioning wastewater treatment plants in Albania, with two others under construction and three wastewater treatment plants completed but not commissioned. Waste management is another area of concern.

Few of the most important Laws and regulations on Water & Waste Water:

- Law no. 111/2012, “On integrated management of water resources”, Official Journal 157/2012. The law came into force in 2013;
- The national IWRM Strategy representing a legal obligation pursuant to Law No. 111/2012 (15.11.2012) “On Integrated Water Management”;
- 14. DCM no. 267 of 7.05.2014 “On the adoption of the priority substances in the aquatic environments”, Official Journal 71/2014;
- 15. DCM no. 246 of 30.04.2014 “On the establishment of environmental quality standards for surface waters”, Official Journal 65/2014;
- Law no. 9115/2003, “For the environmental treatment of polluted waters”, Official Journal no. 78/2003, (as amended by Law no. 10448/2011; Law no. 34/2013);
- DCM no. 480/2012, “On protection of the national emergency plan on reaction to sea pollution in the Republic of Albania”, Official Journal 113/2012;
- 15. Law 8905/2002 “On protection of sea water environment from pollution and damage” OJ 29/202 (amended 10137/2009; 30/2013).

The latest ex-ante evaluation has been focused on the extent to which the Rural Development component of the Instrument for Pre-Accession Assistance (IPARD II) 2014-2020 in the Republic of Albania reflects in particular the priorities and overall country strategy and has been financially supported by the EU to review and re-shape the Agriculture and Rural Development Strategy 2014-2020.

In 2015 and 2016 there were 39 on-going projects in the Integrated Water Resource Management Strategy (IWRM) sector with a total value of about EUR 534 million, out of which EUR 149 million are grants, and about EUR 385 million are loans provided by the EU and bilateral Financial Cooperation with other countries, e.g. European Union, the World Bank and GIZ, Sida, KfW, ADA, USAID.

The specified budget for the IWRM based on the budget programs for the 2015-2018 period would approximately be up to ALL 69 billion (499 million €). On average, 85% of this budget will be required for infrastructure-related projects in water supply, drainage and irrigation systems in the next years.

Public procurement, public private partnerships, others

In general it is to be mentioned that Albania has adopted in 2013 the Private Public Partnership Law Nr.125/2013 “On concessions and public private partnerships”, accompanied by the Council of Ministers Decision Nr. 575 and the Public Procurement Law Nr. 9643/2013. According to these Laws, the contracting authority for local concessions is the relevant local government unit responsible for the activity being subject of concession. The law explicitly provides regulations and parameters for concessions and public private partnerships in waste management sector, including waste collection, treatment, transfer and disposal. These procedures have been in alignment with the EC Directive 2004/18/EC.

Other important laws in context of waste, water, energy:

- Law no. 9587/2006 “On protection of biodiversity”, OJ 84/2006 (as amended by Law no. 37/2013; Law no. 68/2014);
- Law no. 9244/2004 “On the protection of the agricultural land”, Official Journal no. 49/2004, (as amended by Law no. 69/2013, Law no. 131/2014);
- Law 8752 dated 26.03.2001 “On establishment and functioning of the structures for protection of agricultural land”, Official Journal no. 14/2001, (as amended by Law no. 9244/2004; Law no. 10257/2010; Law no. 16/2012; Law no. 130/2014);
- Law no. 9734/2007, “On tourism”, Official Journal no. 63/2007, (amended by Law no. 9930/2008; Law no. 76/2013);
- Law no. 9048/2003 "On the cultural heritage”, Official Journal no. 33/2003, (as amended by Law no. 9592/2006; Law no. 9882/2008; Law no. 10137/2009; Law no. 77/2013);
- Action Plan of the Ministry of Tourism “On the Strategy for Tourism 2014-2020”;
- Law no. 9376/2005, “On sports”, Official Journal no. 36/2005 (amended by Law no. 9816/2007; Law no. 9963/2008).

3.2. Energy demand in local context

3.2.1. Energy demand for buildings

The village Qeparo in the municipality of Himare is chosen as one example for a development towards an eco-village. Qeparo is situated on the coastal line in Southern Albania. The whole village Qeparo is divided into three major parts, one historical village on top of the hill a few km inland. A newer section of the village stretches along the main road. The third part, which is the designated project area, lies directly on the beachfront.

According to the infrastructural development programme of the municipality (Himare 2016), areas are assigned to specific functions (see figure 3-3). One area according to the plan is clearly marked for tourism development (T1). Existing houses are assigned with A 2.2 in the figure 3-3. According to a masterplan project for tourism in Qeparo these houses resp. this area should be used as bed&breakfast destination. Few of the houses are already engaged in tourism activities. Therefore this part of Qeparo is chosen as an example for transforming a destination into an eco-village for tourism.

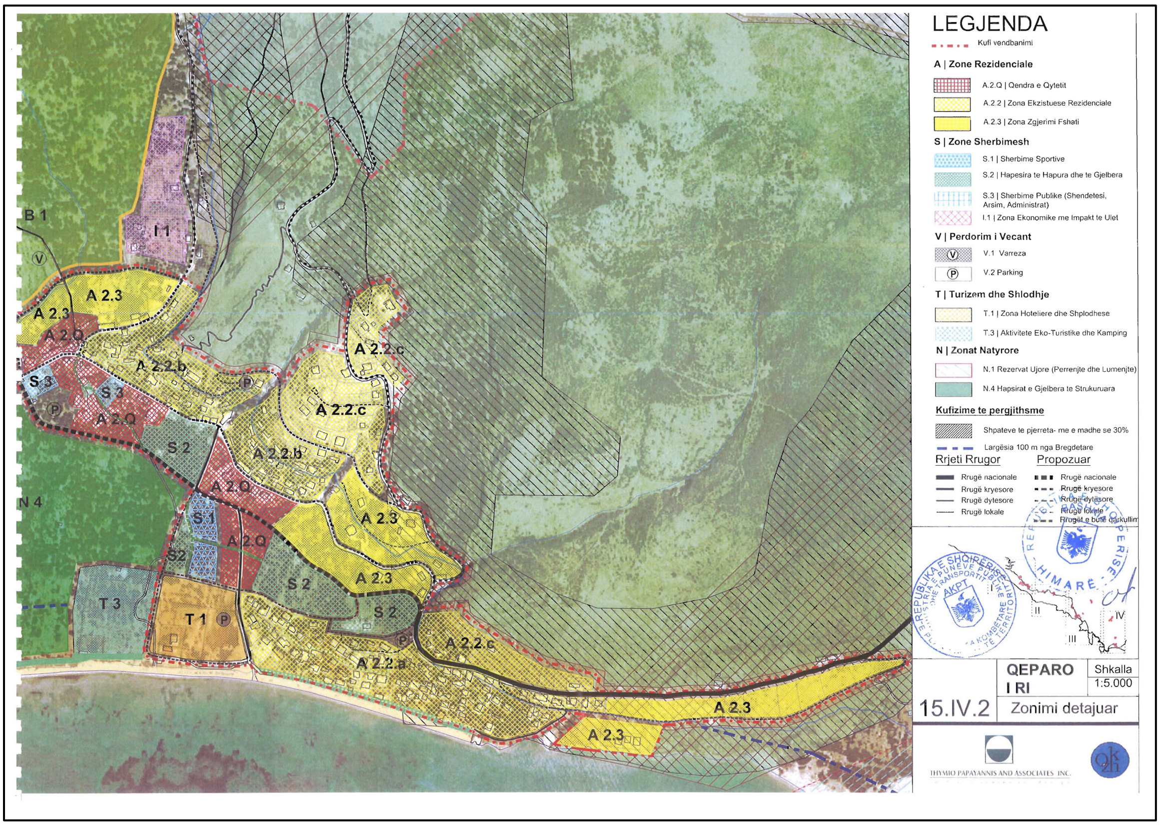

Figure 3-3: Planning areas for Qeparo (Himare 2017-2)

During the process of the masterplan exercise mainly architectural questions were raised and possible solution offered (Banesa 2016). The buildings in that area are erected without a real planning process. The appearance is dominated in majority by standardized concrete buildings of mainly tow storeys with balconies and flat roofs. The figure 3-4 shows an example of the building setup.

The idea behind the masterplan is to refurbish the buildings to get a more “classical” look. Elements are the construction of roofs with historical formatted tiles and classical colour.

Another element is the installation of “Italian” louvers in front of the windows. Also the balcony situation should be changed. Actually the buildings have balconies in front of the houses with very different design features. These are planned to demolish and get even house frontages.

Figure 3-4: Two buildings as example for Qeparo village with present situation (Siemers 2016)

An area mostly identical to the plan area from above explanations is chosen as the pilot area for a development process (figure 3-5).

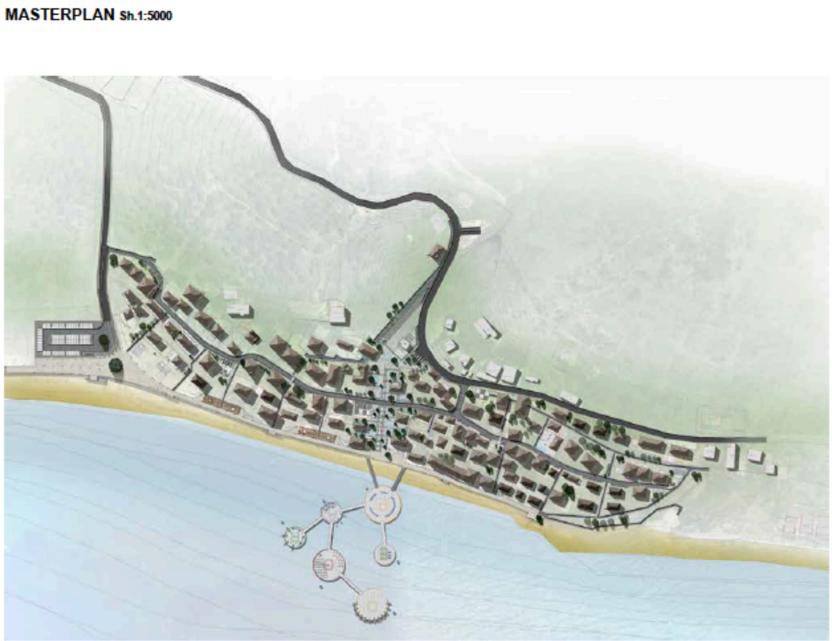

Figure 3-5: Masterplan for development in Qeparo (RAB 2014)

According to the planning process (see figure 3-6) and the rehabilitation programme (see reference Banesa 2016) the area under evaluation consists of a total of some 80 buildings all of which are grouped into different zones (A to D in the figure). This would be called the pilot area in future. Every zone contains some 20 houses, which are separated into houses facing the sea and the others on the backside of the small hilly area. These altogether 8 zones with an average of 10 houses would be called blocks in the future and describe a possible neighbourhood of these buildings and the possible common utilization of infrastructure.

Figure 3-6: pilot area grouped into four zones (RAB 2014)

For these existing buildings, which are under a renovation programme, the energy demand and the occupancy with tourists is estimated. The model house looks like figure 3-7.

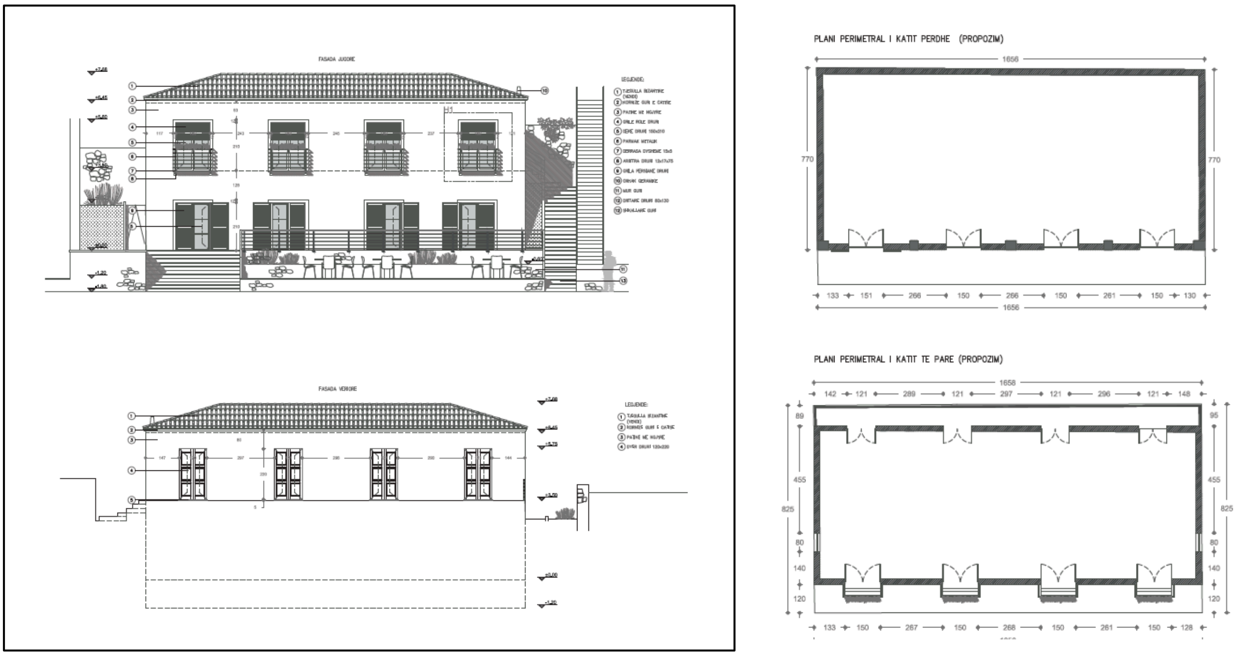

Figure 3-7: Model house sketch and floor plan (RAB 2014)

For the first evaluation, a model building is defined, which consists of a two-storey building with roughly 240 m^2 of usable area. It is estimated, that on the top floor 4 rooms are possible and in the basement two larger rooms can be used for tourism. According to statistics, the average occupancy per room is near to 2,6 persons (Hemeling 2017) or 15.6 persons in all for the whole building.

The peak season in Himare/Qeparo lasts only for 2 months in July and August. During this time the occupancy rate reaches 80% or for the model building or in numbers: 12.5 persons. During the winter season (5 months) fewer tourists are present. The average occupancy rate reduces to 13% only. A transition period for another five months (April to June and September to October) may bring occupancy of 35% on average (information from booking analysis). With this background the number of person-days per month is calculated, which forms the base of subsequent estimations on energy demand and on waste/wastewater generation in the project area. The result is displayed in figure 3-8.

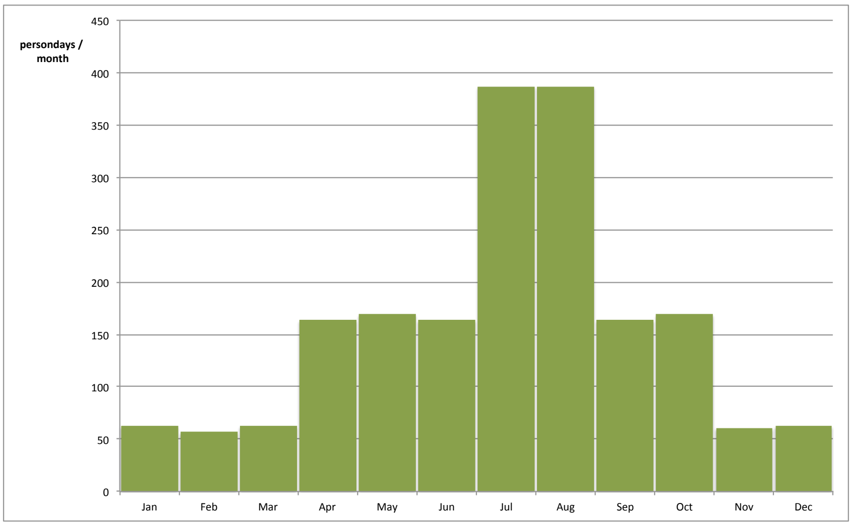

Figure 3-8: Occupancy in person days per month for the pilot area

A simulation programme (TRNSYS) is used to calculate the energy demand of the building. For the base case the building is taken as it is described in the masterplan report (RAB 2014). The walls are made of 25 cm blocks (brick and concrete) without further insulation, windows are double glazed, the roof has a small layer of mineral wool under the wooden roof structure. The basement area at the back of the building is covered by soil. Orientation of the building and the main façade is towards south-west (taken from the graphs with 160°). This is valid for the row of houses on the beachfront. For the other houses on the backside of the small hill the orientation is the other way round.

During the calculation and simulation the ground floor and first floor are calculated separately. Also it is distinguished between heating and cooling according to the specific season. The results are shown in the table.

Table 3-1: Result of simulation exercise, base case

	Ground Floor		First floor		Total building	
	Heating, kWh	Cooling, kWh	Heating, kWh	Cooling, kWh	Heating, kWh	Cooling, kWh
Base case	6,551	1,951	7,458	2,604	14,010	4,555 13,800

Weather data have been taken from Italy, Brindisi, as the simulation programme did not offer Albanian data. According to table 3-1 the model building would demand a total of 14,000 kWh in heat and another 4,555 kWh in cooling. It is not included at this moment, which technology is used for fulfilling the energy needs. In terms of total energy demand, the heating effort is higher compared to the cooling demand. The first floor needs more heating and cooling, because the building is not insulated and the first floor is more exposed to ambient air.

These energy demands are calculated for the whole building and are based on moderate temperature levels, i.e. room temperatures of 25°C for cooling and 20°C for heating. In case of a desired comfort temperature of 20°C for the cooling period, the demand for cooling rises to 13,800 kWh, roughly triple compared to the base case. In the further calculation the weighted average between cooling at 25°C and cooling at 20°C is taken as the reference. The occupancy rate has to be considered in the further analysis, as during times without occupancy neither cooling nor heating is needed. This will be done later.

Of interest is the breakdown between heating and cooling resp. the seasonal variation of energy demand. This result is shown in table 3-2. Here we can see, that during the summer season (peak tourist) only cooling is needed. In the transition period heating and cooling are similar to each other. Most probably there is cooling during the day and heating during the night. The principal difference between the two storeys is also obvious on the seasonal view.

Table 3-2: Heating and cooling according to tourist season (cooling for 25°C)

	Ground Floor		First floor		Total building	
	Heating, kWh	Cooling, kWh	Heating, kWh	Cooling, kWh	Heating, kWh	Cooling, kWh
Winter	5,893	0	6,670	0	12,563	0
Transition	660	502	790	809	1,450	1,312
Summer	0	1,449	0	1,795	0	3,244

3.2.2. Energy demand for tourism activities

Above results are now combined with the model of occupancy. For the peak season the final number comes to 774 person-days per unit of the individual model building. In the transition period the number is 830 person-days (but for 5 months in comparison to 2 months only in peak season) and during winter it is 306 person-days. The rates combined with energy demand give following results for the whole building:

- 4,028 kWh heating and 7,087 kWh cooling.

One block is defined as 10 of the standard buildings. The block then demands 40,276 kWh heating and 70,870 kWh cooling. The whole pilot area based on 80 individual buildings would consume an amount of 322,210 kWh heat and 566,963 kWh cooling.

As an indication rated capacities for the net energy demands can be calculated (based on 1,000 full load hours for example). These are for the bock and the pilot area as follows:

- block: 40 kW heating and 71 kW cooling
- pilot area: 322 kW heating and 567 kW cooling.

Above figures do indicate only the sizing of possible generation technologies. The specific technology will define the actual capacities of the equipment, once it is chosen and commissioned.

3.2.3. Energy demand for water heating

Besides heating and cooling of the rooms the next important energy demand in buildings is for hot water production and utilisation. Based on the total water demand projections (next chapter) it is estimated, that 30% of the total water consumption would be for hot water utilisation. The standard unit then would consume in total 133 m^3 of hot water. This represents in net energy terms an energy volume of 6,187 kWh. For the block of 10 housing units this would be 61,870100 kWh and for the whole village some 494,963 kWh per year.

In comparison to chapter 3.2.2. it is seen, that hot water demand is slightly higher than the heating demand under consideration of the occupancy reduction factors.

In the absence of centrally serviced natural gas networks or petroleum based heating systems, hot water would be traditionally produced with electrical boilers. Alternatively solar collectors may be installed. In this situation solar collectors are ideal, as the highest demand occurs during the summer period, where also the highest production is possible.

Table 3-3: Estimation of hot water demand, per building unit

Season	Occupation, P*days	Demand, L / p*day	Demand m^3	Demand m^3/month	Energy demand, kWh/month	Period months
Winter	306	45	14	3	128	5
Transition	830	60	50	10	463	5
Summer	774	90	70	35	1,617	2
Total per unit, per year			133 m^3		6,187 kWh	

3.2.4. Total energy demand

The three major energy demands are identified with heating, cooling and hot water production. In addition, lighting and other uses of electricity (cooking, fridge, ironing etc.) have to be considered. Also for this demand an estimation is made. According to table 3-4- the results are summarized as follows.

Table 3-4: Total energy demand, per building unit

Season	Heating net, kWh	Cooling net, kWh	Hot water net, kWh	Lighting, kWh	Cooking, misc., kWh
Winter	3,266	0	640	750	1,000
Transition	761	1,378	2,313	750	1,250
Summer	0	5,709	3,234	300	600
Total per unit, per year	4,028	7,087	6,187	1,800	2,850

The above figures are net demands. In the next step this net demand has to be translated into primary energy input. For lighting and cooking/misc. the input energy is still electricity. Thus a factor of 1 is applied. Also heating and hot water in this base case is provided by electrical energy, where we assume a conversion efficiency of 90%. This means, that the net energy demand from above is slightly increased. In the case of cooling an ordinary AC unit is assumed. This can convert electricity into cooling with an efficiency of 250% on average during the operational time (COP of 2.5). As a consequence the primary energy consumption (as electricity) for cooling is reduced. All energy demands taken together result in a yearly consumption of electricity of 18,834 kWh. In this base case electricity is the only energy source.

Table 3-5: Total energy demand in base case, per building unit

	Heating, kWh	Cooling, kWh	Hot water, kWh	Lighting, kWh	Cooking, misc. , kWh
Conversion factor	0.9	2.5	0.9	1.0	1.0
Winter	3,629	0	711	750	1,000
Transition	846	551	2,570	750	1,250
Summer	0	2,284	3,594	300	600
Total per unit, per year	4,475	2,835	6,874	1,800	2,850

The figures in table 3-5 form the base for further evaluation in the next chapters, where different technologies are applied and saving potentials are calculated.

3.3. Infrastructure in the context of local conditions

3.3.1. Waste management

One study for the region of Himare (Studim 2012) estimates the solid waste generation per different zones under a characteristic context. For the normal local inhabitant a figure of 0,93 kg waste per capita and year is considered. Tourists are estimated with 1,5 kg/cap/day. A distinction is made between long-stay tourists (10 days and more) and day-tourists, students groups and other short-stay tourists. The estimation comes up with the following waste volumes per year for the community of Himare.

Table 3-6: Waste generated by different zones, Himare

Number	Group	Tons per year	Qeparo thereof, t/a
1	Inhabitants	4,189	n.a.
2	Tourists in zones	500	n.a.
3	Small businesses	443	37
4	Seasonal businesses	204	24
5	Industrial and institutional	60	n.a.
	Total solid waste	5,396	

Increase in population, tourists and more businesses will project a growth of waste generation in the near future. Waste from tourist will double as well as waste from seasonal businesses. On the long run waste from local population would decrease. Finally, the projected figure for the future ends up with 4,946 tons per year.

Household waste is collected by the local authorities and transported to landfill sites. In most cases the landfill sites are sub-standard. The transport is organised by automated waste vehicles. They take up standard 1,100 L containers at collection points.

In the vicinity of Himare exists a waste transfer station. It was designed and built to enable transfer from small collection vehicles onto larger lorries for transport to the engineered landfill in the town of Bajkaj (at road distance 80 km from Himare). However, the transfer station seems to be not in function. The landfill is designed for 100,000 inhabitants and has an initial capacity of 800,000 m^3. First installation would last for 9 years, an extension of the site can bring another 17 years of planned operation. Actual intake consists 25 tons per day. Disposal costs are 15 USD per ton (Dedej 2012).

Table 3-7: Statistics for solid waste, Himare 2016, transport to landfill (Himare 2017)

Month	Tons of waste
February	67,35
March	68,86
April	88,26
May	125,67
June	239,83
July	
August	957,86

From table 3-7 it can be seen, that there is a strong seasonal influence. In the high tourist season waste volume is nearly 15 times higher compared to the wintertime. Also the increase of waste volume is obvious during the transition period. No separation or recycling of municipal waste occurs.

Waste generation is bound to the number of persons in the building. As there is a strong difference between the winter and the peak tourist period in summer, a model for occupation is developed, as described before. During the winter period only 2 persons are permanently in the model building. As they represent the local population, the waste generation reflects the average for Albania, which is 0.9 kg waste per day and person. During the transition period weekend visitors are coming or some rooms are rented out to long-staying tourists. Also the specific waste generation increases to 1.2 kg per person and day. The tourist season of only 2 months sees a high occupancy and an increase of the waste generation towards 2.1 kg per person and day.

In the table 3-8 below the abovementioned facts are summarized for the standard unit. The total volume of waste reaches 2,896 kg for one unit. The block produces 29 tons per year and the whole pilot area under consideration comes up to 232 t of waste per year.

Table 3-8: Waste generation in the tourist zone

	Occupation, p*days	Period months	Waste generation, kg/p*day	Waste total kg	Waste generation, kg/month
Winter	306	5	0.9	276	55
Transition	830	5	1.2	996	199
Summer	774	2	2.1	1,625	812
Total per unit				2,896	
Total per block				28,964	
Total pilot area				231,712	

Next interesting question is the composition of waste. Because there is no separation at source or recycling, the waste comprises of organics, plastics and all other components. Based on the composition of regular Albanian waste (see also chapter 4), an ideal model waste is designed and calculated. The influence of tourism on the waste composition is also estimated. Besides the volume change also the composition changes slightly with more paper and plastics and eventually less organics for the tourist influence. The figure 3-9 shows the different main waste components such as organics, paper, plastics, glass, metal and others summed up for the standard unit in year. In Figure 3-9 the different seasons of winter, transition and tourist are presented as well

Biggest portion during all seasons is the organic fraction. These component includes all kitchen waste, vegetable and fruit peelings and left over food etc. Especially in the summer period due to the tourist influence the absolute numbers for paper, plastics and glass/metal increases substantially. The latter components should be recycled as much as possible.

For the organic fraction biogas production may be an option. The yearly production reaches 87.8 tons for the whole pilot area. Based on a biogas rate of 150 m^3 biogas per t of organic waste, the yearly production would be in a range of 13,000 m^3 of biogas. The potential assessment will be analysed more deeply in following chapters.

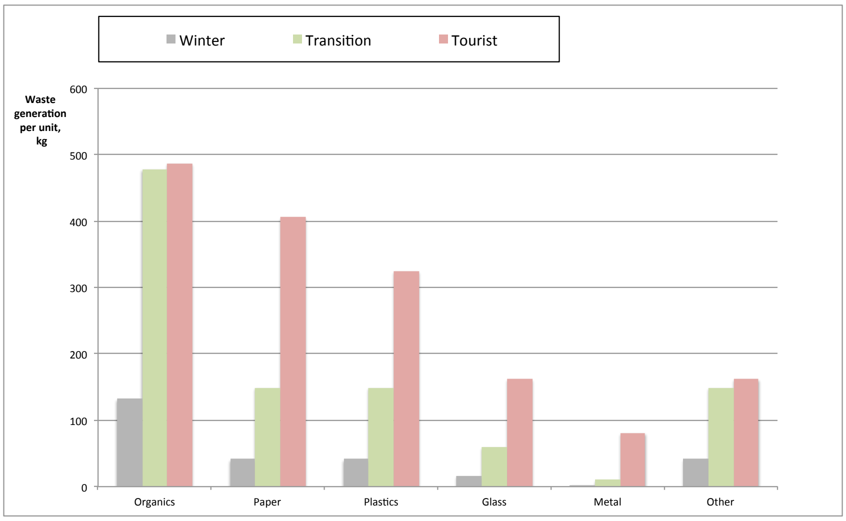

Figure 3-9: Waste composition in absolute figures

3.3.2. Wastewater management

Living of humans consumes fresh water for direct consumption, cooking, shower, washing and toilet operations. In the final end most of the consumed water ends up as wastewater. For the overview the freshwater demand in a building would be similar to the wastewater generation.

The buildings at Qeparo rely on septic tanks for wastewater collection and disposal. This means, the individual building has an underground tank on the premises into which all wastewater is directed. Once the tank is filled up or on a regular base, a service provider is called to empty the tank with a special vehicle. Then the contents of the septic tank are transported towards a central wastewater treatment plant. The reality looks different according to the discussions with different people. In the vicinity of Qeparo and also of Himare there is no functioning wastewater treatment plant in operation. To where the tankers empty their load is unknown. In most cases it would be supplied to agricultural land. In other cases it might be disposed off towards a river or the sea.

The beachfront side at Himare offers a central waste water sewer system, i.e. the buildings are connected to an underground wastewater canal. However, the collected wastewater is pumped into a neighbouring bay and from there released to the sea.

Due to the geological setup in the village (on rock formation) it is also possible, that overflow of the individual septic tanks would disappear into the grounds on the individual premises. For a small local village the situation may be tolerable as only light contaminated wastewater is released. During the peak tourist season, wastewater generation would increase sharply and cause foreseeable problems.

Following the similar approach as for waste generation, we can estimate the wastewater volumes for the three distinguished seasons. During the tourist peak the specific water demand is highest as comfort and weather conditions would increase the demand. For the winter period only 50% of the peak demand is assessed. The calculation according to table 3-9 leads to an amount of 444 m^3 of wastewater per unit per year. For the block the figure increases to 4,440 m^3 and for the whole pilot area it is 35,524 m^3 of waste water.

Table 3-9: Wastewater generation

	Occupation, p*days	Period months	Water demand, L/p*day	Wastewater m^3	Wastewater, m^3/month
Winter	306	5	150	46	9
Transition	830	5	200	166	24
Summer	774	2	300	232	108
Total per unit				444	
Total per block				4,440	
Total pilot area				35,524	

This volume from the proposed eco-village alone is small in comparison to capacities of existing community waste water treatment plants. Either the waste water is transported to a central plant or small decentralised approaches can be considered. Latter would be done in the next chapter.

3.3.3. Identification of problems

The identified problems out of the analysis in this chapter can be summarized as follows:

- in the energy sector
    - no application of renewable energy on site
    - high demand for heating and cooling
    - limited presence of solar thermal collectors
- in the waste sector
    - no recycling of waste
    - landfill in limited operation
    - waste management suboptimal
- in the wastewater sector
    - no central wastewater treatment
    - final destination of wastewater unclear
    - operation of septic tanks questionable.

3.4. Socioeconomic factors in local context

Introduction into key facts and economic data of the „Eco Village Himare Qeparo“

Given to the data received from the Municipality of Himare the tourism counts for more than 23% of the GDP in the whole region. The other important areas of the GDP accumulation are agriculture, ranching, fishing, construction and tourism related services. The cultivated agriculture land has a size of 280 ha in Qeparo.

The object and scope of this pilot project are the bed & breakfast (B&B) villas of Qeparo, which is one of most attractive and expensive tourism sites of Albania - e.g. the market price for land in Qepero is 120,00 €/m^2 compared to the very same located land at a price of 50 - 80 €/m^2 in Durres (the largest tourism site of Albania next to the capital Tirane). The same applies to hotel prices, which may rise twice as high as in Durres or Shkoder (other tourism areas of Albania). One of the reason leading to that situation is the strict strategy of the national and local authorities not to allow „mass tourism“ expanding into this region, in turn leading to much lesser multi-floor high buildings and honoring the culture and typical landscape of the region. The landsite has been kept quite „virgin“ and mostly used as valley for olive, mandarin, lemon and other fruits and forest, inviting people for hiking, cycling, walking and other outdoor actives as well as relaxing and enjoying the nature and culture, as stated above. The flip side of this strategy is the relatively low number of tourists and in turn the lesser profits of the tourism entrepreneurs who cannot invest much to improve the tourism. That explains also the need for this project and finance means through international and national donors in order to stimulate the transformation into ecological tourism.

The Municipality of Himare counts for Qeparo about 2.000 tourists year-to-year and the projections show an increase in the next years of 25% while the increase in inhabitant is somehow at 4,8%. In addition to that there are about 12 small business and 19 mid-sized businesses located in Qeparo, which mainly offers food, beverages and serves for residents, tourists and “passing-through-tourists“. Most of the tourists visiting Qeparo are coming from Albania but also abroad - e.g. via Greece, from Kosovo, Montenegro, Italy, etc. The majority of the tourists are mostly families or couples seeking higher quality tourism „casted away“. That is also one of the reasons why Qeparo has great potential to transform itself into an „ecological tourism“. The tourists targeting Qeparo are seeking this kind of tourism and most of them can afford higher prices if they get higher quality of life and pay a contribution to climate and culture protection.

The inflation rate in Qeparo has been calculated with 3,5% for the upcoming years, while the price increase in fuel (e.g. for vehicles and energy supply) has increased above 0,95 €/L in 2014/2015, which is an increase of +67%, within 5 years and the price for energy increased at a level of 12% at about 11-12,65 ALL/kWh (8 €ct - 9 €ct/kWh) in 2015/2016. The water supply for drinking water increased at a level of 18% from 38,2 ALL/m^3 (0,28 €/m^3) to 45,1 ALL/m^3 (0,33 €/m^3) in 2015 and for wastewater at a level of 50-56 ALL/m^3 (0,37-0,42 €/m^3). Another exponential increase of +40% has been identified in the labor costs 2014/2015 projecting further increases in the future as tourism is going to improve. This is displayed in the figure 3-10 on the next page.

Considering these and other facts identified during the study we come up with the conclusion that for Qeparo it will be important to deal with the issues below:

- Conceptualizing an effective treatment / re-use of waste and waste water solution for heating and cooling the villas as well as in the eco-system of the village - as it grows and transform itself;

- Identifying adaptive state-of-the-art technology solutions for combining waste-water-renewable energy sources in the eco-system of the village - as it grows and transform itself;
- Drafting one ecological and economical sustainable solution for eco-village incl. the mentioned above and the energy efficiency program of the Albanian authorities for the facades of the B&B villas.

Price development in Euro & percentage	2014	2015	2017 - 2025
Fuel (l)		0,95 €	
Price development in percentage		*+67 % (2012)*	
Electricity (kW)	0,07 €	0,08 €	
Price development in percentage		*+12%*	
Water (m³)	0,28 €	0,33 €	
Price development in percentage		*+18%*	
Waste Water (m³)	0,30 €	0,40 €	
Price development in percentage		*+20%*	
Waste Fee (B&B villa/year)	115,00 €	115,00 €	
Price development in percentage		*0 %*	
Others			

Source: Albanian National Agencies for Energy, „Studimi Himare Nov. 2012, Water and INSTAT Rep
Analysis and Grid contributed by Goduni International 2017;

Important note: Estimated inflation rate 3,5% year-to-year by the local Authorities;
The „waste fee“ for b&b hotels in Himare data hasn´t been published officially yet,
the data considered in this grid has been calculated based on national policy „hotel data“
and on the interviews conducted in Dec 2016 in Qipario.

Table 3-10: Price development for energy, water, waste water and solid waste

Breakdown of the economic data of B&B villas of Qeparo

About 80 B&B villas have been identified in Qeparo during this study, which are subject to this project. Each of the B&B villa has an average of 6 units / flats that can accommodate 2-3 persons per day (2,6 person / unit in average). The owners of the B&B villas are all private entrepreneurs / family run villas providing breakfast and valet services for their guests. The average stay of guests has been stated with 2-3 weeks in the summer season and 1-2 weeks in the „off-season“ (spring and autumn). The occupancy in of the villas in the summer season is about 85-100 % (average 80%) and in the off-season between 20-50% (average 35%). In the winter season (5 months) some of the villas are completely closed and some open keeping 1-2 units/flats prepared for guests (average 13%).

The prices vary due to season and occupancy level in summer between 35-65 €/unit/night (an average of 50 €), in off-season between 25-35 €/unit/nigh (an average of 30 €) and in the winter season 18-25 €/unit/night (an average of 22 €).

4. Actual developments and state-of-the-art for sustainable tourism[1]

4.1. Economic development and benefits of tourism

Over the decades, tourism has experienced continued growth and deepening diversification to become one of the fastest growing economic sectors in the world. Modern tourism is closely linked to development and encompasses a growing number of new destinations. These dynamics have turned tourism into a key driver for socio-economic progress.

Tourism has become one of the major players in international commerce, and represents at the same time one of the main income sources for many developing countries, especially in the Mediterranean region. This global spread of tourism has produced economic and employment benefits in many related sectors - from construction to agriculture or telecommunications. The contribution of tourism to economic well-being depends on the quality and the revenues of the tourism offer, leading to an increasing diversification and competition among destinations.

In order to secure a long-term benefit for the locals, the environment and the economy, destinations need to focus on a sustainable development of their tourism product and services. Sustainable tourism is a "tourism which is economically viable but does not destroy the resources on which the future of tourism will depend, notably the physical environment and the social fabric of the host community" (Swarbrooke 1999). Therefore, authorities must control the influence of the tourism development from an ecological, economical and social perspective.

In tourism, the hospitality sector such as hotels, resorts and other types of accommodation, plays a significant role with regard to the local sustainable development (Buhdanowiocz 2005). While the airline sector is generally the most important emitter of CO_2 and thus has a large impact on international climate change, hotels influence destinations mainly on a local level, such as production of waste, use of fossil energy and use of fresh water as well as production of waste water, mostly in water sensitive areas. For a developing destination like Albania, with a growing hotel and accommodation sector, it is imperative to continuously focus on the local impact of their hospitality industry, notably waste management, water management and energy consumption (TUI 2011).

The following sections will provide the reader with the current issues in these three areas, the impact and solutions for hotels but also the role of the guests with regard to waste, water and energy consumption. Best-case examples and industry standards will be presented on how to improve the hospitality sector for a more sustainable management and what could be done to change the behaviour of guests while on holiday.

[1] Chapter 4.1 and 4.2 were drafted and content supported by Prof. Dr. Harald Zeiss, Geschäftsführer, Institut für nachhaltigen Tourismus GmbH, Friedrichstrasse 57-59, 38855 Wernigerode

4.2. Sustainable development in the hospitality industry

4.2.1. Energy consumption

Problems and key issues with energy management in hotels

The hotel industry is not only one of the major consumers of water, but also of energy. With rising electricity prices per kWh and growing pressure to cut carbon emissions, saving energy has never been higher on an hotelier's priority list.

Reducing energy costs can directly increase revenue without the need to increase sales. Energy saving has also been considered one of the most significant areas of environmental management in the hotel industry because hotels in general consume considerable amount of electricity and fossil fuel energy in various operational areas.

Hotel operations require the use of energy on a daily basis for 24 hours, most of the time irrespective of seasonality, number of guests and location. Energy is required to maintain the tools, which are used to carry out the functions efficiently and to maintain the flow – and satisfaction - of guests.

Today, energy reduction is major component of transforming or building a property to be recognized as a sustainable building. Support tools and programs to assist hotels in reducing energy load have been introduced over the past few years as energy management become increasingly important for hotels due to a rising number of electricity appliances in rooms, kitchen and guest areas such as WiFi spots, TVs, Bluetooth speakers, iPads and coffee machines.

In addition to financial benefits, there are social and environmental advantages in reducing energy consumption, for instance, minimizing the release of emissions such as CO_2 into the atmosphere, which contributes to air pollution and global warming. These harmful gases emitted by hotels due to the consumption of different fossil energy sources is estimated to be between 160 and 200 kg of CO_2 per m^2 of room floor area, depending on the type of fuel used.

Increasing awareness about these issues has seen customers and guests becoming more discerning about the environmental credentials of the businesses they deal with. Therefore, being energy efficient can enhance a hotel's reputation and help to attract more customers.

Energy consumption: Guest expectations and behaviours

The main energy consuming activities in a hotel are heating and cooling of rooms (heating, ventilation, air conditioning or HVAC), hot water production, electric lighting, cooking and spas and/or swimming pools (see figure 4-1).

HVAC space conditioning is the largest single end-user of energy in hotels, accounting for approximately half of the total consumption. It is thus widely recognized that outdoor weather conditions and floor areas are among the main factors affecting energy use in hotels. The indoor temperature levels also greatly influence the quantity of energy consumed in a building.

Water heating is commonly the second largest user, accounting for up to 15 per cent of the total energy demand, depending on the geographical position of the hotel. The higher the average outside temperature, the higher the percentage of energy used for cooling and the lower the water heating expenditure, and vice-versa.

Lighting can fluctuate between 12 to 18% and up to 40% of a hotel's total energy consumption, depending on the category of the establishment. Services such as catering and laundry also account for a considerable share of energy consumption, particularly considering that they are commonly the least energy-efficient. Sports and health facilities can be high-energy consumers, again depending on the installations used.

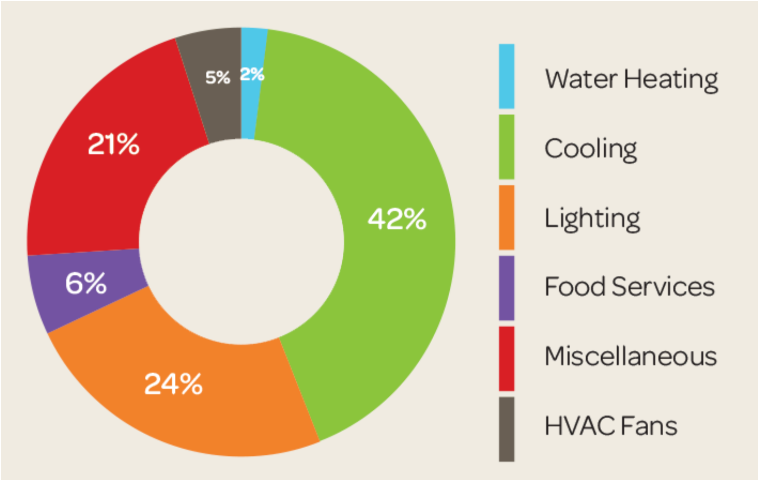

Figure 4-1: Typical electricity use for hotels (HPAC)

Best practices and solutions for energy management in hotels

Within the hospitality sector, an establishment can typically achieve a 20% reduction in energy use by implementing some easy, but efficient measures. To begin with, it is recommended to identify the major areas of energy consumption and to also do an energy monitoring for at least a month in order to obtain a base figure against which energy efficiency improvements can be measured.

An energy survey will help to visualize the utility usage versus weather and occupancy in a graph. As described in the water section, an industry benchmark will help to understand the hotels own consumption and find adequate solutions for improvement.

The most effective actions to reduce energy consumption are the following:

Heating, Ventilation, Air Conditioning (HVAC)

Hotels should ensure that heating and air-conditioning in the guest rooms and the public areas cannot be turned on simultaneously. The HVAC systems should be subject to regular maintenance in order to optimize their efficiency. If possible, high-energy consumption appliances should be replaced by newer ones, such as the installation of energy-efficient air conditioning and chiller equipment.

Most helpful is the insulation of the entire hotel building, especially the windows and doors in heated or cooled areas. If needed, window film can be put on single glazed windows to help maintain the temperature in the rooms and public areas.

Energy management for HVAC should include a daytime/night procedure for thermostats and work with key cards in the guest rooms to ensure that air condition is not running during the absence of the guests. Figure 4-2 shows the recommended temperatures for specific areas in hospitality businesses.

Last but not least, exceed heat can be recovered from air conditioning, kitchen areas and other facilities in order to heat the pools or hot water for the rooms.

Room type	Temperature(°C)
Bars, lounges	20-22
Guest bathrooms	26-27
Guest bedrooms	19-21
Restaurants and dining rooms	22-24
Corridors	19-21
Kitchens	16-18
Laundries	16-19

Figure 4-2: Temperature recommendation for hotels (Carbon Trust 2015)

Control systems and devices

Window and patio door sensors are the key element to automatically shut down all air conditioning while doors and windows are open. These appliances are inexpensive and easy to use. Energy saving can be up to 20% depending on the frequency and length doors and windows are opened. Guest room energy-saver switches and key card will enable guests and staff alike to cut off electricity for the entire room when not in use. Hotel management should however allow for one or two sockets to charge mobile phones and laptops during the absence.

Another form of automated control is done with occupancy sensor controller. These devises can control lights and all HVAC appliances when they are not needed. These sensors are especially effective in public areas during reduced activities of staff and guests, for example during nighttime. The sensors are either controlled through movement sensors or in can be places in beds, chairs and seats where they detect a pressure of guests seating or resting.

Effective lighting management

Replacing older, less efficient light bulbs with low-wattage LED lamps is the most effective way to reduce energy costs for lighting by 90%. An LED lamp of 6 W can easily replace a regular light bulb with 60 W. Moreover, LED lamps are lasting ten times longer and will reduce maintenance costs tremendously.

Installing induction lighting, which offers long-lasting, low-maintenance solutions to hard-to-reach places and public facilities helps to keep the energy bill low. Installing pulse-start metal halide and high-pressure sodium lamps in outdoor areas will reduce energy consumption, maintenance costs and will also contribute to less light pollution to the fauna and flora in the adjacent area. Hotels should use programmable timers to turn lights on at the appropriate hours or use light sensitive sensors to turn on outdoor lamps at dusk and turn them off at dawn.

Energy alternatives for hotels

Options of alternative energy provision will be depending on local climate and availability. The easiest solution is to find a local Green Energy Provider offering energy from renewable sources.

If this is not feasible, hotel management should consider installing devices using the solar energy, especially in areas with long, sunny days all through the year. There are mainly two options:

Solar panels. Solar panels are used to produce hot water through the radiation heat of the sun. They are placed on rooftops, where a liquid in black tubes will be heated up during daytime and delivers heat to a boiler. At the end of the day, when guests are back from the beach or from other touristic activities, the hot water can be used for showers and baths. Solar panels have a quick return on investment, are easy to install and do not need a high maintenance.

Photovoltaic devices. Photovoltaic devices have become very popular in the last years due to their enhanced efficiency and to lower costs of investment. They are used to produce electricity directly. Like the solar panels, they are placed on rooftops but can be also used as natural shading in car parking places. These devices are more complex but often yielding a high return on investment.

Other alternative sources include wind and biogas energy. Wind energy is an interesting alternative especially on islands, where hotels rely only on solar energy. The combination of wind and solar energy can be very efficient because wind is also available during the night.

Biogas is produced from recycled biomass, manure, sewage, green waste or energy crops, and is a low cost, carbon dioxide neutral energy source, which can be used for any heating purpose including cooking. The installation and maintenance is more complex, but yields a high return on investment when used correctly. Moreover, turning kitchen food waste into energy can reduce waste costs. In combination with a separate installation of grey water and black water grid, black water residues can also be used for biogas energy. While return on investment will take longer than with any other form of alternative energy, it can be a convenient solution of hotels that are not connected to the municipal sewage system.

4.2.2. Waste generation

Problems and key issues with waste in hotels

Waste management legislation is changing fast and while municipal waste has often been the primary focus, policy-makers are increasingly turning their attention to commercial and industrial waste. The push to divert material from landfill will continue, and certain materials are being banned from landfill altogether in some countries. In Europe, the new EU Waste Framework Directive has clarified and rationalised EU legislation on waste, applying a new waste hierarchy, and expanding the “polluter pays” principle by emphasising producer responsibility. This trend, coupled with the rising cost of landfill, will certainly help hotel managers make an economic case for separating and recycling more waste.

A hotel guest generates about 1 kg of waste per night, more than half of it in paper, plastic and cardboard (refer to figure 4-3). An excess of waste can produce difficulties for the local landfill capacity, the environment – if the waste is not treated correctly – and also raise operations costs for hotels. In Albania, landfilling is still the dominant concept. It takes up valuable land space, causes air, water and soil pollution, discharging of carbon dioxide and methane into the atmosphere and sometimes chemicals and pesticides into the groundwater. Moreover, waste often has to travel long distances to the landfill site, leading to an excess of fuel consumption and thus contributing to greenhouse gas emissions.

In the hospitality sector, a good waste management can considerately help the local environment and bring operational costs down. Moreover, recycling is an effective public relations tool, because it shows a dedication to corporate responsibility with environmental policy.

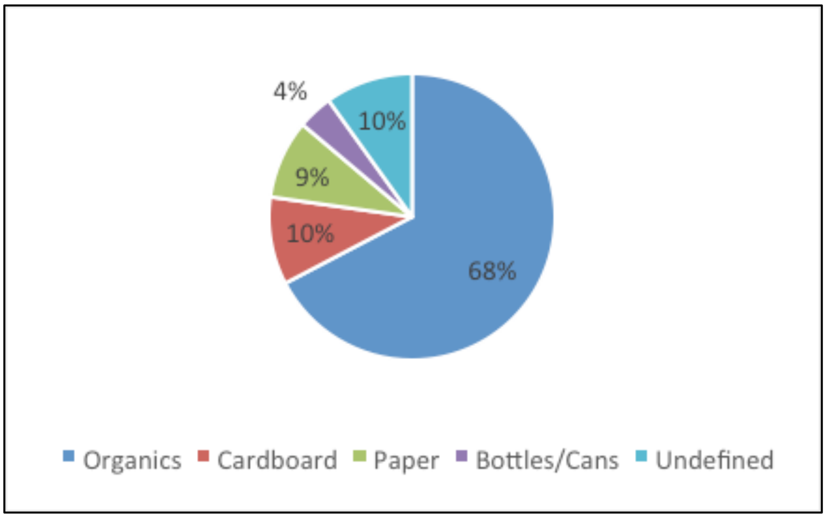

Figure 4-3: Sources of waste in a restaurant (Possector 2014)

Best practices and solutions for waste management in hotels

Best practices in hotel management are plentiful. Up to 60% of the rubbish that ends up in the dustbin can be recycled and a recycled plastic bottle saves enough energy to power a 60-watt light bulb for three hours. Recycled paper consumes 70% less energy and produces 73% less air pollution. In-room recycling is important because guests will notice it and will want to learn about it. Two bins could be put in guestrooms, one for general waste and one for recycling (see picture below, figure 4-4). The recycling one should be larger and specify which products can be placed in it. Housekeeping trolleys must be fitted with separate bins for collecting recyclable material. Moreover, educating guests about the hotel's recycling and environmental policies is very useful and some hotels also introduce a "green day" on a two-weekly basis to adapt their entertainment program to sustainability in the hotel.

There are several options for managing waste in a more sustainable manner and the waste hierarchy, outlined in the EU Waste Directive, provides a very useful process to encourage better practice: prevention, preparing for reuse, recycling (including composting), other recovery (including energy recovery) and disposal. Often it is more resource-efficient to make new products by recycling rather than starting from scratch. For example, recycling used aluminium tins into new tins requires 95% less energy than processing bauxite ore into aluminium. Many discarded materials, such as furniture and food, also have value. When managed efficiently, waste disposal costs fall by up to 50% as the amount of waste produced decreases.

Figure 4-4: Concept for two separates waste bins in guest rooms (media-cdn 2016)

When supplies are used more efficiently, it saves money on raw materials. Income can be generated by selling old equipment or reusing as well as recycling valuable waste materials. A good waste contractor will understand the complexities of waste management and be able to offer advice on the most environmentally friendly and cost-efficient methods of disposal. Compacting waste will reduce the number of collections required and may make storing easier so find out if it is sensible for the types of waste. Hoteliers should ask about market fluctuations for certain waste types and the policy adopted when price falls.

Hoteliers have the ability to reduce waste in various areas. The most frequent best practices are outlined below.

- Old linen can be turned into linen bags or aprons, and stained towels or robes into cleaning cloths. Else, they could be donated to local charities. Newspapers should be provided in central areas, such as the lobby, and guests need to request one at check-in if they want it delivered to their room. Buying in bulk and/or using eco-friendly alternatives such as concentrated non-toxic cleaning products in reusable and refillable containers save money and waste.
- For toiletries, switching to dispensers and purchasing in bulk containers is an easy alternative to the ubiquitous amenities in the guest rooms. For example, international hotel chains found that only 15% of soaps, shampoos and conditioners were used, with the balance thrown away. By replacing traditional amenities with bulk items, waste volume will be reduced by 40% and packaging waste as well. If individual toiletries are offered, guests should be encouraged to take away their half-used soap, or donate toiletries to local shelters.
- Tissues in bathrooms should be replaced only when dispensers are almost empty. If the policy is to replace half toilet rolls, these should be saved for use in employee

restrooms or donated to shelters. Hand dryers instead of paper towels in toilets in public areas are also a good solution.

- Food waste is becoming a major issue in hotels all around the world. Apart from making good environmental and business sense, reducing food waste is what customers want too. A recent survey carried out by UK waste management business “Cawleys” found that 78% of diners believe that where food waste ends up is as important as the provenance of ingredients and that 44% of diners would be willing to pay more in a restaurant with exceptional environmental credentials.
- Hotels have an opportunity to attract new customers and build a loyal customer base by demonstrating that their treatment of food and waste is reflective of a sense of environmental responsibility. Options for reducing food waste include turning leftovers into soup and or pâté. Alternatively, leftovers can be used in the employee canteen or donated to a local food bank or a homeless shelter. Unused food scraps may also be given to a local farm for animal feed if hygiene standards allow doing so. Staffs need to be trained to segregate food waste from the general waste stream, and the collected food waste can be taken to an anaerobic digester for recycling.

Waste audits in hotels

Waste audits play a significant role to help identify where the hotel is creating waste and to quantify the recyclable materials that are currently discarded.

Once identified where to focus the efforts, hoteliers should set priorities and goals, such as ordering fewer supplies, reducing disposal costs or generating revenue from waste materials. Staffs need to be included at all stages so that they understand and support the scheme. Hotel management should provide incentives and rewards to individuals who offer waste-saving ideas or make a significant contribution to the programme.

In order to measure the success of the waste management plan, criteria need to be set for monitoring and evaluating the programme. Hotel management should decide on the frequency of the KPI (key performance indicators) revision. The most common areas to evaluate are savings in purchases, reduction in operating costs, reduction in disposal and recycling costs, increase in recycled-content purchases, increase in productivity and reduction in total waste and recyclable materials.

While Europe-wide legislation has created a more consistent playing field, outside Europe many international hotel groups find that company-wide environmental policies on waste management are not possible because waste facilities and regulations can differ so much from country to country. The best approach is to ensure compliance with all the relevant national legislation and then develop a flexible strategy that sets out key principles and aspirational targets in such as way as to allow businesses in individual countries to work towards these in the most appropriate way, while still working towards environmental sustainability as a whole.

In the future, it is likely to see an increasing focus on waste prevention for municipal, commercial and industrial waste. This will bring issues such as life-cycle impacts, eco-design and sustainable procurement to the fore. The push for greater levels of reuse, recycling and energy recovery is encouraging the public and private sector to work more closely together to achieve economies of scale and cost benefits.

4.2.3. Water consumption

Problems and key issues with fresh water and waste water in hotels

The demand and need for fresh water is more present than ever. While 71% of the earth's surface is covered with water, only an estimated 3% of the global water volume is fresh water. However, less than 1% is available for human use, including water held in lakes, rivers, groundwater, atmosphere and biomass.

Until 2050, the global water demand will rise by 55% due to the increasing number of population, consumer demand and standards of living. UN Water predicts that 40% of the global population may live in areas of severe water stress regions by 2050. Climate change will contribute to this problem. While a number of areas are experiencing periods of prolonged drought, in some other areas rainfall will be more frequent and heavier. This leads to flooding without sufficiently replenishing groundwater stocks. Additionally, temperatures will be rising especially in southern Europe.

All this will be a considerable threat for the hospitality industry as it depends heavily on water supplies. Water supports virtually everything from scenic landscapes to lakes, streams and ocean environments. Also, many touristic activities depend on water: from water parks to pools and spas. Moreover, energy production and of course food production needs fresh water. Few tourism businesses will be able to exist without water. Therefore, it is of utmost importance for hotels to establish a water management plan and to reduce the pressure that tourism is putting on already scarce water resources.

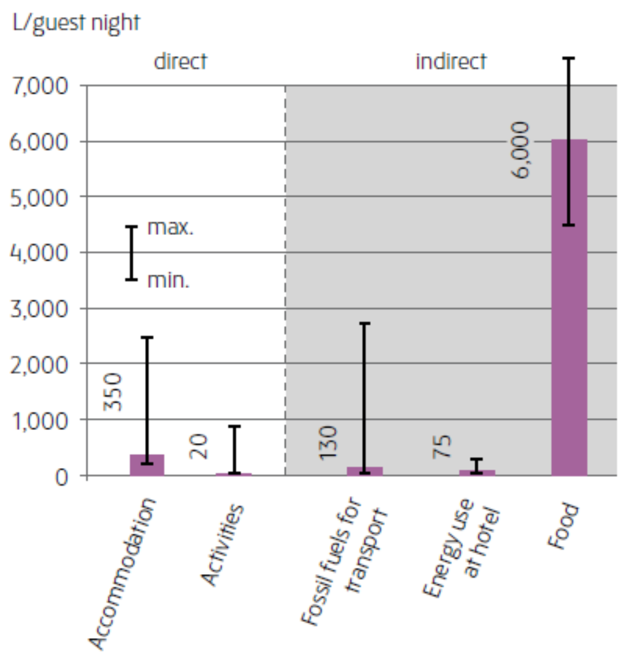

Figure 4-5: Direct and indirect water use at a hotel (Futouris 2015)

Water consumption: Guest expectations and behaviours

Water consumption of guests has to be looked at in two dimensions: the direct and indirect water use. On global average, it can be assumed that direct and indirect water use amount to an estimated average of 6,575 litres of water per tourist per day. Figure 4-5 shows the direct and indirect water use by guests at a hotel.

Direct water consumption is the volume of freshwater that the guest uses immediately, i.e. it occurs in guest rooms, public areas of the hotel, for pools, laundry and irrigation. Direct water use ranges between 84 and more than 2,400 litres per tourist per day in accommodation. Activities are adding 10 to 875 litres per guest night. On global average, direct water consumption values are of 350 litres per day for accommodation and 20 litres per day for activities.

Indirect water consumption on the contrary is the volume of freshwater that is used virtually for the production of goods and services consumed by the guests. This includes food preparation on the buffet, fossil fuels and energy used throughout the hotel. A study by Futouris e.V. and Thomas Cook AG shows that food is the most important consumer, accounting for an estimated 85% of total water consumption. The production of one kg of foodstuffs may require anything between 214 litres (for a kg of tomatoes) to 15,500 litres (for a kg of beef) of water. The water-intensity of foods is primarily related to the amount of water taken up in the production process. To calculate water consumption embedded in food use in tourism, it is necessary to calculate the amounts of different foodstuffs consumed per tourist per day, and their specific water content. It was found that meat consumption, at 2,650 litres of water per tourist per day, is the most water intense aspect of food use. In contrast, carbohydrates (e. g. bread, rice) as well as fruit and vegetables are less water intense.

Best practises and solutions for water management in hotels

A successful water management program requires the two keystones monitoring and benchmarking. To reduce the resources used, it is important to know the origins of water volumes used throughout the hotel. Eventually, one will identify the sub-sectors where most water is used, fix leaks and identify savings that may be achieved in order to improve the system to ensure year-on-year savings. To effectively engage in water management, measurement of on-site water consumption related to gardens, pools, kitchen, and the remainder of the hotel, including laundry (if not outsourced), is needed.

In order to better understand the hotel's water management performance, it is recommended to do benchmarking. Comparing own results to industry benchmarks helps to identify high water consumption and strategies to reduce ones own water use. It is generally acknowledged that hotels can reduce water consumption by at least 10 to 50%, without compromising guest comfort or experience. Savings are dependent on the standard already in place as well as water consumption levels.

Helpful indicators for benchmarking are water use per guest night or water costs per guest night. As energy is very relevant for the indirect water consumption of a hotel, energy consumption should be also examined.

Table 4-1: Water consumption benchmarks in hotels (Futouris 2015)

Litres of water/ guest night	Luxury Hotel			Midrange Hotel			Small/Budget Hotel		
	Low	Medium	High-excessive	Low	Medium	High-excessive	Low	Medium	High-excessive
Mediterranean Climate	<450	450–650	>650	<300	300–500	>500	<150	150–250	>250
Tropical Climate	<600	600–900	>900	<500	500–700	>700	<300	300–400	>400

Table 4-1 helps to compare a hotel's performance to industry benchmarks. Hoteliers have the ability to reduce water consumption in various areas. Key focus areas are direct and indirect water resources. The most frequent best practices in the tourism and hospitality industry are outlined below.

Direct water resources

Instalment of low-flow installations for showers, investment in toilet reduction flushing devices and reduction of flow intensity are some of the anticipated measures. Best practices are low-flow showerheads, flow restrictors in showers, aerators in faucets or dual-flush system for toilets. Depending on the water consumption reduction, payback time can be between less then a year and up to four years. Table 4-2 shows an example of saving opportunities for a three star hotel in the Mediterranean region.

Table 4-2: Best practice and typical water savings per room (Futouris 2015)

Component	Best Practice	Existing Usage	20 % saving	
			L/year	€/year/room
Showers	6–9 L/min	8–15 L/min	1,200 L	5 €
Toilet	6/3 dual flush	6–12 L	15,000 L	33 €
Basin	4–6 L/min	5–12 L/min	600 L	2 €
Cleaning	1 flush	2–3 flush	1,200 L	5 €

Introduction of a linen and/or towel reuse system to reduce water use where bed linen are changed every three days and towels are only exchanged when they are thrown in a specific basket in the bathroom. Clear and attractively designed information on the system should be put in the guest rooms. It is important that the staff is trained on the program. Up to 40% of the weight of laundry processed in hotels consists of guestroom and pool towels that have only been used for a single day and are basically clean.

In gardens, the interactions of soils, hydrology and plants should be improved as well as the irrigation mechanism. Local plants should be planted and grey water and rainwater should be used to reduce water consumption. In an average resort hotel, irrigation will be responsible for 30–50% of overall direct water use.

Pools account for 50 – 100 liters of fresh water use per tourist and day. Smaller pools should be covered at night to reduce evaporation. Moreover, waterfalls or fountains should be only turned on for a certain duration of time. Where possible, freshwater should be replaced by seawater, especially in the pools. Pool inspections can help to identify leaks.

Indirect water resources

Buffet should be less meat-intensive and a sustainable food management will help to reduce the overall water footprint of the hotel. Reusable glass bottles for table water can help to reduce water and energy consumption at the same time, because bottles don’t have to be filled and transported to the hotel over a certain distance. Economic devices that will purify water for drinking quality are as efficient and hygienic as bottled water.

4.3. Energy

Projections for future developments in building improvement

The model building as described in chapter 3 offers ways for improvements on the energy demand of the building. These improvements are:

- Better insulated windows (from double glazed with U=2.8 to double glazed energy saving with U=1.3)
- Insulation of the walls with additional 5 cm mineral wool
- Better insulation of the roof (in total 15 cm)
- Better insulation of the ground floor towards soil and vertical walls to soil.

In the simulation programme these improvements are calculated in consecutive manner according to the above order. The results are presented in table 4-3.

Table 4-3: Energy efficiency at the model building

	Ground Floor		First floor		Total building	
	Heating, kWh	Cooling, kWh	Heating, kWh	Cooling, kWh	Heating, kWh	Cooling, kWh
Base case	6,551	1,951	7,458	2,604	14,010	4,555
Plus Window	6,235	1,724	7,042	2,346	13,277	4,070
Plus wall	1,654	1,824	3,283	2,561	4,937	4,385
Plus roof	1,527	1,859	1,958	2,282	3,485	4,141
Plus ground	1,557	1,888	1,949	2,277	3,506	4,165

Window improvements reduce the cooling demand by some 10%. The effect would be higher at a comfort temperature of 20°C. Thus, for cooling optimisation window improvement is viable and useful. It has only limited effects on the heating behaviour as indicated by the numbers in the table. The outer walls as taken for the model building (25 cm bricks and cement beams) would show an U-value for the wall in the range of U=1.2 W/m^{2}K. It is not advisable to reduce the U-value of the window below the U-value for the wall, because this will bring condensation into the wall structure. By changing to U=1.3 W/m^{2}K for the windows the window comes near to the wall in terms of insulation effect. Should in reality the walls be constructed as taken for the model building, the decision for window change alone needs to be carefully investigated.

Insulation of the wall is the measure to be decided on for the heating option. Large reductions in energy demand are possible. Whether a payback is reasonable especially under low occupancy rates will be analysed later. Additional insulation at the outer wall needs massive interference on the building. Insulation inside is possible as well, but reduces usable space. The U-value can be reduced to some 0.5 W/m^{2}K with a 5 cm additional insulation. This measure together with window improvement makes sense.

All other improvements on the roof and on the walls towards soil have only limited effects. After erection of the building insulation of the ground floor is not easy possible. Also insulation towards vertical soil is not easy because the soil has to be removed. On the other hand a building should be seen as a complete structure with optimised insulation characteristics on all different building envelope materials.

Energy supply for cooling and heating

The existing energy supply was described in the chapter 3. The model building would rely solely on electricity for heating, cooling, hot water, lighting and other demand (cooking, miscellaneous household activities). For the cooling demand individual AC-system are employed (split system), which is the standard application. For heating direct electrical heating with convectors or radiators is used. Hot water would be produced as well in an electrical boiler. During the winter season, the population and the number of tourists are very low in the pilot area. Some buildings would be empty for a certain period (at least for now). If people are living there, it is assumed that some of the buildings use wood fire for heating demand in the cold winter periods. It is assumed, that electrical heating only applies to certain rooms and for special occasions. The demand as described in chapter 3 therefore is a theoretical one and assumes the comfort of 20°C in every room at any time. Realistic at least with local population as residents would be heating of selected rooms and partially heating by fuelwood in open fires or ovens.

Reverse cooling and heating (reverse cycle)

An improved situation could be possible with the application of reverse cooling / heating units, which are in use already in Albania. These units can be air condition during hot summer periods and can be switched to reverse operation in winter climates and be used for heating. Technically, the heat pump process changes its direction in the split system. In normal mode as AC unit the condenser of the cooling liquid sits outside and the liquid evaporates (by demanding heat from the room and cooling it) inside of the building. In reverse mode evaporation takes place outside (thus cooling the environment) and condensation (effect of heating the ambient) inside the building. The design parameters of the appliance must be adjusted to the local situation, i.e. the temperature level and the temperature differences in order to achieve good efficiencies. An example of such a unit is shown here in figure 4-6.

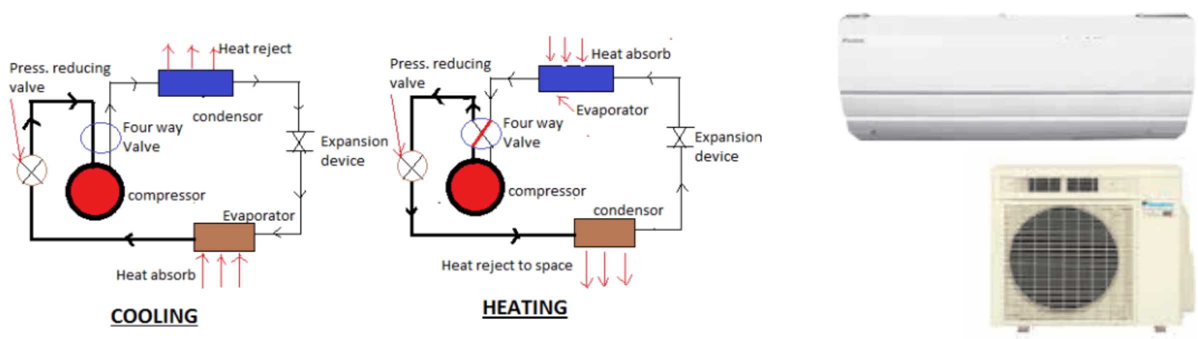

Figure 4-6: Principle of reverse cycle units (nkjskj 2017) and indoor and outdoor unit as example (Daikin 2016)

Centralised cooling and heating

The installation of individual split systems per room leads to a number of outdoor units with an increased noise and temperature emission level. The advantage of individual use and control of the units is obvious, but for several installations at one location there is an advantage of combining the outdoor units in stacks or exchange with larger units serving several rooms. It is also expected, that the COP resp. EER can be increased. However, the housing units in the pilot area are not so large to justify a central cooling plant with individual mounted indoor units or a ducted supply of cool resp. hot air to the rooms. Consequently, the alterative would be a central outdoor unit combined with individual room indoor units.

Application of CHP and CCHP

A CHP (combined heat and power plant) is an internal combustion engine driven by liquid or gaseous fuel and connected to a power generator. The generator supplies electricity to consumers or the grid. The cooling energy for the engine and the exhaust energy of the flue gas can be utilised as heating source. Usually the heat transfer liquid is water. If not existing, the use of the hot water requires a pipe system and radiators for the heating application. For hot water use a liquid/liquid heat exchanger is needed. In larger applications the surplus heat is pumped into district heating networks.

For the situation at Qeparo, the application of CHP could be employed realistically on two levels: central for the whole pilot area or per block of 10 houses. The final design of the CHP then is adjusted to the energy demands of the site.

Energy source for CHP in absence of natural gas networks is diesel or gasoline as the standard fuel for engines. However, fossil fuels are seen as problematic in sustainability contexts. An alternative would be the use of biofuels, in this case of vegetable oils or biodiesel. For this alternative, the local agriculture must be in a position to produce oils seeds (like rapeseed or soybean) on a regular base. In addition, an oil mill is needed for the oil extraction (leaving oil seed cake as valuable fodder and by-product). In case of biodiesel, an esterification process must be employed. Biodiesel production can be scaled down easily. Availability of technology is given, whereas bioethanol production (from sugar or starch) calls for large facilities.

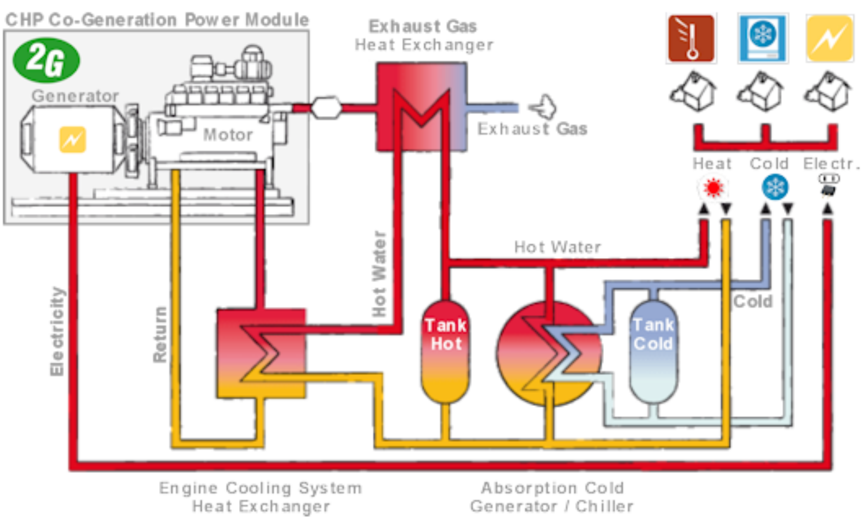

Figure 4-7: Sketch of CCHP (combined cooling and heat and power plant) (CHP 2017)

During the summer season heating is not needed under the climatic conditions in Albania. In this case, the CHP cannot be operated, unless the produced heat is wasted or sent to a cooler unit. Alternative is the installation of an absorption chiller, which is driven by hot water from the CHP and provides cold water as cooling liquid. In this case, the CHP can be operated under summer condition and provide cooling and electrical power. For utilising the cooling effect a network with heat exchangers/radiators is necessary to cool down rooms resp. buildings.

Under certain conditions the same network and the radiators in the rooms may be used for hot water during winter and cool water during summer.

Employment of Renewable energy

Solar collectors

Albania enjoys good solar radiation potential. The average daily radiation is given in the following figure.

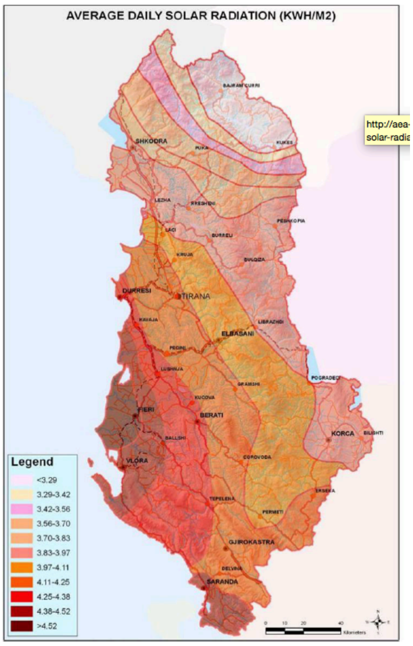

Figure 4-8: Radiation potential in Albania (AEA 2017)

The easiest version of a solar collector is based on a thermosyphon principle. Standard collectors consist of an area of 2 m^2. Simulation with TRNSYS reveals a yearly production of some 1,832 kWh with that type. For a good coverage of the hot water demand by solar energy one would install 2 or maximum 4 of these thermosyphon collectors. Other sources have shown that on average a net gain of 1,200 kWh/m^2 might be possible (AEA 2017).

Figure 4-9: Normal flat plate collector as thermosyphon type (Secutherm 2017)

The base demand for hot water was set to 6,187 kWh/year. With a good coverage one can assume solar assisted water heating of some 70% of the demand over the year. Compared to above figure the saving resp. the renewable amount would be in the range of 4,800 kWh.

The integration of the standard collector in existing buildings is easy on flat concrete roofs. The buildings in the pilot area should be transformed with a tilted roof covered by tiles with an authentic style and look. The application of solar collectors on the roof would cause aesthetic problems. An alternative is the utilization of pipe collectors, which offer more transparency on a roof area. Also this pipe collectors can be mounted on walls and vertically without loosing much efficiency.

Röhren-Kollektoren an der Hauswand. Foto: Ritter Gruppe

Figure 4-10: Pipe solar collector on the wall as vertical installation (Ritter 2017)

Photovoltaic

Photovoltaic is one accepted decentralized solution for power generation without tapping on fossil fuel resources. As shown for solar thermal applications the radiation and sunshine duration are giving good conditions for using solar energy.

Under the conditions at Qeparo a 2 kW_{peak} photovoltaic plant would be a good installation for one housing unit. It requires an area of some 16 m^2 on the roof directed towards south or south-west. The estimated yield is 1,600 kWh per kW_{peak} and year. Produced electricity can be utilised in the building. But in most cases the production would not fit to the consumption (peak in evenings and night). Surplus may be fed into the national grid depending on the feed-in regulations. An upcoming alternative is the application of a battery storage in the homes. The battery can store power, which is produced during the day for the evening and night consumption. The investment costs for battery storages are rather high. An optimised capacity must be found. A complete storage for the night or for several days is too expensive, but the base load could be managed economically.

The construction of PV panels on the renovated roofs in the pilot area may cause opposition as described for the solar collectors as well. For PV the individual space requirements are higher to reach a certain satisfaction level of energy per one building. In case, PV is an option, the majority of the roof area would be covered by panels. An alternative to individual PV panels on roofs are PV installations on public places, for special application (street lighting) or as a free standing plant. In this cases the production of power would be send into the local grid and customers are served by the local grid. No personal identification with the produced solar electricity is possible.

Wind power

Wind power is an ideal application in coastal areas and on hilly environments. However, the impact on nature and visible sights is enormous. As Albania relies already on hydropower as the main energy source, large wind power development seems not be necessary. Plans for wind park developments are under way. Up to now no realisation of a large-scale project was seen. The potential for wind power in Albania is medium to good. Advantageous areas are the coastal lines and the hilly areas near to the coast. Inland is less favourable for wind power.

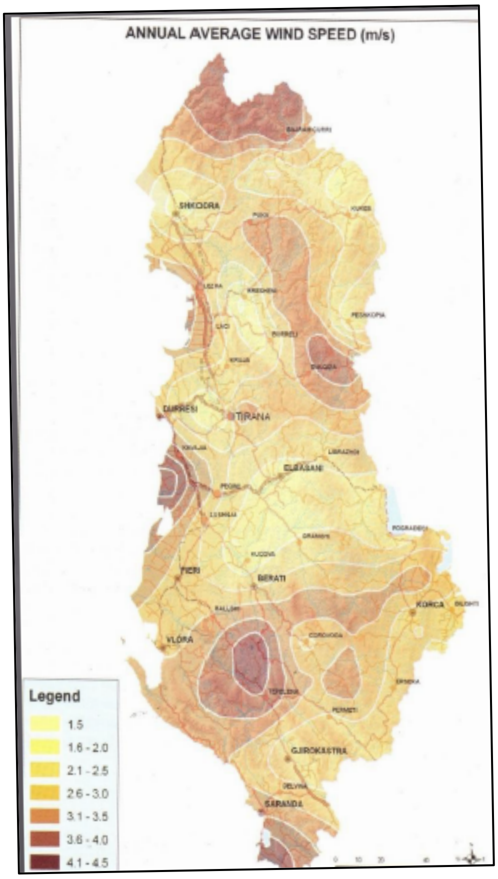

Figure 4-11: Potential for wind power in Albania (AEA 2017)

Combined heat and power, CHP plus cooling, CCHP

The function of CHP and CCHP was explained before. The shift to renewable energy necessitates a shift of the used fuel. Instead of diesel fuel now vegetable oil or biodiesel would make this installation renewable. The function of the CHP is not very much changed. The main difference is the additional effort to produce the feedstock in agriculture and to facilitate the processing of alternative vegetable oil or biodiesel in adequate technological dimensions.

The suppliers of engines for CHP require certain standards for their fuels. These obligations need to be considered by choosing the option renewable fuel for CHP.

Biogas (from waste, wastewater)

Organic components can be turned to biogas under an anaerobic fermentation process. In principle all biomass material is feasible for biogas production. Usually biogas is produced from wet biomass material (animal residues) and should be in a form to be easily pumped. The animal residues contain already the necessary microbes for the biological process. These substrates can be mixed with chopped solid biomass material and would increase the biogas formation potential. Input sources of biomass must be digestible, pure fibres (lignocellulosic) for example cause difficulties. Majority of biogas plants in Germany for example rely on cattle or pig manure as base liquid and are mixed with maize silage. The reference plant in Germany has several digesters as CSTR (complete stirred tank reactor) technology, an after-treatment and the CHP station. Size would be in the range of 500 kW electricity capacity (see fig. 4-12).

Figure 4-12: German reference plant for maize related biogas (BMU 2012)

Waste water contains less substrate for biogas formation per volume. The concentration of the suspended and digestible solids in waste water is rather low. Other technologies are necessary to enable the biogas formation through the biological components. Fixed beds are employed for example or special hydraulic operations (UASB = upflow anaerobic sludge blanket).

Figure 4-13: Example of UASB in combination with fixed bed (Kossmann 2009)

Consequently the biogas formation per volume of wastewater is low. Wastewater from municipalities contains less organic compounds in comparison to industrial wastewater for example. Either the municipal wastewater is delivered with higher concentration (for example only toilet wastewater) or other digestible material is added to the substrate. Mixtures with other solid biomaterial can enhance the situation and lessen the dilution effect. One possibility is the use of the organic compound of the municipal solid waste. The organics must be collected separately, chopped and delivered into the biogas digester.

A rough overview is given for the potential of biogas formation from the different sources. These figures can only give an orientation on the magnitude of a possible project. They have to be verified in a more detailed planning stage.

Organic waste is a medium to good input material for biogas formation. A very rough figure for the potential is 150 m^3 of biogas from 1 t of material (BMU 2012). The range covers 80 to 120 m^3 biogas per t of fresh material (uncertainty of moisture content) or 150 to 600 m^3 biogas per t of organic dry matter of the material (Siemers 2009). Because the quality of the biowaste is not certain, the productivity is set to 120 m^3 per t of fresh material.

The estimation of the biogas potential from wastewater is more complex. Measured data on volume and composition are not available. Only comparable figures from different location and projects can be taken. In one pilot area in Germany the biogas formation from the community wastewater results in 40 to 60 L biogas per person and day (IGB 2017). Another source estimates 100 kWh of biogas per person equivalent (p.e.) (BDW 2010). It is also not sure, how many p.e. per person of the different classes have to be accounted for. It is estimated, that during the tourist season the p.e. is much larger than the real population at that time.

4.3.2. Waste management

The present situation for waste management is the collection of all waste in 1,100 L containers at specific places in the village. The community authority takes the waste and transports it to the transfer station or directly to the landfill (in theory) with specialised automatic lorries. No sorting of the waste occurs at source (the waste producer) nor during the further processing of the waste. The composition of waste will differ from location to location. One example is given in table 4-4 for Albania.

Table 4-4: Waste composition in Albania (EEA 2013)

	Albania	
Waste stream	Average [%]	Weight [tonnes/day]
Organics	47,63	1.106
Wood	1,43	33
Paper	5,37	125
Cardboard	8,13	190
Total biodegradables	62,30	1.454
LD plastics	8,46	198
HD plastics	4,75	111
Glass	5,75	134
Textiles	5,27	123
Metals - ferrous	0,56	13
Metals - non-ferrous	0,57	13

Healthcare waste	0,17	4
Rubber	0,20	5
Inert waste	7,20	168
San-pro waste	3,25	76
WEEE	0,31	7
Batteries	0,02	1
Animal by-product waste	1,08	25
TOTAL	100	2.335 (0,7 kg/person/day)

The National Waste Strategy sets the target of recycling/composting to 25% of total municipal solid waste (MSW) by 2015 and by 2020 it aims at increasing recycling/composting to 55% of MSW generated (Ministry Urban).

The MSW management in Albania is decentralized. Street cleaning, collection of waste and the transportation of the collected waste to disposal facilities are tasks undertaken by private companies, which are financed by the municipalities. The responsibility for urban waste collection lies with the local authorities. Two thirds of the municipalities are contracting private companies, which are selected by public tender and operate under contracts typically of three- to five-year duration. About one third of the municipalities provide waste collection services through their own companies (EEA 2013).

According to (DW 2016) there are only two landfills meeting the requirements of European standards in Albania. Some more are in a planning stage.

The nearest landfill for the pilot area is near the city of Bajkaj in a distance of some 80 km. It is constructed with a geological barrier and a leachate collection system and can accept normal MSW without further treatment. However, the landfill is not in line with present European standards (only non-reacting material on deposits).

The waste transfer station near Himare is not yet utilized. Indications are that operation will start in the near future.

Figure 4-14: Engineered landfill (left) and transfer station (right) near Himare (Siemers 2016)

Separation biological waste from the rest

Up to now all waste material is collected in one container, no separation is required. In order to utilize the energy content of the waste stream (and to reduce emissions on the landfill) the biological part of the waste stream can be separated from the rest of the waste material. Best solution for clean and high quality biological material is the separate collection at source. This is the provision of an extra container, which should only receive the biomaterials. Specific care is given for the clean separation (no plastic, no metals) of this valuable material. If question arise, the waste should rather given to rest waste instead of contaminating the biomaterial. As said, first requirement is a separate container at source, i.e. at the individual building. Inhabitants and tourists need information on that and residents and owners of the houses may need specific training.

The collected material is transported and collected like the normal waste, only on a separate trip and eventually with other logistical details (collection at house level instead collection points for 1,100 L container). The transport then takes over the duty to define the final destination. The alternatives are a compost plant for the biowaste to turn the waste into fertilizer, which could be brought back to the individual houses. The second alternative would be energetic utilisation in a biogas digester. As mentioned above, biowaste can enrich the wastewater stream going to the biodigestion process.

Recycling of valuable materials

The waste management system is characterised by a weak collection systems in cities and very little collection systems in rural areas. Albania's collection coverage is around 77%. Recycling is performed by private companies, which employ poor people to collect plastic, metals, glass and paper waste, which is processed or packed and then sold to other countries. The rest is mostly landfilled. Awareness on waste recycling is low. Littering and dumping trash remains a serious problem for Albania (Wiki 2016). This is illustrated on the attached photographs from the pilot area (see figure 4-15).

Figure 4-15: Littering and composition of waste (Siemers 2017)

For recycling active and passive system are differentiated. Active means that the waste producer sorts already at waste generation. The recycling materials are usually paper/cardboard, glasses and metals. Also certain fraction of plastic material can be easily recycled (PET bottles for example). According to the generation the individual person sorts and stores the recycling material and brings it regularly to collection points. The community is responsible for provision of adequate containers and for routine emptying of the containers.

The passive system would only give the option at source for biowaste (wet container) and all other waste (dry container). The waste operator then sorts out recyclable materials by own efforts and gets profit from the valuable materials inside the waste stream.

Collection of mono-charges (kitchen waste)

Besides in the individual houses waste is generated in restaurants and pubs. The waste generation is bound to the tourist numbers and season. At source one could define mono-charges, which are already sorted by the restaurant personnel. These mono-charges can be biowaste from cooking activities and leftover food. In addition, one waste-stream is used cooking oil, which contains a good biogas potential. As discussed above, the biological material could be utilised in a biogas digester in connection with wastewater treatment.

Also the identified recycle materials from above can be easily sorted and stored at restaurants and pubs (glass bottles, plastic drinking bottles etc.). If the sorting is clean, the collector may pay a fee for getting the recycling materials.

4.5. Wastewater treatment

Wastewater is one of the pressing issues in Albania as a whole and especially for the tourist regions. Only limited capacities of community waste water treatment plants are available. Planning and construction is underway to ease the situation. The majority of the waste water seems to be untreated and leaves the sites via rivers and into the Mediterranean Sea.

In the pilot area the basic installation is a septic tank at the individual building. The septic tank needs to be cleaned and emptied on regular base with specialised lorries. Up to now it is uncertain, to where the lorries would transport the wastewater out of the septic tanks. The suspicion is, that few of the septic tanks are built without basement barrier. This would allow the wastewater to disappear into the underground. The geological formation in the costal line under consideration allows the movement of the waste water through the rock formation. At the end the waste water ends up in the sea or as ground water.

At Himare roughly 1/3 of the town is connected to an underground wastewater pipe system (area near the beach). The wastewater is collected and pumped into the adjacent bay, where in absence of a treatment plant the wastewater is released into the sea (figure 4-16). The remainder of the town relies on septic tanks. At Qeparo the newly built promenade contains an underground pipe, which could be used for wastewater transport. No buildings are connected.

Figure 4-16: Overflow of pumped wastewater into a bay (Siemers 2016)

Especially during the high season the amount of wastewater increases dramatically. The capacities of the septic tanks are not sufficient for the influx. Several options exist for improving the situation. Not only for qualify for an eco-tourist village but also out of environmental concern, the situation of wastewater needs a prompt and effective solution.

Septic tank improved operation

The least option would be a regular operation of the septic tank. This would include the sealing of the tank against the ground and the regular cleaning and emptying of the tank by specialised vehicles. These vehicles should employ an underpressure suction system and empty the tanks also including the solid parts. The disposal of the septic tanks content should be planned for a standard wastewater treatment plant. There might be a transition period, in which the wastewater still is brought onto agricultural fields or disposed off. This is another scope of problem. At least, the local situation must be improved.

Small treatment plants

Decentralised treatment plants for individual houses or groups of houses are available on the market. In theory, each of the building could rely on a treatment plant, which is usually built for houses or villages, which cannot be connected to larger community treatment plants.

The individual treatment plants are placed either underground outside or inside buildings. In climates without freezing temperatures for longer periods the plants could be also operated on ground outside. Examples are shown for a new system and a combined system using an existing septic tank.

Figure 4-17: Underground tank system for individual house (left) and combination with existing septic tank (right) (GRAF 2017-2)

Grey water system

A distinction can be made between greywater and blackwater. Greywater is low contaminated wastewater coming from shower and washing. Blackwater is the higher organic loaded wastewater from toilet and possibly kitchen. Standard procedure is to use drinking water for all the purposes in a house directly. Then all the effluents are mixed and declared wastewater. Two problems arise from this procedure. At one, lots of water is used for the different purposes at the house. The resulting mixture is very diluted. This might be an advantage for decentralised treatment plants, but is a disadvantage for central options. Second, the dilution effect disqualifies the wastewater for anaerobic treatment, because the productivity of biogas per volume of water received is very low, but investment must be done in large capacities to pump and store this high amount of volume.

One solution is the installation of a greywater system. The produced wastewater from low contamination (shower, washing) is cleaned and used afterwards only for blackwater generation (toilet flush for example). By this, the concentration of the wastewater is higher and overall water consumption is reduced. Greywater is one prerequisite for installing biogas technology in combination with wastewater treatment.

The figure shows the principle of an installed system at house level. The greywater system can be enlarged to a combined system of water use and energy production as shown by the concept of semizentral (IWAR 2015). However, last mentioned strategy is one dimension too big for the pilot area under consideration.

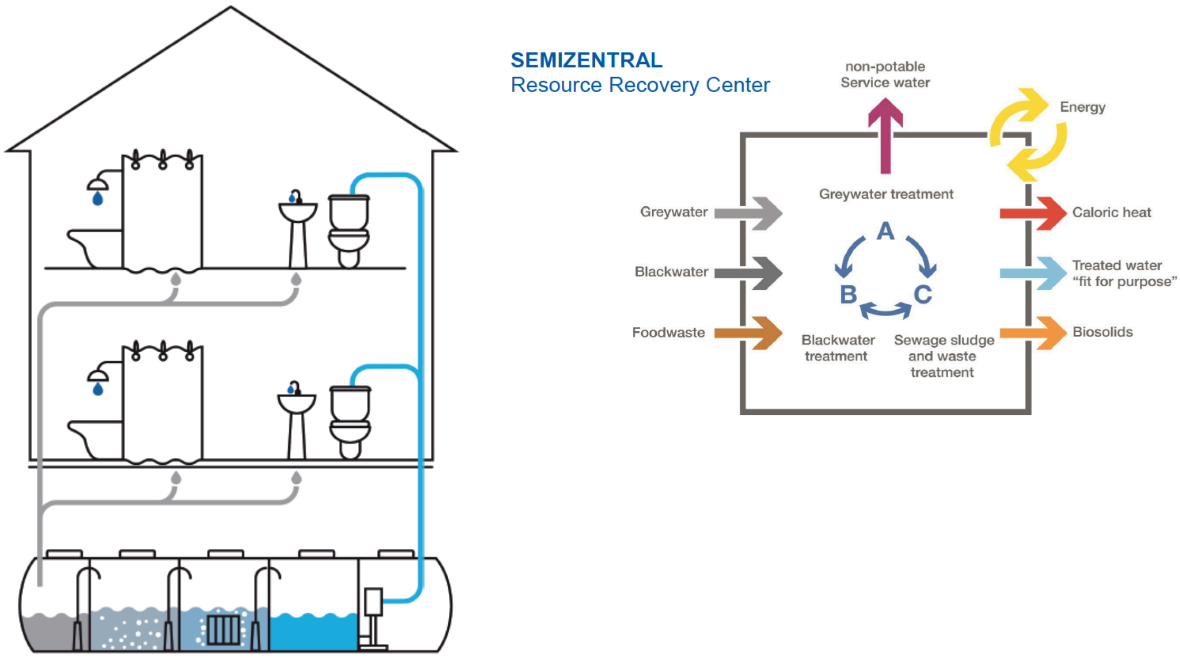

Figure 4-18: At left the greywater collection, treatment and use (ewuaqua 2016), at right the concept for semizentral (semidezentral 2017)

Central treatment

Depending on the amount of wastewater resp. the amount of inhabitants to be served, the decentralized concept may be enlarged to considerable numbers of people. The picture shows a plastic underground plant serving 250 inhabitants.

Figure 4-19: Example of underground plant for 250 inhabitants (Graf 2017)

Industrial sized wastewater treatment plants are starting for several thousand inhabitants. In Germany the standard plant starts at 20,000 inhabitants or so. Depending on the local population, the population density and the distance between populated areas, there is a transition point, from where centralised plants offer opportunities against the decentralised approach.

Figure 4-20: Large central treatment plant for more than 100,000 inhabitants (INCOWest 2016)

4.4. Socioeconomic and tourist development

Tourism attraction and opportunities

Outdoor & Health

For the outdoor oriented sport fans Qeparo has a lot to offer. The Albanian government and local authorities have undertaken a lot of measures in cooperation with international institutions to create more opportunities for outdoor activities in these sites - e.g. the „hiking valley“ map with guided hiking routes or the „mountaining bike“ routes for biking fans which are offered for easy - heavy tours. The valley with its bio-diversity and beautiful olive groves has also been mentioned in the early 19th century in the work of Francios Pouquevielle, Napoleon Bonaparte´s general counsel at the court of Ali Pasha in Loannia.

Some of the valleys and forests has been declared as „climate protected zones“ with a diversity of flora and fauna contributing to the „quality of nature“ feeling for the region.

Due to the climate and air quality this site is also interesting to offer more of wellness/SPA and health care services - these kind of services so far haven´t been promoted in Himare-Qeparo but should be taken into consideration especially in combination with the transformation into „ecological tourism“.

Culture & Tradition

For the tourists interested in culture and tradition the old village of Himare-Qeparo is a must-visit place in Albania. It is an ancient place belonging and inhabiting by the Greek tribe of the Chadians who in 1720 refused to submit to Pasha of Delvina. The first school built here dated back in 1860 as an elementary and secondary school and an additional girls´school with about 100 students. The rich history of this village and municipality attracts a lot of tourists and should be further improved and sustained. The food and beverages in Qeparo are mostly cocked in the own and specific Greek-Albanian cooking manner using local vegetables, meat and also fish. This area is well known for its high-quality traditional cuisine and attracts a lot of visitor even to come for a lunch or dinner.

Family & Time-Off

For the families, couples or individuals who wants to have high quality of time or to take a time-off Qeparo is one of the best places in Albanian to be. The coast of Qeparo is ideal for children to play given to its flat long coast line in the sea while the B&B villas or hotels are closed by at the coast, so that parents can have both time for the children and for itself. Given to the small shaped bays there is also enough space for couples or individuals to have a relaxing and quiet time and enjoy.

Water Fun & sport

Besides hiking and biking the water sports have increasingly becoming popular in Himare and also in Qeparo offering the tourists lessons and renting them boats, jets, etc. This field is expected to grow further and become more and more as attractiveness element for tourists.

These and other tourism attractions are contributing to transform the conventional tourism into a more „meaningful“ and high-end tourism for the sophisticated people in and outside Albania. These aims perfectly fit with the goal of this project.

Identified handicaps and potentials

As stated above the key asset and attractiveness of Himare-Qeparo is its reach „virgin coast“, its culture heritage, tradition and diversity. This fact imply another fact that some of these sites cannot be accessed easily by now - despite Butrinti which is one of the most ancient amphibian theatre in the region and by now easy accessible.

The majority of the other sites are accessible by foot, bike or smaller boats. For the future some of these sites should become accessible as well.

The infrastructure / roads leading to Qeparo are being reconstructed. For the time being „on progress“ and should continue to improve.

The only airport in Albania is located in Tirana, which would take a tourist about 7 hours to come to Qeparo. The Government has planned to open another Airport in south of Albania, but still there are no construction plans being revealed.

The public transportation and mobility is based on an old fashion and poorly coordinated manner. There are public buses in use for tourists and inhabitant transportations but not well timed and mostly too old - uncomfortable and air polluting. There are no railway solutions in the region. The mostly used transport ways are the private cars and by private (SMEs) offered Mini-Bus. Some of the last mentioned are more comfortable than the buses but also insufficient and pollution impacting. This area is one of the most important action fields in the short and mid-term perspective.

The water and energy supply and coverage have improved significantly in the last years, reaching a coverage of 85% with very few fallouts (mostly in the winter season). The further improvements are under way.

Close to Qeparo is an old military base which is partly in use and partly shut down, but for them to remove special authorizations are required which haven´t been granted by now. This shall be done in the near future and the shut down facilities shall be remediated effectively and fully.

There are some land sites, which are contaminated by waste - historically used dump sites - that soon shall be remediated completely. In the past some NGOs have undertaken serious steps to improve that by activating the youth and engaging them. These activities are expected to continue and shall continue.

In the last years the national and local authorities have established a landfill nearby with the support of the World Bank. This landfill is now in operation and should continue at least for the next 10 years. But in the middle- and long term another solution is needed and should be taken into consideration by now.

These authorities have also plans to build and take in operation a wastewater treatment facility nearby.

5. Discussion and identification of possible measures

5.1. Measures Energy

The possible measures for improvements in the energy sector are summarized in the following table. Possible interventions are identified on the building level and for the energy supply. Energy supply is differentiated between building scope and energy supply for the whole pilot area. The individual measures are described in more detail following the sequence in the table.

Table 5-1: Identified measures for energy

A	**ENERGY**	
1.	**Building**	
1.1.		Improvement windows
1.2.		Insulation building
1.3.		good housekeeping
		..... LED lighting
		..... other measures
2.	**Energy supply**	
2.1.		Reverse cooling/heating individual
2.2.		central cooling/heating per house
2.3.		Photovoltaic
2.4.		Solarthermal
2.5.		energy centre for block
		.....based on electricity
		.....CHP plus absorption chiller
		..........CHP on biodiesel/plant oil
2.6.		energy centre for pilot area
		.....biomass CHP
		.....biogas plant micro
		.....biogas plant central
		..........organic waste
		..........sludge, wastewater
		..........green waste
3.	**Energy infrastructure**	
3.1.		street lighting

The energy price for electricity on local consumption is 7 ct/kWh for consumers below 300 kWh and 10 ct/kWh for business. In the financial evaluation the higher price for business is taken as reference (ERE 2017).

In the description of the individual measures the investment costs are estimated (CAPEX). If applicable, also operating costs are given (OPEX). Together with the energetic saving potential and the price for electricity the final cash savings can be calculated.

A 1.1. Improvements of windows

The effect is calculated and explained in chapter 4.3. For one unit the windows are changed from ordinary insulation characteristics to low energy ones. The resulting U-value drops from previous 2.8 towards 1.3. Savings can be expected in the range of 10% both for the heating and the cooling period. Total savings according to the base case energy supply of the unit would then be 731 kWh electricity per unit and year. To achieve this, the whole building needs new windows, i.e. 8 window–doors and 2 normal windows. The total investment incl. service is estimated with 7.000 € (Capex). Operational costs are minimal and are set to 0 in this evaluation. Based on the electricity price of 10 ct/kWh, the yearly savings can reach 73 €. The simple payback (investment divided by savings per year) is reached after 96 years. The change of windows alone for energy saving reasons is not viable.

The non-insulated walls of the reference building show an U-value of roughly 1.2, which increases the risk of condensation in the inner walls, if the windows are switched to an U-value of 1.3. Change of windows as a separate measure should be analysed deeply based on the real housing situation.

A 1.2. Insulation of building

The base case exists with non-insulated outer walls made from bricks with concrete support structures. An additional insulation with 5 cm mineral wool increases the thermal behaviour of the building dramatically. A saving potential of the heat demand of 65% against the base case is possible, in absolute terms 2,909 kWh/a. The total investment for the renovation/insulation of the building is estimated with 25,000 €. A simple payback of 86 years is possible. As seen in the case of the windows, investment in the building envelope is not economical under the present conditions in Albania and for energy saving reasons alone.

A 1.3. Good housekeeping

The term good housekeeping summarizes a package of measures with no or minimal investments but with a high interaction of the involved people. For a start soft measures can be planned to inform owners of buildings and visitors equally on advantages of energy efficiency in connection with tourist activities. Sources of information are leaflets and written information on how to use and maintain energy efficient appliances (e.g. the temperature in the refrigerator, the heating temperature inside rooms etc.). Accompanied is this with specific training courses for the house owners and the service personnel. Costs and effect of this package is not easy to estimate.

More practically, an example is presented for shifting towards LED lighting (if not already done). In comparison to the standard a saving potential of 75% is possible through the shift (1,350 kWh/a). The investment cost for LED lighting are also going down. A total investment of 500 € is estimated for one unit building. Then, the payback would only be 4 years and viable because lifetime of LED technology is longer.

Additional technical or organisational measures can further reduce the energy demand (cooking, occupancy control, standby reduction, efficient TV resp. electronics etc.). The possible reduction is estimated with 30% of the other electricity demand in the model building (855 kWh/unit a). Necessary investment may be in the range of 1,000 € per unit, which would result in a payback of 12 years.

A 1. Building summary

The measures in summary are improvements in the building and the utilization procedures. They show a different picture, as a better building envelope has no economic viability whereas housekeeping measures can offer interesting payback periods.

A 2.1. Reverse cooling and heating individual

The base case was described with a combination of an electrical heater for the winter cold and an AC unit for the hot summer period. Hot water would be produced by an electrical appliance. It might also be common to use wood fire in the winter period.

The first step to a modern and efficient system is the change to an electrical driven reverse cooling / heating system. One appliance (a heat pump as technical function) acts as cooling unit in hot situations (comparable to the AC-system). The cycle can be reversed in cold situations heating the inside of the building and “cooling” the outside. The normal procedure consists of installation of a split system for each individual room. This allows the specific operation of the unit according to comfort requirements and occupation of the individual room. Usually the appliances have similar heating and cooling capacity. For the situation in Qeparo roughly 3 kW capacity is seen as sufficient.

A split unit for 3 kW capacity costs roughly 800 € per unit. 6 units are needed per house with an extra 200 € installation cost. This gives an investment of 5,000 € per standard house. For maintenance 150 € per year should be assigned. The savings are mainly through the shift from direct electrical heating to the heat pump principle. The base case electrical heating shows a COP (coefficient of performance, gives the units heat per unit input electricity) of 0.9, whereas the split system on a yearly average can reach a COP of 2.5. Similar figures must be assumed for the cooling effect EER (energy efficiency ratio, units cold per units input), but no savings are reached compared to the base case. Consequently, savings are realized with some 2,684 kWh/year for the heating period.

Taking the investment into account and calculating the net savings (electricity savings minus maintenance) the yearly savings reach 136 € per year. This in turn gives a simple payback of 37 years, which is longer than the expected lifetime of the appliance. However, it must be stated, that the operational and comfort advantages cannot only justified by energy savings but must be seen as an investment in the destination quality.

A 2.2. Central cooling / heating per house

An improvement of operational behaviour and a reduction of noise and space demand is the installation of a central reverse cycle unit. This means one large cooler outside the building and individual room appliances inside the building. This option needs a bigger heat exchanger, but only one or two and more advanced piping works. The outer space around the apartments is limited. The reduction of cooler units outside would ease the situation. Also the appearance of the building changes positively if not every room has it own outside unit.

Savings are possible through an improved COP / EER from 2.5 to 3.0 because of the larger units and better control options. In energy terms it might save 741 kWh/year. Additional costs are estimated with 2,000 €. Additional maintenance is taken with 25 € per year. This results in a payback of 41 years.

A 2.3. Photovoltaic system

The sun offers good energy producing opportunities as this area in Albania shows a high amount of solar radiation and a high amount of total sunshine hours per year. Photovoltaic on individual buildings is a standard building procedure.

For the size of the building and the energy demand an installation of 2 kW_{peak} in PV panels is appropriate. This plant demands a roof area of approximately 16 m^2. The estimated yield for Qeparo is 1,600 kWh / kW_p. The 2 kW_p plant then produces 3,200 kWh per year. Out of this it is estimated that 1,800 kWh could be used in the building and the remainder of 1,400 kWh is sold to the regional grid (for 4 ct/kWh).

Investment costs for this relatively small plant are given with some 1,600 € / kW_p, in total 3,200 € per building. For maintenance (incl. monitoring) 50 € should be reserved. Under described conditions a payback of 16 years is possible.

The utilization of PV electricity can be increased with the installation of a battery storage. For the 2 kW_p plant a storage in the range of 2 to 4 kWh is sufficient. This additional storage costs roughly 4,000 € and enables another 700 kWh to be utilized on site. The export is reduced to 700 kWh then. Maintenance should be 30 € per year. This additional investment has a simple payback of 53 years.

A 2.4. Solar thermal system

Already discussed in the chapter 4, a solar thermal system can be installed to satisfy the hot water demand in the buildings. A standard 2 m^2, thermosyphon system can produce 1,800 kWh per year according to our simulation programme. Depending on the local situation (orientation of the building, roof structure etc.) 2 up to 4 units may be installed to cater for the hot water demand. For the calculation an installation of 3 units is taken as a reference. With this some 70% of the hot water energy demand can be produced by solar energy. This would result in an energy saving of 4,800 kWh per year and building.

The investment in one unit of that simple design is 1,200 €. The 3 units then cost 3,600 €. For maintenance an amount of 100 € per year should be reserved. This opposed to the savings in the electricity bill reaches a simple payback of 9 years.

Two concerns are associated with solar thermal use. First, the installation of thermal collectors on the roof area would influence the building appearance. In case, the roof is renovated with historic type tiles, the additional installation of flat plate collectors is not advisable. One option would be the use of pipe system collectors either on the roof or mounted on walls or side buildings. Second concern is the future development of solar thermal applications. We see a strategy towards electricity in the move to 100% renewable energy scenarios. In that case, it is more efficient to use available space for photovoltaic and produce hot water by CHP or surplus electricity from the grid. This development will take some time and solar thermal application can be seen as a transition technology. Short payback times would support the transition idea.

A 2.5. Energy centre for block

One idea is to install energy centres for building blocks. This block could involve 10 individual buildings grouped around the proposed energy centre. Leaving aside the organisational requirements here only the theoretical energy effect of such a strategy is presented.

The energy centre is designed in the first instance without the measures A 1.1. to A 1.3. and also A 2.1. to A 2.4., because some of these measures are competing and overlapping. The 10 individual units together have an average demand of 40 kW heat and 71 kW cooling. With COP of 2.5 and EER of 3.0 the net capacity of a reverse cycle plant would be 16 kW net heat and 24 kW net cool. Including some reserves the design capacity of a central heating / cooling unit would be set to 40 kW. This unit supplies heat, cooling and hot water to the 10 buildings. The individual buildings need no installations on their site. The ten houses must be connected with a piping system for hot and cold water. Savings are possible through better efficiency and utilization in a range of some 33,400 kWh per year for the block.

The investment consists of the cooling / heating unit (40,000 €), a building for the energy centre with some infrastructure (10,000 €) and investment in piping, connections and control (30,000 €). Total cost amounts to 80,000 € per block. For operation and maintenance 5% of CAPEX should be assumed, i.e. 4,000 € per year.

A payback cannot be calculated for this case. Instead, the energy centre must be seen as an individual business approach, investing and buying energy and supplying heat, cooling and hot water to customers. A complete business case must be made up for the final decision.

If an energy centre would be a viable and manageable option for Qeparo one could also think of shifting from electricity as energy source to liquid fuel by applying CHP. The easiest way is the installation of a diesel driven CHP, which is connected to an absorption chiller. In this case, the cooling demand of the CHP is utilized in winter for heating directly and in summer for driving the cooling process. The CHP can be used for supplying the base load, additional peak demand must be satisfied by ordinary sources. Based on running hours of 3,000 per year a possible design capacity for the energy unit could be 20 kW electrical capacity. This in turn would deliver 33 kW heat or some 30 kW cooling with the absorption process. A substantial investment in infrastructure is also necessary. As now heat is delivered with hot water and cooling with cold water, radiators instead of the split units have to installed in the buildings and a cold water circuit as well as a hot water circuit including storage tanks need to be erected.

The total investment would be:

CHP	50,000 €	
Chiller	72,000 €	
Infrastructure	20,000 €	
Network	60,000 €	
Radiators	10,000 €	
Miscellaneous	8,000 €	
Total		**220,000€**

By changing from electricity consumption to diesel fuel, massive savings are possible in the power demand in comparison to the base case (188,000 kWh). On the other hand, diesel must be purchased. The consumption of diesel would reach some 20,000 L per year with a present price of 95 ct/L. In addition the CHP demands maintenance, which is at minimum 2 ct/kWh electricity produced (or 1,200 € per year). Diesel and maintenance then produce a cost factor of 20,000 € per year. In comparison to the substitution of 188,000 kWh of electricity with 10 ct/kWh only an amount of 18,800 € is saved. Thus, the diesel costs are higher than the electricity cost for the base case operation. Also in comparison to the idea above with a central reverse cycle option the CHP with diesel is no viable option.

If it is possible to switch from diesel to alternative fuel, the cost situation can change. Diesel is still a fossil fuel. To rely on renewable energy, plant oil can substitute diesel fuel. One can get plant oil from rapeseed or other vegetable oil producing plants. This can be used directly or manufactured to biodiesel. It is estimated, that a producer price of 50 ct/L of vegetable oil or biodiesel can be assumed (without taxation). Investment costs are slightly higher for the CHP and some infrastructure (tank). Some additional 30,000 € are necessary bringing the total investment to 250,000 €. The yearly cost with the lower fuel price end up with 11,500 € per year. Here real savings are achievable in comparison to electricity costs of 18,800 € per year in the above options. This savings opposed to investments result in 34 years payback (seen in comparison to the 2 options above).

A 2.6. Energy centre for pilot area

The theoretical evaluation of a block type energy supply brings no real viable alternative. Next step now is to assess an energy centre for the whole pilot area of the 80 buildings.

The discussion is similar to the cases from the previous paragraph A 2.5. A central reverse cycle plant, however, is not realistic for the pilot plant area, because the infrastructural investments would be too high. As shown for the block area, a CHP option with absorption chiller and driven with diesel fuel is not a real economic alternative. Economies of scale (8

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times bigger) would be realized for the individual equipment, but infrastructure demand increases in comparable magnitudes. A central CHP driven by vegetable oil or biodiesel might offer financial attractiveness. However, a set of open issues for producing and using biofuels exists. Other decisions on different levels must be taken before this would be a realistic option.

The alternative under this heading would be the installation if a biogas plant for utilising solid waste and wastewater from the area and producing energy out of it. Biogas is not an option for the micro level (the block of 10 houses), a certain size of equipment is needed to be operational. In the first instance, biogas can be produced from two sources.

As shown in chapter 3.3., the organic waste or biowaste in the pilot area alone reaches 87.8 t per year. An average value taken for the biogas potential is 120 m^3 Biogas per ton of fresh material (BMU 2012). This would amount to 10,500 m^3 biogas from the organic waste fraction.

According to chapter 3.3. the volume of wastewater is 35,524 m^3/a for the pilot area. This amount is relatively high in comparison to average values but reflects the tourist specifics. The potential for biogas from wastewater is given in the literature with wide variations. One source (Lecture Thai) assumes the production of 1 to 2 m^3 Biogas per m^3 wastewater based on an organic load of 5,000 mg /L COD resp. BOD. This organic load is high and reflects production processes. Community wastewater usually shows between 400 to 800 mg/L COD or BOD. Taking this into account, one could assume 0.24 m^3 biogas per m^3 wastewater. Multiplied with 35,000 m^3 per year, the biogas potential is 8,400 m^3. Another source (IGB 2017) from a pilot project reports 40 to 60 L of biogas per person per day. Calculating with the occupancy figures for high, transition and winter and the length of the respective season, one can sum up 7,644 m^3 biogas per year. A third source (BdW 2010) also from observations gives a figure of 100 kWh/person equivalent and year. The average number of persons in the pilot area (weighted figure) is 425, which would result in 7,083 m^3/a. In taking a biogas potential of 8,000 m^3 would be a good average based on figures from the different sources.

If a biogas plant is installed, other biological material can be used in addition. For example, green waste from street cleaning (cuttings, leaves) or garden operations (lawn, vegetables) may be supplied to the digester. All together, the biogas potential from the pilot area is estimated to 20,000 m^3 per year (10,500 biowaste, 8,000 wastewater, 1,500 green waste).

The amount of 20,000 m^3 biogas represents an energy value of 120,000 kWh per year based on a calorific value of 6 kWh/m^3 biogas. A biogas plant is operated best throughout the year with only small changes in throughput. Realistic is an operation time of 7,000 h per year. Then, the capacity of biogas comes to 17 kW. Assuming an electrical efficiency of 30%, the electrical capacity would be 5 kW. This figure must be seen in contrast to the "standard" German biogas plant of 500 kW electrical capacity. In consequence, the option biogas for the pilot area seems to be a very limited size in comparison to existing plants. It can be described as pilot plant or laboratory scale plant. Cost estimation is difficult for this small size of a prospective plant. For rough overview a minimum of 250,000 € must be assigned to a project like this. The capacity of 5 kW power can produce 35,000 kWh electricity per year. This represents a value of 3,500 € per year on present electricity price. Compared to the investment of 250,000 € for the plant alone, an economic justification only on the energy production is difficult.

A 3.1. Street lighting

For the completion of the overview, street lighting can be taken into consideration with an exchange to LED lamps, which would reduce energy demand and offer a reasonable payback.

5.2. Measures Waste

Interventions in the waste sector are possible on different levels. First, the individual building may offer opportunities, where waste can be separated already and prepared for further use and recycling. Next level is the neighbourhood or block. Here collection points can be offered for recycling materials. A possible collection system for biowaste can be organized on the block level as well. The municipality level touches the responsibility of the authorities for the waste management in the area. They are responsible for the collection and transport of the waste (or rest waste). The transport is directed towards a transfer station or directly towards the final destination of a landfill. The principle of the intervention is given in table 5-2.

Table 5-2: Level of intervention in the waste sector

B	**WASTE**	
1.	**Building**	
1.1.		Informatin and training
1.2.		Separation at source
2.	**Block/pilot area**	
2.1.		Collection system for recycling materials
2.2.		Collection system for biowaste
		..... composting
		..... biogas
3.	**Municipality level**	
3.1		transfer station
3.2.		engineered landfill
3.3.		Transport

B 1.1. Information and training

The reduction of waste volume and increased recycling at building level is a matter of training and information. Visitors, guests, employees and owners must get information on how to handle the different waste fractions, to identify the recycling option and how to act accordingly. Objective is a reduction of (rest) waste at the end. Measures are training courses for employees, leaflets and information for guests and other soft skill activities.

B 1.2. Separation at source

To enable recycling a separation at source must be introduced. Easiest way is the provision of at least two different waste bins, which are clearly marked and differentiated. For further use the differentiation should be made between wet waste and dry waste. Wet waste would be the biological fraction consisting of remains from cooking, eating and drinking. No contaminations should be allowed. Major foreseeable problem is the use of plastic bags for kitchen waste for convenience by the waste producer. One can supply a paper bag for food waste or drop the waste directly in the waste bin. Dry waste consists of plastic, glass, paper and rest waste. The two waste bins are used by guests, but the employees or owners of the buildings are responsible for the final sorting and the decision which waste stream to use as final destination. At this stage corrections are possible, e.g. separating plastic bags from biowaste.

It is estimated that not more than 100 € are necessary on the building level to install the separation system.

B 2.1. Collection system for recycling materials

Either the guests or the owners of the buildings take the responsibility to bring recyclable materials to central collection point in the pilot area. The collection system consists of containers, which are clearly marked for the material to take: Paper and cardboard, glasses, plastics and metals.

For the pilot area it is advisable to use 4 collection points for the recycling materials. Containers and preparation of places would cost 12,000 € in all.

B 2.2. Collection system for biowaste

Similar to the “dry” material also for the “wet” waste resp. biowaste a collection system is needed. However, due to the high degradability of the material especially in summer climate, the frequency of service must be higher. Collection points should be more dense (few buildings together) and the transport organised centrally.

For setting up the system an amount of 8,000 € is budgeted. It does not include the service, which is included in the waste collection tax. For the tax an amount of 115 € per year and building is recommended.

B 3. Municipality level

The municipality level in terms of waste transfer and landfill is not touched in this study. A transfer station exists and access to an engineered landfill is given.

5.3. Measures wastewater

Also for wastewater different levels of intervention are thinkable. Major problem is the missing treatment of the wastewater in the pilot area. The system of individual septic tanks not under regular service and uncontrolled spill of wastewater into the sea must be improved. The table gives an overview on the possible improvements on the different levels.

Table 5-3: Level of intervention in the wastewater sector

C	**WASTEWATER**	
1.	**Building**	
1.1.		information and training
1.2.		saving activities
1.3.		grey water system
2.	**Block/pilot area**	
2.1.		individual septic tank
2.2.		micro treatment plant
3.	**Municipality level**	
3.1		wastewater sewer system
3.2.		central treatment plant

C 1.1. Information and training

According to discussion in the previous chapters, there is scope for wastewater reduction through behavioural changes of the guests and users. The effect can be achieved with training and information for the final users. These soft activities can be incorporated into advanced training programmes for the owners and employees at the buildings. For guests ready made information through leaflets or guidebooks is possible. No extra cost is calculated in this report.

C 1.2. Saving activities

Above activities can be supported by small technical improvements in the building, e.g. reduced flow of water, water stops etc. in the sanitary equipment. No special investment is planned under this heading. Necessary costs are contained in the term good housekeeping measures under the energy heading.

C 1.3. Grey water system

Massive saving of fresh water is possible with the installation of a grey water system. Unfortunately the fresh water costs in Albania are very low in international comparison. This would not lead to a payback for the installation of a grey water system. Another important aspect, however, is the reduction of wastewater volume going into a biogas plant. The usual wastewater shows a low concentration of organic matter, because a high amount of wastewater is generated by washing and cleaning alone. Installing a grey water system would increase the organic matter of the final wastewater and makes it more attractive for a biogas production. It is not a prerequisite for biogas, but it would make the biogas option more valuable.

Simple grey water systems have been shown in chapter 4. It is estimated, that an individual cleaning system would cost 8,000 € per building. Cost for maintenance and repair should be calculated with an amount of 100 € per year.

C 2.1. Individual septic tank

The individual septic tank for each building shows certain operational and organisational disadvantages. At least it must be assured that no wastewater contaminates the grounds directly. Two conditions need to be followed. The septic tank should be sealed against the surrounding environment (bottom and possible overflow). Second, the emptying process and final disposal must be organized on a regular service interval. The pilot area has difficulties for the access of the individual building by the service vehicle. Pre-mounted pipes and central pumping spots can enhance the situation. The septic tank is seen as a transition towards a more modern and central treatment plant. If it is deemed a transition, then it should be in good function for the time under use.

C 2.2. Micro treatment plant

An alternative to septic tanks or central treatment is a so-called micro treatment plant. This can be designed individually for single houses or for groups of houses (in a block). The function and appearance has been described in chapter 4. A variety of companies are offering these systems with different sophistication.

For a building such a treatment system would cost between 10,000 € and 20,000 €. In the budget overview the average cost is assumed with 15,000 €. Maintenance and repair may consume 600 € per year and unit.

If several buildings can be grouped to a block of 10 buildings a more central plant can be erected. It would have a small scale effect and cost about 120,000 € only for all 10 buildings. Maintenance and repair may be calculated with 1,200 € per year.

C 3. Municipality level

On the larger level of he municipality, wastewater is organised with an underground sewer system and a central waste water treatment plant. In order to benefit from economies of scale, a central treatment plant should serve several thousand inhabitants. Then, an advanced and extended sewer system must be erected, which needs large investments and planning / construction time. This alternative is out of scope of this study, but it has to be considered for the final solution.

In any case, a pipe infrastructure must be installed to serve the pilot area. The renovated promenade at Qeparo already contains a wastewater pipe. A natural place for a centralized wastewater treatment would be the area north-west of the main village. The central pipe is already near to that place. On that site either a modular treatment plant can be installed, which serves as interim solution until a central treatment plant is erected and the village connected to that central plant. Or the site is used to install a small biogas operation. Input into biogas would be besides the wastewater the collected biowaste. The biogas operation can be started on small scale serving only the pilot area. If the operation is smooth and successful, more wastewater and more biowaste can be acquired from the adjacent villages and increase throughput and outcome for the biogas plant.

The figure 5-1 on the next page shows the layout of a piping system for the pilot area. Two main collection points are defined to cater for the terrain as one half of the area shows a slope towards the beach, whereas the other half orients into a small valley after an elevated part of the village. The two main collection pipes are then combined and lead the wastewater towards the chosen site for biogas resp. treatment.

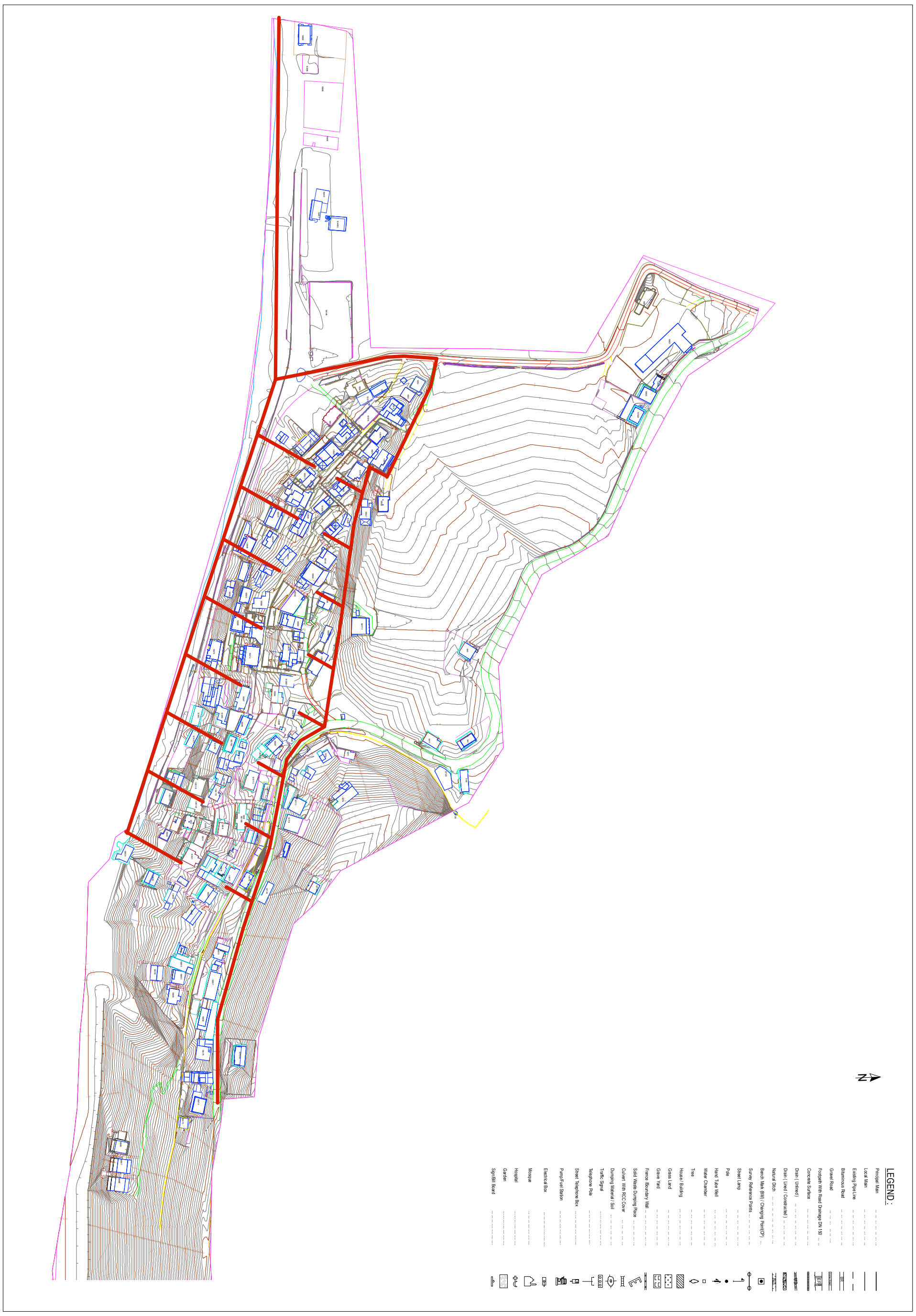

Figure 5-1: Possible piping infrastructure (CUTEC based on (Himare 2017-2))

6. Recommendations

The final recommendations are formulated after consultation with the local stakeholders and after further internal evaluations.

Out of the presented cases in chapter 5 the following elements should be chosen:

- Improvement of building envelope (A 1.1. and A 1.2.)
- Good housekeeping (A 1.3. and A 1.4.)
- Solar thermal energy supply (A 2.4.)
- Reverse cooling / heating (A 2.1.)
- Grey water system (C 1.3.)
- Waste separation at source (B 1.1. and B 1.2.)
- PV on public places and central
- Waste collection biowaste (B 2.2.)
- Centralized waste water collection and biogas (A 2.6.)

The single measures are summarized in the table 6-1 indicating the needed investment cost and a recommendation for forming a budget taking into account probabilities and possible synergies.

Table 6-1: Recommended measures with budget

Measure	**Costs per unit, €**	**Costs per pilot area, €**	**Budget recommendation, €**
Building envelope	32,000	2,560,000	0
Housekeeping	1,500	120,000	100,000
Solar thermal	3,600	288,000	200,000
Reverse heating/cooling	7,000	560,000	190,000
Grey water system	8,000	640,000	320,000
Waste separation	100	8,000	8,000
Subtotal units		**1,616,000**	**818,000**
PV on places		30,000	30,000
PV central		625,000	0
Waste collection biowaste		20,000	20,000
Subtotal pilot area		**675,000**	**50,000**
Wastewater and biogas			
- Piping infrastructure		500,000	300,000
- biogas plant		250,000	250,000
- CHP / ORC		50,000	0
Subtotal biogas		**800,000**	**550,000**
Engineering, planning			282,000
Grand total			**1,700,000**

The last row in table 6-1 contains figures for an indicative budget. These figures reflect the urgent necessity to invest under this programme heading. It is also considered, how the dissemination of the measures would be in the first step. Not all owners of housing units will participate in the beginning for example, which reduces the estimated total investment cost. In some other cases pilot installation are planned before the full project is realized. By this, the total budget and necessary investment can be reduced to an amount of 1,7 Mio. € for realizing the majority of the measures and initiating important changes.

Measures on buildings

The thermal improvement of the building envelope is a useful measure under the aspect of energy saving. The payback period under present conditions is very long. The total investment on the whole pilot area is massive with 2,56 Mill. €. It is a measure under full control of the house owner. For that reason and due to overall budget optimisation it is recommended not to consider the building envelope in this study.

Small investments into good housekeeping measures are very useful and should be incorporated into the planning. It is also envisaged that the majority of houses will participate in this programme part. Therefore the budget recommendation is only slightly lower than the total estimated budget for the whole pilot area.

Solar thermal installation will assist in reducing the electricity load and bill in the units. Besides the aesthetic consideration (where to place the solar collector) a good majority of the buildings should install collectors or improve existing installations. A participation rate of roughly 2/3 is assumed.

The reverse heating / cooling appliance offers certain advantages. It is not clear how many cooling systems are already installed and where the combined effect will bring a real advantage. The willingness of the owners to change is uncertain. For that reason, the recommended budget considers only 1/3 of the total amount for all buildings.

The grey water system would be a good innovation for saving drinking water and enabling an efficient biogas production from wastewater. It is therefore a precondition for a functioning biogas system. However, due to technical constraints not all houses can be equipped with a grey water system. Therefore a saturation of only 50% is assumed. This reduces the initial budget accordingly.

Waste separation at source is also a prerequisite for the biogas system. It reduces rest waste volumes and brings valuable materials into the recycling path. It should be in function in all buildings.

The measures on individual buildings are herewith complete. The total investment for all recommended activities reaches 1.6 Mill. €. Out of that half of the budget should be considered as necessary for the first step and the initial phase.

Measures on pilot area

Photovoltaic on individual buildings causes difficulties with appearance and function of the renovated houses. A solution to use PV is the installation of panels on public places and under special conditions (shading). In a first guess some 20 kW_{peak} of panels might be possible under that compromise.

Another possible solution would be a free standing PV plant near to the site for wastewater treatment resp. biogas. Then the energy production can be combined with all different sources. A size of 500 kW_{peak} would be recommended for the size and the demand in the pilot area. A budget of 625,000 € is necessary for a plant like that. The investment is not forwarded in the final budget in this study. Finance may be obtained under different conditions in a different programme.

The waste collection system for biowaste is needed for the function of the biogas plant. It should be executed fully.

Total theoretical investment into the pilot area sums up to 675,000 € , but only 50,000 € should be invested in the first step of the project.

Wastewater and biogas

For completion of the picture the wastewater system and a biogas plant is needed. The first investment is into a piping system leading the wastewater towards the central biogas plant resp. the interim waste water treatment. The piping infrastructure alone would cost 500,000 € (personal communication Plan-Consult). In the first phase at least 300,000 € are needed to start the installation. Minimum requirement for a simple biogas installation is 250,000 €. It can be planned as modularized plant enabling enlargements as material intake increases. A small CHP (biogas engine) or an ORC-plant (organic Rankine cycle) is an option for producing electricity. The decision to invest into a CHP should be taken after the successful operation of the biogas plant. In absence of a CHP the biogas may be used in direct form for heating and cooking. Therefore, some investment can be postponed. The needed budget for the first step is estimated with 550,000 €.

Total investment

Some of the measures described above need a detailed planning and procurement procedure. An allocation of roughly 20% of all investments is made for this additional effort.

Including the engineering part, the overall budget for the first phase comes to 1,7 Mio. €. This amount of investment has to be considered as the first and necessary step towards a complete reorientation of the existing system. Other measures, which have been described in the different chapters, may follow, once the first steps are successfully implemented.

Recommendation for a sustainable, inclusive and ecological tourism in Qeparo

We recommend the introduction of a *pollute and user pay principle* for all tourists visiting Qeparo to successfully transform the conventional tourism into a sustainable, inclusive and ecological tourism. That would include a set of technology implementations and re-organization of existing processes as well as the introduction of an „eco fee“ for tourists visiting an ecological site - as Qeparo - in the future and spending their vacations on site. This „eco fee“ is one element, which can be about 10% of the price per unit and night and another element would be to create „incentives“ - e.g. incentives for children.

To identify an affordable ecological solution we identified the fey figures and data as shown in the grid below.

Few of recommended phases and steps (vertically) towards a „sustainable, inclusive and ecological tourism“ with the impacting and affected areas (horizontally) are given in the following table.

Table 6-2: Phases and steps towards eco-tourism

Smart growth	Waste	Water	Energy	Mobility	Society	Culture
Improvement in comfort						
Shifting minds „ecological vacations“						
Familie & Youth on the move program						
Qualified job creation & acceleration						
Sustainable growth						
Increasing the resistance & attractiveness of sites						
Varying ecotourism activity in time and space						
All-Year-Vacation Site (incl. Senior programs)						
Healthy & Wellness programs (corr. „All-Year)						
Inclusive growth						
Making tourists feel „home“ & responsible						
An agenda for new skilled jobs (health, wellness, etc.)						
Protection of cultural sites programs with vulnerable groups & NGOs						
Diversity programs for the residents						

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