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MARKET PAYMENTS FOR WETLAND RESTORATION IN PERSINA NATURE PARK, BULGARIA

Authors: Maya Bankova-Todorova and Yulia Grigorova, WWF DCP Bulgaria

Contributors: Ivan Hristov, Georgi Stefanov, Lora Jebril, WWF DCP Bulgaria, Irene Lucius, WWF DCPO, Eng. Stela Bozhinova and Vesselin Koev, Directorate of Persina Nature Park, As. Prof. PhD Rossen Tzonev, Sofia University "St. K. Ohridski", Department of Ecology and Environmental Protection, Milan Jousten, Intern

Technical advisor: PhD Julio Tresierra

Editor: Olga Apostolova
Translator: Rumyana Pankova
Graphic design: Boyan Petkov

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WWF is one of the world's leading independent environmental organizations with 5 million volunteers and a global network, which operates in more than 100 countries. WWF's team in the Danube-Carpathian region is responsible for leading and implementing WWF's efforts to preserve, restore and sustainably manage the natural values of the Danube-Carpathian ecoregions. The team works across political borders developing model projects, influencing policy, capacity building, raising awareness and seeking solutions to the challenges that the region faces in order to ensure prosperity, sustainability and biodiversity conservation.

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EXECUTIVE SUMMARY

As part of the project *"Promoting PES and other related sustainable financing schemes in the Danube river basin"*, carried out with the financial support of the GEF through UNEP, WWF DCPO implemented the project *"Market payments for wetland restoration in Persina Nature Park"* in Bulgaria. Persina Nature Park is the biggest Ramsar protected wetland in Bulgaria. It offers a home to rich fauna and flora and plays an important role in securing the livelihoods of local and downstream communities. Following years of conservation experience in this park, WWF decided to focus its intervention in the area of the Kaikusha marsh. This 155,4 ha wetland faces quick degradation due to infrastructural development, contamination from pesticides and most importantly, reed overgrowth. Nowadays, even in springtime, there is no open water surface in the marsh, as the whole area of Kaikusha is occupied with reeds and ruderal species, which could lead to a the disappearance of this habitat in the coming years.

Experts identified that a balanced reed-cutting is a desirable way to regulate the water regime and stimulate the restoration of the open water surface in Kaikusha marsh. In this framework, WWF introduced an innovative market payment scheme in order to achieve sustainable financing of the restoration, due to a lack of available funding. WWF proposed local entrepreneurs to harvest and use the biomass from reed-cutting to produce and market pellets and briquettes.

WWF developed a complete framework to support a safe long-term commitment for a green entrepreneur. A business plan was designed to assess the costs and benefits of running a company in the new market of biomass energy from reed. Moreover, tests were conducted to ensure the energy efficiency of pellets and briquettes produced out of reed and confirm that such a product would be attractive on the local energy market. Regarding the environmental challenges, a management plan was drafted to guide the harvesting practice so that that amount and timing of operations are in line with conservation objectives. A monitoring procedure was also put in place to check that the reed harvesting delivers expected results and is conducted in agreed conditions.

Thanks to these solid foundations, a local entrepreneur joined the project and signed a partnership agreement on the maintenance and protection of ecosystem services in Persina Nature Park. He received further support to access public funding for the purchasing of machineries, which were bought at the end of 2013. Since the installation of his workshop, first tests of processing biomass were conducted so that production of pellets and briquettes can start. Local public institutions are the most likely and appropriate customers for his products, as they can reduce their costs on electricity and heating and could support the awareness-raising at local level of the importance of these products, which could widen the market.

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INTRODUCTION

This report presents the work of WWF DCPO on a pilot scheme designed to test an innovative finance mechanism for wetland restoration. Pilot activities have taken place in Persina Nature Park, in Bulgaria, as a component of the project *Promoting payments for ecosystem services and other related sustainable financing schemes in the Danube river basin*. This report gives an overview of the different phases required to develop and to bring into effect this market mechanism constructed with the aim of contributing to the restoration of typical ecosystems along the Lower Danube.

The primary objective of the project *Promoting PES and other related sustainable financing schemes in the Danube river basin* (hereafter **Danube PES project**) is to demonstrate the feasibility of PES and sustainable financing in the Lower Danube river basin. Five pilot sites – including Persina Nature Park, which is specific to this case, - were selected in Romania and Bulgaria. Secondary project objectives include environmental awareness raising and capacity building at local, national and Danube river basin level with a view toward an eventual scaling up of the intervention and uptake of the ecosystem services approach into public policies and funding instruments.

The GEF Danube PES project has been coordinated by the WWF with financing from the GEF, and implementation support from the UNEP since October 2009. The project is operational until 2014 end[1]. This report covers the period between 2010 and May 2014. Although the pilot scheme seeks innovative solutions to wetland restoration- such as the potential use of biomass from wetlands for providing renewable energy - it is nevertheless built on previous efforts by the Danube PES team in Persina Nature Park. The pilot focuses on one marsh in the Nature Park: Kaikusha marsh, as it experiences serious deterioration of its hydrological regime, due to infrastructure development, intensive agriculture and natural succession by reeds. If no action is taken to **effectively** change the current situation in Kaikusha, the marsh and its biodiversity will be **most likely** lost **in the near future**.

This report is organized in four sections. **Section 1: Background**, presents a short summary of the situation in the pilot site and outlines a general environmental profile of Persina Nature Park. **Section 2: Design**, includes the elaboration of a market scheme for wetland restoration and maintenance. It also includes information on targeted ecosystem services in Persina Nature Park and, identifies the threats to selected ecosystem services in the intervention area, identifying the potential barriers to the implementation of the proposed financial scheme. **Section 3: Implementation**, elaborates on the legal, financial, monitoring and reporting frameworks of this market scheme. It also provides an overview of the results achieved by May 2014 in relation to the expected outcomes. **Section 4** is the last section. It includes Lessons learned and portrays foreseeable scenarios as next steps following upon the major conclusions of the pilot.

The report includes as annexes a summary of Kaikusha management guidelines; an investment feasibility study and, a business plan.

[1] The project was designed to last until 2013 end. However, after the project mid-term evaluation it was proposed and WWF in coordination with GEF agreed on a one year non-cost extension.

SECTION 1: BACKGROUND

1.1. DESCRIPTION OF THE PILOT SITE

Persina pilot site covers the territory of Persina Nature Park. The Nature Park occupies a territory of 21,762.2 hectares. It was designated a nature park by the Minister of Environment and Water in 2000[2]. **The main conservation targets for announcing the nature park are:** 1) Protection, restoration and maintenance of the diversity of local ecosystems and landscapes, local species of wild plants and animals as well as local varieties and breeds; 2) Restoration of floodplain forests and wetlands in Svishtov, Belene valley and neighbouring Danube islands. Persina Nature park overlaps with the territories of 11 protected areas of different conservation status (See Annex I).

Persina Nature Park is one of the most important Ramsar sites in Bulgaria. In May 2014, the Bulgarian Ministry of Environment and Water, supported by WWF deposited a proposal for the revision and expansion of the existing Ramsar site (6,898 ha). The new area of the Ramsar site covers more than 18,000 ha, which will make it the biggest Ramsar site in Bulgaria.

Besides a nature parks, Persina is an Important Bird Area (IBA) and lies within four Natura 2000 sites. The conservation value of Persina Nature Park is formed by over 743 higher plants species, most of which are connected with the availability of water, and 1,100 animal species, including 250 zoo-plankton and 99 zoo-benthos species, over 770 kinds of invertebrates with 35 snails species and 16 kinds of mussels, over 200 bird species and almost all of them of protected.

Some of the main ecosystems within the Nature Park are the Danube River and the wetlands connected to it, including: marshes on the Belene Island, the remnants of the former Belene and Svishtov marshes, the Osam River and the flooded areas around it, the drainage canals in the lowlands, the flooded forests (the flora of which is not rich but quite specific), and the mesophyllic high grass meadows.

The nature park is administered by the Directorate of Persina Nature park, based on a management plan approved in 2012[3]. The management plan is valid for 10 years and is revised after the first 5 years. The Directorate is a specialized territorial unit of the Executive Forest Agency (EFA), which is under the mandate of the Ministry of Agriculture and Food.

The Directorate is funded by the state, the budget is provided per annum based on a financial plan on estimated overheads and events. In addition, the Directorate works on projects to fund its communications and conservation activities. The Directorate can also generate income from activities, such as tour guiding, training and sales of promotional materials.

[2] Ordinance No. 684 from 04.12.2000
[3] Decision No. 287 from 11.04.2012

Box 1: The National Ecological Network (NEN) in Bulgaria

NEN in Bulgaria is developed according to the Biological Diversity Act. Its objectives are: long-term conservation of biological, geological and landscape diversity; provision of breeding, feeding and resting areas of sufficient size and quality; creation of conditions for genetic exchange between separate populations and species; participation of Bulgaria in European and global environmental networks; limitation of the negative anthropogenic impact on protected areas.

The National Ecological Network consists of protected areas declared under the Protected Areas Act, which are in accordance with the requirements of Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds. The National Ecological Network includes with priority CORINE sites, Ramsar sites, important plant and birds areas.

At present in Bulgaria 955 protected areas are designated covering approximately 5.1% of the country territory. According to the Protected Areas Act, the protected areas are of 6 categories: reserves (55), national parks (3), natural monuments (350), managed nature reserves (35), nature parks (11), protected sites (501).

The protected areas are part of the European ecological network NATURA 2000. At present 114 protected areas for conservation of wild birds, covering 20.3 % of Bulgaria's territory and 228 protected areas for conservation of habitats, covering 29.5 % of the territory of Bulgaria are adopted by the Council of Ministers. At present 332 Natura 2000 sites covering a total of 33.89 % of the country territory are adopted by the Council of Ministers.

Source: Bulgarian Executive Environment Agency

1.2. INTRODUCING A SUSTAINABLE FINANCING SCHEME IN PERSINA NATURE PARK

WWF has been present in Persina Nature Park for many years. The organisation was among the initiators of the establishment of this nature park. WWF has been implementing different restoration projects. These included, among others, restoration of natural vegetation, including on the islands, protection and monitoring of waterfowls and fish species and their populations, restoration and protection of agricultural lands of high nature value (HNVF).

The biggest challenges in Persina Nature Park have been the restoration of wetlands, the maintenance after restoration and the access/ availability of funding to implement them. Kaikusha marsh, as part of Persina Nature Park, has been a place of WWF's conservation interest for many years. WWF has put efforts in finding solutions to restore Kaikusha with minimal human impact. Further these efforts, in 2012, WWF established an infrastructure necessary to restore the water inflow to the marsh - two gateway channels to bring water to the deeper parts of the marsh and sluice-gates.[4]

[4] Cross-border conservation of Phalacrocorax pygmaeus and Aythya nyroca at key sites in Romania and Bulgaria - http://www.green-borders.eu/

In addition to the water feeding infrastructure, experts identified reed-cutting in Kaikusha as a desirable way to slow the anthropogenic-driven succession of the marsh. This would stimulate the restoration of the open water surface in Kaikusha that was succeeded by reed several decades ago. However, reed-cutting should be done very carefully so that Kaikusha is not converted into highly modified, man-made ecosystem, which will in turn destroy habitats of water biodiversity. Therefore, it is necessary to find the balance, under which the reed-cutting will bring a positive change to the habitat.

Under the Danube PES project, the plan of WWF for this pilot has been to explore opportunities to launch private and public-funded PES schemes enhancing the conservation and restoration of Danube riparian wetlands and protection of fish populations. Private PES scheme would be based on the potentials and economic efficiency of use of biomass from wetlands (from poplar and other energy plants).

Public funding opportunities for PES schemes on this site search for in the National Rural Development Program 2007-2013 (NRDP), Axis 2 Improvement of the environment. The Agri-environmental measure of the NRDP contains a set of sub-measures contributing to the reduction of the impact of agriculture on the components of the environment and biodiversity. These schemes are voluntary and provide payments to farmers who commit themselves to develop organic agriculture, protect traditional landscapes, high-nature value farmlands, prevent soil erosion, etc. Some of these measures contribute to improving the ecological status of water and water-dependent biodiversity. In 2011, the measure "Natura 2000 payments for agricultural lands" was launched. Natura 2000 payments compensate farmers, whose lands fall within Natura 2000 zones, for the restrictions on farm activities, which they should comply with. Natura 2000 restrictions and related compensations are presented in Annex II. It should be noticed that there is a measure in the NRDP - "Restoration of Riparian habitats", which has been just announced but not opened.

The Operational Programme for Environment also provides opportunities to the Directorate of Persina Nature Park to support field researches and conservation activities.

In summary, there are existing public funds to support the protection and restoration activities in Persina Nature Park but they do not represent sustainable funding for wetland management and are not really payments for ecosystem services. These funds can be well used in combination with a running private scheme, as planned and described in the Project Document of the Danube PES project.

The Danube PES team has focused on finding a sustainable solution for wetland management. WWF proposed a market solution, which allows for involving local stakeholders into the restoration and maintenance of wetlands. This is reached through giving them the opportunity to harvest the biomass on the wetlands, respecting biodiversity safeguards. The biomass could be then processed into marketable goods - pellets and briquettes. In this way non-market ecosystem services, such as regulating ones, would be integrated into the goods based on the biomass provided by the Kaikusha marsh.

In this scheme, the Directorate of Persina Nature Park would play the role of the manager to ensure that biodiversity safeguards are well respected. WWF identified local farmers as the potential providers. They could be interested in harvesting the reed and other wetland vegetation to produce marketable energy goods because they have some of the machineries and can diversify their farming activities. Potential beneficiaries would include biomass processors, local fishermen, buyers of the end goods produced with the biomass and local residents and visitors of the area.

1.3. INTERVENTION AREAS

The project intervention area in Persina Nature Park covers the entire territory of Kaikusha protected site. Kaikusha was announced a protected in 1978. At the time, the protected site included a remnant of the biggest Danube lowland, Svistov-Belene, and covered an area of 155.4 ha. The main conservation goals of the protected site were to protect the natural habitats of rare waterfowls and plant species, and the typical landscape of this region. [5]

Figure 1: Map of Persina Nature Park and Kaikusha protected site

Source: Green borders project, 2012

The literature review reveals that in the past Kaikusha was the third largest marsh in that area of the Danube lowland.

Kaikusha was the only one marsh which remained after the first half of XX century, when a huge conversion of wetlands into arable lands took place. Some sources even point out that in the second half of XX century there were already reed formations in the marsh. At that time, the reeds were cut to free space for fishing and to use the reed as construction material. The marsh was connected to several rivulets in the area, which together with reed-cutting contributed to maintaining its hydrological regime. Finally, the disconnection of the marsh from its water sources because of infrastructural development and the last two dry decades, as well as the termination of reed cutting practices had lead to quick degradation of the marsh. As a result, today, even in springtime, there is no open water surface in the marsh - the whole area of Kaikusha is occupied with reeds and ruderal species. In addition, the contamination from intensive agriculture, practiced on nearby fields has aggravated even further the situation in the marsh. These changes have undermined completely the conservation value of Kaikusha protected site.

[5] Ordinance No 438/ 02.08.1978

Box 2: Excerpt from Final report on Management planning of protected areas

Between 1939 and 1946, dykes were constructed in a piecemeal fashion beside the Danube between Svishtov and Belene and a network of channels established on the floodplain. The aim was to create new agricultural land. Only the lowest lying land, the Kaikusha Marsh, with a high water table survived as wetland. Its water level, maintained by irrigation and an abundance of water from nearby agricultural areas, survived until the 1980's.

In 1978 the Kaikusha Marsh, reduced to 240 ha, was declared a protected area of national importance by Bulgaria's Committee for Nature Conservation, but the act failed to preserve it. The marsh is linked to a fishpond area, which has been abandoned. It was affected by a fall in water from irrigation that had replenished the marshland and drainage. Part of the area of Dekov village was converted into fish ponds (70ha) and they were managed as fishponds until 1990.

Source: GEF project "Wetland restoration and pollution reduction", GEF TF 024837, Volume 1

In 2005, the marsh was declared as an Important Bird Area by BirdLife International.

In 2010, the Directorate of Persina Nature Park, commissioned the development of a project proposal on improving the hydrological regime of Kaikusha marsh. The aim of the project was to restore the damaged conservation status of the marsh by creating open water areas. The main activities of restoration and maintenance of this habitat included: restoration of the connection between the marsh and the rivulets, and maintenance of the habitat through the harvesting of reeds.

1.4. THE PROBLEM THE PROJECT ADDRESSES

This pilot scheme addresses the problem of hydrological changes in Kaikusha marsh. More specifically, it focuses on the management of reed overgrowth which has created functional changes in the habitat. The overgrowth, the decaying biomass and the luck of freshwater inflow have resulted in a loss of carbon sink, worth 6000 EUR, according to WWF estimations. But it has also affected other ecosystem services, such as the spawning grounds of fish, which are almost extinct in the marsh, as well as the biodiversity.

The pilot also addresses the issue of ensuring sustainable funding for the management of and conservation activities in protected areas, such as Kaikusha, which is missing in this case.

SECTION 2: DESIGN

2.1. IDENTIFICATION OF THE TARGETED ECOSYSTEM AND ITS SERVICES

Persina Nature Park lies along the Svishtov–Belene lowland, including part of the steep Danube terrace bank at Nikopol and Svishtov, and all the Bulgarian islands in this part of the Danube. Administratively, Persina includes territories of three municipalities – Belene, Nikopol and Svishtov . It is a typical rural area with a population of 19 637 inhabitants (2011 census, National Statistics Institute).

Persina pilot site provides different benefits. Besides offering a habitat to fauna and flora species, Persina plays an important role for the livelihoods of local and downstream communities. The wetlands of Persina are a nursery for fish species of both conservation and commercial importance. They also provide many benefits intangible for local people. These services include the maintenance of the carbon, nutrients and hydrological cycles, as well as nutrients and sediments retention. These services are important for the water quantity and quality (Danube water is used for irrigation), formation of the local climate (precipitation), soil formation and erosion control. In this sense, they maintain local development and more specifically, support the development of fisheries and agriculture, which are the main economic activities in the region.

This pilot explores in particular the following ecosystem services by Persina nature park:

- **regulation of carbon (regulating)**

Table 1. Ecosystem services from Persina pilot site

Ecosystem Service	Annual value at 2012	Assessment method
CO_2 sequestration (Kaikusha marsh, 150 ha)	6,000 euro	Market value

- **provisioning of biomass (provisioning service)**
- **habitat maintenance (regulating service)**

It is believed that the exploration of these services may contribute to both preventing further the functional changes of the marsh and ensuring sustainable funding for wetland management. Enhancing these services will also improve the provisioning of fish, which is important for local and Danube communities downstream. Furthermore, Kaikusha is representative for other marshes in Persina Nature Park and for other wetland areas in Bulgaria. As there are 40,000 ha of protected wetlands in Bulgaria, the lessons learned from this project could be replicated to similar sites. Indeed, other wetlands also require biomass management and funding. They have the potential to ensure 24,000 tons annually in production of pellets and briquettes. This estimated volume is derived under biodiversity safeguards scenario of using wetlands biomass, under which only 20% of the biomass is cut per year.

2.2. ENVIRONMENTAL THREATS AND FUNDING CHALLENGES

The main rationale for focusing on biomass provisioning and carbon regulating services is

(1) the ongoing succession by reeds and loss of biodiversity in Kaikusha marsh

Due to the large drainage of wetlands in the area of Svistov-Belene lowland, Kaikusha marsh is not in its natural status. On the one hand, the restoration of the dynamic link between Kaikusha and the Danube is not possible today because of the drained marshes between them. On the other, reed succession has lead to the disappearance of open water surface and loss of flora and fauna diversity. Reed is a typical hygrophytes, which forms dominating societies. Usually, it occupies the most shallow parts of the marshes and grows very fast. These features of the reed ensure the quick distribution of the species in shallow waters, which causes additional shallowing. The rhizome of the reed and its decaying leaves and stalk create a layer of peat, which further stimulates the succession and increases the emissions of green house gases. Reed formations are the last phase of succession of water bodies.

(2) the lack of an economic instrument ensuring long-term financing for the management of wetlands

Existing public funding do not address the specific case of wetlands. Rural development payments, under Axis 2 support farmers for environmentally-friendly practices, which is highly needed. However, there is no running payment scheme which targets wetlands restoration and maintenance in the longer-term.
One of the problems with maintenance of biomass on wetlands is that reed-cutting requires special machineries suitable for wet terrains. Usually, this kind of machineries is relatively more expensive compared to those for terrestrial terrains. In addition to the cutting, the biomass should be brought out of the water body, so it does not decay there. This requires additional technical capacity to transport and store the biomass, and additional funding, respectively. Capital investments, such as specialized equipments can be acquired under existing EU support given that the project is financially viable. However, financial viability is hard to prove without economic, for-profit activity in place, which has been the Kaikusha case.

To tackle these problems and based on the pre-feasibility studies, the Danube PES team decided to work on a self-sustaining market solution to contribute to the restoration and sustainable management of wetlands in Persina Nature Park.

2.3. MARKET PAYMENTS SCHEME AS SOLUTION TO THE BIODIVERSITY PROBLEM

The goal of this market payments scheme is to support the restoration and sustainable management of wetlands in Persina Nature Park through integrating the value of non-market watershed regulating services into marketable goods provided by Kaikusha marsh, with the active involvement of local stakeholders.

The proposed solution for Kaikusha differentiates from PES, event that both, PES and the market payments are sustainable financing and tackle environmental problems.

PES is a deal between a user and a provider of ecosystem services. The provider manages the ecosystem and ensures a flow of ecosystem services. The buyer pays to the seller only if the seller ensures a flow of ecosystem services, preliminary identified between the parties.

In this **market payment scheme** the ecosystem services is directly generated by the user through managing the ecosystem respecting environmental safeguards. The generation of the ecosystem services becomes a core business of the user, ensuring a financial flow to the user re-invested in the sustainable management of the ecosystem.

2.3.1. BARRIERS FOR IMPLEMENTING THE MARKET PAYMENTS SCHEME FOR WETLAND RESTORATION

During the Design phase, the Danube PES team identified several issues, which could prevent a successful market payments scheme:

1) Maintaining the delicate balance of human activities to use the biomass

Kaikusha is a protected site, under the supervision of the Bulgarian Ministry of Environment and Water. The harvesting of reed should consider the natural carrying capacity of the area. At that stage, there was no wetland in Bulgaria with a management plan covering the use of wetland biomass. There were no practices to showcase the balance that should be reached and maintained between biomass used and left. So, there were no evidences of the environmental impact of biomass collection on wetlands in Bulgaria. This was an issue especially sensitive for Persina, in general, and Kaikusha, in particular, being an Important Bird Area (IBA).

The absence of a legal and practical basis was a barrier to introducing the market payments scheme for wetlands management.

2) High business risk

The introduction of profit-generating activities in wetlands was new to the Directorate of Persina Nature Park and the business. Since there were no precedents, there was no information on revenues and costs, which made the risk of generating economic loss rather high. This knowledge gap was especially linked, on the one hand, to the start-up costs of the scheme and, on the other, to the market for wetland biomass products. The start-up costs comprises the costs on machinery and equipment needed to collect the reed in the wetland and to process it into final goods, pellets and briquettes.

At the Design phase, the market of biomass energy products was still developing in Bulgaria. Most of biomass energy products were wood-based. In order to be competitive, new products, as reed pellets and briquettes, should be either sold at a better price than available marketed products, or have better energy generation performance (calorific values), or even both. During the design of the scheme, there were no evidences of the calorific value of reed.

The existing consumption patterns of poor rural areas could also be a business risk. Indeed, in the settlements on the territory of Persina Nature Park, people were used

to fossil fuels and would hardly shift to other new products, except if price was not considerably low. This could be a problem of attracting a business partner in the scheme and could prevent its start.

3) Lack of legal framework

There was no legal framework in Bulgaria, regulating the restoration and maintenance of ecosystem services provided by protected wetlands. The term freshwater ecosystem services[6] did not legally exist and the economic values associated with ecosystem services were known.

Furthermore, the practice of reed harvesting from protected wetlands for the production of marketable goods was not established in Bulgaria, as described above. On the one hand, this made it difficult to ensure the compliance of reed harvesting with environmental safeguards. On the other hand, the responsibilities and interests of parties in this deal could not be secured without a legal basis. This all put under uncertainty the parties involved in a potential deal, and could lead to their withdrawal.

[6] Note: WWF in cooperation with other Bulgarian NGOs has introduced the term in the Forest Act. More details can be found in the technical report on Payment Scheme for aesthetic and biodiversity values of Rusenski Lom nature park

SECTION 3: IMPLEMENTATION

Work in progress thus, so far includes:

- Addressing the barriers for implementing the market payments scheme for wetland restoration
- Development of a legal and operational frameworks
- Development of a financial framework
- Development of a monitoring and reporting framework

3.1. ADDRESSING THE BARRIERS

The introduction of market payments for wetland restoration and maintenance has been identified by WWF as a solution to the deteriorated hydrological cycle of Kaikusha marsh, in addition to the infrastructural measures needed[7]. The aim has been to involve local entrepreneurs in the sustainable management of wetlands by creating favourable investment conditions for them.

In this case, sustainability relates to the balance between business and environmental goals. Business interests of using reeds should in no case prevail environmental goals to maintain the good conservation status of the Kaikusha marsh. In the same time, the market payment scheme should be business rational, in order to sustain the interest of companies in maintaining the wetland.

To address this issue, WWF has taken several steps:

- **Assessing the capacity of Kaikusha marsh for sustainable use of wetland biomass**

WWF, together with biodiversity and water experts has developed guidelines on the sustainable use and management of biomass in Kaikusha. The report provides detailed information on the periods and method of reed cutting. It also gives the monitoring framework to be followed, as well as the indicators. The plan and all recommendations were coordinated with the Bulgarian Ministry of Environment and Water (MoEW). For reference, see Annex III Management guidelines on the sustainable use and management of Kaikusha marsh.

Box 3: Excerpts from the report on sustainable use and management of Kaikusha marsh

"...We suggest rotational cutting of reeds. The harvesting may take place on the whole territory of the marsh, occupied by reeds. However, no more than one thirds of the total reed surface should be cut per year. Uncut territory may form a compact fragment or several sports in different parts of the marsh.

[7] Green Borders, WWF, 2012 - http://www.green-borders.eu/en/noutati/Kaikusha-Swamp-Restoration-Finish.html

...The area, where Bozhurlushka rivulet empties into Kaikusha marsh should be kept uncut. In this way the reed will support the purification of water flowing in.

...It is very likely that the reed cutting zone covers the periphery of the marsh in most years, in a 100-200 m wide strip. The strip should be narrower (100 m) in the north part and wider in the south part of the marsh (200-300 m).

...Wet meadows, located in the south-west part of the marsh will be used for monitoring. The might be vulnerable to reed-cutting activities because of the use heavy machineries in place, which may lead to their degradation. This is why, these meadows should be excluded from the reed cutting plan by using heavy machineries.

...Reed cutting should take place in the period November - February of the year..."

Source: Management guidelines on the sustainable use and management of Kaikusha marsh

- **Expanding the area, providing the biomass**

The Danube PES team has assessed the viability of the market scheme from the business perspective. The team estimated cash flows, provided that a business partner invests in purchasing the necessary machineries and equipment to cut and process the wetland biomass. The analysis showed that to optimally use the production capacity it is necessary to either increase the intensity of biomass-collection from Kaikusha or expand to other areas in Persina Nature Park. Given the conservation status of Persina and the novelty of the approach, the team decided to select an area in proximity, to provide additional biomass resources. The selected site is called Karaboaz protected zone. It is located on the west of Persina Nature Park.

Some of Karaboaz territories are used for farming for crop cultivation. Burning of stubble fields is a common problem there, despite the legal prohibitions (Art. 5, par 4, Law of Protection of Agricultural Lands). These practices have lead to an increase of green-house gas emissions, loss of biodiversity and ecosystem services, which could be addressed within the market scheme proposed.

Box 4: In brief about Karaboaz protected zone, Natura 2000

Kraboaz is a protected zone, designated under the European Habitats Directive, with a unique identification code BG 0000335. The zone is located in north Bulgaria, west of Persina nature park. It includes the last section and the estuary of the Iskar river.

The main conservation goal of Karaboaz is to protect riparian forests. In the past this area was the biggest floodplain forest along the Danube, important for its temporary marshes, sand dunes, meadows and the rich flora and fauna.

The total area of Karaboaz is 12,200.36 ha. This includes arable lands of 5293 ha, managed by private farmers. WWF studies show that corn is the main crop cultivated in Karaboaz by farmers. This is logical given the high level of groundwater and the proximity to Danube, Iskar and Vit rivers. The distribution of reeds, Phragmites communis and Juncus maritimus, on arable lands, among farm crops is typical in Karaboaz. The share of reed vegetation in the total area of arable lands varies between 20 and 45%.

The zone is administered by the Regional Inspectorate of Environment and Water - Pleven.

Source: information system of Natura 2000 protected zones in Bulgaria
http://natura2000.moew.government.bg/Home/ProtectedSite?code=BG0000335&siteType=HabitatDirective

Feasibility studies of WWF and contacts with 25 farmers have confirmed their interest in providing part of the residues on farmlands after the harvesting for processing.

These supports not only the economic but also the environmental sustainability of the scheme.

- **Strengthening the business perspective**

To ensure the economic sustainability of the scheme it has turned necessary to show to businesses the economic potential of biomass-derived pellets and briquettes. WWF tested the energy potential of wetland biomass in an independent laboratory. The results showed that it was possible to create energy products from reeds. In addition, WWF has presented a comparison among different sources of energy, showing the advantages of pellets and briquettes. For reference, please see **Table 1, Annex IV Business plan**.

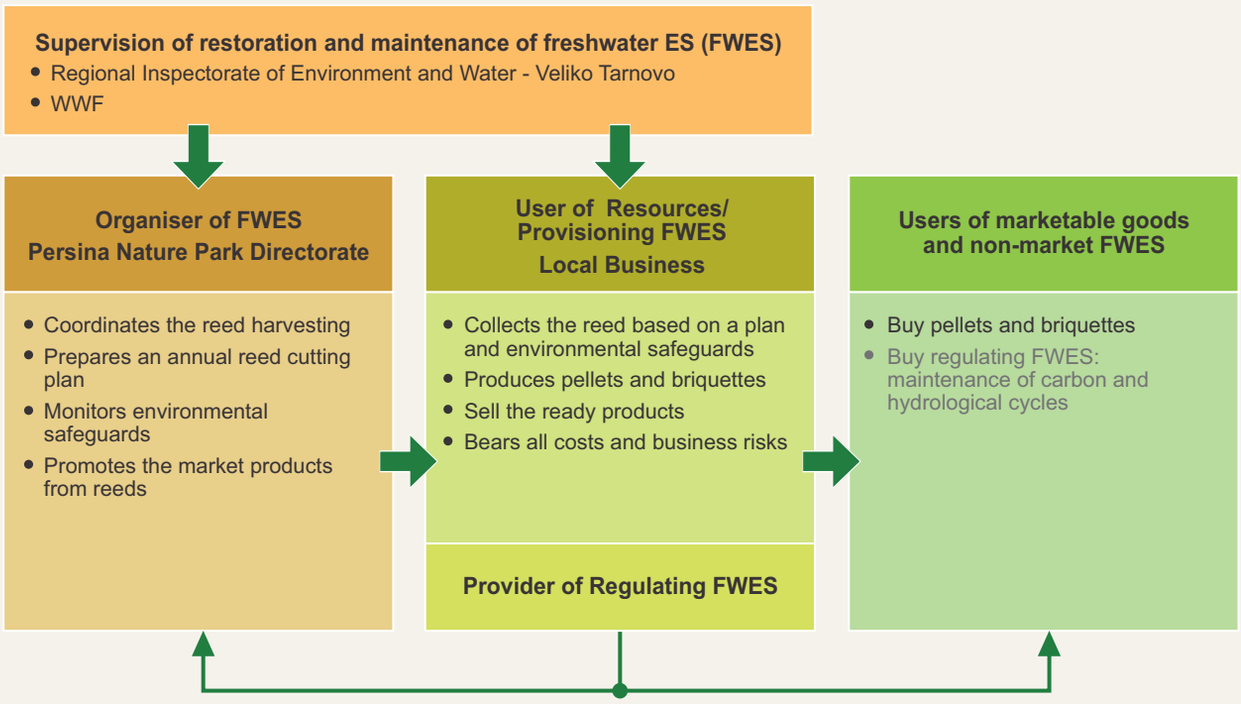
Following the conducted implementation work, the Danube PES team has given strong foundations to show that the restoration and sustainable management of Kiakusha marsh could be economically reasonable. At that stage, the further role of WWF is to raise the awareness of both the Directorate of Persina Nature Park and local businesses of the economic value of ecosystem services provided by wetlands, to facilitate the dialogue and establishment of contractual relationships and to monitor the results from this market scheme.

3.2. LEGAL AND OPERATIONAL FRAMEWORKS

WWF together with a legal expert has developed a partnership agreement on the maintenance and protection of ecosystem services in Persina Nature Park. The Agreement stipulates the rights and responsibilities of parties. The parties involved include:

- **the organiser of the scheme**
- **the user of resources - a local company interested in reed harvesting and processing into pellets and briquettes.**

The following chart presents the operational structure of the market scheme, based on the Partnership Agreement:



Source: Todorova M., 2014, Personal interpretation of the scheme

The **Organiser** of the scheme is the Directorate of Persina Nature Park, based in Belene. It is the custodian of the Nature Park. Its main responsibility in the scheme is to ensure the coordination, management, implementation and monitoring of the use of reed in Persina Nature park. The Directorate should develop a reed cutting plan each year in order to duly ensure the integration of environmental safeguards. It is also possible that the Directorate may support the promotion of finished reed products - pellets and briquettes, in this case - and have the right to get a share of the revenue of the business partner for supporting the sale of products. If generated, this income should be used only for the restoration of the hydrological cycle in Persina Nature Park, of wetlands different from those used by the business partner.

The **User of Resources** is actually a user of provisioning ecosystem services, provided by wetlands of Persina Nature Park. These are business partners who are interested in investing in reed cutting for the production of finished or non-finished goods. The User is obliged to comply with the reed-cutting plan developed by the Organiser, as well as with all management norms, regimes and restrictions imposed by the Bulgarian and European environmental legislation in Persina Nature Park. By cutting the reed the User also contributes to improving the carbon and hydrological cycles of the wetland. In this case, he enters into the role of a provider of regulating ecosystem services.

The **User** sells the pellets and briquettes to customers on the market, which in return supports the restoration of wetlands by sustaining the funding. Annex IV Business plan provides more information about the market of pellets and briquettes.

The implementation of the Agreement is **supervised** by the **Regional Inspectorate of Environment and Water (RIEW) in Veliko Tarnovo**. The Inspectorate is subordinated to the Ministry of Environment and Water, and is responsible for supervising all conservation and other activities in Kaikusha protected site. The RIEW gives a written permission to the Organiser and the User of Resources based on the reed cutting plan (prepared by the Organiser).

WWF also have a supervision role, stipulated in the Agreement. The Organisation should be updated of the progress of the scheme/ Agreement implementation every year.

3.3. FINANCIAL FRAMEWORK OF THE SCHEME

In this market scheme, the user of reeds (the provisioning service) bears all the costs and the business risk. In general, there is no transaction of cash from the User to the Organiser of ecosystem services. Even that the Partnership Agreement provides the conditions for income generation by the Organiser, this is linked to the revenues of the User of ecosystem services. For this, the financial framework presented here is developed from the perspective of the User of ecosystem services. The financial flows constitute the costs of the user to produce and market the good, and the revenues related to the sale.

The Business plan in the Annex presents comprehensive information on the specific investment needs and related costs, the value of unit of pellets and briquettes, as well as the net cash flows. The estimate of the cash flow cover a ten-year period. The analysis of the effectiveness of the investment shows that:

- the net present value of such a project is positive
- the internal rate of return is nearly 68%
- the pay-back period of such an investment is 2 years
- the Profitability index above 1 (PI = 6,23)

Therefore, it is safe to conclude that the investment in the collection and processing of biomass from Kaikusha is financially viable and economically reasonable, while respecting the biodiversity safeguards proposed in the sustainable management guidelines.

3.4. MONITORING FRAMEWORK AND INDICATORS

Respect of the environmental and biodiversity safeguards are the key element of this market scheme for restoration and maintenance of wetlands. If this is not reached, there is a risk of converting Kaikusha marsh into a man-made ecosystem. This will lead to further loss of biodiversity and ecosystem services. That is why the monitoring framework is especially important. The main aim of the monitoring is to trace and identify trends in populations of different species related to Kaikusha during its restoration. WWF has developed management guidelines on the use of biomass from Kaikusha - **Annex III** provides a summary of it.

The guidelines proposed two types of monitoring:

- key monitoring, which should be performed once every 3-5 years. It should include more comprehensive analyses of the status of the restored wetland, which will give the ground of future restoration activities and research of long-term development of the ecosystem.

- operational (annual) monitoring is performed within the duties of the administration of Directorate of Persina Nature Park. Its purpose is to provide the operational information necessary to manage the wetland.

According to the guidelines, the monitoring of the restored wetland should cover abiotic and biotic components. Monitoring of abiotic components includes mostly water quantity and quality (bio-physical parameters) in the marsh.

Monitoring of biotic components covers key species, including birds, fish, amphibians and reptiles. The figure below present species, indicators of good status of the restored wetland.

Figure 3: Species, indicators of good status of a restored wetland

BIRDS	FISH	AMPHIBIANS
Ferruginous Duck */Aythya nyroca/*,	European bitterling */Rhodeus amarus/*,	European fire-bellied toad */Bombina bombina/*,
Pygmy Cormorant */Phalacrocorax pygmeus/*,	Common carp */Cyprinus carpio/*,	Danube crested newt */Triturus dobrogicus/.*
Red-necked grebe */Podiceps grisegena/*	European weather loach */Misgurnus fossilis/*,	
	Leocarpus delineates	

Fish species are the main focus of the monitoring since they are the best indicators of a restored wetland. **Annex VI** provides a table of fish species identified as key indicatiors of the wetland econological status.

The body responsible for the monitoring is the Directorate of Persina Nature Park. The Directorate may implement on spot checks at any time of the reed-harvesting period and process.

The User of the resource is obliged to ensure an access to the area to be monitored. Monitoring on the field can also be performed by the RIEW - Veliko Tarnovo.

3.5. TIME FRAME

The Partnership Agreement is the basic legal document of the scheme and will be initially valid for 3 years, after which it can be renewed. The Agreement may be terminated by mutual consent of the parties at any time, as well as in case of force majeure. It may be terminated by any of the parties unilaterally in case of failure to perform their obligations.

New partners could be involved in the scheme but they should sign a separate agreement with Persina Nature Park Directorate.

4. RESULTS

✔ First tests

The first test production of pellets from wetland biomass took a place nearby Sofia, in the winter of 2010-2011. The wetland biomass used in that time was not from Kaikusha but form another marsh (Dragoman marsh). First pellets and briquettes were produced after series of trials and errors. This success lead to the first harvesting of biomass from Kaikusha, in the winter period of 2012-2013. The biomass was processed by the only company located the closest to Kaikusha marsh at that time - 140 km away (in Lesidren). Several test treatments of the biomass resulted in the production of approximately 3 tons of pellets.

Pictures 1,2 and 3: From reeds to pellets

Source: Georgi Stefanov, WWF

However, the production was not cost-efficient for the producer because of the costs to transport the biomass to the processing premises.

✔ Partnership with a local farmer and purchasing of machineries

Looking for local level partner during series of workshops in the area, in 2012, the team started working with a local farmer and his company **Eko Den ST**[8]. The farmer was interested in the scheme but had no technical and financial capacity to enter it. I this framework, the Danube PES team had developed two proposals on behalf of the farmer to find public funding for covering the scheme start-up costs. A first proposal[9], submitted under GEF small grant, operating in Bulgaria was rejected - according to evaluators the proposal was not financially viable. A second proposal was submitted under the EU Operational programme Human Resources 2007-2013. The second proposal included machineries with a smaller production capacity than the first one because the funding ceiling was lower. It was approved and all machineries were purchased and installed in the end of 2013. One machine for the production of pellets and one machine for the production of briquettes were installed.

Furthermore, the business partner, Eko Den ST and the Directorate of Persina Nature Park signed the Partnership Agreement regulating the scheme on 13 February 2014 in Belene. The Agreement was preliminary coordinated with the RIEW Veliko Tarnovo.

[8] ST - sole trader
[9] BG051PO001-1.2.03 Promoting start-up of projects for the development of independent economic activity

✓ Winter 2013-2014, first production and further testing

The winter period of 2013-2014 was relatively warm in Bulgaria and did not permit cutting of reed on time, as instructed in the management guidelines. The temperatures went below zero only in February 2014 but this was the period when first birds usually come to Persina.

The first production of pellets with new machineries took place in April 2014 in the premises of Eko Den ST.

During the production process, further tests have been conducted to achieve high quality standards. This process includes an assessment of the best biomass mix. Indeed, former tests have shown that it is not possible to produce pellets and briquettes only with reed biomass, due to small quantity of lignine in reed fibers. A mix, including around 20 % of agricultural wastes and wood (pine, beech) is currently evaluated. The final product would propose stronger calorific efficiency and more competitive costs.

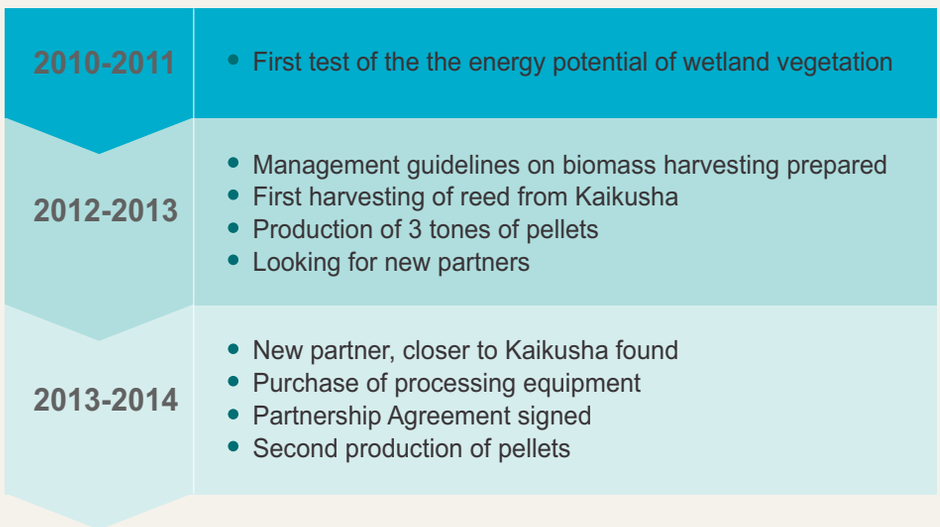
✓ Scale up to the national level

All the outcomes related to this pilot required active communication and coordination with the Bulgarian Ministry of Environment and their regional body, RIEW Veliko Tarnovo, which supervises Kaikusha marsh.

It should also be noticed that in 2013, WWF was actively involved in the consultation process related to the development of a National Plan for the protection of the most important wetlands in Bulgaria, undertaken by the Bulgarian Society for the Protection of Birds. In the National Plan, biomass harvesting and PES schemes exist as proposed measures and instrument to manage wetlands. The Plan also stipulates that the features and conditions of each wetland should be considered on a case-to-case basis. It has been adopted by the Bulgarian Ministry of Environment.

The main results achieved under the project are presented in the next figure.

Figure 4. Chronology of progress



SECTION 4: LESSONS LEARNED AND NEXT STEPS

4.1. LESSONS LEARNED

- **PES or non-PES**

The original idea for this pilot site was to develop a payments for freshwater ecosystem services scheme. aiming to restore a wetland through the application of sustainable land-use practices. However, during the design it became apparent that not all elements of a typical PES existed in place. In particular, there was no clear distinction between a user and a buyer of the ecosystem service. Rather than arguing for a change of objective, the project team got trapped in making the scheme fit the PES framework in order to "check off" a deliverable. It would have been better to accept earlier on that we are developing a valuable and innovative market instrument, supporting the restoration and management of a wetland, Kaikusha marsh, even if it cannot be called a genuine PES.

- **How a user of nature resources is also an ecosystem steward**

This market scheme for restoration and management of Kaikusha marsh is still in its beginning, despite the pre-feasibility studies and numerous tests. It can be said that developing a business-related solution to tackle an environmental problem, such as the degradation of Kaikusha marsh caused by the change in the hydrological cycle, requires the integration of both business and environmental aspects in the longer term. It is possible to apply the scheme only if the business solution respects of environmental, in particular biodiversity safeguards.

What is peculiar in this case is that the user of ecosystem services does not buy or obtain them from a provider. The user of ecosystem services generates directly the benefits during the restoration of the ecosystem; and he continues to generate them after the restoration by managing the ecosystem in a manner respecting the natural carrying capacity and the biodiversity. The restoration and the environmental management generate economic return and become the actual core business of the user of the ecosystem services.

At the same time the user of the provisioning ecosystem services in the scheme enters into the role of a provider of regulating services (see Section 2, 3.2). By using the biomass from the wetland (provisioning services) to produce a finished marketable good, the user restores the water and carbon cycles, as well as the habitat functions of the marsh. In this sense, the use of the provisioning services enhances the regulating services.

So far, nobody pays for the regulating services provided by the user/reed-cutter. However the user takes out the biomass from the wetland without paying for it. He also covers all the capital and running costs at his own risk. The current situation involves thus no payments for the ecosystem services.

Nevertheless, this situation might change in the future. Indeed, the user of the biomass could generate much more public benefits in terms of saved costs on managing the wetland and enhanced regulating services than considered in the scheme. Furthermore, the market may not pay off the full price of all these services

by only purchasing the pellets and briquettes, and actually it might be the role of the state to support the business entrepreneur, providing a small compensation for the public benefits associated with a sustainable wetland management. This is a subject of further research, and it should be based on an assessment and valuation of the ecosystem services enhanced and maintained further to the implementation of this scheme.

Some other important aspects include:

- **Environmental aspect**

The reeds are a dominating species, which in the case of Persina aggravate the problem of habitat change due to the deteriorated water regime in Kaikusha marsh. Clearing the reeds is a potential solution to overcome the problem. However, this should be done carefully, as reeds also play a water purification role, at the point of water inflow in the marsh.

This solution is specific to Kaikusha. It should not be automatically replicated to other wetlands, even those located in Persina Nature Park. Restoration by using the biomass should be very well assessed. Biological and ornithological expertise is needed to ensure a balance biomass use between restoration and maintenance of existing ecosystem services.

- **Capacity to participate**

For engagement in the scheme, the business partner as user of the provisioning ecosystem service needed not only technical but also financial capacity, in particular for investing in machinery and equipment, which was a problem. The Danube PES team consequently submitted project proposals to financing programmes on his behalf and succeeded in raising funds from the Operational Programme Human Resources.

Therefore, it is important to assess potential sources of funding, which may support the start-up cost of the scheme, especially capital investment. It is also important to support partners in accessing public funding by providing an information and expertise (development of project proposals).

- **Business risk and interest**

The business risk in this market scheme is carried entirely by the business partner. Given this, it was the role of the Danube PES team to assess/ prove the feasibility of the scheme from the perspective of the user of ecosystem services. For the purpose, the team worked on finding an optimal solution, combining the business interest (profit generation from biomass) with the conservation interests. The team made investment feasibility studies. It also calculated the prime costs of pellets and briquettes, based on which the team made ten-year projections of costs and benefits. It became apparent that profit is not the only aspect to consider when working with potential business partners. It is also necessary to consider the business risk related to the novelty of the market scheme for wetland restoration and management. This is also associated with the possibility to attract funding for implementing the scheme, in addition to the risk of business interruption. Taking this into consideration, it is important to prepare all this information in order to attract a partner in the scheme.

- **Public funding for ecosystem services**

As mentioned before, the Danube PES team prepared two proposals to support the acquisition of the machineries to collect and process the wetland biomass because it did not deliver immediate financial benefits within the timeframe of the project, and was rated financially unsustainable. The first proposal was rejected. It was assessed from financial perspective - the value of ecosystem services was not considered by the evaluators of the proposal.

The second proposal was improved based on the feedback to the first proposal. It was approved. Therefore, there is existing public funding which should be review and used, on one side. On the other side, it should be noticed that existing public funding instruments do not have the framework to account for the value of ecosystem services, when assessing capital investments projects enhancing ecosystem services.

- **Markets**

For this market scheme it is highly important to work on the local markets. In this regards, the scheme success depended also on the commitment of the local government. Local public institutions are the first logical customers of the pellets and briquettes from wetland biomass. From one side, they could reduce their costs on heating. On the other, they will support the awareness raising at local level of the importance of these products, while supporting the wetlands and local economies. From the perspective of the producer of pellets and briquettes, the local market is an entry point - they are located closer and this reduces the prime costs of the pellets and briquettes. Therefore, it is necessary to work with local governments and local stakeholders to raise their awareness about the opportunity and benefits of replacing fossil fuels used at the moment with biomass pellets and briquettes.

4.2. NEXT STEPS

The development of this pilot will continue after the Danube PES project. It is a test case, which could be applied in other wetlands in the country. Further to the experience under the Danube PES project, as well as in relation to other initiatives of WWF in Persina Nature Park, it is expected to revise the management plan of the Nature Park and to include the biomass management as a measure for the restoration of the wetland. The procedure has started and it is now up to the Bulgarian Ministry of Environment and Water to finalise this process.

The further development of the scheme also includes to develop the work in Karaboaz, as described earlier in this report. The interest among farmers exists. However, first, it is necessary to start the production of pellets and briquettes at the local level, with Eko Den ST. Given that machineries were installed and tested it would be possible to expand the biomass collection activities on the ground and reach the optimal potential of this scheme.

There is already an interest among other stakeholders to get involved in the scheme. In addition to farmers cooperatives, the local Hunting Association of Belene is interested in this scheme and currently observes its development.

A key step forward would be to work on the market development. At the moment the market for biomass pellets and briquettes is still evolving. There is a niche but it is necessary to increase the market share, so to keep the business interest. In this sense, it is important to undertake a campaign to raise the awareness of the local population of the advantages and role of reed pellets and briquettes for their households, the wetlands in the area and ecosystem services generated.

It should be noted that the market of energy products is influenced by the national policy on Renewable Energy Sources (RES). Currently, this policy favours big production capacities. The new draft National Energy Strategy 2030 (with a 2050 vision) supports the production of energy on the larger scale, decreasing the role and share, respectively of biomass renewable energy. This brings an uncertainty among smaller entrepreneurs, like Eko Den ST. The role of WWF is to follow this process and to lobby for a fair share of RES in the new National Energy Strategy.

WWF will continue to work on ecosystem services provided by Persina Nature Park. In 2013, WWF has started a scientific project on ecosystem services and instruments for their enhancement and management, as part of a project called OPERAs - for reference, please visit http://operas-project.eu/

A socio-cultural and socio-economic valuations of ecosystem services provided by Persina will be conducted. The results from these two studies will be compared to identify commonalities and differences between economic and cultural values. This knowledge will feed the local development policies, as well as different existing funding and developing instruments for wetland management. This work will help the team to assess in socio-economic terms the impact of restoration activities in Persina and the results of this scheme.

- **Upscaling potential**

This pilot shows the business perspective of restored and sustainably managed wetlands. It provides a green economy model that generates economic, social and environmental benefits.

The knowledge and experience generated from the application of the scheme in Kaikusha pilot has inspired the initiation of similar pilots along the Danube and the potential for further applications is considerable.

In the Danube Delta, for example, reed-cutting is a pivotal element of ecosystem management. Like in Persina, the production of reed pellets and briquettes contributes to the restoration of wetlands and reduction of greenhouse gas emissions.

In addition to the production of pellets and briquettes, reeds can be used for the production of roofs, light furniture and housing insulation. The Danube PES team has checked these opportunities and found few German and Australian companies who have patented reed-based products. However, for the start up of such initiatives and the involvement of investors along the Lower Danube, it would be necessary to create a favourable business environment. This means that: (1) legal grounds for use of wetlands on protected areas for profit activities need to be established; (2) the hydrological and ecological limits of using wetland biomass need to be assessed as basis for realistic business planning; (3) and potentially technical support must be ensured for potential investors to acquire the capacity needed to start the production processes. The last point is especially relevant for small scale local companies who, in most cases, are not ready to invest in innovative solutions.

Furthermore, this means that the restoration and sustainable management of wetlands should go beyond the national (or local) environmental agenda and should be given proper inter-institutional attention and capacity and be part of national green economy development.

ANNEXES

ANNEX I. LIST OF PROTECTED AREAS OVERLAPPING PARTIALLY OR FULLY WITH THE TERRITORY OF PERSINA NATURE PARK

1. Managed Nature Reserve: Peschinski Blata
2. Protected Site: Kaykusha
3. Protected Site: Persin
4. Protected Site: Persin Iztok
5. Protected Site: Plavala
6. Reserve: Kitka
7. Reserve: Milka
8. PZ under the Bird Directive: Kompleks Belenski ostrovi
9. PZ under the Bird Directive: Nikopolsko plato
10. PZ under the Bird Directive: Ostrov Lakat
11. PZ under the Bird Directive: Svishtovsko-Belenska nizina

Source: EEA Bulgaria, Internet site

ANNEX II. NATURA 2000 SITES IN PERSINA NATURE PARK ACCORDING TO THE BIRD DIRECTIVE AND RESTRICTIONS TO FARMING ACTIVITIES

Code of the site	Name	Restrictions and level of compensation, Euro/ ha					
		1	2	3	4	5	6
BG 0002017	Belene islands complex	20	-	70	30	-	-
BG 0002074	Nikopolsko plato	20	65	-	30	28,5	70
BG 0002091	Lakat Island	20	-	-	30	-	-
BG 0002083	Svistov-Belene lowland	20	65	-	30	28,5	-

Coding of restrictions:

1 - Removal of landscape features (single or a group of trees, landmarks) when using agricultural lands for farming

2 - Use of non-selective means against pests in forests (in agriculture)

3 - Mowing of meadows until 01 July

4 - Ploughing and forestation of meadows, pastures and common grazing areas, as well as their conversion in arable lands and perennial crops

5 - Application of pesticides and fertilizers on grasslands

6 - Machine mowing of meadows from the periphery to the centre, at high speed, before 15 July

ANNEX III. KAIKUSHA MANAGEMENT GUIDELINES - SUMMARY

RECOMMENDATIONS FOR MANAGEMENT OF KAYKUSHA PROTECTED SITE

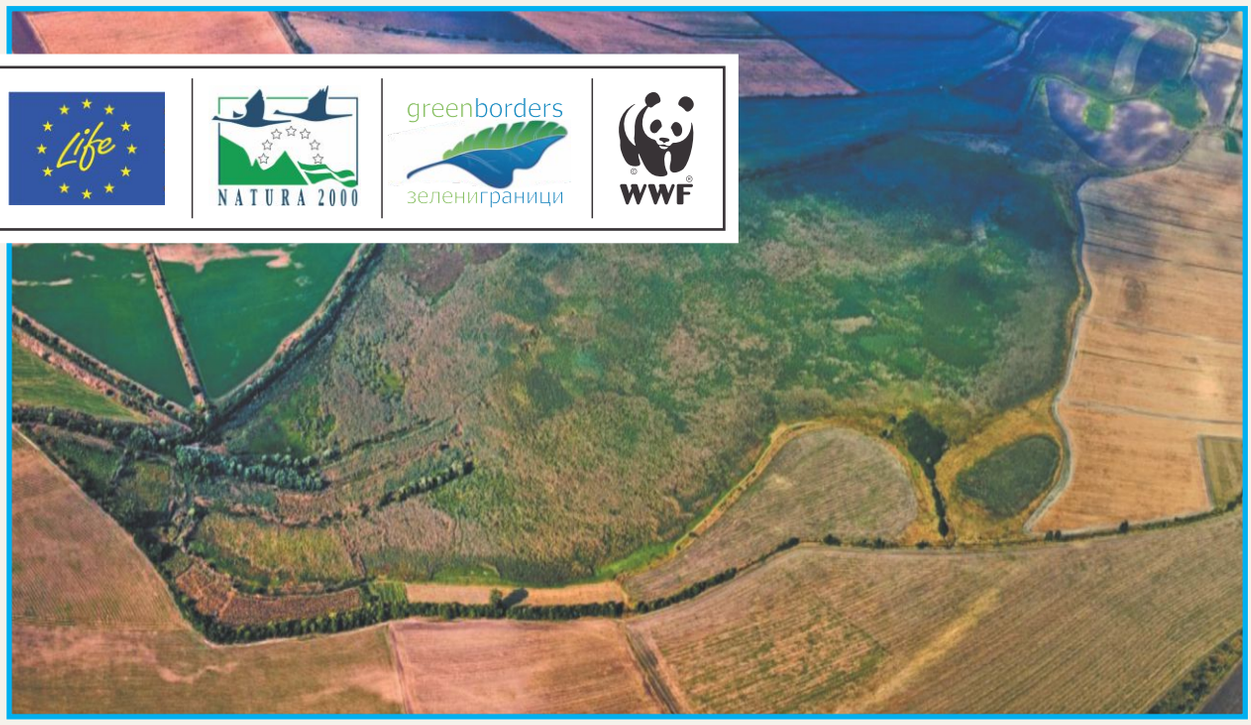


Photo: © Alexander Ivanov

Authors:
Rossen Tsonev, PhD
Vesselin Koev – Persina NPD
Ivan Hristov – WWF

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KAYKUSHA PROTECTED SITE DESCRIPTION AND HISTORICAL DATA REVIEW

Kaykusha Protected Site is designated under Order No. 438/ 02.08.1978 within an area of 155.4 hectares covering the remaining part of a wetland within the former floodplain of Svishtov-Belene. The purpose of its designation is to preserve the natural habitat of rare water birds and plant species as well as the typical landscape features, as outlined in the designation proposal of a team surveying the vegetation of water bodies in Bulgaria (ref. Kochev, Yordanov 1981).

According to the available baseline sources (Bonchev 1929) the Kaykusha marsh has been the third largest within the Svishtov-Belene lowlands and the only one in the area that has not been dried up following the 1950s. As reported by Stanev (1956) the water mirror of the marsh, although confined by reeds that were already being cut at that time, had been big enough for fishing in the beginning of 1950s. According to Bonchev (1929), it has been the deepest marsh, along with Srebarna (up to 3 m), downstream the Danube River. This fact, as well as its additional feeding by small streams running down the villages of Dekov, Oresh and Tatari, has preserved it relatively intact for quite a long time after the neighbouring Danube marshes, including the Svishtov Balta, had been dried up. Bonchev (1929) states that the marsh area was about 300 hectares and, although twice as big as the current area (approximately 160 ha), had similar distribution of marsh coenoses.

In the summer of 2010 surveys were undertaken at Kaykusha marsh with the purpose of mapping the natural habitats to inform a restoration project for the marsh ecosystem and the water level. It was established that, for all the water feeding the marsh (e.g. by infiltration), the inflow is not of such magnitude as to change the existing habitats. In comparison with the period between 2001 and 2004, there were no significant changes in the marsh vegetation and the natural

habitats diversity. Even nowadays the predominant communities are that of reed *(Phragmites australis)*. A fragment of narrowleaf cattail *(Typha angustifolia)* community was established only in the former fish breeding pools. The level of ruderalization of these communities is high – there are a number nitrophillic and ruderal species, such as Urtica dioica, Galium aparinae, Cirsium arvense. Only in the periphery of the marsh, in particular in its west and southwest part, there are vast floodplain meadows rich in various mid-height hygrophytes *(Bolboschoenus maritimus, Lythrum virgatum, Althaea officinalis, Iris pseudacorus, Festuca arundinacea)*. It was concluded at the time that if measures for additional water feeding to the marsh are not taken to restore its water balance, the dynamic equilibrium between the meadow communities and the reed coenoses will be preserved. Invasion of reed into meadows is possible in years of higher precipitation and longer flooding period, and vice versa – expansion of the meadow coenoses in dryer years, but these are not significant in magnitude.

The survey undertaken in 2010 within the area of Kaykusha Protected Site did not identify any plant species of conservation importance. Locations of the endemic and protected species Bulgarian statice *(Limonoim bulgaricum)* were identified relatively close to the Protected Site. In our opinion the species of conservation importance (listed in the Red Data Book of Bulgaria or in Appendix 2 and 3 to the Biological Diversity Act) *Nymphaea alba, Nuphar lutea, Nymphoides peltata, Marsilea quadrifolia, Salvinia natans* recorded by Kochev, Yordanov (1981) have become extinct, except for *S. natans*, with the marsh drying out. The latter species, floating fern, currently occurs in some drainage channels.

During the summer survey carried out in 2010 within the Protected Site, 9 natural and man-made or influenced habitats listed in the EUNIS Habitats Classification were identified and mapped.

A project for water sourcing to the Kaykusha marsh was implemented in 2011. The main water sources were the streamlets of Oreshka and Tatarska. Nonetheless that continuous water inflow to the marsh had been in place for more than an year, this has not led to any considerable changes in the marsh vegetation, because of the very dry year of 2012.

PROBLEMS RELATED TO HABITATS SUCCESSION AND MANAGEMENT

As underlined above, the Kaykusha marsh has lost the natural state it had before the large scale dewatering of Svishtov-Belene lowlands. Its water balance in the past was also maintained by the high tide of the Danube River, which is practically impossible now, since the marshs imparting the dynamic relation between Kaykusha and the Danube have been dewatered. Its filling up with turf and organics has resulted in the loss of water area and considerable decrease of the diversity of flora, plant communities and natural habitats. Typical hydrophytes and their communities have become extinct. The marsh was fully taken up by reed communities and much less by narrowleaf cattail, and its periphery lined up with wet meadows.

The common reed is a typical hygrophyte often forming monodominant communities in water bodies. It usually occupies the shallowest parts of lakes and marshes where water depth does not exceed 0.5 m in the active vegetation season which, for this species in Bulgaria, is June-September. The reed could reach 2 to 6-7m in height, and due to its creeping root system, a plant can spread within a radius of 5 m in an year. These features enable the species to rapidly occupy shallowing water bodies and cause their further shallowing. The roots of reed and its dead leaf and stems can swiftly form a turf layer, triggering succession. In addition, the green stems of reed are very strong and fast growing. They vigorously transpire water and cause its quick depletion. Reed communities are poor in species diversity because of the strong edification role of the dominant. They include relatively small in number, usually common hygrophyte species, such as *Calystegia sylvatica, Stachys palustris, Lythrum salicaria, Lycopus europaeus, L. exaltatus, Solanum dulcamara, Epilobium parviflorum, E. hirsutum,* etc. The reed is the last stage of water body succession which ends up with replacement of hygrophyte by mesophyte communities. The common reed is the most drought resistant species among the high hygrophyte-helophyte species. Quite often after it has gone, meadows or hygrophyte woodland communities occur at the place of the water body.

Water bodies vastly occupied by reed communities have poor faunal diversity. There is limited number of fish species or even none. Relatively low in number are the bird species breeding in vast reed areas when there are no other pools nearby to use as feeding places. Such species, breeding in reed, are the Western Marsh-harrier *(Circus aeruginosus)*, the Purple Heron *(Ardea purpurea)*, Great Bittern *(Botaurus stellaris)*, Great Reed Warbler *(Acrocephalus arundinaceus)*, etc.

Annual cutting of reed will slow down the natural succession and the flow of nutrients into the marshes. However, it will not essentially reduce the transpiration, since reed cutting is usually undertaken outside the season of active vegetation. The annual removal of a considerable amount of biomass will decrease the rates of water depletion and transition of hygrophyte to mesophyte communities.

Reed roots, and in particular the bacteria living in symbiosis with them, are bio-remediators and take an active role in water self-purification. They are natural filtering agents and actively absorb nutrients. It may well be said that due to the nature of land in the vicinity of Kaykusha – actively fertilized areas, the existence of a well-developed reed belt in the Kaykusha marsh ensures the self-purification of water, including the inflow from surrounding areas. Therefore the main objective of activities related to restoration and maintenance of the water balance of the marsh should be aimed at ensuring a natural dynamic equilibrium between the water area and the area occupied by reed communities.

RECOMMENDATIONS FOR HABITATS MANAGEMENT

The necessity of reed cutting off the Kaykusha marsh cannot be currently defined unambiguously. Taking a large quantity of biomass off the common reed communities that form the current appearance of Kaykusha will delay the anthropogenically accelerated natural succession of the marsh. This will stimulate the restoration of the water mirror in Kaykusha that was gone in the last decades. On the other hand, continuous reed cutting would create an ecosystem that would be highly modified by human activity; it would destroy the permanent refuges of water species (especially birds and mammals) and would cause their recurrent disturbance. Therefore the balance, where reed cutting will not lead to complete transformation of the current ecosystem into one severely influenced by human activity, shall be sought. Reed cutting itself is a complex process related to providing funds and stakeholders to implement the activity while making the most efficient use of the biomass collected. In addition, reed cutting also depends on climatic conditions throughout the year and respectively on the water level in the scheduled period for reed cutting.

Our suggestion is that reed cutting should be undertaken on a rotation basis. While cutting may be implemented throughout the marsh area occupied by reed communities, it should be limited to not exceed 1/3 of the area of such communities within an year. We assume that cutting will be undertaken mainly along the marsh periphery where water is less and access of machinery is possible. In dryer years however reed cutting off the deeper part of the marsh (including the place of water mirror shaping) should be undertaken to aid the process of water mirror reinstatement.

We would suggest no reed cutting within the area where Bozhurlushka streamlet flows into Kaykisha. Reeds in this area will take part in the purification of nutrient rich water running down the villages where the steams pass by. In this case the reeds will aid to reduce the flow of these nutrients into the marsh. We would suggest keeping machinery off this area in order to protect the newly built channels letting water into the marsh. If rotation cutting of reed is adopted, a flexible scheme could be applied consistent with the climatic conditions over the years. It is highly probable that for most of the years the reed cutting area will cover the periphery of the marsh – a strip about 100-200 m wide in average. This strip shall be narrower (100 m) in the north part of the marsh and wider (200-300 m) in its southern part.

Reed cutting could have an adverse effect on the wet meadows in the south-western part of the marsh. These may be damaged by heavy machinery running over the area, which is likely to cause their degradation and ruderalization. Therefore meadows (indicated on the natural habitats map) should not be included in the cutting scheme using heavy machinery. This may be done after identification of their development trends following the restoration works and after the relevant monitoring results.

REGIMES AND QUOTAS FOR VEGETATION CLEARANCE IN KAYKUSHA PROTECTED SITE

1. The area of Kaykusha Protected Site is divided into Zone 1 (Non-Disturbance Area) and Zone 2 (Vegetation Management Area).

2. Zone 1 has an area of 31.43 ha within the boundaries identified by the following waypoints:

No.	X	Y
1	25° 11' 3,484" E	43° 35' 49,590" N
2	25° 11' 9,791" E	43° 35' 57,570" N
3	25° 11' 48,929" E	43° 35' 52,768" N
4	25° 11' 54,517" E	43° 35' 49,095" N
5	25° 11' 52,375" E	43° 35' 48,798" N
6	25° 11' 48,897" E	43° 35' 48,388" N
7	25° 11' 43,887" E	43° 35' 47,348" N
8	25° 11' 40,184" E	43° 35' 46,601" N
9	25° 11' 39,182" E	43° 35' 46,255" N
10	25° 11' 23,330" E	43° 35' 41,151" N
11	25° 11' 13,017" E	43° 35' 45,477" N
12	25° 11' 8,091" E	43° 35' 47,544" N
13	25° 11' 3,484" E	43° 35' 49,590" N

3. Vegetation clearance and biomass yield are prohibited in Zone 1. As an exception, such are allowed only in case of unplanned events, non-regular works related to maintenance of hydrotechnical facilities, and management of habitats and species, provided that a project for such activities is prepared in advance.

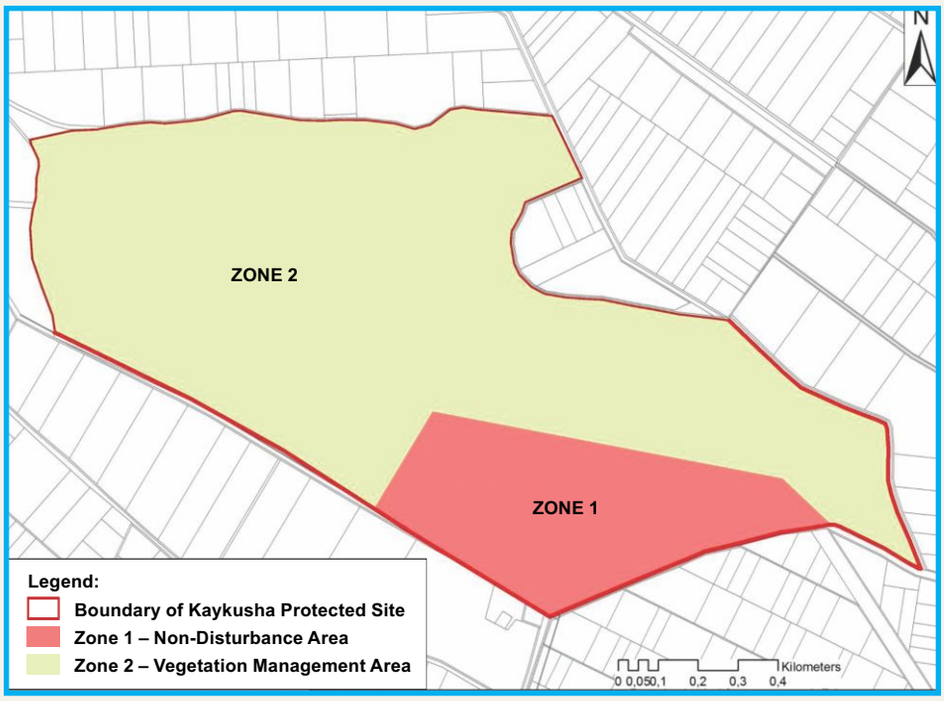
4. Zone 2 covers the area of Kaykusha Protected Site which is not included in Zone 1.

5. Regular vegetation clearance and biomass yield are allowed in Zone 2 under the following provisions:

- Vegetation clearance may be undertaken only between 1 November and 30 January each year.
- The maximum clearance area within an Autumn-Winter period shall not exceed 35 ha.
- Vegetation clearance is allowed only in separate detached sections with no more than 2 ha maximum area of each individual section. Strips of minimum 50 m width shall be left intact between the sections.
- Vegetation clearance from the periphery to the center within a section is prohibited.
- Mowing of wet meadows and other vegetation communities where reed is not dominant is allowed only when the soil substrate is dry or frozen. Mowing in these areas shall be implemented only with non-heavy equipment that will not damage the sod and the structure of soil substrate.

- Vegetation clearance shall be implemented in line with a plan agreed in advance by RIEW-Veliko Tarnovo and Persina NPD.
- Up to 1 March the entity that has carried out the clearance shall submit to RIEW-Veliko Tarnovo and Persina NPD a report for the works implemented in the preceding Autumn-Winter Period. The report shall mandatorily include information about the boundaries of cleared areas, identified with maximum allowable deviation of 10 m.

Zoning within Kaykusha Protected Site



TECHNOLOGICAL PLAN FOR IMPLEMENTATION OF ACTIVITY

We would suggest that prior to any vegetation clearance the handler should develop a technological plan for implementing the activity which is to be agreed by Persina Nature Park Directorate and the Director of RIEW- Veliko Tarnovo, who may require it to be amended or suspend the clearance for a certain period of time. The plan shall include the following information:

1. Data about the reed handler – actual status of the company, number of machines and information about the operators who will carry out the cutting.
2. Quantity and use designation of the reed yield.
3. Surface areas, locations and map layout of the Protected Site (Scale 1:10000) showing the areas subject to vegetation clearance and the areas that are not.
4. Direction and sequence of vegetation clearance works.
5. Periods for implementation of the activity.

Vegetation clearance may be undertaken each year; however RIEW-Veliko Turnovo or Persina NPD may put restrictions or suspend the activity for a certain period of time.

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ANNEX IV. INVESTMENT FEASIBILITY STUDY

Pre-feasibility investment study of the collection and processing of residual biomass from arable lands and reed in Persina-Karaboaz pilot area

WWF Danube-Carpathian Programme Bulgaria

Commissioned by: WWF Danube-Carpathian Programme Bulgaria, under the project "Promoting payments for ecosystem services (PES) and other related sustainable financing schemes in the Danube river basin".

Sofia, October 2011

INTRODUCTION

The project "Promoting payments for ecosystem services (PES) and other related sustainable financing schemes in the Danube river basin" aims at the development and practical application of innovative financial instruments focused on maintaining and funding the protection of the environment and its components – air, soil, and biodiversity.

In this connection, for the purposes of elaborating a scheme for the production and processing of residual biomass from the arable lands and reed in Persina-Karaboaz pilot area was carried out a pre-investment study aimed at analysing the economic and ecosystem benefits as well as the efficiency of the collection and processing of biomass, including minimising the impact of climate change in the area of Persina and Karaboaz. A sample structure and argumentation of the scheme has been prepared.

Source: © Georgi Stefanov

SITE DESCRIPTION

Kaikusha Marsh is a protected area designated by Ordinance No.438/02.08.1978 with an area of 240 ha. Its territory includes remnants of a wetland area in the former Svishtov-Belene floodplain and is part of Persina Nature Park, designated according to the Protected Areas Act. It was designated in order to preserve the natural habitat of a number of rare water bird species and aquatic plants, as well as the characteristic landscape. The site is located 15 km west of the town of Svishtov, 3 km south of the town of Belene, north of the village of Oresh and east of the village of Dekov. It comprises a large reedbed, which in the past was part of the no longer existing Marsh of Svishtov and Belene. It is included in Natura 2000 (BG000208 – „Svishtov-Belene Lowland").

In Kaikusha Protected Area there are 6 marshes, 3 of which were transformed into fishponds. Part of the village lands of Dekov, north of Kanchova Mogila, were turned into Dekov Fishponds with an area of 70 ha. These were functional until 1990, and at the moment the area is covered by the Dekovo Marsh. Directly next to it is the largest of the Kaikusha marshes, which was transformed into a fishpond with an area of 0.12 sq km. The other marshes are the Nikovo Marsh (0.08 sq km) and the Old Marsh (both used as fishponds) The marshes Kaikusha (0.06 sq km) and Dizepovo Marsh (or Dvoyno Marsh) are located in the central part of the area. The drainage structures and facilities in the adjoining arable lands of Kaikusha have caused massive degradation to this formerly important habitat of water birds.

Kaikusha Marsh was designated as a protected area in 1978 in order to preserve the habitats of some rare water bird species and aquatic plants, as well as the specific landscape. This is a nesting area of the globally threatened species of Pygmy Cormorant *(Phalacrocorax pygmeus)*. Kaikusha includes a wetland area, which, as a result of the diking of the Danube and the construction of a drainage system, has a disrupted water regime and ecosystem functions. At the moment it constitutes a reed field covering an area of 150 ha, without any open water surfaces. The natural habitat 3150 Natural eutrophic lakes with *Magnopotamion* or *Hydroharition* vegetation, which is supposed to be present in the central parts of the marsh in the open water surface is degraded, practically absent. Highly degraded are also the priority habitats on the fringe of the marsh – 1530 *Pannonic salt steppes and salt marshes and 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara*.

Karaboaz Protected Area takes up an area of 13,659.86 ha and includes the lowest stretch of the Iskar River, its confluence (Genchov Orman) and the river bank by the villages of Zagrazhden and Dabovan. It ends at the village of Somovit. It is located in the central northern part of the Danube Plain, 50 km from the district administrative centre (the town of Pleven) and 20 km from the municipal town of Gulyantsi. Its northern border is the Danube, with a length of 35 km.

Karaboaz Pilot Area includes the protected area of the same name. The Danube, shifting to the north, has left four natural barriers (swells) made up of sands, clay and sand deposits. The water streams (arms) that used to flow between these swells later turned into marshy areas (marshes). Until 1939, the Chernopol Lowland (Karaboaz) was flooded annually by the Danube and was the largest ever flooded forest, rich in plant and animal species. It was used mainly for fishing, and its marsh vegetation was used in part (mainly reed *(Phragmites australis)*).

The survey of the area shows that the drainage canals are clogged by reed roots, which in future will hinder the proper soil drainage and can lead to rising of the ground waters and consequent salinisation in 30 years (source: discussion with the respondent of the site Chief Assistant Rosen Tsonev PhD during a Natura 2000

seminar in Sofia). The possibility for this process to continue depends directly on land use and the choice of landowners between either cultivating the fields or preserving them as species habitats and using the future compensatory funding under Natura 2000.

According to information by the RIEW-Pleven from 2009, the aims of designation of the protected areas covered by the current study are the following:

Source: © Directorate of Persina Nature Park

- **Preserving the area of the natural habitats and habitats of species and their populations that are subject to protection within the protected area.**
- **Preserving the natural state of the natural habitats and habitats of species that are subject to protection within the protected area, including of the species composition, characteristic species and environmental conditions that are natural to these habitats.**
- **Restoration (if necessary) of the area and the natural state of priority natural habitats and species habitats, as well as of populations of the species that are subject to protection within the protected area.**

SWOT analysis

In the analysis below are summarized the opportunities and threats in the areas:

STREGTHS	WEAKNESSES
• A variety of freshwater bodies – rivers (Danube, Iskar, Vit); • An agricultural area with developed agriculture; • Generation of supplementary funding for the farmers;	• Application of excessive quantities of chemical fertilizers (NPK) of various compositions, total herbicides and insecticides; • Lack of knowledge of sustainable agriculture; • Low environmental awareness of land users; • Non-observance of the agrotechnical requirements in Natura sites; • Weak control enforcement by the National Service for Plant Protection, Quarantine and Agrochemistry and the RIEW.
OPPORTUNITIES	**THREATS**
• Improving the informedness of the locals, the local administration and the land users in the protected area of the relevant prohibitions and their obligatory observance; • Training of farmers in using good agriculture practices; • Restoration, if necessary, of the area and the natural state of priority natural habitats and species habitats, as well as of species populations that are subject to protection within the protected area.	• Stubble burning; • Disappearance of vulnerable species due to lack of control over the land users by the respective instituions; • Growth of the construction business – construction of wind farms; • Growth of agricultural activity, widespread plowing of pastures and commons; • Switching from food-producing agriculture to energy-producing agriculture.

With the changing climate, the role of agriculture as a provider of services related to environment and ecosystems will grow even more important. In order for us to receive high-quality ecosystem services, we need to protect the ecosystems that provide them. In today's commercial world, this is possible only if we are fully aware of their economic value.

Through ecosystems, nature provides us all with invaluable services. This is the idea that needs to be established in popular thinking, before people realise completely that the continuous degradation of our environment not only poses a threat to our own well-being but also is simply “bad business”. Accordingly, the aim of the scheme is, while protecting nature and switching to alternative energy sources, to create:

- an additional stimulus for farmers not to burn stubble – this will reduce greenhouse gas emissions, help protect biodiversity and preserve the soil structure;
- use of biomass from reed and straw for the production of heating pellets;
- reducing the environmental footprint of agriculture in a way that will minimise its negative environmental impact by prohibiting the burning of stubble, the use of unregulated chemical fertilizers and substances;
- environmental awareness of the farmers who are cultivating arable lands within a protected area for using good farming practices;
- preserving the area of natural habitats and habitats of species and their populations that are subject to protection within the protected area;
- preserving the natural state of natural habitats and habitats of species that are subject to protection within the protected area, including of the species composition, characteristic species and environmental conditions that are natural to these habitats.

ECONOMIC DATA AND STUDIES:

The production of heating pellets from biomass is an industry that is part of the energy sector as a heat source and a method for electricity production. Biomass pellets are included in Renewable Energy Sources (RES), more precisely in the group of biomass fuels. At present, the production of pellets is regarded as a promising enterprise.

Pellets are used most widely in Sweden (1,400,000 t in 2006) as an alternative to liquid fuels. In Australia, two-thirds of the new heating systems are pellet-based. Italy is the largest European market for automated pellet systems. New Zealand sold 3,000-5,000 t of pellets in 2003.

According to data from the National Long-term Programme for Encouraging the Use of Renewable Energy Sources 2005-2015, straw is used on a wider scale only in Denmark (around 1,000 t of straw annually). The use of other biomass types is still limited and at a demonstration stage of technology.

The only way of achieving zero greenhouse effect and zero emissions is the use of residual biomass as a fuel component, i.e. burning will generate as much CO2 as the plant has absorbed from the atmosphere during its growth.

Solid agricultural waste can also be used for energy production, e.g. straw, corn stalks and cobs, sunflower stalks and heads, tobacco stalks, fruit tree and vine cuttings. Studies show that in Bulgaria 30% of the straw, 65% of the corn stalks and 80% of the remaining solid agricultural wastes can be considered as sources for energy production, which amounts to around 800,000 t annually. The calorific value of straw with 10% moisture content is around 3,500 kcal/kg, and the ash content is around 5-6 %.

The most popular way of using biomass in Bulgaria is by burning firewood (logs). According to data by the Ministry of Agriculture and Forests, the quantity of logs used for heat production has risen more than three times over the period 1997-2004.

One of the ways of employing biomass for energy production is the direct burning of wood or straw particles in heat-production or cogeneration boilers. One of the main sources of waste biomass in Bulgaria are wood wastes from wood production and

wood processing. Studies show that every year around 1,600,000 t of wood waste are produced. The calorific value of wood waste strongly depends on its moisture content, which varies widely – from 10% in wood-processing waste to 55% in freshly cut wood. The calorific value of dry wood is around 4,300 kcal/kg, and of air-dried wood – around 1,500-1,700 kcal/kg. The ash content is only around 1-1.5 %.

Pellets are products acquired by pressing wood waste or agricultural waste without adhesive substances. Pellets are small cylinders produced by applying high pressure and temperature. Lignin acts as a natural glue and holds together the plant fibres. At temperatures higher than 100°C it melts and allows the material to assume a different shape. In this way the heated lignin serves as a glue that holds the pellets together in the form they are pressed into.

Parameters:

- Moisture content: below 10%;
- Calorific value: 4,300-4,500 kcal/kg;
- Length: around 2 cm; diameter 6-12 mm;
- Ash: around 0.9 – 1.5 %.

The calorific value of pellets is approximately equal to that of coal briquettes and only 2.1-2.2 times lower than that of diesel. The ash content is considerably lower than that of coal briquettes (5-10 %) and even of firewood (2-4 %). This means that after burning 1 t of pellets, the ash residue measures only 10 kg.

Advantages:

- Compact, easily transportable, easy to use, allow automated fuel feeding and have relatively high calorific value;
- Modern heating systems have high efficiency – around 80-85%;
- Easy maintenance and cleaning. If 200 m3 are heated only with pellets, around 710 kg per month are needed, which means around 7 kg of ash, i.e. the ash can be removed once a week;
- Pellets contain very small amounts of sulphur and other harmful components that are contained in much larger amounts in coal and petrol products.

Disadvatages:

- High production technology that requires considerable investment, therefore they are more expensive than coal briquettes and firewood (around 300 BGN/t);
- No sufficient local production, mostly imported fuel is used;
- No quality standards and guarantees.

Pellets are still new to the Bulgarian market due to the high investment costs and the lower purchasing power compared to other EU countries. Nevertheless, attempts are being made by local producers and it is expected that pellet production will gain momentum together with the development of the economy and the rise of the living standard over the next years.

For the past few years, automated systems for burning waste biomass (pellet boilers and stoves) have been available on the Bulgarian market. The price per kilowatt hour of thermal energy produced by burning residual biomass in these systems is 0.075 BGN. The waste from these systems when burning a mix of biomass does not exceed 3%.

Table 1: Comparison between prices of thermal energy from various fuels that allow an automatisation of the heating process

No.	Fuel	Calorific value	Efficiency	Price	Price per 1 kW
1	Diesel	11.67 kW/litre	88%	2.07 BGN/litre	0.204
2	Electricity	1 kW	100%	0.173 BGN/kW	0.173
3	Gas	9.89 kW/m^3	90%	0.9349 BGN/m^3	0.105
4	Wood pellets	4.9 kW/kg	90%	0.36 BGN/kg	0.081
5	Sunflower pellets	5.16 kW/kg	90%	0.28 BGN/kg	0.063

Note: Fuel prices as of 01.06.2010; prices keep changing continually.

The market has been growing steadily in Europe. All indicators demontrate stable growth, with demand higher than supply.

HOW IS BIOMASS USED FOR PELLET PRODUCTION IN EU COUNTRIES?

Skellefteå Kraft is a municipal company in the northeast of Sweden. The company possesses a large and growing teleheating network that serves households and industries. The cogeneration plant of Skellefteå is fed with waste biomass of up to 200,000 t (moist) or 450 GWh per year that comprises mainly sawdust, but also contains bark, turf, branches and loppings from wood production. The pellet production plant was commissioned in June 1996. The testing of the plant started in May 1997. The raw material for pellet production comes from sawdust from logging. The incoming raw material is 56 t per hour with moisture content of 55%. At full capacity the pellet production can reach up to 30 t per hour. The yearly production is around 130,000 t.

According to data from the Federal Ministry of Environment in Berlin, in 2003 in Germany biomass can cover 8% of the fuel demand.

According to a study by Deutsche Bank Research, a daughter enetrprise of Deutsche Bank, pellet burning systems have a particularly good perspective. Experts judge from the fact that only until the end of 2005 the number of pellet burning systems has grown to 34,000 and is expected to double.

Structure of scheme for payments for ecosystem services:

This scheme is intended for application in the protected areas of Persina and Karaboaz and will contribute to reducing the effect of climate change and to biodiversity conservation by means of supporting and encouraging farmers to utilize residual raw material from grains and oil-bearing plants for the production of eco-pellets and eco-briquettes.

INSTITUTIONAL FRAMEWORK

The providers of ecosystem services are farmers in the pilot areas who are growing wheat, barley, corn and sunflowers. After harvesting the crops, the residual straw is baled and sold to businesses as raw material for pellet production. In the scheme, these businesses act as buyers of ecosystem services and pay to the farmer the value of the biomass produced by the farmer. The scheme involves no intermediaries, the provider and the buyer are in direct contact.

Indirect participants are:

- People who are not cultivating lands within the protected area but are buying pellets from the producer;
- Reduced carbon emissions in the air – 10,280 inhabitants are benefited within the protected area;
- Reduced nitrate content of water for irrigation outside the protected area;
- Fishing in the rivers Iskar, Danube, and Vit, stabilisation of fish resources.

LEGAL FRAMEWORK

In order for the scheme to achieve its aims and to defend the interests of the supplier and the buyer of ecosystem services, between the parties must be signed a contract with clear purchase clauses stipulating:

- the kinds of biomass to be purchased;
- minimum size requirements for shipments;
- parameter requirements for the material (admissible moisture content, additives, rotting, pests);
- bale size requirements (length, breadth, height);
- mode of transportation;
- payment method.

FINANCIAL CALCULATIONS OF THE SCHEME:

On the basis of preliminary research and data provided by the District Directorate of Pleven – Agrostatistics Department about the crops harvested in 2010 were made the calculations of biomass quantities per decare for the various crops. For the purpose we used the farm of “Evro Si Komers OOD” in the village lands of Lenkovo, the Municipality of Gulyantsi in Pleven District.

To calculate the quantity of biomass acquired per decare, we proceeded in the following way: by GPS we measured 1-daa areas sown with wheat, corn and sunflowers. After reaping the wheat, the straw is baled and measured on the farmyard weighbridge. The same method is used for measuring the of corn and sunflower stalks. The measuring showed that the grains (wheat, corn) provide a quantity of straw and stalks that is equal to the grain yield per decare. One decare of sunflowers yields around 250 kg biomass. To calculate the quantity of biomass acquired from wheat and corn, we multiply the average yield per decare for the region by the number of decares of cultivated land, and for the sunflowers – by 250. The biomass quantities that can be utilized from Karaboaz Protected Area are as follows:

Table 2: Biomass quantities acquired from various crops

Crop	Cultivated areas (daa)	Average yield per daa	Quantity of acquired biomass (t)
Wheat and barley	14,010	400	5604
Corn	28,750	734	21,102.5
Sunflowers	10,270	250	2,567.5
Reed	17,918	540	9,675.7
TOTAL:			**38,949.7**

The only problem so far is the lack of machinery for the production of pellets in the region. Therefore the baled biomass will have to be transported 200 km to Lesidren, where it will be processed and returned in the form of pellets. This raises the cost of the pellets by 20-30% in comparison to conventional ones. At the moment the price of 1 t of pellets or briquettes varies between 300 and 450 BGN depending on the composition and producer. Over the past few years there has been a growing trend in the pressing of biomass into pellets or briquettes. Both products have the same energy form as the material they are made of but are much more durable, easier to transport, more efficient, and they produce less waste.

The process of converting biomass into pellets is presented in the diagram below. Every step of the process adds value to the whole process.

The chief factor in calculating the costs is the type of raw material used. If the raw material has a moisture content higher than 12%, this requires drying, which increases the electricity costs and raises the price of the production. In addition, if the raw material is coarse (if the particles are larger than a matchbox), a special shredding machine is needed. The additional costs must include the costs for drying (electricity), pellet pressing, storage.

According to data by the WWF for 2010 on the use of reed biomass in Persina Nature Park for pellet production, the final price of reed pellets reaches up to 448 BGN/t, which is by 20% more expensive than the market price of pellets made from conifer material. 1 t of reed and bulrush yields 700-800 kg of pellets.

In the pilot area, straw is usually compressed into round bales of 500, 800 or 1,000 kg, depending on the baler. At present, baled straw is used as fodder for livestock and is sold as such at the following prices:

- a roll of 500 kg – 50 BGN.
- a roll of 800 kg – 80 BGN.
- a roll of 1000 kg – 100 BGN.

EXPECTED OUTCOMES:

The PES scheme realisation will contribute to:

- minimizing the negative impact on the environment by prohibiting stubble and the excessive use of mineral fertilizers and pesticides;
- straw will not be left behind in the fields – this will help reduce evaporation and greenhouse gas emissions from agriculture;
- improving the water quality, supporting the protection of soils as ecosystems and preserving soil variety;
- generating additional income for farmers from the sale of biomass;
- use of biomass for pellet production;
- biodiversity conservation in Karaboaz Protected Area;
- reducing the impact of climate change.

To ensure the sustainability of the scheme, the suppliers and buyers of ecosystem services will sign contracts containing clear clauses on the purchase of biomass. Besides, in order to adopt sustainable agriculture in the region, the farmers cultivating lands within the protected areas will attend training for raising their environmental awareness and employing good agriculture practices aimed at environmental protection.

In 2012 it is planned to start the Natura 2000 programme under the Habitats Directive. This will be a good opportunity for farmers to apply under this measure and to fulfil the obligatory requirements included in it. The monitoring will be carried out by the Paying Agency and the RIEW-Pleven.

In 2010 and 2011, WWF Bulgaria implemented the project „Demonstrational installation of a heating system based on biomass and solar energy in the building of Persina Nature Park, to reduce electricity consumption and CO_2 emissions, and establishment of economic mechanisms for wetland restoration and sustainable use of reed as local energy source".

The implemented activities demonstrate the opportunities and potential for the use of biomass from wetland areas as a local energy source. The new technology has brought about a tangible reduction of greenhouse gas emissions by saving electric energy.

In connection with the forthcoming biomass collection, with the support of the agricultural co-operative was carried out the first mechanical and hand mowing of reed for collecting biomass from Kaikusha Protected Area. Calculated was the dry reed biomass per square metre – a little more than a ton of dry biomass per decare. The biomass processing was tested, and the biomass itself was subjected to energy and combustion analysis in a specialized laboratory. Energy analysis was performed for the various plant species (bulrush, reed) from the wetland areas.

Table 3: Amounts of sequestered carbon for various species from Kaikusha Marsh, 150 ha

	P gC/m^2/y	D gC/m^2/y	Area - ha	P gC/m^2/y	R gC/m^2/y
Reed (Phragmites)	802	617	120	104,3	80,2
Bulrush (Typha)	955	735	21	150,6	69,3
Club-rush (Schoenoplectus)	890	685	9	127,2	77,2
Carbon loss					20
Total production					719
Total respiration					499
Carbon sink					201

Production (P), decomposition, digestion (D) carbon retention (R)
Average total of 2 t C/ha/y = 600 t for Kaikusha Marsh > 6,000 Euro

Table 4: Test results for bulrush *(Typha)* – Protocol No.759/25.06.2010 – Independent Analysis Laboratory, Sofia.

No.	Quantity	Measurement unit	Methods (standardized, validated, intralaboratory)	No. of sample in lab logbook	Test results	DIN 51731 quality standard
1	Moisture	%	DIN 51718	638-2	**8,6** ±0,2	**12 max**
2	Specific combustion heat:	kcal/kg	DIN 51900	638-2	-	**-**
2.1	- of fuel	kcal/kg	DIN 51900	638-2	**4410** ±25	**4181 - 4657**
2.2	- of fuel	kJ/kg	DIN 51900	638-2	**18465** ±90	**17500 - 19500**
3	Sulphur content per dry matter mass	%	DIN 51724	638-2	**0,052** ±0,003	**0,08 max**
4	Combustion residue (ash) per dry matter mass	%	DIN 51719	638-2	**0,3** ±0,1	**1,5 max**
5	Released volatile substances per dry matter mass	%	DIN 59700	638-2	**82,4** ±0,2	**-**

Table 5: Test results for reed *(Phragmites)* – Protocol No. 760/25.06.2010 – Independent Analysis Laboratory, Sofia

No.	Quantity	Measurement unit	Methods (standardized, validated, intralaboratory)	No. of sample in lab logbook	Test results		DIN 51731 quality standard
1	Moisture	%	DIN 51718	638-3	**5,1**	±0,2	**12 max**
2	Specific combustion heat:	kcal/kg	DIN 51900	638-3	**-**		**-**
2.1	- of fuel	kcal/kg	DIN 51900	638-3	**4346**	±25	**4181 - 4657**
2.2	- of fuel	kJ/kg	DIN 51900	638-3	**18196**	±90	**17500 - 19500**
3	Sulphur content per dry matter mass	%	DIN 51724	638-3	**0,056**	±0,003	**0,08 max**
4	Combustion residue (ash) per dry matter mass	%	DIN 51719	638-3	**5,5**	±0,1	**1,5 max**
5	Released volatile substances per dry matter mass	%	DIN 59700	638-3	**78,2**	±0,2	**-**

The bulrush is the species with the best energy values and lowest ash content.

In the practical pellet-production experiments were tested the three main types of biomass, together and separately. The conclusion is that it is not necessary to collect biomass separately and process it into different types of pellets; on the contrary, the mixed biomass yields the pellets of the highest quality and with the best combustion indicators. It is not cost-effective to separate the different types of biomass.

Table 6: Comparison of the financial values of two variants for the collection of biomass

	VARIANT 1. Processing of 1 t of biomass in Lesidren *(BGN/t)*	**VARIANT 2. Processing of 1 t of biomass in Belene** *(BGN/t)*
Biomass collection	40.00 BGN	40.00 BGN
Primary treatment (baling) and transport	120.00 BGN	30.00 BGN
Biomass processing and delivery	200.00 BGN	200.00 BGN
Labour	100.00 BGN	100.00 BGN
Value of pellets	460.00 BGN	370.00 BGN
Market value of conventional pellets	400.00 BGN	400.00 BGN
Reserve / remainder	+ 40.00 BGN	- 30.00 BGN

PARTICIPANTS IN THE SCHEME REALIZATION:

The participants in the scheme are farmers cultivating lands in the protected areas. According to studies by the WWF of June-July 2011, there are 25 medium and large leasholders cultivating lands in the area.

The names of farmers cultivating lands in Karaboaz Protected Area are listed in **Annex 1**.

In June-July 2011 we held individual meetings and discussions with land users in the protected areas, who are willing to bale the residual biomass after harvest, but they insist on guaranteed purchase and a fixed price.

Other stakeholders are the companies producing pellets and briquettes. They are members of the Association for Biomass Energy Utilization (ABEU) founded in 2001 by several natural and juridical persons on the basis of shared professional interests in the area of using biomass for energy purposes. The Association is a member of the European Biomass Association (AEBIOM). A map of pellet producers in Bulgaria is attached in Annex 2.

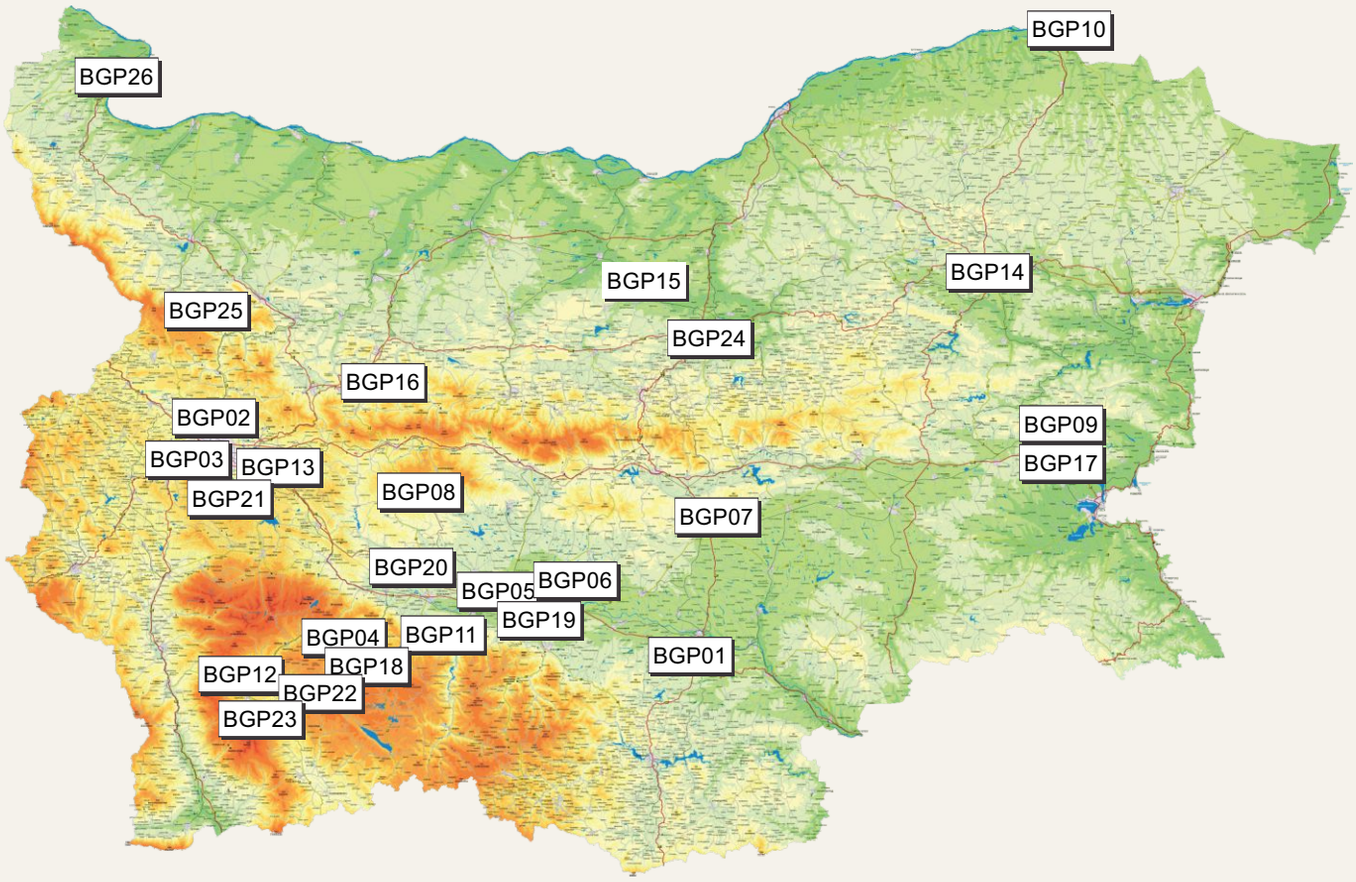
The written inquiries to companies producing briquettes and pellets showed that companies prefer to work with waste from the wood processing and wood production industry, as well as from the food industry. They are sceptical about the use of different types of straw, because this kind of waste can cause damage to the combustion chambers of pelletizers.
Indirect beneficiaries of the scheme can be the farmers cultivating lands outside the protected areas, as well as people using pellets and briquettes for heating.

ANNEX 1: FARMERS CULTIVATING LANDS IN KARABOAZ PROTECTED AREA

Village lands of	Name	Total area (ha)	Cultivated crops		
			Wheat and barley (ha)	Corn (ha)	Sunflower (ha)
Iskar	Ivan Mirchev	200	60	100	40
Iskar	Georgi Yankov	40	20	20	0
	TOTAL:	**240**	**80**	**120**	**40**
Gigen	Resen OOD	340	100	240	0
Gigen	Hera Agro OOD	80	80	0	0
Gigen	Velichko Tonchev	36	12	0	34
Gigen	Plamen Tonchev	40	0	40	0
Gigen	Katya Miloslavova	20	0	20	0
Gigen	Albena Tsvetkova	5	0	0	5
-	**TOTAL:**	**521**	**192**	**300**	**39**
Brest	Agro Bel 2001 OOD	600	0	600	0
Brest	Amber-Plamen Dachev ET	46	15	0	31
Brest	Asen Danchev	4	4	0	0
-	**TOTAL:**	**650**	**19**	**600**	**31**
Gulyantsi	Niki-Georgi Angelov ET	400	130	50	220
Gulyantsi	Resen OOD	400	0	400	0
Gulyantsi	Leokomers OOD	200	100	40	60
Gulyantsi	Svetoslav Ilchovski ET	70	70	0	0
Gulyantsi	Iliyka Opreva	50	0	0	50
-	**TOTAL:**	**1120**	**300**	**490**	**330**
Dabovan	Resen OOD	1000	400	600	0
Dabovan	Georgi Vasilev	100	20	30	50
Dabovan	Kostadin Dimitrov	60	0	30	30
Dabovan	Milen Popov	50	20	0	30
Dabovan	Nikolai Bolnov	150	50	0	100
-	**TOTAL:**	**1360**	**490**	**660**	**210**
Zagrazhden	Resen OOD	600	0	600	0
Zagrazhden	Kamen Pantaleev	180	80	30	70
Zagrazhden	Tihomir Todorov	190	60	30	100
Zagrazhden	Velichko Tonchev	12	0	0	12
Zagrazhden	MelInvest – Yanko Kopchev	200	120	0	80
Zagrazhden	Kiril Kirilov	180	45	35	100
Zagrazhden	Georgi Vasilev	40	15	10	15
-	**TOTAL:**	**1402**	**320**	**705**	**377**

ANNEX 2: LIST AND MAP OF PELLET PRODUCERS IN BULGARIA

The map below was compiled by the ABEU using information and support provided by Bulgarian pellet production companies.



ANNEX V. BUSINESS PLAN

PURCHASE AND INSTALLATION OF MACHINERIES FOR THE PRODUCTION OF BIOMASS PELLETS AND BRIQUETTES

1. SHORT DESCRIPTION OF THE INVESTMENT

The aim of the investment, described in this business plan is the sustianable management of biomass from protected areas, through purchse and installation of machineries for the production of biomass pellets and briquettes. The machineries will be placed in Ovcha Mogila village, located between Karaboaz Natura 2000 site and Persina Nature Park.

The investment is part of public-private partnership between WWF and a business partner, on a basis of a ten-year contract. The investment and the associated activities for the processing of biomass and production of pellets and briquettes falls in the Manufacturing sector of the economy, under the section of Production, non-classified elsewhere (according to the Codes of Economic Activiteis 2008).

To achieve the aim of this business plan it is necessary to invest in the purchase of installation for the processing of biomass and the production of pellets and briquettes. The installation includes:

- Millin machine needed for milling of the biomass of various sizes, depending on the final product
- Drying machines, necessary to reduce the humidity of the milled biomass to 8-10%
- Biomass briquetting machine
- Biomass pelleting machine
- Scales
- Hand sewing machine for bags for sale of finished products
- Construction works in the production area

The purchase and introduction of this installation will lead to the following oucomes:

A) ENVIRONMENTAL

- Sustianable management and use of the biomass from wetlands and farmlands, covering a territory of approxmately 5,400 ha (Persina-Karaboaz);
- Decrease of unsustainable farming practices, slash and burn practices on farmlands and protection of the biodiversity;
- Reduction of CO_2 emissions related to burning of stuble fields and decaying of biomass on wetlands;
- Improvement of the water regime of one wetland and restoration it its regulating functions related to water, maintenance of the fish population, sequestration of CO_2, maintenance of the biodiversity;

- Improvement of the water regime of one wetland and restoration it its regulating functions related to water, maintenance of the fish population, sequestration of CO_2, maintenance of the biodiversity;
- Improvement of the soil fertility on about 5,400 ha of agricultural lands;
- Improvement of water quality on a territory of approximately 150 ha;
- Improvement of air quality for nearly 280,000 citizens in the region, as a result of ceasing stuble burning practices.

B) ECONOMIC

- Invement in an installation for the processing of biomass, amounting at 20, 566 Bulgarian lev (BGN) - based on avergage prices for the equipment, as derived from several preliminary collected offers;
- Development of a business interest in the use of biomass, through the generation of income from sale of pellets and briquettes, amounting to 170,000 BGN per year;
- Development of economic opportunities for land-users, for the use of agricultural residues on farmlands, as an additional income source, as well as for covering costs on their collection and transportation;
- Development of an alternative to the local population for shifting from fossil fuels to briquettes for heating and decrease of their costs with 30% on the average.

C) SOCIAL

- Creation of employment at local level, through the involvement of two employees, full time, to support the production of briquettes;
- Creation indirectly of employement, as an additional income source related to the collection and tansportantion of the biomass to the processing premises.

2. PRE-FEASIBILITY STUDY

2.1. COMPETITION

According to the Energy Utilization Biomass Association – Bulgaria (EUBA), in 2010-2011, there were 26 companies in Bulgaria producing pellets or/ and briquettes from biomass. Most of the producers are located in semi and mountenous regions of the country, near to the logging centres, mainly in south and southwest Bulgaria. The comanies work mainly with residues from the timber and wood processing industry, producing pellets and briquettes.

Currently, according to the EUBA, there is only one company in the country, which has started the production of pellets and briquettes based on straws, located in Mizia. According to information provided by this producer, the interest in ther products in the region is very low. For this reason, in 2012, that company has started to work in new location, closer to the sources of inputs for the production, in the municipality of Gurmen.

In general, the companies of this sector do not use their full production capacity. In 2010, all these 26 producers used about 32% of their production capacities on the

average. The price of a ton of pellets and briquettes in 2010, according to EUBA, was 300 and 450 BGN, respectively.

EUBA further states that there is no a company in the country, producing pellets and briquettes from reeds. In this regard, the investor in reed energy products will be a pioneer in this production in the country.

There are no competitors in the production of pelles and briquettes from biomass on the local leve. At the moment, if there is a supply of pellets and briquettes in the region at all, they are provided from other producers, out of the region or from foreign producers. According to WWF data, the local population uses mainly fossil fues for heating, imported from Ukraine.

In the same time, in the region there are other ecnomic acitiviteis related to the use of biomass from farmlands These activities include:

- The use of biomass from arable lands under wheat and rapeseeds in the municipality fo Nikopol. This is used by the Heating Plant in Nikopol. Its annual need of biomass is 110,000 tones.
- The use of residues from arable lands for feeding farm animals in the region. According to WWF data, 50% of the residues on arable lands under crops are used by local animal breeders in the region of Karaboaz site to feed the farm animals.

Currently, there has not been other company interested in the reeds from Kaikusha marsh, Persina Nature Park. The reeds there is a free resource, which should be managed and cleared in a regulated manner in orfer to maitain the water regime of the marsh, during its restoration. There is not a natural process, which would elliminate the biomass in excess. In the same time, the accummulation of the biomass in Kaikusha marsh leads to its decaying, siltation and obstruction of the natural functions of the habitat for the regulation of the water regime, and the emissions of CH_4 and CO_2 in the atmosphere.

2.2. MARKETS

The briquettes and pellets produced, will be sold locally. To achieve an economic efficiency , the maximum distance from the place of production to the point of realization should be 60 km. As described above, there are 12 major administrative centers in the radius, with a total population of 282,836 inhabitant (NSI data, December 2010), which makes approximately 70,709 households. The sales of products near the site of production will contribute to achieving environmental sustainability, as it will maintain the lowest possible greenhouse gas emissions associated with the transport of the finished product. The projected market share for the first three years is 10% at the regional level, with a tendency to increase it to 20 % or until reaching the maximum production capacity, respecting the environmental standards for reed collection. The product will be sold on the market price, which at the moment of the study vary between 350 and 450 BGN per tonne of pellets and 300-350 BGN per tone of briquettes. At present, consumption of briquettes and pellets from biomass is not popular in the study area. Local households use firewood and coal for heating. In contrast to these two different sources, the use of pellets and briquettes is not associated with the provision of special space for storage or further processing, as in the case of firewood, which requires further splitting. The consumption of pellets and briquettes is more time saving for its users, comparing it to the consumption of firewood and coal. The main competitive advantage of biomass briquettes and pellets is their high efficiency, high calorific value - up to 5800 kcal/kg, long duration of the combustion and low residual ash.

In addition, the density of the briquettes and pellets, resulting from the pressing technology of the raw material, is between 30-50 % higher than that of firewoods. Hence, the energy efficiency of briquettes and pellets compared to firewood is four times higher. The following table, published by the companies in the industry, shows the comparative performance of different energy sources and the advantages of pellets and briquettes from biomass:

Table 1: Comparative performance of different energy sources

Comparative indicators	Calorific value	Ash content	Humidity	Separated Sulfur	Heat use
Eco-Briquettes	18.2-28.5 mj/kg	0.05-0.06 %	5-8 %	0.02 %	93.6-98.3 %
Briquettes from brown coal	13.4-17 mj/kg	5.0-28.0 %	13-16 %	4.20 %	56-64 %
Lignite briquettes	16.7-28.7 mj/kg	9.0-20.0 %	11-14 %	3.80 %	61-67 %
Firewood	10-12 mj/kg	~ 35 %	15-20 %	~ 6 %	45-50 %
Pellets of reeds[9]	18-19 mj/kg	0,3 %	8,6 %	0,052 %	85-93 %

It is expected that this market will develop in the egionin the region. This will be achieved through an appropriate marketing mix. In its marketing strategy the business partner will rely on:

- Maintaining the quality of products
- Advertising in local media and on the Internet
- Flexible pricing policy, depending on the season, size of the buyer, adapted to the market environment

NOTE: **ALL PRICES BELOW ARE IN BULGARIAN CURRENCY, BGN. FOR COMPARISON, 1 EURO = 1,95583 BGN**

3. INVESTMENTS

Table 2: Construction works

No.	Item	Measure	Quantity	Unit price	Value
1	Wooden-roof contruction	m^3	3,11	280,00	870,80
2	Tiles	m^2	78,33	10,67	835,78
3	Concrete	m^3	12,59	114,00	1435,26
4	Reinforcement	kg	1167	1,60	1867,20
5	Gutters and culverts	m	20,67	1,50	31,00
6	Brickwork - 25 cm	m^3	10,21	64,00	653,44
7	Water and canalisation	-	-	-	669,00
8	Construction supervision	-	-	-	332,00
	TOTAL:				**6693,48**

[9] According to data from an Independent laboratory, Sofia

In order to function well, the entreprise would need the following equipment

Table 3: Machineries and equipment

No.	Item	Quantity	Unit price	Value
1	Pelleting machine	1	7203,00	7203,00
2	Briquetting machine	1	3 220,00	3 220,00
3	Drier	1	3 850,00	3 850,00
4	Biomass miller	1	1 113,00	1 113,00
5	Suing machine	1	1 400,00	1 400,00
6	Meter - scales for finished products	1	1700,00	1700,00
	TOTAL:			**18 466,00**

4. FINANCIAL PLAN

Table 4: Invements, subject to public fudning *(BGN)*

INVESTMENT				Unit price	Value
Type	**Model/ sort/ kind, etc.**	**Q**	**Measure**		
Equipment					
Pelleting machine	equipment	1	pcs	7 203,00	7 203,00
Briquetting machine	equipment	1	pcs	3 200,00	3 200,00
Drier	equipment	1	pcs	3 850,00	3 850,00
Miller	equipment	1	pcs	1 113,00	1 113,00
Sueing machine	equipment	1	pcs	1 400,00	1 400,00
Meter - scales for finished products	equipment	1	pcs	1700,00	1700,00
Transport costs	transport	1	pcs	2 100,00	2 100,00
				Total	**20 566,00**

Table 5: Investment costs at own expenses *(BGN)*

INVESTMENT				Unit price	Value
Type	**Model/ sort/ kind, etc.**	**Q**	**Measure**		
Construction works					
Construction works	Construction	1	pcs	6 693,48	6 693,48
				Total:	**6 693,48**

Table 6: Future customers

Customers	Products/ services	% of sales	Annual sales
Directorate of Persina Nature Park	Pellets	10%	20 tones
"St.St. Kiril&Metodi" primary school, village of Ovcha mogila	Briquettes	49%	25 tones

Annex V.

4.1. FINANCIAL AND ECONOMIC STATUS - BENEFITS AND COSTS

4.1.1. REVENUES FROM BUSINESS ACTIVITIES

Table 7: Production and marketing programme *(BGN)*

Type of production per year	Measure	Quantity/ average annual production load	Production			Average price per unit of product		Revenues from sale of products	
			For export	For local market	For own consumption	For export	For local market	For export	For local market
Previous year									
					TOTAL:				**0**
I year									
Pellets	T	192		192			430,00		82 560,00
Briquettes	T	48		48			450,00		21 600,00
	T								
					TOTAL:				**104 160,00**
II year									
Pellets	T	230		230			430,00		99 072,00
Briquettes	T	58		58			450,00		25 920,00
	T								
					TOTAL:				**124 992,00**
III year									
Pellets	T	230		230			430,00		99 072,00
Briquettes	T	58		58			450,00		25 920,00
	T								
					TOTAL:				**124 992,00**
IV year									
Pellets	T	288		288			430,00		123 840,00
Briquettes	T	72		72			450,00		32 400,00
	T								
					TOTAL:				**156 240,00**
V year									
Pellets	T	384		384			430,00		165 120,00
Briquettes	T	96		96			450,00		43 200,00
	T								
					TOTAL:				**208 320,00**

Table 7: Production and marketing programme *(BGN)*

Type of production per year	Measure	Quantity/ average annual production load	Production			Average price per unit of product		Revenues from sale of products	
			For export	For local market	For own consumption	For export	For local market	For export	For local market
VI year									
Pellets	T	384		384			430,00		165 120,00
Briquettes	T	96		96			450,00		43 200,00
	T								
					TOTAL:				**208 320,00**
VII year									
Pellets	T	384		384			430,00		165 120,00
Briquettes	T	96		96			450,00		43 200,00
	T								
					TOTAL:				**208 320,00**
VIII year									
Pellets	T	384		384			430,00		165 120,00
Briquettes	T	96		96			450,00		43 200,00
	T								
					TOTAL:				**208 320,00**
IX year									
Pellets	T	384		384			430,00		165 120,00
Briquettes	T	96		96			450,00		43 200,00
	T								
					TOTAL:				**208 320,00**
X year									
Pellets	T	384		384			430,00		165 120,00
Briquettes	T	96		96			450,00		43 200,00
	T								
					TOTAL:				**208 320,00**

Table 8: Production capacity of the processing enterprise

Type of production	Previous year/ Last reporting period	I year	II year	III year	IV year	V year
	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)
Pellets		192	230	230	288	384
Briquettes		48	58	58	72	96
Total production (t.)		**240**	**288**	**288**	**360**	**480**

Table 8: Production capacity of the processing enterprise

Type of production	VI year	VII year	VIII year	IX year	X year
	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)	Annual production capacity of the enterprise (t.)
Pellets	384	384	384	384	384
Briquettes	96	96	96	96	96
Total production (t.)	**480**	**480**	**480**	**480**	**480**

4.1.2. OPERATING EXPENSES

Table 9: Cost of raw materials and external services *(BGN)*

Type of expenses	Previous year/ Last reporting period	I year	II year	III year	IV year	V year
Prime costs of Pellets		55 680,00	66 700,00	66 700,00	83 520,00	111 360,00
Prime costs of Briquettes		14 880,00	17 980,00	17 980,00	22 320,00	29 760,00
Work clothing		600,00	600,00	600,00	600,00	600,00
Telephone services		600,00	600,00	600,00	600,00	600,00
Fuels		2 400,00	2 400,00	2 400,00	2 400,00	2 400,00
Electricity		6 000,00	6 000,00	6 000,00	6 000,00	6 000,00
Insurances		1 300,00	1 300,00	1 300,00	1 300,00	1 300,00
TOTAL		**81 460,00**	**95 580,00**	**95 580,00**	**117 740,00**	**153 020,00**

Type of expenses	VI year	VII year	VIII year	IX year	X year
Prime costs of Pellets	111 360,00	111 360,00	111 360,00	111 360,00	111 360,00
Prime costs of Briquettes	29 760,00	29 760,00	29 760,00	29 760,00	29 760,00
Work clothing	600,00	600,00	600,00	600,00	600,00
Telephone services	600,00	600,00	600,00	600,00	600,00
Fuels	2 400,00	2 400,00	2 400,00	2 400,00	2 400,00
Electricity	6 000,00	6 000,00	6 000,00	6 000,00	6 000,00
Insurances	1 300,00	1 300,00	1 300,00	1 300,00	1 300,00
TOTAL	**153 020,00**	**153 020,00**	**153 020,00**	**153 020,00**	**153 020,00**

Table 10: Expenses on salaries and social securities *(BGN)*

Staff	Number of employees	Monthly salary	Total salaries per year	Social securities	Total per year
Previous year / Last reporting period					
Management					
Administrative					
Production					
I Year					
Management	1	400,00	4 800,00	868,80	5 668,80
Administrative	1	350,00	4 200,00	760,20	4 960,20
Production	2	290,00	6 960,00	1 259,76	8 219,76
TOTAL					**18 848,76**
II Year					
Management	1	400,00	4 800,00	868,80	5 668,80
Administrative	1	350,00	4 200,00	760,20	4 960,20
Production	2	290,00	6 960,00	1 259,76	8 219,76
TOTAL					**18 848,76**
III Year					
Management	1	400,00	4 800,00	746,40	5 546,40
Administrative	1	350,00	4 200,00	653,10	4 853,10
Production	2	290,00	6 960,00	1 623,42	12 063,42
TOTAL					**22 462,92**
IV Year					
Management	1	500,00	6 000,00	933,00	6 933,00
Administrative	1	450,00	5 400,00	839,70	6 239,70
Production	3	390,00	14 040,00	2 183,22	16 223,22
TOTAL					**29 395,92**
V Year					
Management	1	500,00	6 000,00	933,00	6 933,00
Administrative	1	450,00	5 400,00	839,70	6 239,70
Production	3	390,00	14 040,00	2 183,22	16 223,22
TOTAL					**29 395,92**
VI Year					
Management	1	500,00	6 000,00	933,00	6 933,00
Administrative	1	450,00	5 400,00	839,70	6 239,70
Production	3	390,00	14 040,00	2 183,22	16 223,22
TOTAL					**29 395,92**

Table 10: Expenses on salaries and social securities *(BGN)*

Staff	Number of employees	Monthly salary	Total salaries per year	Social securities	Total per year
VII Year					
Management	1	500,00	6 000,00	933,00	6 933,00
Administrative	1	450,00	5 400,00	839,70	6 239,70
Production	3	390,00	14 040,00	2 183,22	16 223,22
TOTAL					**29 395,92**
VIII Year					
Management	1	500,00	6 000,00	933,00	6 933,00
Administrative	1	450,00	5 400,00	839,70	6 239,70
Production	3	390,00	14 040,00	2 183,22	16 223,22
TOTAL					**29 395,92**
IX Year					
Management	1	500,00	6 000,00	933,00	6 933,00
Administrative	1	450,00	5 400,00	839,70	6 239,70
Production	3	390,00	14 040,00	2 183,22	16 223,22
TOTAL					**29 395,92**
X Year					
Management	1	500,00	6 000,00	933,00	6 933,00
Administrative	1	450,00	5 400,00	839,70	6 239,70
Production	3	390,00	14 040,00	2 183,22	16 223,22
TOTAL					**29 395,92**

Table 11: Depreciation and amortization *(BGN)*

Asset	Date of aquisition	Aquisition price	Period of operation	Depreciation rate	Depreciation quota				
					Previous year/ Last reporting period	I year	II year	III year	IV year
Pelleting machine	2012	7203,00	10	10%		720,00	720,00	720,00	720,00
Briquetting machine	2012	3 220,00	10	10%		322,00	322,00	322,00	322,00
Drier	2012	3 850,00	10	10%		385,00	385,00	385,00	385,00
Miller	2012	1 113,00	10	10%		111,00	111,00	111,00	111,00
Sueing machine	2012	1 400,00	10	10%		140,00	140,00	140,00	140,00
Meter - scales for finished products	2012	1700,00	10	10%		170,00	170,00	170,00	170,00
TOTAL						**1 848,60**	**1 848,60**	**1 848,60**	**1 848,60**

Table 11: Depreciation and amortization *(BGN)*

Asset	Date of aquisition	Aquisition price	Period of operation	Depreciation rate	Depreciation quota					
					V year	VI year	VII year	VIII year	IX year	X year
Pelleting machine	2012	7203,00	10	10%	720,00	720,00	720,00	720,00	720,00	720,00
Briquetting machine	2012	3 220,00	10	10%	322,00	322,00	322,00	322,00	322,00	322,00
Drier	2012	3 850,00	10	10%	385,00	385,00	385,00	385,00	385,00	385,00
Miller	2012	1 113,00	10	10%	111,00	111,00	111,00	111,00	111,00	111,00
Sueing machine	2012	1 400,00	10	10%	140,00	140,00	140,00	140,00	140,00	140,00
Meter - scales for finished products	2012	1700,00	10	10%	170,00	170,00	170,00	170,00	170,00	170,00
TOTAL					**1 848,60**	**1 848,60**	**1 848,60**	**1 848,60**	**1 848,60**	**1 848,60**

4.1.3. OTHER COSTS

Table 12: Other costs *(BGN)*

Other costs	Previous year/ Last reporting period	I year	II year	III year	IV year	V year
Expenses on construction works		6693,48				
TOTAL		**6693,48**				

Other costs	VI year	VII year	VIII year	IX year	X year
A	B	C	D	E	F
TOTAL					

4.1.4. PRIME COST

Table 13: Prime cost per unit of product *(BGN)*

Product type	Inputs, necessary for the production of a unit of products	Quantity for unit production	Measure	Unit price	Costs per unit of product by type
Pellets, kg	Reed cutting	1	kg	0,03	0,03
	Baling	1	kg	0,02	0,02
	Transport	1	For kg	0,01	0,01
	Processing	1	kg	0,23	0,23
TOTAL					**0,29**
Briquettes, kg	Reed cutting	1	kg	0,03	0,03
	Baling	1	kg	0,02	0,02
	Transport	1	For kg	0,01	0,01
	Processing	1	kg	0,25	0,25
TOTAL					**0,31**

4.2. PROJECTED NET CASH FLOWS

4.2.1. PROJECTED NET CASH FLOWS

Table 14: Projected net cash flows *(BGN)*

Index	Previous year/ Last reporting period	I year	II year	III year	IV year	V year
I. Revenues:						
1. Revenuesof sales	0,00	104 160,00	124 992,00	124 992,00	156 240,00	208 320,00
2. Other revenues	0,00	0,00	0,00	0,00	0,00	0,00
Total revenues (1+2)	**0,00**	**104 160,00**	**124 992,00**	**124 992,00**	**156 240,00**	**208 320,00**
II.Expenses						
A. Operating expenses:						
3. Raw materials, inputs and services	0,00	81 460,00	95 580,00	95 580,00	117 740,00	153 020,00
4. Depreciation	0,00	1 848,60	1 848,60	1 848,60	1 848,60	1 848,60
5. Salaries and social securities	0,00	18 848,76	18 808,86	22 462,92	29 395,92	29 395,92
6. Other expenses	0,00	6 693,48	0,00	0,00	0,00	0,00
7. Interests	0,00	0,00	0,00	0,00	0,00	0,00
Total expensees (3+4+5+6+7)	**0,00**	**108 850,84**	**116 237,46**	**119 891,52**	**148 984,52**	**184 264,52**
III. Profit before tax (I-II)	0,00	-4 690,84	8 754,54	5 100,48	7 255,48	24 055,48
IV. Taxes and fees	0,00	0,00	875,45	510,05	725,55	2 405,55
V. Profit after tax (III – IV)	0,00	-4 690,84	7 879,09	4 590,43	6 529,93	21 649,93
VI. Principal on loans	0,00	0,00	0,00	0,00	0,00	0,00
VII.Public funding	0,00	20 566,00	0,00	0,00	0,00	0,00
VIII. Net cash flow (V+4+VII)	**0,00**	**17 723,76**	**9 727,69**	**6 439,03**	**8 378,53**	**23 498,53**

Index	VI year	VII year	VIII year	IX year	X year
I. Revenues:					
1. Revenuesof sales	208 320,00	208 320,00	208 320,00	208 320,00	208 320,00
2. Other revenues	0,00	0,00	0,00	0,00	0,00
Total revenues (1+2)	**208 320,00**	**208 320,00**	**208 320,00**	**208 320,00**	**208 320,00**
II.Expenses					
A. Operating expenses:					
3. Raw materials, inputs and services	153 020,00	153 020,00	153 020,00	153 020,00	153 020,00
4. Depreciation	1 848,60	1 848,60	1 848,60	1 848,60	1 848,60
5. Salaries and social securities	29 395,92	29 395,92	30 782,52	29 395,92	29 395,92
6. Other expenses	0,00	0,00	0,00	0,00	0,00
7. Interests	0,00	0,00	0,00	0,00	0,00
Total expensees (3+4+5+6+7)	**184 264,52**	**184 264,52**	**185 651,12**	**184 264,52**	**184 264,52**
III. Profit before tax (I-II)	24 055,48	24 055,48	22 668,88	24 055,48	24 055,48
IV. Taxes and fees	2 405,55	2 405,55	2 266,89	2 405,55	2 405,55
V. Profit after tax (III – IV)	21 649,93	21 649,93	20 401,99	21 649,93	21 649,93
VI. Principal on loans	0,00	0,00	0,00	0,00	0,00
VII.Public funding	0,00	0,00	0,00	0,00	0,00
VIII. Net cash flow (V+4+VII)	**23 498,53**	**23 498,53**	**22 250,59**	**23 498,53**	**23 498,53**

5. CONCLUSIONS

Indicators for assessing the effectiveness of the investment and financial indicators give reason to assume that this investment is effective and the project could be realized.

1. Net present value (NPV) *e 107 598,42 (positive)*

NPV>0. The positive NPV shows that the present value of the cash flow is higher than the costs of the project/ investment, meaning that the investmetn is effective.

2. Internal rate of returs *(IRR) – 67,89%*

3. Profitability index *(PI) – 6,23*

Each invested lev will ensure a revenue of ot 6 BGN

4. Pay back period *(PBP) – 2 years*

The PBP, meaning the period for which revenues cover the investment costs is 2 years.

ANNEX VI. FISH SPECIES INDICATORS OF THE WETLAND ECOLOGICAL STATUS

Species-indicator	Relevance	Indicating
European bitterling, *Rhodeus amarus*	- - -	Clean water and functioning gases cycle
Common carp, *Cyprinus carpio*	Requires submerged vegetation to reproduce	Restored wetland
European weather loach, *Misgurnus fossilis*	Needs flooded areas and marshes	Presence of H_2S (Hydrogen sulphide) in the bottom layer
Leucarpus delineates	Requires well-aerated water; might be used for control over mosquitoes	Good ecological balance
Prussian carp, *Carassius gibelio*	Highly invasive, not-demanding, pioneer species	Bad ecological status and non-functioning gas cycle
Stone moroko, *Pseudorasbora parva*	Highly invasive species	Bad ecological status and non-functioning gas cycle

Essential Danube region "services" and benefits

100% RECYCLED

500 million €

If 100,000 ha of Danube floodplains are restored at an average cost of 500,000 €/km², this would cost less than the damages caused by floods

29 million €

Danube River basin forests and grasslands store carbon with total value of 29 million € per year

500 €

1 hectare of functioning Lower Danube floodplain provides benefits worth as much as 500 € per year (water cleaning, flood mitigation, fish spawning)

WWF

Why we are here.

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

http://wwf.panda.org/dcpo

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