



## SUMMER SCHOOL



# Ecological state of the lake during restoration measures

## Lake Management

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# **1. Introduction**

## *1.1 Why do we need nature management?*

Today we reached the consciousness that to have a healthy environment is fundamental in order to ensure the continuity of the ecosystem services. What the nature is providing for us is necessary in almost every aspect of our life and having a clear view on the future, we must think on its conservation. In order to ensure the future generations to be able to use the natural resources as well as we do, we would need an efficient and sustainable resource management. Furthermore focusing our attention on a short term basis, the improvement of the natural conditions of the ecosystems which we already partly damaged, could also ensure a better quality of life for the nowadays` population and an increase of the development potential.

With today`s growing population it is essential to keep a balance between human activities and the nature protection. On the other hand a harmony between ecosystem and our activities can provide the possibility for an increase of benefits which we can receive.

## *1.2 Why do we need to manage Lake Durowskie?*

The fact that Lake Durowskie plays a major role in most aspects of the people`s lives in Wagrowiec is quite obvious. Therefore preserving it`s integrity leads to the preservation of the community`s identity. Furthermore the health of the surrounding environment is directly connected to the community`s health.

On the other hand, since the local people`s activities in the area are directly connected to and dependant on the lake Durowskie, increasing the current exploitation of the lake could lead to a worse condition for the existing aquatic ecosystem there.

### *1.3 Aim of the study*

Unlike the previous approach, this year the Lake Management Team decided to put the most emphasis on a future vision of the area to find some solutions and to come up with some suggestions for the improvement of the natural conditions of the whole region.

We decided not to describe the present state of the water in details, but to focus our attention on a general idea about how it could be possible to continue with the lake restoration having better results and a more effective use of the public resources.

### *1.4 Strategic plan for Wagrowiec*

In order to realize any development plans for the region, we are trying to find ideas to collect the financial resources linking this aim to the real local needs. A good means to do so, is using the great opportunity nowadays represented by tourism which is currently one of the main growing industries.

The town Wagrowiec is already on the right track for modernization and for becoming a major tourist attraction. It would be more convenient to have further “long-term” strategies in order to increase the number of tourists to the town with a low impact on the environment.

## **2. Materials and methods**

### *2.1 Mapping the interest spots using GPS*

For marking the spots of interest, we used a GPS device with a digital camera incorporated. Also the satellites maps help us observe the areas which need improvement. Each terrestrial and aquatic spot was recorded on GPS and afterwards it was uploaded to a computer. This way a considerable amount of data can be obtained from maps with low costs.



**Bikes for terrestrial investigation (original photo)**



**Kayaks for aquatic investigation (original photo)**

### *2.3 Surveys*

To get a better idea of the local people and visitors` opinion, we decided to prepare questionnaires and they were distributed among different groups of people representing the social scheme of the town.

### **3. Results and discussions**

#### ***3.1. Present state of the lake Durowskie***

Generally, this year we observed a higher water quality in the lake than the previous years.

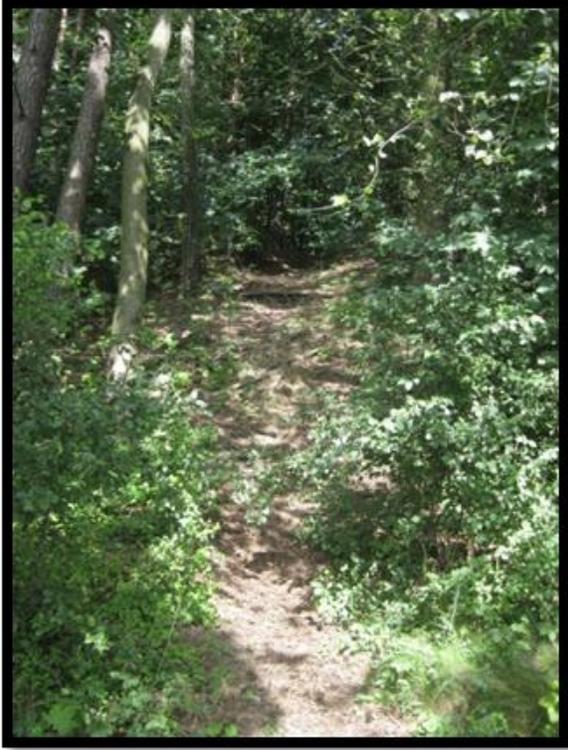
An increase of the bioindicator species presenting a lower state of pollution was recognized and we also came up with finding new macroinvertebrate species indicating an improvement in the water quality .

The MIR ( Macrophytes Index of Rivers) in the outflow river and ESMI ( Ecological status of macrophytes index) show considerably higher values this year, compared to the previous years which shows that the lake restoration prject is on the right track so far , although the current condition of the lake could still be improved .

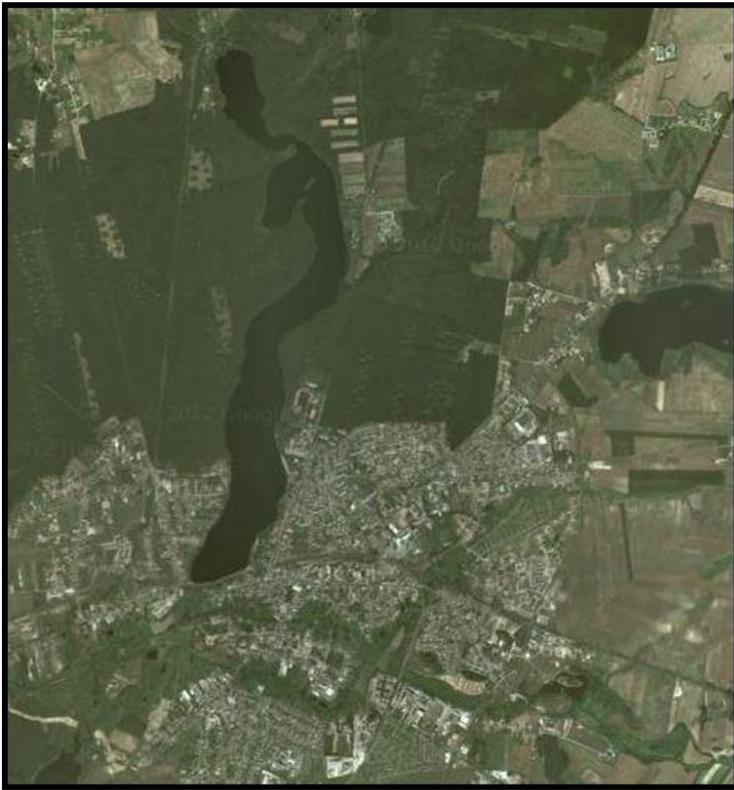
Despite the positive changes , there is still Continuous pollution of inflow area with water from the neighboring lakes and the accumulated sediments with a high gradients of nutrients are also still present.



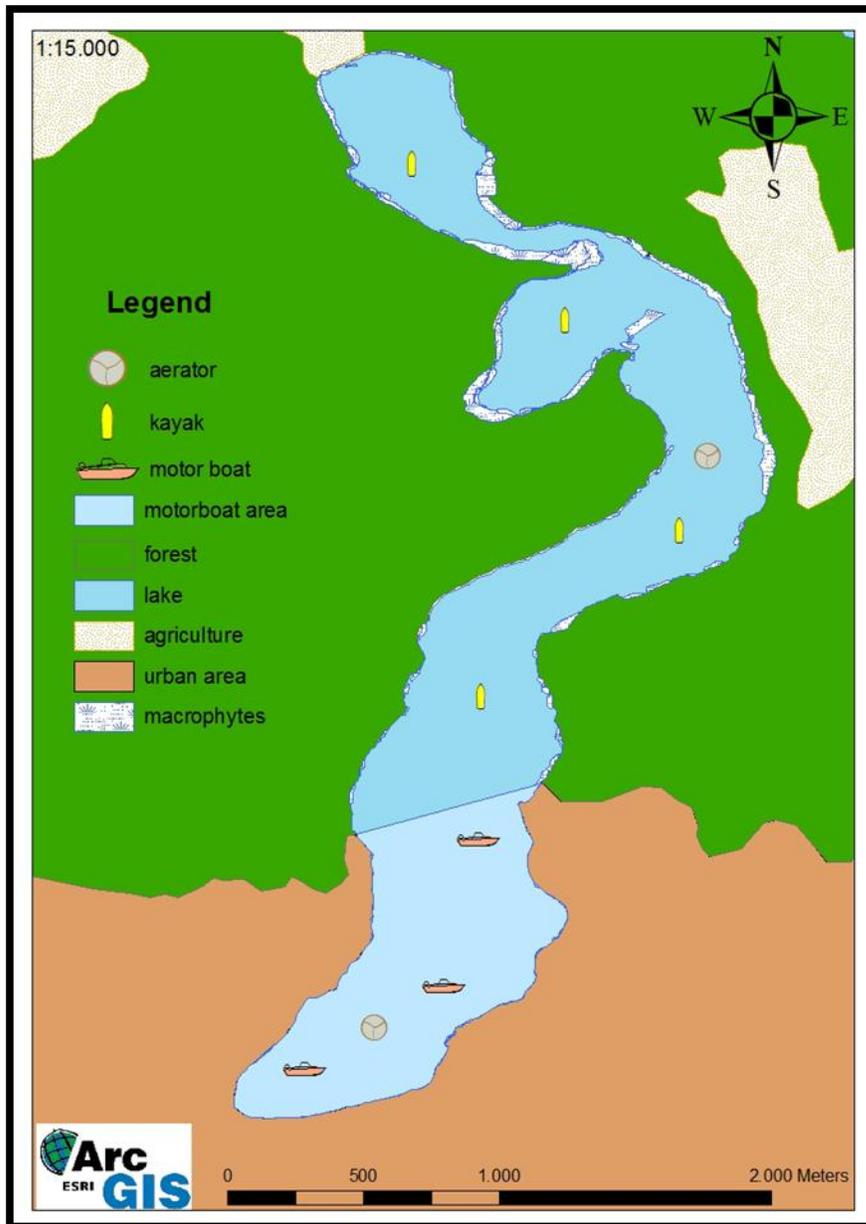
**Inflow area with water from Kobyleckie lake**



Nutrients from inland area



Satellite image of lake Durowskie (source [www.GoogleEarth.com](http://www.GoogleEarth.com))



Map of different activities in the lake area, Source Lake Management Final report July 2011

### ***3.2.Human activities in the lake area***

Current human activities in the lake and the surrounding area consist of :

Swimming,kayaking,fishing,motor boats, biking ,water usage for irrigation of tennis court etc...



Kayaking and camping



Motor boats



Fishing

### *Opinions about current activities*

Through the survey conducted among tourists and local inhabitants it's possible to make an idea about the satisfaction of the population on the usage of the lake and the possible changes that the people would like to see.

Most tourists come to Wagrowiec to do sports or to relax, which are both activities that could continue with the restoration of the lake to keep the possibility of attracting tourists.

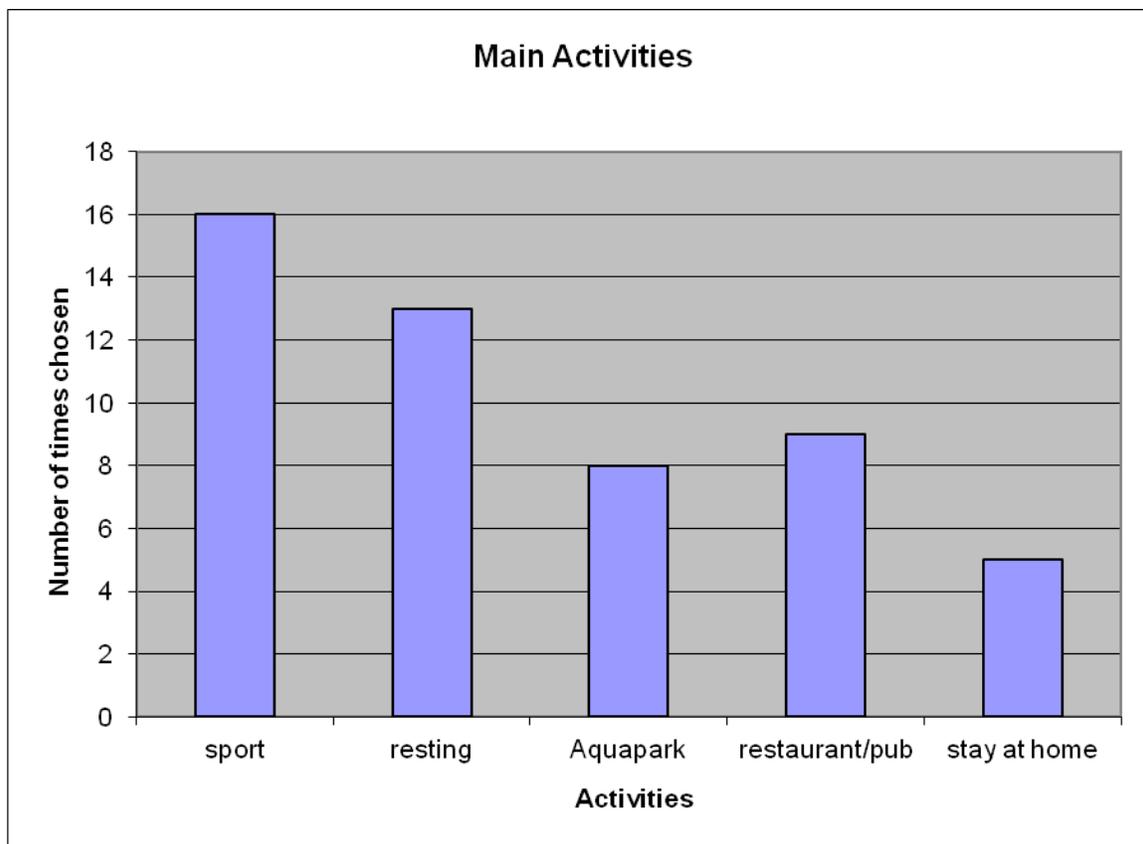


Figure 1: Main activities on Lake Durowskie

It is important to consider how, according to the survey, the inhabitants of Wagrowiec agree with the possibility to increase the tourism in the area.

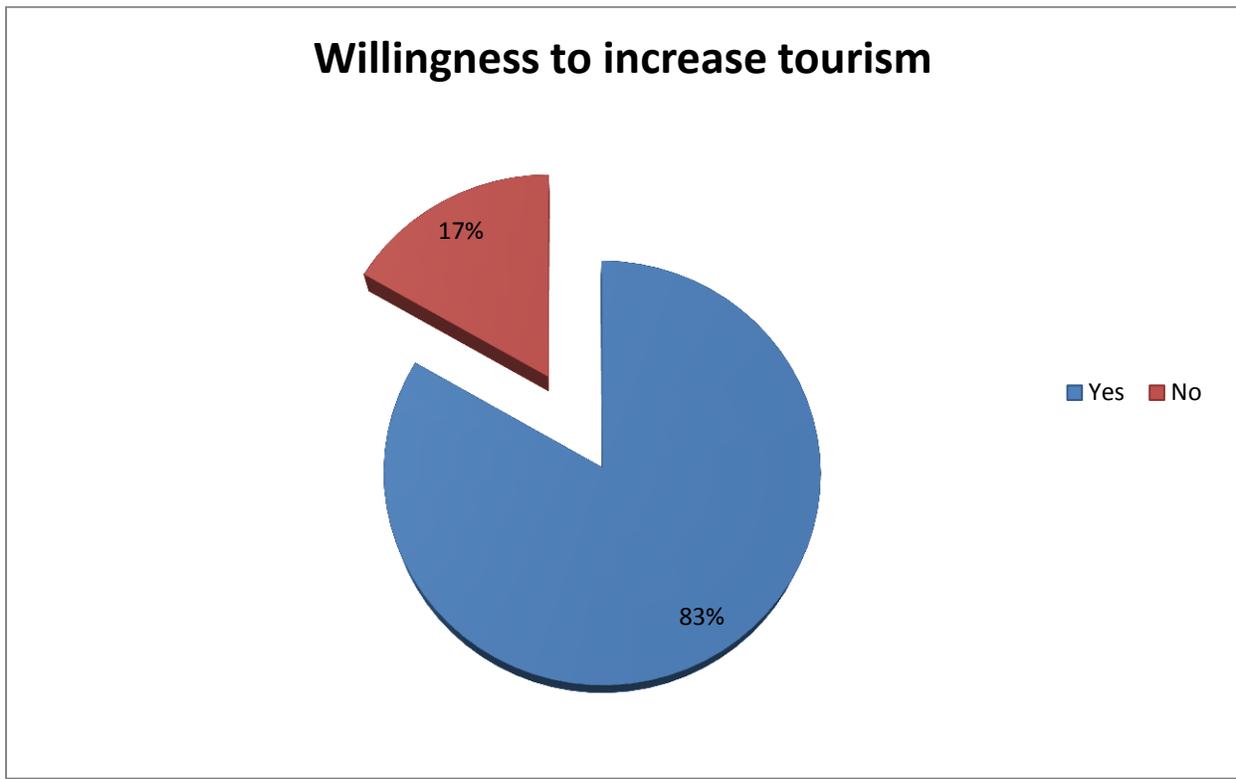


Figure 2: people's opinion about the tourism increase

### **3.3. Ideas to improve the condition**

#### *Source of pollution*

The city of Wagrowiec and Lake Durowskie are downstream from several other lakes which, heading away from Durowskie, increase the level of contamination. Lakes Kobyleckie, Bulkowieckie, Grylewski and Golancz reservoir have severe algal blooms due to eutrophication. ( taken from the "Lake Management Group: final report2011") The direct sources of pollution in

Lake Durowskie are obviously not able to deteriorate the quality of the water to the level which it currently is. The huge quantity of pollution which is raising in the lake from the catchment area and the limited possibilities to improve the condition of lake Durowskie independently, clearly show that the city of Wagrowiec cannot solely afford the restoration of the lake.

### *Collaboration and benefits sharing*

So far the whole activities of preventing pollution and restoration of Lake Durowskie have been implemented by the city of Wagrowiec. There has been not significant cooperation with the other cities of the region which do not probably recognize important reasons to take part in the process. The absence of any joint effort to improve the general situation could neutralize the measures taken so far by the city of Wagrowiec or even lead to a further aggravation of the situation. Moreover, from a political point of view, it will be always more difficult to go on with projects of lake restoration, using public money, without any remarkable improvement. A good way to involve the other cities in the restoration project could be making a general plan of development of regional tourism having the lakes chain and the surrounding areas as a focal point. The touristic activities should have a low impact on the ecosystem and consider the general good condition of the water, to give an incentive to the proper management of lake. The benefit of the new economical activities have to be shared among the different communities to allow a real collaboration which would increase the revenues for all the parts involved. The spread of activities and infrastructure in the region would not only be a way to start a profitable collaboration, but also important to avoid an excessive concentration in a small area like the city of Wagrowiec, which could cause a high impact on an ecosystem which is already suffering.



Map of Powiat Wągrowiecki

### *Some practical possibilities*

One of the best examples of successful regional collaboration is the case of South Tyrol. In the alpine region at the border between Austria and Italy the possibility was represented from the winter tourism, but it was difficult to realize because of the particular conformation of the territory. The local authorities of the region have been able to connect the different valleys and villages with a net of ski-lifts and cableways. To share the same infrastructure allowed to contain the costs and to create an effective mobility system. Moreover the possibility to move with ski in a very wide area across the mountains became a great attraction for the tourists, increasing significantly the economical benefits for the whole region.

It would be simpler to organize activities and infrastructure to improve the tourism in the region of the lakes chain due to the conformation of the territory which allows a much easier connection among the different communities. Furthermore it is already in the intention of the Wagrowiec mayor to increase the tourism of the area and this intent is well seen from a large part of the city population. The area to put in practice the projects would be the already existing *Powiat Wagrowiecki*, which includes the catchment area of Lake Durowskie making an effective management of the lakes body in its entirety possible.

A good idea to start the general project could be using the natural infrastructure offered by the nature and creating a kayaking route in the lakes. It would not take a big effort to create some more points in the lakes where it is possible to rent a kayak and to connect it with campsites and rest points. The possibility of such a long water adventure would certainly attract a lot of tourists and would make it necessary to have the lakes in a good state. The same facilities for the kayakers could also be used to serve bike riders who can ride on tracks in the forests around the lakes. The facilities for both, kayakers and bikers, are already present in an initial form, it would be just necessary to enlarge it in the whole area and to advertise it as a common attraction of the region.

A further attraction to create could be a tree-climbing park or an area to play some war games such as paintball. Both of them would just need some space in a natural area and a very small organizational effort to be realized. In addition a tree-climbing park would need some different species than the pine, which is not very stable, therefore its creation could start some

replacement of these plants which do not suit very well with the ecosystem of the lakes and have an unnatural presence on the shoreline. Both suggested attractions could be realized in the territory of the partner communities of Wagrowiec to give them some more opportunities of economical development and to avoid a too high exploitation of Wagrowiec territory.

The main target of the new touristic development of the area would be the lovers of natural activities and sports, however to attract other of tourists too and to involve some other social sector of the communities in the new economical activities could ensure a higher effectiveness at the project. The other communities of the region have a higher presence of farmers who are also economically more important, hence could be a good idea to involve the farmers in a farm holidays project. In particular the small farms and the ones which have a family-owned business could organize an accommodation for tourists who are looking for a genuine way of life. Moreover the farmers, in collaboration with the local restaurants could develop a brand of local food which could be offered in the region.

#### *Local improvements*

It is clear that the main source of pollution to Lake Durowskie is coming from the lakes upstream, however there are some possible improvements in the area of Lake Durowskie which could be useful to put in practice. An additional source of nutrients to the lake is represented from the erosion, especially in case of big rain events. An aggravation of the erosion is brought by the presence of the tracks for the mountain bikes which are situated too close to the shoreline. Next to the tracks located close to the coast, it is possible to notice the absence of the macrophytes on the shoreline. It would be probably better to mark out the tracks farther from the shoreline, maybe limiting this sport to the forest areas and not involving the lake.

An additional problem to the normal erosion going on near the shoreline is the habit of the people to leave the mowed lawn or some other vegetable waste from the gardens on the slope quite close to the shoreline. Obviously all the nutrients will flow to the lake with the rain going down to the slope. It would be useful to avoid the deposit of that material on the slope, maybe creating a collecting point for it in another area of the city where there is not the risk of flowing into the lake.

## **Conclusion**

We tried to elaborate a project for a new concept for managing the lake restoration to achieve a higher effectiveness of the initiatives. Our approach includes different suggestions which are supposed to be only examples and possible alternatives to start with a general plan for the whole region. The idea is to find a way for the different communities to cooperate for the benefit of the ecosystem basing it on the incentive represented by the economic development resulted from tourist activities. These activities are supposed not only to increase the richness level of the region, but also to focus the attention of the people to a correct balance between the exploitation of the natural resources and the regeneration capacity of the ecosystem. We are looking for a suitable way to minimize the trade-off between these two aspects, linking the advantages of an increased wealth with the restoration of the natural areas damaged in the previous decades. We assume that especially the organization of regional kayaking and biking routes would be attractions which can give the idea of a development which connects our activities with the nature. The promotion of local products can be a good means to attract other tourists who are not interested in very active sports. On the other hand the city of Wagrowiec could look for a way to furthermore improve the management of its territory, by for example avoiding the deposit of further source of nutrients on the slope going down to the shoreline. In order to solve the pollution issue of Durowskie lake, we suggest a cooperation with authorities of other neighboring lakes which contribute to the transfer of nutrients to this region and furthermore planting of macrophytes in the inflow region could be a means of photoremediation to decrease the incharge of pollutants and accumulated substances .

For attracting the local people and visitors` attention towards more activities in the surrounding area rather than overexploiting the lake ecosystem, our suggestions included considering some area for other new activities ,for instance tree-climbing parks and paintball as well as renting the local farmlands as rest-houses and providing local products in restaurants or cutting the reeds in winter and using it for summer shades and so on...

#### **4. Appendix (survey, photos etc.)**

##### *Survey*

Assessing the western coast of Lake Durowskie

Start point: Inflow

Stop point: Closed outflow

##### **Certain structures built to encourage people to use the lake**

- Street = Easy access
- Stairs = Fishing
  - o Owners have their own stairs but access is not limited!
  - o No erosion
- Ramp to bring (only) motorboats into the lake
  - o Organize special use
  - o Conflict: Swimmers (are regulated by the yellow hat), fishermen
  - o Additional threats of hazardous substances, waves, propeller, currents
    - Fosters erosion
  - o Improvement: Limit the number of boats, tax, technical survey, training
- Access suitable for the disabled
- Bins and benches
  - o Bins need to be emptied regularly and early enough
    - Training, education to rise awareness

e.g. Excursions, walks for tourists, trash collection day for locals, signs

Integrated approach to address the different clients

*Additional notes*

- **Manage differently** → **Impact differs strongly**
- **Different slopes call for different measures**
- **Bigger belt of macrophytes** → **Better water quality**
- **No signs indicating of where to fish and where to swim**
- **VEGETATION**
  - Alder: Bacteria in the roots fix nitrogen → Can grow in wet condition
  - Dead wood = Natural protection of the coastline
  - Potential natural vegetation: Oak trees
  - Nowadays pines, less decomposable needles, steep slope = Erosion
  - Deforestation (Pillars in coal mines were made of wood, Substitute = Petrol)
  - Reforestation with fast growing trees
  - No use of the pine cones in the lake → System is not prepared
  - Nowadays conifers are substituted by broad leaf trees (PEFC)
- **Ecosystem services: Provisioning, Cultural, Regulating**
  - Regulation function is disturbed when the macrophyte belt is disturbed  
→ More phytoplankton due to more nutrients
  - Purification of water can be replaced by manmade structures  
But: Temperature regulation is difficult to address
  - Reduce the input of phosphorus
  - **Sewage plant:**
    - 1 Physical filter = Macrophytes
    - 2 Biological filter / procedure = Bacteria decomposition
    - 3 Chemical procedure = Ironsulfide
    - 4 Denitrification

- Biomanipulation: Pike = Predator of small fish, Small fish reduce zooplankton
- Closed inflow
  - o Normally droughts 4 - 6 weeks
  - o Raise the level of groundwater to get higher yields
  - o Sandy soil agriculture
  - o Flooding terrestrial areas mobilize nutrients
  - o Communities not able to interact
  - o How to allow benefit sharing?
  - o Analyzing the situation: Good or bad

*Photos from the field that explain the situation from the study area*

**Like**



**Photo 1 Playground for children**

**Dislike**



**Photo 1 Fireplace in forest near lake**



**Photo 3 Kayaking area (Like)**



**Photo 4 plastic garbage in forest near lake (Dislike)**



**Photo 5 Recreation area with all facilities(Like)**



**Photo 6 Motor boats near swimming area (dislike)**



Photo 7 Beach needs improvements



Photo 8 Information points need improvements

**Questionnaire**

1. Are you a local fisherman or a tourist?

2. Are the jetties/places private?

3. What are the prices for the fishing license?

Day	Week	Month	Year

4. Which are the major species you are fishing?

5. Which equipement do use?

6. Is there a season prohibited for fishing?

7. How often are you going to fish?

8. Do you use your catch for personal use or for sale?

9. Do you feel disturbed by the tourist?

1	2	3	4	5
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10. How do you rate the water quality for fishing?

1	2	3	4	5
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11. Is this a good lake for fishing (location)?

1	2	3	4	5
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12. What do you think needs to be improved?

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**References:**

**The lake management group`s final report 2011 ,Dr W.Windhorst**