PROVINCE OF RIELT
SETTORE VI AMBIENTE

LAKE ADMIN - REGIONAL ADMINISTRATION OF LAKE
RESTORATION INITIATIVES

DOCUMENT CODE

Rev 01

FILE

Implementation_Plan_eng_rev01

REALIZZAZIONE INDAGINE:

Dr. Paolo Turin
Biologo
Via Vergerio 25
35100 PADOVA
P.I. 02150720288
C.F.: TRNPLA61H26A568C

01 12 DICEMBRE 2014
00 25 SETTEMBRE 2014
REV. DATE

01 12 DICEMBRE 2014
00 25 SETTEMBRE 2014
FIRST ISSUE
FIRST ISSUE

Dott. P.Turin/Dott.ssa S. Squizzato
Dott. P.Turin

Dott. P.Turin
Dott. P.Turin

WRITTEN
VERIFIED
APPROVED

CONTENTS:

FINAL IMPLEMENTATION PLAN
INDEX

1. INTRODUCTION .................................................................................................................. 1

2. PROJECT DESCRIPTION .................................................................................................... 2

3. THE IMPORTANCE OF LAKE ............................................................................................ 5

   3.1 THE CURRENT STATE OF EUROPEAN LAKES .............................................................. 5

   3.2 THE CURRENT STATE OF ITALIAN LAKES ..................................................................... 6

   3.4 RELATIONSHIP BETWEEN CLIMATIC CHANGES AND THE MANAGEMENT OF ITALIAN LAKES .......................................................................................................................... 10

   3.5 THE CURRENT STATE OF LAKES IN THE PROVINCE OF RIETI (PARTNER 9) .......... 12

   3.6 RELATIONSHIP BETWEEN NUTRIENT LOADING AND CLIMATE CHANGE AND LAKE MANAGEMENT FOR THE PROVINCE OF RIETI (PARTNER 9) .................................................. 18

   3.7 VALUES OF LAKE ECOSYSTEMS AND LAKE RESTORATION .................................. 19

      3.7.1 General background .................................................................................................. 19

      3.7.2 Ecosystem services provided by lakes and reservoirs in LakeAdmin Regions..... 20

      3.7.3 Value of the lakes in the Province of Rieti (Partner 9), with particular focus on Lakes Salto and Turano .......................................................................................................................... 21

4. LAKE RESTORATION AND WATER FRAMEWORK DIRECTIVE (WFD) IMPLEMENTATION .............................................................................................................................. 25

   4.1 LAKE RESTORATION IN THE LAZIO REGION ................................................................. 25

   4.2 DESCRIPTION OF LAKE RESTORATION FOR THE PROVINCE OF RIETI (PARTNER 9) ....... 31

   4.3 INCLUSION OF THE LAKE ARCHIVE AND THE RATIONALE OF ITS PREPARATION ........ 37

   4.4 OPEN ACCESS GUIDANCE MATERIAL ........................................................................... 40

   4.5 NEEDS OF KNOWLEDGE (NoK) .................................................................................... 41

      4.5.1 Needs of Knowledge (NoK) for the partners regions................................................. 41

      4.5.2 Needs of Knowledge Requirements (NoK) for the Province of Rieti ....................... 42

5. GOOD PRACTICES (GP) ..................................................................................................... 48

   5.1 GOOD PRACTICES PROPOSED AND SHARED BY PARTNER REGIONS .................... 48

   5.2 CONTEXT ANALYSIS FOR THE PROVINCE OF RIETI ................................................... 52
6. TRANSFER OF THE GOOD PRACTICE IN THE PROVINCE OF RIELI ............... 53

6.1 GOOD PRACTICE (GP) N. 7 - STAKEHOLDER PARTICIPATION AND FEEDBACK .............. 53

6.1.1 Description ........................................................................................................................................................................ 54

6.1.2 Objectives ........................................................................................................................................................................... 54

6.1.3 Application .......................................................................................................................................................................... 54

6.1.4 Target Groups ...................................................................................................................................................................... 55

6.1.5 Duration of Operation .......................................................................................................................................................... 56

6.1.6 Bodies and Organisations Involved ........................................................................................................................................ 57

6.2 OUTCOMES ............................................................................................................................................................................. 57

6.2.1 Local needs ........................................................................................................................................................................... 57

6.2.2 Elaboration of a detailed Management Plan for Sport And Professional Fishing in Lake Salto and Lake Turano ................................................................................................................................. 62

6.2.3 Initial implementation activities .............................................................................................................................................. 66

7. REFERENCES ............................................................................................................................................................................. 68
1. INTRODUCTION

Fresh waters make up only 3% of the global water resources. Freshwater lakes, including reservoirs and ponds, are important elements for communities and their relevance is increasing. Lake ecosystems and their catchments have provided several societally valuable benefits and ecosystem services like shelter, drinking water, bathing water, food, a means of travel and wealth in a number of ways and allowed whole cultures to develop.

Lakes have values associated with well-being and relaxation, their proximity has catalyzed rural development and has been important in regional socio-economic development. Lake districts are often very popular destinations for domestic and foreign tourism and visitors.

Eutrophication and its ecological consequences, pollution, over abstraction and invasive species are serious threats and increase the need for restoration and management to prevent the potential adverse economic and social impacts. There is increasing evidence that lakes are affected by climate change. Lake management is for these reasons an important part of sustainable regional development as set by Lisbon and Gothenburg agreements.

However, the most significant piece of legislation in response to the increasing threat of pollution and the increasing demand from the public for cleaner lakes, rivers and beaches and freshwater biodiversity, is the EU Water Framework Directive (WFD).

This Directive is unique in that it sets out an established framework for the protection of all water bodies (including lakes) and for all EU member states to achieve good water ecological status by December 2015. This objective is likely to be achieved in slightly over half (53%) of EU waters and, therefore more effort needs to be scheduled for the following 6-year periods of WFD.

The economic values of attractive, clean lakes are well established. There is a rising appreciation of good quality lakes across Europe. More intensive lake protection through sharing Good Practices with European lake managers and the regional influencing bodies is critical if we want to improve the current quality of lakes in Europe and to build long term capacity for sustainable use of lakes.
2. PROJECT DESCRIPTION

The LakeAdmin Project (Interreg IVC) consists of ten partners from nine countries including Finland, the Czech Republic, Denmark, Estonia, Greece, Hungary, Ireland, Italy and Malta (Figure 2-1).

The Lake Admin project aims at an exchange of good water management practices to support the implementation of the Water Framework Directive in each of the partner regions and to produce case study collection on restoration and management experiences and water quality data from the relevant lakes in each partner region covering the last 30 years.

Figure 2-1: Location of partner organisations in LakeAdmin.

All participating regions have identified lakes as important elements in their regional development policies. LakeAdmin aims to improve the effectiveness of regional development policies related to water management and restoration of lakes, ponds and reservoirs by:

- Sharing and transfer of good water management practices (Table 2-1).
- Mainstreaming of programs in participating regions, each participating region defining how the selected and adopted Good Practices will be implemented.
- Compiling Good Practices and examples into guidance material ready to be disseminated to other regions in the EU, recognizing the European dimension and expanding values of the project beyond the partner regions.
- Expanding the results of the LakeAdmin Project to a wider partner-network to have a long term impact.
Table 2-1: Summary of Lake Admin Project Partners and Good Practices Identified

<table>
<thead>
<tr>
<th>PARTNER</th>
<th>ZONA</th>
<th>BUONE PRATICHE IDENTIFICATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner 1 (Lead Partner) - Finland</td>
<td>Finnish Environment Institute</td>
<td>- Multi-criteria assessment in the comparison of options in lake restoration planning. - Mapping for presenting eutrophication pressures of lakes. - A practical tool for evaluating reduction of diffuse phosphorus loading. - Stakeholder participation and feedback. - Monitoring for investigation and surveillance of lake restoration cases.</td>
</tr>
<tr>
<td>Partner 2 - Finland</td>
<td>Savonia University of Applied Sciences</td>
<td>- A flexible education-model to help management planning for stakeholders. - Efficient and environmentally good use of manure for protection of watercourses</td>
</tr>
<tr>
<td>Partner 3 – Czech Republic</td>
<td>University of South Bohemia, Faculty of Fisheries and Protection of Waters</td>
<td>- Assessment of contamination with passive samplers and juvenile fish analyses. - Evaluation of the secondary losses caused by protected piscivorous birds - the great cormorant.</td>
</tr>
<tr>
<td>Partner 4 - Denmark</td>
<td>Allerød Municipality</td>
<td>- Restoration of eutrophic temperate lakes by biomanipulation</td>
</tr>
<tr>
<td>Partner 5 - Estonia</td>
<td>University of Life Sciences</td>
<td>- Lake restoration guidance material in native language.</td>
</tr>
<tr>
<td>Partner 6 - Greece</td>
<td>Pelion Development Company</td>
<td>- Re-watering of a drained large lake in Greece - Planning the multi-purpose use of a reservoir</td>
</tr>
<tr>
<td>Partner 7 - Hungary</td>
<td>Lake Balaton Development Coordination Agency</td>
<td>- Integrated shoreline management and spatial planning in the Balaton Region - Integrated regional on-line monitoring system. - Waste water treatment of small villages by on-site household units.</td>
</tr>
<tr>
<td>Partner 8 - Ireland</td>
<td>West Regional Authority</td>
<td>- CAISIE *Control of Aquatic Invasive Species in Ireland.</td>
</tr>
<tr>
<td>Partner 9 - Italy</td>
<td>Province of Rieti</td>
<td>-</td>
</tr>
<tr>
<td>Partner 10 – Malta</td>
<td>Temi Zammit Foundation</td>
<td>-</td>
</tr>
</tbody>
</table>

Most partners have identified Good Practices including models for collaborative planning, lake restoration methods, experiences in public participation and lake management partnership and have evaluated the “needs of knowledge” (i.e. knowledge gaps) and effectiveness of the good practice actions.

By exchange of experience between partner regions, Good Practices will be transferred into regional Implementation Plans to be implemented within the operational programs of Water Framework Directive or/and Structural Funds in the participating regions. LakeAdmin will improve the knowledge of local and regional actors in lake management issues and give better tools to enhance the ecosystem services provided by lakes and reservoirs in line with the Lisbon and Gothenburg strategies.

The overall objective of the LakeAdmin Project is to improve goal setting through an integrated catchment management approach and quality of lake restoration outcomes and results in
regions which have acknowledged the importance of lakes in their economic development. In more detail the objectives are:

- To capitalise the identified good lake management practices by transferring them to Implementation Plans.
- To share Good Practices beyond partner regions by establishing open access guidance material available to lake managers, regional authorities and stakeholders in other regions.
- To increase the use of collaborative planning methods and understanding in line with WFD principles.

The main outputs of Lake Admin are to:

- Create a European database of lake restoration case studies called LakeAdmin Archive.
- Devise Good Practice Guideline material to be disseminated, widely beyond the partnership.
- Compile Implementation Plans for each participating region, 9 in total, in order to mainstream Good Practices in lake management.
- Build a network of different stakeholders across regions involved in water management.
- Increase the capacity of individuals across the EU states in policy creation and implementation.
3. THE IMPORTANCE OF LAKE

3.1 The current state of European lakes

There are 14,755 lakes classified for their ecological status in the Water Framework Directive. Almost 6,500 of them (44%) are in less than good ecological status or potential (EEA, 2012;).

If lakes in Finland and Sweden are excluded, the picture is even worse and e.g. in parts of Central Europe more than 90% of all water bodies (including rivers) are in less than good ecological status or potential. On the other hand, no significant pressures were reported for 48% of the lake water bodies. Lakes are clearly in better status than transitional waters and rivers and also slightly better than coastal waters (Figure 3-1).

From a lake restoration or a management point of view, it is noteworthy that in the EU scale the state of water bodies (Figure 3-2, left) is not as good as it could possibly be based on the identified pressures (Figure 3-2, right).

This difference may be seen as a potential sign that the less than good status of some lakes, ponds or reservoirs, where they are not heavily affected by pressures of diffuse or point source loading, may improve with management and/or restoration measures especially in the water body.

Diffuse loading from agriculture is a major pressure in one third of the water bodies in lakes and transitional waters, especially in north-western Europe in the regions where there is high fertiliser input and high river nitrate concentration (EEA 2012).

Since all smaller water bodies have not been included in the classification, the real percentage of lakes influenced by diffuse loading from agriculture may be even higher. Moreover, discharges from wastewater treatment plants and industries and the overflow of wastewater from sewage systems is still a significant pressure for 22% of water bodies in Europe (EEA 2012).
3.2 The current state of Italian lakes

The following information has been taken from the publication: “Leading Issues - Yearbook of Environmental Data – 2012 edition” as drawn up by ISPRA (the Italian Institute for Environmental Protection and Research) and available as Stato dell’Ambiente 39/2013 – www.isprambiente.gov.it, as concerns the Quality of Inland Waters, (Chapter 4 of the Yearbook).

A classification for the ecological status of a superficial body of water is obtained by taking the lowest category as revealed by monitoring of its biological elements, its supporting physical-
chemical and chemical elements (other substances not being listed on the list of priority elements). Where the overall status proves ‘high’, confirmation should be obtained by means of an examination of the body's hydro-morphology. If the latter yields a negative result, the body of water is downgraded to ‘good’.

Classification of the ecological status of a superficial body of water is obtained on the basis of its biological elements, its supporting physical-chemical and chemical elements.

To classify the chemical status, a body of water whose priority-listed substances meet all environmental quality standards (Point 2, Letter A.2.6 of Table 1/A, or Table 2/A of the Annex to Ministerial Decree 260/2010) is identified as being in “good chemical condition”. Should this not be the case, it is classified as a body of water not acknowledged as being in good chemical condition.

Regulations for evaluating long-term variations include the selection of a set of fixed indicators known as the Core Network. These are divided according to whether variations are due to natural phenomena or result from pervasive human activity. Bodies of water coming under the first heading are identified as reference bodies; those containing sites of human activity are listed for the purpose of determining or confirming the impacts these activities have.

The quality data for 2011, which were requested from the Regional Authorities, refer to the Core Network. As this is by definition a fixed network, trends in quality assessments can be evaluated.

Results are reported of the monitoring of lakes and rivers during 2011, showing the data used in processing as transmitted by the Regions. Data refers to the Core Network, or, where one has not yet been defined, with reference to monitoring stations that are considered significant.

Figure 3-3: EQB Quality Classes and some chemical-physical parameters (LTLeco) of Lakes in Italy (source: Stato Ambiente 39/2013 ISPRA)

Just seven Regions communicated their 2011 monitoring data for lacustrine bodies of water, and, specifically, among the EQBs, only those for phytoplankton were reported in a significant
way. For this reason geographical coverage is patchy and the scarcity of data does not permit analysis.

For the purposes of classification of the ecological status of lacustrine bodies of water, the physical-chemical indicators to be used for assessing biological support are total phosphorus, turbidity and hypolimnetic oxygen concentration: these are integrated in a single descriptor: LTLeco (Lake Trophic Index for ecological status). This is a summary index for describing the trophic condition of lacustrine waters.

In evaluating the chemical status of superficial waters, Environmental Quality Standards (EQSs) are applied. EQSs refer to the substances named in the priority list (Table 1/A-Water Column, 2/A-Sediments, 3/A-Biota, of Ministerial Decree on the Environment No. 260/2010).

These standards represent the concentrations that identify a good chemical condition. These EQSs are further defined as EQS-AM (Annual Mean) and EQS-MAC (Maximum Admissible Concentration) for inland superficial waters, rivers, lakes and artificial or highly modified bodies of water.

Verification of EQSs takes the mean annual value of concentrations on the basis of the evaluation of the worst datum over a three-year period for operative monitoring and over one year for surveillance monitoring.

With reference to the distribution into EQS water quality classes of lacustrine bodies of water for the year 2011; only eight Regions have communicated their monitoring data. For this reason, it is not possible to make any meaningful assessment. For Lazio, data were transmitted for the ISPRA report from a total of two measuring stations.

**Figure 3-4: Chemical Status of Rivers and Lakes (2011) (source: Stato Ambiente 39/2013 ISPRA)**

![Chemical status - LAKES 2011 - # 30 stations](image)

![Chemical status - RIVERS 2011 - # 233 stations](image)

3.3 The current state of Lazio Region lakes

For the Lazio Region the ecological status of the lakes is monitored by a monitoring network for the classification of the environmental quality of the lakes of the Lazio Region which is run by ARPA LAZIO.
This covers a total of 16 regional lacustrine bodies: Posta Fibreno and Canterno for the Province of Frosinone; Albano, Nemi, Martignano and Bracciano for the Province of Rome; Bolsena and Vico for the Province of Viterbo and the seven lakes of Lungo, Paterno, Ripasottile, Salto, Scandarello, Turano and Ventina of the Province of Rieti.

These bodies of water are constantly monitored through biological and chemical-physical sampling and analysis in order to obtain a qualitative evaluation of their environmental status and to check on compliance with applicable legislation.

Monitoring pursuant to Legislative Decree No. 152/06 was begun in Lazio in 2011. Monitoring covers the monitoring network defined by the regional government’s Resolution No 44/2013. For this reason, all data up until 2010 are calculated according to the classification system provided for by Legislative Decree No. 152/99, while the data obtained for the period from 2011 up to the present are calculated according to Ministerial Decree No. 260/10, which modifies the technical standards of Legislative Decree No. 152/06.

Introduced by Ministerial Decree No. 260/2010, the LTLeCo index takes into consideration: total phosphorus, turbidity and dissolved oxygen (as hypolimnetic aeration, expressed in saturation percentage).

The calculation procedure assigns a point score for each of the above parameters; their sum constitutes the overall score to be attributed to the LTLeCo index. It is useful for allocating the quality classes foreseen by the limits defined in the Decree. Quality is expressed in three classes: High, Good and Satisfactory

Data is taken from a three-year period to classify lacustrine bodies of water according to the LTLeCo Index (individual years are not assessed). Point scores are allocated for each parameter to arrive at the LTLeCo score. Where more than one site is monitored in the same body of water, the lowest state from among those given by individual stations is considered.
### Table 3-1: Ecological and chemical quality indices for the monitored network of lakes - period 2011-2013 for the lakes of the Lazio Region (source: www.arpalazio.gov.it)

<table>
<thead>
<tr>
<th>Provincia</th>
<th>Codice Stazione</th>
<th>Comune</th>
<th>Corpo Idrico</th>
<th>LTLecco</th>
<th>Chimica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frosinone</td>
<td>L1.30</td>
<td>Forentino</td>
<td>Lago di Canino</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Frosinone</td>
<td>L1.32</td>
<td>Posta Fibreno</td>
<td>Lago di Posta Fibreno</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Rieti</td>
<td>L3.39</td>
<td>Colli sul Vinino</td>
<td>Lago Ventina</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Rieti</td>
<td>L3.40</td>
<td>Rieti</td>
<td>Lago Ripasottile</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Rieti</td>
<td>L3.41</td>
<td>Rieti</td>
<td>Lago Lungo</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Rieti</td>
<td>L3.42</td>
<td>Amatrice</td>
<td>Lago Scandarello</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Rieti</td>
<td>L3.44</td>
<td>Rocca Sinibalda</td>
<td>Lago Turano</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Rieti</td>
<td>L3.45</td>
<td>Petrelli Salto</td>
<td>Lago Salto</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Rieti</td>
<td>L3.57</td>
<td>Castel Sant'Angelo</td>
<td>Lago Paterno</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Roma</td>
<td>L4.26</td>
<td>Trevignano Romano</td>
<td>Lago di Bracciano</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Roma</td>
<td>L4.27</td>
<td>Roma</td>
<td>Lago di Martignano</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Roma</td>
<td>L4.28</td>
<td>Nemi</td>
<td>Lago di Nemi</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Roma</td>
<td>L4.29</td>
<td>Castel Gandolfo</td>
<td>Lago di Albano</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Viterbo</td>
<td>L5.30</td>
<td>Capodistiano</td>
<td>Lago di Bolsena</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Viterbo</td>
<td>L5.34</td>
<td>Caprarola</td>
<td>Lago di Vico</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LTLecco</th>
<th>Giudizio di qualità/Ecological Status Classification</th>
<th>Chimica/Chemical</th>
<th>Giudizio di qualità/Chemical Status Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Elevato / High</td>
<td>0</td>
<td>nessun superamento / Good</td>
</tr>
<tr>
<td>2</td>
<td>Buono / Good</td>
<td>1</td>
<td>uno o più parametri hanno superato i limiti / failing to achieve good</td>
</tr>
<tr>
<td>3</td>
<td>Sufficiente / Moderate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Scarso / Poor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cattivo / Bad</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From an analysis of the findings reported by ARPA LAZIO, during the period 2011-2013, the 16 lakes monitored in the Lazio Region show an ecological quality class ranging from “good” to “moderate”, with 13 of the regional lakes not exceeding the chemical parameters and 3 of the region’s lakes exceeding one or more of the chemical parameters (Table 3.1).

### 3.4 Relationship between climactic changes and the management of Italian lakes

The ISPRA 153/2011 Report shows some interesting data on the relationship between climate change and lakes, both in general and with regard to the nationally available data. The clearest evidence of the effects of climate change on the status of fresh-water environments are supplied by research conducted on those lakes for which we have a robust series of long-term ecological data.

Very interesting findings were obtained by using paleolimnological techniques which allow the
evolution of physical, chemical and biological parameters to be reconstructed using various time scales, which can be correlated to significant environmental changes from natural or anthropic causes. Paleolimnological research separates at the local level impacts of climate variations on the ecosystem from effects determined by human activity and represents an essential precondition for understanding the future evolution of the planet’s climactic system and the potential consequences of future global changes (Guilizzoni et al., 2007).

Significant findings were also obtained from hydro-chemical and hydro-biological research on the Alpine lakes: Rogora et al. (2003) highlighted considerable effects of the greater exposure of rocks and soil to weathering processes due to a reduction in the period spent under snow cover, on the pH value and on the solute content of waters; to these effects are added effects induced by biological processes which are in turn influenced by meteorological-climactic factors. But the studies of greatest interest regarding climate change impacts relate to modifications in the succession of seasonal temperature changes that have affected the sub-Alpine lakes over the past decades. A trend has been observed, which has also been noted in other lakes in Europe and in other continents, of an increase in the temperature at which full winter circulation occurs, and especially of a clear diminution in the amount of time this phenomenon lasts.

It is thought that the warming of the water mass in Lake Maggiore and the gradual reduction in complete mixing of the water column will contribute to a further isolation of the deep hypolimnion, thus promoting a stagnation of those processes of meromixis known to be present in the lakes of Lugano, Idro and Iseo (Ambrosetti et al. 2007).

Associated with these hydrological and hydrodynamic changes are decisive modifications to the pathways and timings and magnitude of the flow and recycling of nutrients that affect the seasonal succession in the populations of plankton. Abnormal blooms, of diatoms in spring and of cyanobacteria in summer, have recently been observed in Lake Maggiore (Bertoni et al., 2007); of particular interest appear to be the effects of these extraordinary changes on populations in the shallow waters in the shoreline areas of the lake. With regard to the issues of conservation and good management of shallow lakes, reference is made to the recommendations of a group of experts from the Netherlands (Mooij et al., 2005).

According to these authors, the most marked effects of climate change on small lakes will be the reduction in numbers of certain bird species and an invasion by ponto-caspian species, with an overall negative impact on biodiversity. The dominance of cyanobacteria will stabilise and the production of this component of phytoplankton will have an overriding influence on biocenosis metabolisms, while the regulating role of higher trophic levels will decline. The authors recommend interventions that
focus on the reduction of nutrient loads, on the development of vegetated shoreline areas and on the adaptive management of fishery.

Limited ecological knowledge is available regarding smaller bodies of lentic water such as wells, ponds and marshes that are for the most part temporary. This is mainly due to the fact that European directives have provided no form of protection for most of these biotopes with related institutional monitoring of habitats, birds and waters devoted to the safeguarding of natural resources. It is, however, known that these bodies of water play an important role in conserving biodiversity: they host a remarkably high number of invertebrates, many of which are rare and severely threatened (Ruffo and Stoch, 2005).

The effects of climate change that is currently under way (in view of the lengthy periods of drought followed by exceptionally heavy precipitation events) on the hydrological cycles and on the richness of species in small bodies of water, particularly in the Mediterranean area, are foreseeably grave and will further contribute to the general state of deterioration of these biotopes and the trend towards their eventual disappearance (already estimated at between the 60% and 80% in some areas of Italy), which is mainly caused by over-intensive human activity (Stoch, 2005).

Several priority actions are therefore necessary to protect these environments: the organisation and implementation of coordinated monitoring campaigns provided for by targeted laws; the safeguarding of areas that are naturally rich in small bodies of standing water, that function as reservoirs of biodiversity; interventions aimed at counteracting the more widespread human infringements (ground-fills for agricultural purposes, zootechnology and irrigational uses) and the introduction of alien species; hydro-geomorphological interventions aimed at reactivation and restoration based on criteria of alleviation and adaptation that are in keeping with the local context of the landscape.

3.5 The current state of lakes in the Province of Rieti (Partner 9)

The ecological status of the lakes in the Province of Rieti is monitored by a monitoring network for the classification of the environmental quality of the lakes of the Lazio Region, run by ARPA LAZIO. The network for the Province of Rieti covers seven lakes: Lungo, Paterno, Ripasottile, Salto, Scandarello, Turano and Ventina.

Table 3-2: Register of ARPA monitoring stations for lakes in the Province of Rieti (source: www.arpalazio.gov.it)

<table>
<thead>
<tr>
<th>Province</th>
<th>Station code 2005-2010</th>
<th>Current station code</th>
<th>Basin</th>
<th>Lake</th>
<th>Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rieti</td>
<td>3.39</td>
<td>L3.39</td>
<td>Velino</td>
<td>Lago Ventina</td>
<td>Colli sul Velino</td>
</tr>
<tr>
<td>Rieti</td>
<td>3.04</td>
<td>L3.40</td>
<td>Velino</td>
<td>Lago Ripasottile</td>
<td>Rieti</td>
</tr>
</tbody>
</table>
From an analysis of the findings reported by ARPA LAZIO, it emerges that over the period 2011-2013, the seven lakes monitored in the Province of Rieti show an ecological quality (Table 3-3).

Table 3-3: Ecological and chemical quality indices and parameters of the monitored network of lakes for the period 2011-2013 (for L.Ripasottile the informations are referred only to a spot sampling operated on september 30, 2014) for the lakes of the Province of Rieti (source: Arpa Lazio)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lago Ventina</td>
<td>12</td>
<td>n.a.</td>
<td>&lt;1</td>
<td>14,13</td>
<td>35,5</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Lago Ripasottile</td>
<td>105</td>
<td>n.a.</td>
<td>4</td>
<td>18,67</td>
<td>27,9</td>
<td>1,2</td>
<td>3</td>
</tr>
<tr>
<td>Lago Turano</td>
<td>560</td>
<td>5,56</td>
<td>163</td>
<td>11,61</td>
<td>3,93</td>
<td>2,75</td>
<td>3</td>
</tr>
<tr>
<td>Lago Scandarello</td>
<td>109</td>
<td>n.a.</td>
<td>12,5</td>
<td>11,3</td>
<td>7</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Lago Salto</td>
<td>1000</td>
<td>5,14</td>
<td>268</td>
<td>9,38</td>
<td>10,7</td>
<td>1,8</td>
<td>3</td>
</tr>
<tr>
<td>Lago Paterno</td>
<td>2</td>
<td>n.a.</td>
<td>&lt;1</td>
<td>20,43</td>
<td>6,07</td>
<td>4,33</td>
<td>3</td>
</tr>
</tbody>
</table>

With specific regard to Lake Salto and Lake Turano, the ecosystem quality was further investigated by means of targeted campaigns.

A technical report, commissioned by the Province of Rieti, was drawn up in 2012 on the characteristics of the fish communities in Lake Salto (Puzzi et al., 2012). As well as qualitative and quantitative data on the chemical-physical and trophic status of the lake, the report also describes the fish communities present. During fish communities monitoring, the Report says, targeted chemical-physical data were also gathered.
By means of a multi-purpose probe, measurements were made of the vertical development of the following parameters: Temperature, dissolved oxygen and its relative saturation percentage, specific electric conductivity and pH value. The values obtained are shown in graphic form below (Figure 3-5). Conditions of induced hypoxia (<2 mgO2/l), which had already been detected in the past decade, are therefore still present.

**Figure 3-5: Vertical profile of chemical-physical parameters as measured using a multi-probe in November 2011 (mS/cm, the unit of measurement for conductivity, stands for microSiemens/centimetre) (source: Rapporto tecnico Lago del Salto - Puzzi et al., 2012)**

[Legend: Temperatura=Temperature; Ossigeno=Oxygen; Ossigeno % saturazione=Oxygen saturation %; Conducibilità= Conductivity; Profondità= Depth]

As can be seen from the vertical profiles of chemical-physical parameters, a clearly stratified
condition persists through to November. In temperature terms, this reduced in magnitude (thermal gradient of 4°C between the surface and the bottom but in terms of oxygenation and conductivity it appears much more significant, with a clear jump in values at around 10 m in depth. The water mass below a depth of 10m in fact shows oxygen concentrations of less than 4 mg/l. Of particular note is the formation of a “metalimnion-related oxycline” that follows intensive oxidisation processes of the organic material accumulating at the base of the thermocline (at a depth of 10-15m) caused by the density gradient and the resulting oxygen consumption.

The total phosphorous values indicate a condition of meso-eutrophy, and transparency, measured using a Secchi disk, was 5.8 m.

There exist no annual series of updated data that would be necessary for assessing the trophic status of the lake basin using Vollenweider’s ‘probabilistic’ methodology as developed by the OECD (Organisation for Economic Cooperation and Development) as part of the “Monitoring of Inland Waters (OECD, 1982)”.

For this reason, the Report shows the eutrophication evaluation conducted in 2007 using the chemical-physical parameters investigated by CIRSPE in the 2000-2001 campaign. The mean annual value for chlorophyll ‘a’, equivalent to 6 µg/l, indicates a 60% probability that the basin is mesotrophic and a 30% probability that it is eutrophic, while the mean transparency indicates a state of eutrophy.

Lake Salto is therefore in a condition of meso-eutrophy. The oxygenation levels found in correspondence with the summer thermal stratification and which persist until December indicate, however, represent a critical situation.

With regard the Lake Salto’s vocation to salmonidae fishery, the report shows that the thermal gradient and oxygenation level that characterise the lacustrine reservoir are not suitable for guaranteeing the survival and well-being of salmonidae (in this case, lake whitefish and trout) during the summer months, from June to September, as the temperatures of the surface layers are too high and the oxygen concentrations in the underlying layers are too low.
With regard to the composition of the fish communities, a qualitative analysis of the sample shows a moderate variation in species. In 2011, a total of 906 fish were caught, belonging to 14 different species, of an overall biomass of approx. 166 kg. The Table below gives a systematic classification of all the species encountered during the 2011 sampling, compared to the findings for 2007.

Table 3-4: Systematic classification of all the species found during the 2011 sampling, compared to the findings for 2007 (source: Rapporto tecnico Lago del Salto, Puzzi et al. 2012)

<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
<th>ORIGIN</th>
<th>COMMERCIAL VALUE</th>
<th>2007</th>
<th>2011</th>
<th>TREND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esocidae</td>
<td><em>Esox lucius</em></td>
<td>Native</td>
<td>High</td>
<td>x</td>
<td>x</td>
<td>↑</td>
</tr>
<tr>
<td>Salmonidae</td>
<td><em>Salmo trutta trutta</em></td>
<td>Transferred</td>
<td>High</td>
<td>x</td>
<td>x</td>
<td>↓</td>
</tr>
<tr>
<td>Coregonus “forma hybrida”</td>
<td>Allochthonous</td>
<td>High</td>
<td>x</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Ciprinidae</td>
<td><em>Alburnus a. alborella</em></td>
<td>Transferred</td>
<td>Poor</td>
<td>x</td>
<td>x</td>
<td>↑</td>
</tr>
<tr>
<td>Cyprinus carpio</td>
<td>Allochthonous</td>
<td>High</td>
<td>x</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td><em>Carassius carassius</em></td>
<td>Allochthonous</td>
<td>Poor</td>
<td>x</td>
<td></td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td><em>Leuciscus cephalus</em></td>
<td>Autochthonous</td>
<td>Poor</td>
<td>x</td>
<td>x</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td><em>Rutilus rutilus</em></td>
<td>Allochthonous</td>
<td>Poor</td>
<td>x</td>
<td>x</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td><em>Scardinius erythrophthalmus</em></td>
<td>Native</td>
<td>Poor</td>
<td>x</td>
<td>x</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td><em>Tinca tinca</em></td>
<td>Transferred</td>
<td>High</td>
<td>x</td>
<td></td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td><em>Abramis brama</em></td>
<td>Allochthonous</td>
<td>None</td>
<td>x</td>
<td>↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhodeus sericeus</td>
<td>Allochthonous</td>
<td>None</td>
<td>x</td>
<td>↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cobitidae</td>
<td><em>Cobitis taenia</em></td>
<td>Transferred</td>
<td>None</td>
<td>x</td>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>Anguillidae</td>
<td><em>Anguilla anguilla</em></td>
<td>Native</td>
<td>High</td>
<td>x</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Cottidae</td>
<td><em>Padogobius martensii</em></td>
<td>Transferred</td>
<td>None</td>
<td>x</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Percidae</td>
<td><em>Perca fluviatilis</em></td>
<td>Transferred</td>
<td>High</td>
<td>x</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
A decrease in species diversity in the fish stock is to be observed in the sample compared to the previous sampling. From 17 species there has been a decline to 14, with a loss of the brown trout, crucian trout, tench, common roach and perch, with the appearance of two exotic fish not previously reported: the bream and the bitterling. In 2011, a total of 14 species were sampled in Lake Salto.

Three of these are considered to have ‘transferred’ as they are typical for the Padano-Veneto basin, while seven are ‘allochthonous’ as they do not stem from Italian basins.

From the quantitative point of view, data are given for composition in terms of numbers of individuals and the percentage of the biomass of the fish fauna sampled in 2011, as may be gathered from the Technical Report:

Table 3-5: Composition data for the overall fish sample taken in 2011 (source: Rapporto tecnico Lago del Salto, Puzzi et al. 2012)

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>NUMBER OF INDIVIDUALS</th>
<th>INDIVIDUALS %</th>
<th>BIOMASS ESTIMATION</th>
<th>BIOMASS %</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gymnocephalus cernuus</em></td>
<td>518</td>
<td>72,3</td>
<td>76953</td>
<td>46,5</td>
</tr>
<tr>
<td><em>Lepomis gibbosus</em></td>
<td>64</td>
<td>8,9</td>
<td>9595</td>
<td>5,8</td>
</tr>
<tr>
<td><em>Alburnus a. alborella</em></td>
<td>46</td>
<td>6,4</td>
<td>568</td>
<td>0,3</td>
</tr>
<tr>
<td><em>Scardinius erythrophthalmus</em></td>
<td>31</td>
<td>4,3</td>
<td>414</td>
<td>0,3</td>
</tr>
<tr>
<td><em>Rhodeus sericeus</em></td>
<td>15</td>
<td>2,1</td>
<td>86</td>
<td>0,1</td>
</tr>
<tr>
<td><em>Esox lucius</em></td>
<td>10</td>
<td>1,4</td>
<td>40551</td>
<td>24,5</td>
</tr>
<tr>
<td><em>Abramis brama</em></td>
<td>8</td>
<td>1,1</td>
<td>778</td>
<td>0,5</td>
</tr>
<tr>
<td><em>Coregonus “forma hybrida”</em></td>
<td>6</td>
<td>0,8</td>
<td>2030</td>
<td>1,2</td>
</tr>
<tr>
<td><em>Cyprinus carpio</em></td>
<td>5</td>
<td>0,7</td>
<td>33650</td>
<td>20,3</td>
</tr>
<tr>
<td><em>Leuciscus cephalus</em></td>
<td>5</td>
<td>0,7</td>
<td>681</td>
<td>0,4</td>
</tr>
<tr>
<td><em>Padogobius martensii</em></td>
<td>4</td>
<td>0,6</td>
<td>20</td>
<td>0,0</td>
</tr>
<tr>
<td><em>Lepomis gibbosus</em></td>
<td>2</td>
<td>0,3</td>
<td>15</td>
<td>0,0</td>
</tr>
</tbody>
</table>

*most likely il refers to *C.auratus*
The fish sample taken from Lake Salto showed a predominance of the common roach (*Rutilus rutilus*), which represented over 72% of the sample in numerical terms and approx. 46% in terms of biomass. This was followed by perch, bleak and rudd.

With regard to the water quality of Lake Turano, findings are given of the 2011 dossier of the environmental NGO Legambiente (*Il Lago del Turano tra passato e futuro* - *Goletta dei laghi 2011*).

Legambiente has been monitoring the waters of Lake Turano with regard to quality since 2008. As the findings of the 2001 dossier show, (Table 3.6), conclusions reflect the critical situations that have been deteriorating across all of the locations surveyed.

**Table 3-6: Samplings taken by Legambiente’s Lake Schooner on Lake Turano (source: Dossier Legambiente 2011)**

<table>
<thead>
<tr>
<th>MUNICIPALITY</th>
<th>POINT SAMPLE</th>
<th>CONCLUSION</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colle di Tora</td>
<td>gorge under village</td>
<td>Slightly polluted</td>
<td>12/06/2008</td>
</tr>
<tr>
<td>Ascrea</td>
<td>beach</td>
<td>Polluted</td>
<td>12/0620/08</td>
</tr>
<tr>
<td>Paganico Sabino</td>
<td>beach</td>
<td>Slightly polluted</td>
<td>12/06/2008</td>
</tr>
<tr>
<td>Ascrea</td>
<td>beach</td>
<td>Polluted</td>
<td>29/06/2009</td>
</tr>
<tr>
<td>Paganico Sabino</td>
<td>beach</td>
<td>Polluted</td>
<td>29/06/2009</td>
</tr>
<tr>
<td>Colle di Tora</td>
<td>beach under the village</td>
<td>Polluted</td>
<td>29/06/2009</td>
</tr>
<tr>
<td>Rocca sinibalda</td>
<td>ditch in Irto hill</td>
<td>Significantly polluted</td>
<td>29/06/2009</td>
</tr>
<tr>
<td>Rocca sinibalda</td>
<td>ditch in Valleverde</td>
<td>Significantly polluted</td>
<td>01/07/2010</td>
</tr>
</tbody>
</table>

### 3.6 Relationship between nutrient loading and climate change and lake management for the Province of Rieti (Partner 9)

A certain and measurable effect of climate change is to induce hydrological and hydrodynamic changes in watersheds; with these are associated decisive modifications to the paths and timings of the flow and recycle of nutrients that affect the seasonal succession in the populations of plankton.

Several authors believe that the most marked effects of climate change on small lakes will be the reduction in numbers of certain bird species and an invasion by ponto-caspian species, with an overall negative impact on biodiversity. The dominance of cyanobacteria will stabilise and the production of this component of phytoplankton will have an overriding influence on
biocoenosis metabolisms, while the regulating role of higher trophic levels will go into decline. The authors recommend interventions that focus on the reduction of nutrient loads, on the development of vegetated shoreline areas and on the adaptive management of fishery.

For this reason it is specifically the reduction of the nutrient load on the watersheds, the maintenance and development of bank vegetation and management of the pressure exerted by fishery that will bring benefits to the lake ecosystem and thereby counteract the qualitative decline resulting from climactic changes currently taking place. Counteracting disturbances of human origin to the shoreline will have indirect benefits in promoting the maintenance of a rich biodiversity within the watershed.

Among the good management practices identified by the LakeAdmin project conducted for the Province of Rieti, with a particular focus on Lakes Salto and Turano, were the following: interventions aimed at conservation and enhancement of biodiversity, with the adoption of management protocols to reduce fluctuations in water levels in the artificial lakes, the reduction in the load of pollutants from animal husbandry or agriculture, with the drafting of a detailed fishery plan, interventions for the restoration of specific lacustrine habitats with a restoration of natural shoreline structures, as with the creation of services and/or innovative systems for exploiting lake resources. These measures were without doubt effective in counteracting the negative effects of the current changes in climate.

3.7 Values of lake ecosystems and lake restoration

3.7.1 General background

Ecosystem services are benefits that people and society can enjoy. The term “ecosystem services” was introduced as a framework for social-ecological systems a decade ago in the Millennium Assessment (2003) which identified the services as provisioning, regulating, cultural and supporting services.

They can also be divided into two main categories namely extractive and non-extractive (Figure 3-7). The concept can be a useful tool in local, regional and even global policy (Carpenter et al. 2009). In regional lake or water management, the valuation of the ecosystem services can pave the way for implementing management programs and participation of local stakeholders.

It can demonstrate that management of aquatic habitats is a cost to be recovered for a better environment and also as an investment which safeguards the benefits of natural capital for local people. The original approach has been largely focused on linking scientific research with ecological functions and biodiversity (e.g. Carpenter et al. 2009). A simpler and more practical approach may be needed for the preliminary assessment of lakes and their management for regional policy purposes. For this reason a list of the different uses of lakes or reservoirs and
their frequency of such uses has been compiled. These have direct economic significance or are related to economically significant uses.

**Figure 3-7: Types of lake ecosystem services as defined in the US-EPA (source da: F.I.P. Lakeadmin - West Regional Authority - Ireland, 2014)**

### 3.7.2 Ecosystem services provided by lakes and reservoirs in LakeAdmin Regions

A preliminary survey of ecosystem services identified by partners in their regions resulted in a list of 16, mainly provisioning lacustrine ecosystem services related to some economically significant uses.

These recognised ecosystem services are either directly (e.g. raw water, irrigation, aquaculture, commercial fisheries, hydropower) or indirectly (e.g. recreation, tourism, recreational and sport fishing) important in the local economy. Most of these ecosystem services are also dependent on a sufficiently high quality of water. Since their local economic value is high, extensive water protection or management measures have been or will be carried out to maintain them. The role for example of irrigation is of special importance in the southern Mediterranean partner regions while boating and fisheries are more pronounced in Northern partner regions. Recreation,
biodiversity and landscape value are considered high priorities in all regions and maintaining biodiversity and economically significant ecosystem services is a common goal. Therefore maintaining economically valuable activities like tourism may also require maintenance of biodiversity. In Local Authority regions, the highest income generated from tourism is significantly related to high biodiversity due to the quality of the natural environment and biodiversity.

Table 3-7: Benefits gained from the ecosystems of lakes, reservoirs and ponds in LakeAdmin partner regions (Categories: P= Provisioning, R = Regulating, C = Cultural - Supporting services which are less directly policy related or measurable are not listed.)

<table>
<thead>
<tr>
<th>Ecosystem Services Lake use</th>
<th>Use of lakes in partner regions LakeAdmin countries (blue = yes, white = no)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquaculture</td>
<td>Finland, Czech Rep., Denmark, Estonia, Greece, Hungary, Ireland, Italy, Malta</td>
</tr>
<tr>
<td>Bathing</td>
<td>C</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>P</td>
</tr>
<tr>
<td>Boating and sailing</td>
<td>C</td>
</tr>
<tr>
<td>Env. education</td>
<td>C</td>
</tr>
<tr>
<td>Fisheries commercial</td>
<td>P</td>
</tr>
<tr>
<td>Fisheries recreational</td>
<td>P</td>
</tr>
<tr>
<td>Fisheries sportfishing</td>
<td>C</td>
</tr>
<tr>
<td>Flood protection</td>
<td>R</td>
</tr>
<tr>
<td>Freetime residence</td>
<td>P/C</td>
</tr>
<tr>
<td>Irrigation</td>
<td>P</td>
</tr>
<tr>
<td>Landscape value</td>
<td>C</td>
</tr>
<tr>
<td>Raw water</td>
<td>P</td>
</tr>
<tr>
<td>Tourism</td>
<td>P/C</td>
</tr>
<tr>
<td>Water sports</td>
<td>C</td>
</tr>
<tr>
<td>Water transport</td>
<td>P</td>
</tr>
</tbody>
</table>

As referred to previously, the value of ecosystem services should not be underestimated. Such a valuation demonstrates the significance of aquatic habitats and how they should be managed. This requires investment which will benefit the local community, the natural environment and the local economy.

3.7.3 Value of the lakes in the Province of Rieti (Partner 9), with particular focus on Lakes Salto and Turano

The main value of the two lakes of Salto and Turano in the Province of Rieti is linked to the presence of hydroelectric facilities. This main utilisation of the two lakes derives from their origins, as both basins are the result of artificial dams created in the 1930s for the production of hydroelectric energy. Lake Turano is linked to Lake Salto by means of a conduit which is approx. 9 km in length and 2.5 m in diameter.

Together they feed the hydroelectric power station of Cotilia via a pressurised conduit 11.8 km in length and 4 m in diameter. With reference to Lakes Salto and Turano, Cotilia power station
is able to exploit a 128 m head of water with a maximum throughput of 50 m³/s. The plant has an annual production of 75.45 GWh (data supplied by Endesa S.p.A.). Cotilia power station has two minor offtakes: Canetra (constructed 1951 - 2.30 MW) and Peschiera (constructed 1943 - 2.20 MW). Along its course, the Salto-Cotilia conduit is joined by one originating from Velino, thus increasing the capacity available to Cotilia.

Figure 3-8: Diagram of inputs to Cotilia power station (source: www.progettodighe.it)

The following chart refers to the mean annual production of Cotilia Power Station in the period 1994-2013, that was of 61.5 GWh/year. The mean annual economic gross value of hydropower production is about 3.6 Million €.
The following figures show, instead, the multiannual amplitude of water level fluctuation in Salto Dam and in Turano Dam in the period 1981-2013.

In the year 2013 the mean amplitude was approximately 9 m for Salto Dam and 8 m for Turano Dam (source: E.ON Produzione S.p.A.).

**Figure 3-10: Multiannual amplitude of water level fluctuation in Salto Dam (period 1981-2013)**

(source: E.ON Produzione S.p.A.)
Figure 3-11: Multiannual amplitude of water level fluctuation in Turano Dam (period 1981-2013)  
(source: E.ON Produzione S.p.A.)

Other ecosystem services provided by the lakes consist mainly in tourism (with the presence of beaches equipped for bathing) and both professional fishery and angling. The most recent available data on quantities fished in the area are shown by the CIRSPE study of 2004 on Lake Salto. This study reinstates data on potential minimum and maximum secondary production of Lake Salto as compared with data from professional fishing activity, which totalled 19,851 kg in the year concerned. For the purposes of determining the amount of fishing pressure on the two lakes in question, it gives an estimate of the number of fishing licenses issued by the province divided by type:

- Professional fishing: 2 licenses of Type "A" for the Lake Salto and 1 license for Lake Turano.
- Sports fishing: approximately 100 licenses of type "B" for the Lake Salto and n. 100 licenses for Lake Turano.
4. **LAKE RESTORATION AND WATER FRAMEWORK DIRECTIVE (WFD) IMPLEMENTATION**

4.1 **Lake restoration in the Lazio Region**

Legislative Decree N° 152 of 3 April 2006, laying down regulations pertaining to environmental protection provides, under Article 64, Paragraph 1, for the division of the whole national geographical area into eight river basin districts, among which the Middle Apennine district comprises the watersheds referred to under letter e) of the same Paragraph 1.

The foregoing Article 53, Paragraph 1, letter t) contains, for the purposes of Section I of Parte III of the environmental geographical unit, the following definition of a river basin district: “an area of land and sea comprising one or more adjoining watersheds and their underground and coastal waters that make up the principal units of management of the watersheds”.

In adopting the Directive of the European Parliament and Council of 23 October 2000, among other legislation, setting up a framework of Community action concerning water (WFD - 2000/60/CE), the above-mentioned Legislative Decree N. 152/06 therefore introduces, into national regulations, the concept of River Basin District (Article 3, Paragraph 1 of the Directive) as a new physical entity and object for the planning and management of water resources and planning of hydrogeological structures to be regulated by Articles 65 and following of the above-mentioned Section I and by Article 117 of Section II.

The subsequent Legislative Decree N° 49 of 23 February 2010, concerning the implementation of Directive 2007/60/CE relating to the assessment and management of flood risks, regulated at district level the planning of flood risk management, providing for coordinating measures under the regulation referred to under Sections I and II of Parte III of Legislative Decree 152/06.

Planning relating to the Middle Apennine river basin district is coordinated, within the framework of the constitution of the individual authority for the Middle Apennine River Basin District pursuant to Article 63 Paragraph 1 of Legislative Decree 152/06, by the Authority for that nationally significant basin of the River Tiber as regulated by Article 4 of Legislative Decree N° 219 of 10 December 2010. It is currently subdivided into:

- Management Plan (of water resources) - PGDAC (Which represents the River Basin Management Plan - RBMP ex art. 13 WFD)
- Management Plan for Flood Risk - PGRAAC.

With Prime Ministerial Decree of 5 July 2013, the River Basin Management Plan for the Middle Apennine River Basin District (in Italian “Piano di gestione del bacino idrografico del distretto idrografico dell’Appennino centrale”) was approved.
Part VII of the above-mentioned PGDAC indicates the basic measures (Types 1A and 1B) and the supplementary and additional measures of the plan for the safeguarding of bodies of water of the Middle Apennine district, including the Lazio Region.

The Middle Apennine management plan is the result of a regional planning process, but also contains contributions from the Basin Authority. It is a long and complex document that is for the most part based on Legislative Decree 152/1999 through which the major Community directives relating to water were adopted into Italian regulations.

It is therefore a task of the district management plan to develop the various planning measures so far provided for by local and sector bodies and by the basin Authority as well as to verify their effectiveness in tackling emergent and foreseeable criticalities and to plan further programmes of measures.
The RBMPs draw heavily on previous plans, in particular the “Piani di Tutela delle Acque” (Water Protection Plans) prepared at regional level. The regional plans are dated from 2004 to 2009, and they are an element of the Italy’s approach prior to the transposition of the WFD. The RBMPs take a number of measures from these earlier plans. In addition, the RBMPs cite to her water plans, for example, the Piani di assetto idrogeologico (Plans of hydrological assets), typically at regional level: these cover water quantity issues.

The following table is a list of detailed programmes and management plans for the river basin district dealing with particular sub-basins, sectors, issues or water types, together with a summary of their contents, in according to Annex VII, letter A, point 8 of WFD.

<table>
<thead>
<tr>
<th>PLANS (IN ITALIAN)</th>
<th>AUTHORITY</th>
<th>PLANS (TRANSLATION)</th>
<th>CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piani di tutela delle acque</td>
<td>Lazio Region and other neighboring regions</td>
<td>Water Protection Plans drawn up by the Regions pursuant to Article 44 of Legislative Decree 152/99 or to Article 121 of Legislative Decree 152/2006</td>
<td>They contain all the measures necessary to protect quality and quantity of water systems, at regional and river basin.</td>
</tr>
<tr>
<td>Piani delle Autorità di ambito</td>
<td>Areas Authority</td>
<td>Area Agencies Plans pursuant to Article 149 of Legislative Decree 152/2006</td>
<td>They contain the survey of infrastructure, the plan of remedial measures, the management model and organizational and business plan</td>
</tr>
<tr>
<td>Piani di bacino – stralci settoriali o tematici del piano di bacino idrografico del fiume Tevere</td>
<td>Authority for the River Basin of Tiber River</td>
<td>Management Plan for the River Basin of Tiber River</td>
<td>They contain the directions for the safety of the areas at risk of flooding and landslides and to define the structure of the areas subject to danger</td>
</tr>
<tr>
<td>Piani di bacino dei bacini di rilevanza regionale ed interregionale</td>
<td>Authority for the River Basin of Region Abruzzo, of Region Marche, of Region Lazio, of River Tronto, of River Sangro,</td>
<td>Management Plan for regional or interregional River Basin</td>
<td>They contain the directions for the safety of the areas at risk of flooding and landslides and define the structure of the areas subject to danger</td>
</tr>
<tr>
<td>Piano regolatore regionale degli acquedotti</td>
<td>Lazio Region</td>
<td>Regional Master Plan of the aqueducts</td>
<td>The plan covers the allocation of resources to different uses and the interventions for the use of water resources</td>
</tr>
<tr>
<td>Piano irriguo (nazionale)</td>
<td>Italian Government</td>
<td>Irrigation Plan (National)</td>
<td>It contains the planning of works necessary for the operation of irrigation systems a national level</td>
</tr>
<tr>
<td>Piani regionali per l’Irrigazione o per la Bonifica</td>
<td>Lazio Region and other neighboring regions</td>
<td>Regional plans for Irrigation and Reclamation</td>
<td>They are aimed at the completion, modernization and functionality of the systems of land reclamation and at the hydrogeological accommodation of mountainous areas, and at the development of irrigation.</td>
</tr>
<tr>
<td>PLANS (IN ITALIAN)</td>
<td>AUTHORITY</td>
<td>PLANS (TRANSLATION)</td>
<td>CONTENT</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------</td>
<td>---------------------</td>
<td>---------</td>
</tr>
<tr>
<td>I piani generali di bonifica</td>
<td>Reclamation Authority</td>
<td>General plans for Reclamation</td>
<td>They give the guidelines and makes proposals for the protection of natural environment and for the preservation of agricultural soils.</td>
</tr>
<tr>
<td>I Piani di gestione dei siti Natura 2000 (Sic e Zps)</td>
<td>Lazio Region and other neighboring regions</td>
<td>Natura 2000 sites Management Plan</td>
<td>They contain the conservation measures for Natura 2000 sites</td>
</tr>
<tr>
<td>Piano regionale delle aree naturali protette</td>
<td>Lazio Region</td>
<td>Regional plan for natural protected areas</td>
<td>It contains the guidelines objectives to be pursued for the protection of regional natural areas</td>
</tr>
<tr>
<td>Piani di sviluppo rurale (PSR)</td>
<td>Lazio Region and other neighboring regions</td>
<td>Rural Development Programme</td>
<td>They contain the measures for increasing the competitiveness of the agricultural production and to give a role and an identity to the regional rural areas</td>
</tr>
<tr>
<td>Piani regionali energetici (PER)</td>
<td>Lazio Region and other neighboring regions</td>
<td>Regional energy plans</td>
<td>They give the guidelines and contains strategic objectives and actions for the management of energy resources</td>
</tr>
<tr>
<td>Piani territoriali di coordinamento provinciale</td>
<td>Provinces</td>
<td>General Provincial Local Plan of the Province of Rieti</td>
<td>They are aimed at the management of land resources through their protection and enhancement.</td>
</tr>
</tbody>
</table>

The main point of reference in, as explained above, constructing the framework of policies for safeguarding and managing water resources at a district level are the Water Protection Plans (in Italian “Piani di Tutela delle Acque”) drawn up by the Regions pursuant to Article 44 of Legislative Decree 152/99 or to Article 121 of Legislative Decree 152/2006. The Water Protection Plan for the Lazio Region was adopted by Regional Council Resolution N° 266 of 2 May 2006 and approved by Regional Council Resolution N° 42 of 27 September 2007 (Ordinary Supplement to “Official Bulletin” N° 3, 34 of 10 December 2007).

From an analysis of the Water Protection Plans, a substantial overlap in methodological approaches emerges with instruments differing only in terms of the measures linked to specific impacts in the areas of competency. Derived from these water planning instruments are basic measures defined as Type 1A by Ministry of the Environment Decree of 17 July 2009, that implement, among other planning measures, the main Community directives relating to water resources and in particular:

The basic Type 1B measures defined as “the minimum planning requirements” provided for by Directive 2000/60/CE as listed by the Ministry of the Environment Decree of 17 July 2009.

The RBMP for the Middle Apennine River Basin District also lists additional measures deriving from Annex V to WFD 2000/60/CE, which provides a list of measures defined as supplementary and additional that are to be adopted whenever the monitoring data or other data indicate that the objectives assigned to the body of water through adoption of the basic measures cannot be
attained.

From the Tables reported by the Lazio Region in the Water Protection Plans “Piano Regionale di Tutela delle Acque”, the following Type 1A measures may impact on lakes:

**MEASURES ON SANITATION**

In areas of new urban construction, and where pre-existing urban areas are been renovated, the sewerage system shall be separate from the system of storm water collection. In such a case, arrangements shall be made to divert first-flush rainwater into the sewerage system, if this is compatible with the sewage treatment system adopted.

**MEASURES FOR SEWAGE TREATMENT**

*Measures for treating effluent water from large built-up areas:*

In basins of poor or bad quality and in sensitive areas, the following measures are provided for (by 2008):

- treatment of urban effluent from urban areas with population densities above 7,000 inhabitants
- discharges into sensitive areas relative to the total number of them and total population
- sewage treatment with capacity for more than 50,000 inhabitants to service the Rome urban area
- industrial waste discharges with more than >1,000 m³/day
- the population that cannot be served by the sewerage system estimated at 7% of inhabitants

In basins of moderate, good or high quality, the following measures are provided for (by 2008):

- the treatment of effluents from built-up and industrial areas

  - In all regional basins (by 2015):
    - all urban areas >2,000 inhabitants and industrial effluents above 500 m³/day shall fulfil the treatment capacity specifications provided for basins of poor or lowest quality.

*Measures for treating effluent water from small built-up areas (with scattered housing, isolated buildings and urban areas of fewer than 2,000 inhabitants):*

- Measures for domestic discharges of scattered houses, residential estates, isolated housing and urban areas of <2,000 inhabitants, discharged into superficial waters or into the ground
- Measures for domestic discharges of scattered houses, residential estates, isolated
housing and urban areas of <10,000 inhabitants, discharged into sea/coastal waters

From the Tables reported by the Lazio Region, the following Type 1B measures are applicable to lakes:

**MEASURES FOR THE PROTECTION OF AREAS OF COMPETENCE AND RIVER RESTORATION OF BODIES OF WATER**

- Enhancing the self-treatment capacity of superficial bodies of water and ensuring the maintenance or restoration of spontaneous vegetation in the strip immediately adjacent to the bank with the functions of filtering suspended solids and pollutants of diffuse origin, stabilising banks and conserving biodiversity as well as providing ecological connections between aquatic and shoreline ecosystems

- The Regional Council sets criteria and protection goals for the bodies of water in their area of competence and regulates change-of-use projects in compliance with the provisions of basin planning and state and regional legislation as it concerns water policies.

- The provinces identify minor bodies of water or stretches of river within their area of competence for which protective measures shall be provided, proceed to apply limits to discharges that are sufficient to guarantee attainment of the objectives and to maintain self-treatment capacities in the watershed body.

- Adoption of a Programme of River Restoration, declaration of works of prime regional interest with regard to reinstatement of riverbeds and the maintenance and extension of flood plain areas

- The Programme of River Restoration shall identify those bodies of water and specific river stretches requiring restoration works for their ecological functionality

- Identification of ecological connections to be given priority protection in the green belts between aquatic and river ecosystems, standing and moving wet areas and protected nature reserves.

- Restoration works are subject to the binding decision of the competent basin Authorities for evaluation of the compliance with projected plans for the basin.

- According to priority, a list of projects is defined that is to be financed using funds for protection of the soil or through the utilisation of Community, regional and local authority funding

From the Tables reported by the Lazio Region, the following supplementary and additional measures are applicable to lakes:
GOOD AGRICULTURAL PRACTICE CODE; MINISTRY OF AGRICULTURAL AND FOREST POLICIES, MINISTERIAL DECREE OF 19 APRIL 1999

Some initial phases are taken into consideration that characterise the various types of cultivated land and for each of these essential aspects are identified and in some cases constraints to be observed in order to attain a balanced relationship between farming and the environment. In particular, in the Introductory Remarks, general aspects are defined relating to Good Agricultural Practice for each of the principal phases of cultivation.

MANAGEMENT PLAN FOR THE MIDDLE APENNINE DISTRICT

Feasibility of the rationalisation works on the hydroelectric systems through an increase in regulatory capacity to recover water resources

4.2 Description of lake restoration for the Province of Rieti (Partner 9)

In this section the work scheduled by policy plans or documents presently in force, for the restoration of Lake Salto and of Lake Turano, is discussed.

LAKE SALTO comes within the local area identified by the General Provincial Local Plan of the Province of Rieti, in Italian P.T.P.G. “Piano Territoriale Provinciale Generale della Provincia di Rieti” (as approved by Decree N° 14 of 15 April 2009) as Local Project N° 6 - Salto-Cicolano.

For this area, the Local Plan (identifies certain planning specifications and criteria for local planning. As indicated under Article 8 of the Regulations and as specified in the "Organisation of the Planning Process" of Local Project N° 6, the following planning specifications and criteria constitute a point of reference for the evaluation of compatibility or compliance for the Province Authority pursuant to Regional Law 38/99 and its subsequent modifications.

The specifications for aspects of the "Settlement-Environment Relationship" are as follows:

- the perimeter band around Lake Salto shall be preserved from new building construction and the ecological (and in particular the vegetation) continuity of this bank shall be reinstated, creating ecological interconnections - thereby also maintaining adequate levels of environmental permeability - between the lake and its surrounding environmental systems (the system of woodland and middle mountainous area, system of farmed areas). In particular, constructions for residential or tourism purposes are not permitted near the lake;
- the continuity of recent building construction expansion shall be prevented, thereby maintaining high levels of environmental permeability (Fiamignano, etc.);
• settlement projects in agricultural areas or in areas of landscape-environmental interest shall be excluded or limited to recovery and requalification works on existing edifices (traditional farmhouses etc.) or further limited in extraordinary cases to isolated buildings of limited dimensions in defined areas that shall not impact upon or degrade areas of landscape-environmental interest. Such interventions shall be justified by specific functional or service requirements;

• provisional type works are permitted that have the purpose of tourism use and tourist services, including use of the lake system, provided that they do not impact upon or degrade areas of landscape and environmental interest, particularly those of the lake perimeter.

The Local Plan further identifies Planning Lines of Action by means of which set objectives are to be attained and further indicates which actions have already been initiated according to the programmes laid down along with their relevant sources of funding and the planning schedule. Among the lines of action indicated for Lake Salto are:

- initiatives for the exploitation of the lake resource by means of a restructuring project with a view not just to bathing (organisation of the Borgo San Pietro area) but for development of innovative and diversified means that take water as their central point of reference; this also considers existing project proposals put forward by the Mountain Community: a circuit of water mills, a dam museum, nature trails linked to the water courses and springs, and the project of the 'Water and Natural Resources Park' which forms part of the Tourist Information Point, etc. Projects may also be assessed aimed at supporting outdoor sporting activities (also supported by adequate equipment and structures) and sport angling (including the verification of any disputes with professional fishing activities and fish production), as well as the organization of sporting events of regional and national interest: sculling (possibly with the involvement of the Italian National Olympic Committee - CONI and the Italian Rowing Federation), canoeing, windsurfing. Development of sports tourism. All activities connected with the lake and its development shall of necessity include agreements of collaboration with the company that manages the dams (presently ENDESA) in order to overcome various problems, particularly that of the excursion of the lake levels. Such agreements may even lead to innovative solutions (e.g. gratuitous concessions of non-utilised areas, etc.);

LAKE TURANO comes within the local area identified by the Local Plan mentioned above (P.T.G.P. Province of Rieti) as Local Project N° 5 - Turano.

For this area, the Local Plan identifies certain planning specifications and criteria for local planning. As indicated under Article 8 of the Regulations and as specified in the "Organisation of the Planning Process" of Local Project N° 6, the following planning specifications and criteria
constitute a point of reference for the evaluation of compatibility or compliance for the Province Authority pursuant to Regional Law 38/99 and its subsequent modifications.

The specifications for aspects of the “Settlement-Environment Relationship” are as follows:

On the morphological aspects of the settlement-planning organisation:

- development of local planning specifications in a coordinated format between the various community centres, with particular attention to the regulations relating to recovery and requalification of historical centres (including their colour schemes);

- recovery and requalification of the historical centres with particular attention to the interventions that should integrate adequately with local morphological, historical architectural and landscape characteristics;

- environmental areas in context; safeguarding of areas of greatest historical architectural and landscape interest;

- works on new built-up areas may not develop in a linear way across areas immediately overlooking infrastructures or infrastructure centres;

- in the case of (highly limited) new settlement developments, nuclear-form settlements should be given decided preference, integrated with existing historical centres and in any case with the most careful attention paid to preserving areas of natural interest and rural areas of the highest landscape value. To this end, the following site-planning methodologies shall be used;

- development of second homes and especially of settlements exclusively dedicated to tourism use must be limited and controlled; for this purpose, the recovery and enhancement of existing villages and historical centres shall be preferred, which many include installation of equipment and services destined for leisure activities and enjoyment. In particular, for those historic villages and historic centres that are facing abandonment, forms of recovery and reuse for tourist use may be incentivised, which may include the realisation of integrated enhancement projects. In this case too, site-planning methodologies are to be used.

On the relationship between settlement and environment:

- construction projects in agricultural areas or in areas of landscape-environmental interest shall be excluded or limited to the recovery and requalification of existing edifices (traditional farmhouses etc.) or further limited in extraordinary cases to isolated buildings of limited dimension in defined areas that shall not impact upon or degrade areas of aesthetic landscape/environmental interest. Such interventions shall be justified by specific functional or service requirements;
- provisional type works are permitted for the purpose of tourism use and tourist services, including use of the lake system, provided that they do not impact upon or degrade areas of landscape and environmental interest, particularly those of the lake perimeter.

Regarding the productive, functional and service components of the settlements:

- organisation of a networked system of services managed collaboratively among the various community centres

The Local Plan further identifies PLANNING LINES OF ACTION by means of which set objectives are to be attained and further indicates which actions have already been initiated according to the programmes laid down along with their relevant sources of funding and the planning schedule. Among these lines of action indicated for Lake Turano are:

- development of productive economic activity with a naturalistic scope that should form the basis of local resources;

- development of service activities of in support of production activities as above; development of all related promotional activities, such as for example the "Chestnut and Truffle Way";

- interventions to be proposed for increasing biodiversity in agricultural ecosystems;

- interventions to be proposed for improvement of woodlands;

- interventions for urban and environmental restoration and requalification of built-up areas (historical centres, scattered farmhouses, new built-up areas) with criteria for integration with elements of the landscape and the environment, including those for purposes of tourism;

- initiatives for exploitation following innovative and diversified methodologies;

- development of cultural and organizational projects that should enhance the aesthetic landscape and environmental qualities of Turano. Reference is made to the above-mentioned project initiatives for the Mountain Community regarding the lake area. Central among these is an enhancement project with the creation of two bathing beaches on opposite shores of the lake close to Castel di Tora and to Colle di Tora - and the creation of a 36-km-long lakeside cycle path, organising the necessary facilities, including those for fishing and sporting activities, as well as other contexts that are tackled in the following themed projects: The "Project Historical Centres" and the "Project Abandoned Rural Heritage", which foresee accurate census-taking of real estate and possible lines of development; the "Architectural Project", relating to areas of interest such as the Vicus Campilianum, with the remains of houses and a mill, in continuity with the area of Fonte Palombo Park, for which collection of the water is planned and the greening of the thermal
spring bearing the same name; the “Castelli Project” (Collalto, Roccasinibalda), suited to high class conference organisation (meetings, congresses, etc.); the “Eco-Museum of the Dam”, for which, through a convention with the present management, guided visits may be arranged, and the creation of a museum of material culture and folklore, but above all a permanent exhibition on the transformation of the area following the construction of the dam and the artificial basin; the “Porta del Turano” project, that proposes an entrance to the valley arriving from the A24 motorway along the course of the Turano river, with a guest centre in Turano; the “Porta delle Rocche” project, along the Provincial Highway approximately 15 km from Rieti, with a guest centre and possibly a museum of industrial archaeology linked to water mills close to a canalisation of the River Turano. On the other hand, a strategy of this kind is also being proposed by the Tourist Information Point of Rieti, especially through its project “Natural Resources and Water Park”;

- promotion and incentivising of guest lodging facilities whether they be of the bed & breakfast type, linked to organised excursions, hostels (as foreseen by the Mountain Community in Nespolo, Rocca Sinibalda and Stipes), or camp sites (Ascrea);

- organisation of tourist trails, routes and itineraries, which may include facilities, enabling enjoyment of the area, especially with a view to bringing existing potential ‘on-line’ (e.g. the Cervia-Navegna trail proposed by the Mountain Community);

- projects for equipment and services to support enjoyment of the environment (which may include major initiatives by the Reserve);

- projects for reinforcing the structure of services to the local population, which may use distance communication technology, particularly in the areas of education, public information and administrative services;

- modernisation restructuring and safety upgrading projects for the local road network (especially with regard to the provincial road along the valley floor);

- creation of syndicated public transport services relating to the two network units defined by the Provincial Plan affecting the area (eight in total: Ascrea, Castel di Tora, Collalto Sabino, Colle di Tora, Collegiove, Nespolo, Paganico and Turania).

- projects of environmentally sustainable production in the strict sense of the term that are able to attract new operators;

- cultural promotion and training projects, as well as awareness raising and image forming (which may include EU-funded projects, e.g. from the LIFE funds);

- development of projects in the social field.

With regard to the management of other productive or leisure activities in the area of Lake Salto
and Late Turano, **fishery management** is regulated by regional bye-laws, decrees and provincial regulations aimed at safeguarding fish stocks. In particular, Regional Law N° 87 of 7 December 1990, concerning “Rules for the protection of the fish heritage and for the regulation of fishery activities in the inland waters of Lazio”, as amended and supplemented, lays down permissible equipment for professional and sports fishing, limits on catches and off-season periods for some species. This regulation also establishes a licence requirement (“Type A” for professional fishery and “Type B” for angling). It also regulates the methods by which competition areas shall be set up and conducted.

At the provincial level, Provincial Council Resolution N° 3 of 9 January 2012 sets out a requirement that a catch report card be filled out both by sporting anglers and professional fishers. Provincial Council Resolution N° 183 of 14 October 2010 lays down, for Lake Salto and for Lake Turano among others, the identification of specific zones where carp fishing is permitted. In these zones, restrictions are in force for permissible catch sizes for pike and perch as well as for the use of floats.

Data on the size and condition of fish populations in provincial lakes are systematised in the “Provincial Map of Fish Biodiversity” (in Italian “Carta della biodiversità ittica provinciale”) for 2009, which also includes a monitoring station for Lake Salto and one for Lake Turano.

Furthermore, the Province of Rieti each year compiles a “Plan for Fish Repopulation”, which plans the introduction of a total of 650 kg of brown trout spawn into the Salto river and 650 kg in the Turano river.

With regard, on the other hand, to the damming of the Salto and Turano rivers for the purposes of hydroelectric power generation, reference is made to the report issued by the management of the Cotilia plant, E.On Italy S.p.A., in their “Project for the Management of the Salto Reservoir” and in their “Project for the Management of the Turano Reservoir”, drawn up pursuant to Article 114, paragraphs 2-6 of Legislative Decree No. 152/2006 and the Ministerial Decree of 30 June 2004. These projects list the operational methods for control of the reservoirs in question, by means of:

1) systematic actions to be undertaken whenever favourable circumstances arise: opening of the deep discharge outlets during full phases in order to promote the formation of currents to minimise the deposit of sediments and the associated gradual decrease in lake depth and to promote the gradual movement of sediment that has already formed; these operations also help ensure the functioning of the deep outlets.

2) specific maintenance actions to be initiated intermittently or whenever planned interventions prove insufficient to keep silting within acceptable limits:
   - dredging operations during hydrologically favourable periods to reduce
accumulated silt;
- operations of complete drainage of the basin, possibly accompanied by the mechanical removal of sediment;
- mechanical removal of sediment by means of dredging operations with the basin full.

Among the activities for management of the Salto reservoir, the following operational methodologies have been defined:
- operational discharge activities;
- emptying for maintenance and/or inspection;
- floating or dredging;
- mechanical removal of sediment.

The management project envisages the monitoring of specific dredging interventions during periods of inactivity (with the scope of promoting reduction of accumulated silt), that provides for the following investigations:
- monitoring of water quality downstream from the dam (conducted during releases),
- monitoring of macroinvertebrates downstream from the dam by determining the Biotic Extension Index (I.B.E.) (conducted before and following releases),
- fishes survey in the receptor river downstream from the dam (conducted before and following releases).

### 4.3 Inclusion of the Lake Archive and the rationale of its preparation

The lakes of the Province of Rieti occupy just 0.6% of its geographical area but, being more numerous than extensive, they nonetheless characterise the area to a great degree. The Roman era witnessed the draining of Lake Velino, which covered the whole of the Rieti plain. A particular feature of the province is that it has the greatest number of artificial lakes, all of which are considerable in size. Lake Salto and Lake Turano, which are the fourth and the sixth largest respectively, and Lake Scandarello, have all been formed by dams constructed during the 1920s to supply various hydroelectric power stations. To these basins should be added the lakes of the Rieti plain, Lake Ripasottile, Lake Ventina and Lake Lungo, which are vestiges of the once present Lake Velino. Then there is a series of small lakes scattered among the mountains, which are karstic or even glacial in origin, each one magnificent and one of a kind, and still visited mainly by experts in the field: Lake Rascino and the Duchessa Lake.
Alongside these we can call to mind those lakes in the San Vittorino plain, close to the thermal spa of Cotilia: Lake Canetra, Lake Cotilia (with its sulphurous waters) and Lake Paterno. The latter, despite being very small, has a depth that varies between 30 and 45 metres, making it the sixth deepest lake in the region.

The principal lakes of the Province of Rieti are as follows:

- Lake Salto
- Lake Turano
- Lake Scandarello
- Lake Ripa Sottile
- Lake Lungo

**Figure 4-2: Location of the main lakes in the Province of Rieti**

**Salto Lake** is the biggest artificial lake of Lazio region. It was created in 1940 by the barrage of Salto River. As a consequence Salto Valley, situated in Cicolano area, was submerged. This lake is connected to Turano Lake, another hydroelectric basin, through an artificial canal 9 Km long. These two lakes provide water to Cotilia hydroelectric power plant, which was built in 1942.
to supply the surrounding valleys. About 10 Km long, with an average width of 1 Km, it has a perimeter of about 57 Km. The ichthyic fauna is composed of: carp, grass carp, tench, trout, eel, squalius, crucian carp, common roach, alburnus, royal perch, pike, largemouth bass, pumpkinseed, sheatfish, common rudd, crawfish and american prawn. Main uses: tourism (presence of bathing beaches) and fishing. Engine boats (more than 4 hp) are forbidden.

**Turano Lake** was created in 1939 by the barrage of Turano River. It is also known as Posticciola Lake, from the name of the town where the dyke was built. It is surrounded by woods that separate it from Salto Lake. The two lakes are connected through an artificial canal 9 Km long. They provide water to Cotilia hydroelectric power plant. Turano Lake lies at the foot of Navegna Mountain reserve (1506 m). The most interesting peculiarity of this lake is the presence of old towns and castles along its banks. Along the banks there is no vegetation, due to the variations in the water level related to its artificial nature. Because of its size and depth, Turano Lake has an extensive ichthyic fauna. Among minnows, the bream fish is the largest. There are many common carps. The cyprinus carpio specularis and the amur carp are less common. European chub, carassius, common rudd, chondrostoma soetata, tench and eel can be found. The pike is the main predator. From the family of salmons there is the coregonus, the brown trout and the rainbow trout.

**Scandarello Lake** is an artificial lake created by a dyke built in 1924 along the stream Scandarello. The dam is 55 m high and it creates the 3rd bigger artificial lake of Rieti province (about 3 Km long, with an area of about 1 Km² and a depth of 41 m). Its waters supply Scandarello hydroelectric plant, the first built in Tronto Valley. The lake is surrounded by the Laga Mountains and its waters are full of fish. It is a great destination for fishing enthusiasts due to its sinuous shape basin that doesn't look like artificial. The main problem is linked to the water variation. Due to withdrawal, both for the production of electricity and for the irrigation of the surrounding fields, in summer water level lowers several meters. This strongly influences aquatic species.

**Ripasottile Lake** It is the largest of the lakes in Rieti Valley and it is located at 371 m above sea level. Along with Lake Lungo, Ventina Lake and Piediluco Lake (which is actually in Umbria) is all that remains of the ancient Lake Velino, which used to occupy the entire Rieti plain. Its maximum depth is 7 m.; this prevents the lake to freeze completely during the coldest winters. Located 1.5 Km far away from Lake Lungo, they are connected through Vergara canal. There are two small islands that characterize the lake: Matella Island and Scoscione Island. Water pumps regulate the water level of the lake. The lake is also a popular fishing destination. Numerous underwater springs contribute to the exchange of water in the basin, making the alluvial soil constantly damp and swampy. Since 1985 it is a natural reserve of the Lazio region; identified as "Natural Reserve of Lakes Lungo e Ripasottile".
Lake Lungo has a surface of about 44 hectares and a 3 Km perimeter. As it is located next to Cantalice town, it is also known as Cantalice Lake. It is part of the "Natural Reserve of Lakes Lungo e Ripasottile". The lake has a length of 1 Km and a circumference of about 3 Km and is supplied by ditches that descend from the Reatini Mountains. At its most southern point it is connected to another small lake, Fogliano Lake. Its maximum depth is of 7.25 m. Vergara connects the lake to Ripasottile Lake. The canal function is to drain the water and to maintain the wet level lower than it would be naturally. The most common fishes in the area are: pike, tench and carp.

4.4 Open Access Guidance Material

LakeAdmin is dedicated to identifying, exchanging, adopting and transferring Good Practices in lake management processes. Regional and local policy is also enhanced through closer cooperation between lake restoration managers and policy makers. The compilation of the LakeArchive which includes data on previous restoration measures (including limnological, hydrological and ecological measures) spanning a time period of 30 years will no doubt increase the capacity of managing authorities to tackle environmental problems and issues associated with water body restoration. Access to the LakeAdmin Archive will be available to all relevant and appropriate stakeholders and authorities through the social networking site LakeWiki at http://www.jarviwiki.fi/wiki/Main_page?setlang=en. In the LakeWiki, each lake of over 1 ha, each drainage basin, region and river basin district has its own page. The development of the Lakewiki has followed a number of steps and can be reviewed at: www.jarviwiki.fi/wiki/LakeAdmin.

Figure 4-3: LakeWiki Map (http://lakeadmin.savonia.fi/)
The contribution made by the Province of Rieti to the LakeAdmin database includes geographical, political-geographical, socio-economic and wildlife information on five of the lakes in the province, covering a total area of approx. 1,760 hectares.

The lakes of the Province of Rieti provide the habitat for large numbers of wild fish. Various species are present, both native and introduced, all belonging to Italian wild fish species: Brown Trout, Top, Tench, Rudd, Cyprinidae, Common Roach, Bitterling, Pumpkinseed Sunfish, European Perch, Pike, Padogobius bonelli, Coregonus lavaretus (freshwater whitefish), Cobitis bilineata, European Chub, Carp, Crucian Carp, Italian Barbel, Eel, Alburnus arborella, Ruffe, Common Bream.

Various species, in fact, such as Padogobius bonelli and the European Perch originate from other regions of Italy but have been introduced over the years into the province’s network of waterways. A specific information chart has been compiled for each one of the fish species present in the lakes (http://www.lakeadmin-rieti.eu/fauna-ittica), containing its characteristics, description, biology and the distribution of the various species.

4.5 Needs of Knowledge (NoK)

4.5.1 Needs of Knowledge (NoK) for the partners regions

‘Needs of knowledge’ have been identified by five of the ten LakeAdmin partners, who have indicated a total of 12 “Needs of Knowledge”, which are shown in the Table below:

<table>
<thead>
<tr>
<th>NOK &amp; OWNER</th>
<th>NAME OF THE NEED OF KNOWLEDGE</th>
<th>LINK TO AN IDENTIFIED GOOD PRACTICE (AND GP OWNING PARTNER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Costs of lake management as regional and local investments</td>
<td>Chapter on Ecosystem services</td>
</tr>
<tr>
<td>P5</td>
<td>Economic methods for utility assessment of lake sediments</td>
<td>partially linked to Chapter on Ecosystem services</td>
</tr>
<tr>
<td>P5</td>
<td>Application of biomarker tests into the programs for assessing the ecological status of lakes</td>
<td>GP 18. Biomonitoring by passive sampling and juvenile fish analysis (P3)</td>
</tr>
<tr>
<td>P6</td>
<td>Co-operation between stakeholders and</td>
<td>GP 15. Stakeholder participation and feedback (P1)</td>
</tr>
</tbody>
</table>
4.5.2 Needs of Knowledge Requirements (NoK) for the Province of Rieti

The following sections show the 5 NoK forms identified for the partner region of the Province of Rieti.

4.5.2.A Needs of Knowledge (NoK) n. 1

<table>
<thead>
<tr>
<th>The need of knowledge (NoK)</th>
<th>Partner and country</th>
<th>Region(s) of the need and its national significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor level of environmental education of local actors as an integral part for the sustainable development of lake areas by preventing unsustainable land use, excessive consumption of natural habitat and species, space pollution;</td>
<td>Partner 9 – Province of Rieti, Italy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Region of Lazio.</td>
<td>The need mainly concerns the local context of the Province of Rieti, but in general it affects the most part of the italian territory with similar characteristics: areas of great environmental interest with the presence of Natural Parks, Reserve, Natura 2000 sites; green tourism as an important driver for the local economic development; territory belonging to the so called “inner zones”, that indicates an area far from the traditional great areas of attraction in terms of huge urban centres, industrial cluster, main viability and communication systems, but very valuable from the point of view of nature, agriculture, wellness and culture.</td>
</tr>
</tbody>
</table>

*People living, working and enjoying in place of environmental interest (e.g lakes, rivers, basin) are at the same time the main “nature consumers” and the most useful and effective actors for keeping that place in a good status of preservation. In doing so, it is possible to multiply the profits they take from a well preserved natural status. Sometimes the link between preservation and profits increasing is not duly known, and this lack of knowledge brings the local actors to unsustainably exploit the natural resources at disposal in order to maximize their immediate earnings. Improving the awareness of local actors about the long term benefits of a sustainable land use as well as the suitable level of consumption of natural resources in a specific area of*
<table>
<thead>
<tr>
<th>The phase of the NoK</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target groups</td>
<td>Stakeholders (Fisherman, Farmers, Tourists, Private Operators in the field of aquaculture)</td>
</tr>
<tr>
<td>Involved bodies and organizations</td>
<td>Province of Rieti, Municipalities, Region of Lazio, Managing Authorities of Natura 2000 Sites and Natural Parks and Reserve; Basin River Managing Authority; Associations of private local operators</td>
</tr>
<tr>
<td>Activities</td>
<td>Advertising campaign; Press conferences; Seminars and Workshops; Dissemination activities in general; Stakeholders round tables to regulate the economic activities and the exploitation of natural resources.</td>
</tr>
<tr>
<td>The possibilities resulting from a Good Practice for the Need</td>
<td>Awareness increased about the importance of nature for the local socio-economic system in all the local actors living close by a lake or river basin area and/or taking both monetary revenues and not material profits (relax, holiday, inspiration, culture) from that. Adoption of agreements and regulations for the release of licences and permits linked to private economic activities</td>
</tr>
<tr>
<td>References to the NoK (publication, report, website, …)</td>
<td>==</td>
</tr>
<tr>
<td>Contact person(s)</td>
<td>Maurizio Rosati, Paolo Magi, Alessandro Masci, Paolo Turin, Marco Simone, Elisabetta Bolognini</td>
</tr>
</tbody>
</table>

### 4.5.2.B Needs of Knowledge (NoK) n. 2

<table>
<thead>
<tr>
<th>The need of knowledge (NoK)</th>
<th>Lack of a sustainable land use model for the integrated management of the natural, cultural, economic and social potential of the lake areas devoted to foster the touristic attractiveness of the territory;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner and country</td>
<td>Partner 9 – Province of Rieti, Italy</td>
</tr>
<tr>
<td>Region(s) of the need and its national significance</td>
<td>Region of Lazio. The territory of the Province of Rieti includes different Natura 2000 sites. Natura 2000 network is one of the most important EU instrument to preserve biodiversity across Europe. The management of SCIs and SPAs requires integrated approaches due to the close link between land and the various human activities. Both the huge number of people benefiting from nature and the mobility of benefits and beneficiaries reflects the broader importance of reaching and keeping a useful and integrated management approach in each one of Natura 2000 site</td>
</tr>
<tr>
<td>Brief summary of the need of knowledge or problem (background, current knowledge, why the knowledge is needed)</td>
<td>A Natura 2000 site is not only an area where environment is valuable. Nature can also be considered as an important driver for local economic development especially in inner zones, representing at the same time a resource to preserve and a factor to use. Management activities become underlying in order to maximize the potential of environmental assets in a specific territory, considering nature preservation in an integrated view looking also beyond the short term goal of conservation. Matching the</td>
</tr>
</tbody>
</table>
short term impacts of management activities (mainly conservative measures) and the long term impacts of these activities in terms, for example, of touristic attraction of a site requires a clear vision of sustainable land use model, which often misses especially for sites placed within small Municipal territories

The phase of the NoK | Drafting of Management Plan of some Natura 2000 sites  
---|---
Target groups | Managing Authorities and Public Administrations (Natural parks and reserves, Regions, Provinces, Municipalities)  
---|---
Involved bodies and organizations | Managing Authorities and Public Administrations (Natural parks and reserves, Regions, Provinces, Municipalities); Local Association, Interest groups, Stakeholders in general  
---|---
Activities | Studies and analysis; Meetings, Questionnaires and Interviews; Public consultations and round tables.  
---|---
The possibilities resulting from a Good Practice for the Need | Guidelines for the settlement of a sustainable land use model (Integrated Plan) or a Management Plan for the integrated management of natural, cultural and economic resources oriented towards the tourist attraction of a site of environmental importance;  
---|---
References to the NoK (publication, report, website, …) | = =  
---|---
Contact person(s) | Maurizio Rosati, Paolo Magi, Alessandro Masci, Paolo Turin, Marco Simone, Elisabetta Bolognini

### 4.5.2.C Needs of Knowledge (NoK) n. 3

| The need of knowledge (NoK) | Training need of public employees on assessment methodologies for the evaluation of the socio-economic values of nature, in order to let the benefits linked to the preservation and the improvement of lakes coming out, interpret these results and communicate them to relevant stakeholders for a better allocation of public and private financial resources;  
---|---
Partner and country | Partner 9 – Province of Rieti, Italy  
---|---
Region(s) of the need and its national significance | Region of Lazio.  
DG environment of EU Commission issued a toolkit on how to evaluate the socio-economic benefits linked to nature preservation. Even if it is highly recommended to all relevant actors to adopt the approaches and methodologies suggested, many local actors still lack knowledge and skills about that. Improving the know how in this direction can contribute to implement at the best the Natura 2000 network and the nature conservation and biodiversity protection goals set by the European Union  
---|---
Brief summary of the need of knowledge or problem (background, current knowledge, why the knowledge is needed) | Nature preservation activities need of huge investments and, especially in this era of austerity, financial resources run out. Investing on environment during periods of economic recession is seen by public opinion as wasting money, and so political choices tend to support less activities and programmes for the preservation of the green assets of territories. But Nature offers different kind of revenues for local communities that could be considered and recorded when an investment plan has to be set. To understand how to let the economic benefits of nature come out could lead to a better and more effective
allocation of financial resources and support at the best programmes and project in the field of environment.

<table>
<thead>
<tr>
<th>The phase of the NoK</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target groups</td>
<td>Managing Authorities and Public Administrations (Natural parks and reserves, Regions, Provinces, Municipalities);</td>
</tr>
<tr>
<td>Involved bodies and organizations</td>
<td>Managing Authorities and Public Administrations (Natural parks and reserves, Regions, Provinces, Municipalities); Environmental Agencies and Associations, Universities</td>
</tr>
<tr>
<td>Activities</td>
<td>Studies and analysis; Meetings, Seminars, Training sessions</td>
</tr>
</tbody>
</table>

The possibilities resulting from a Good Practice for the Need

Local administrators could improve their evaluation skills about the assessment of different options of public investment.

The evaluation criteria in public tenders and calls could be more oriented towards environmental aspects including pure economic parameters linked to each benefit provided by a specific measure of nature conservation (something similar to what already is put in place through the Green Public Procurement, but more targeted on cost-effective long terms parameters)

References to the NoK (publication, report, website, …)


Contact person(s)

Maurizio Rosati, Paolo Magi, Alessandro Masci, Paolo Turin, Marco Simone, Elisabetta Bolognini

### 4.5.2.D Needs of Knowledge (NoK) n. 4

<table>
<thead>
<tr>
<th>The need of knowledge (NoK)</th>
<th>Lack of a sustainable management plan to run professional and game fishing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner and country</td>
<td>Partner 9 – Province of Rieti, Italy</td>
</tr>
<tr>
<td>Region(s) of the need and its national significance</td>
<td>Region of Lazio. Professional fishing is an widespread traditional activity in the lakes of the Region of Lazio and the Italian peninsula. The economic exploitation of the fish resource is intertwined in some contexts with the need to protect the aquatic environment and the river ecosystem, sometimes overlapping with the rights of sport fishermen.</td>
</tr>
<tr>
<td>Brief summary of the need of knowledge or problem (background, current knowledge, why the knowledge is needed)</td>
<td>The professional fishing in some lakes of Province of Rieti is object of open disagreement between the different categories operating in the fishing world. The sport anglers’s associations consider themselves damaged by professional fishing activities who are supposedly responsible of drastically reducing the density of the fish species present within the lake. In this context, it becomes necessary to check the real severity of the condition of fish populations, and initiating a process of comparison between the administrative authorities and the different categories of fishermen. Advancing knowledge would help identify the actions needed to address the proper management of the fish</td>
</tr>
<tr>
<td>The phase of the NoK</td>
<td>Analysis</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Target groups</td>
<td>Authorities and Public Administrations; Environmental Agencies and Associations. Stakeholders (Fisherman, Farmers, Tourists, Private Operators in the field of aquaculture)</td>
</tr>
<tr>
<td>Involved bodies and organizations</td>
<td>Managing Authorities and Public Administrations (Natural parks and reserves, Regions, Provinces, Municipalities); Environmental Agencies and Associations, Universities</td>
</tr>
<tr>
<td>Activities</td>
<td>Studies and analysis; Meetings, Questionnaires and Interviews; Public consultations and round tables.</td>
</tr>
<tr>
<td>The possibilities resulting from a Good Practice for the Need</td>
<td>The application of a balanced fishing regulations in the most important lakes of Province of Rieti must lead to a regular coexistence between the various fishing associations. These rules must allow the exercise of economic and tourist activities by assuring the conservation and the protection of aquatic ecosystem as a whole.</td>
</tr>
<tr>
<td>References to the NoK (publication, report, website, …)</td>
<td><a href="http://www.ilgiornaledirieti.it/leggi_articolo_f1.asp?id_news=30107">http://www.ilgiornaledirieti.it/leggi_articolo_f1.asp?id_news=30107</a>; <a href="http://www.carponline.it/blog/p/salviamo_il_salto.htm">http://www.carponline.it/blog/p/salviamo_il_salto.htm</a></td>
</tr>
<tr>
<td>Contact person(s)</td>
<td>Maurizio Rosati, Paolo Magi, Alessandro Masci, Paolo Turin, Marco Simone, Elisabetta Bolognini</td>
</tr>
</tbody>
</table>

### 4.5.2.E Needs of Knowledge (NoK) n. 5

<table>
<thead>
<tr>
<th>The need of knowledge (NoK)</th>
<th>The verification of management plans for artificial lakes, with a specific focus for the management and treatment of sediments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner and country</td>
<td>Partner 9 – Province of Rieti, Italy</td>
</tr>
<tr>
<td>Region(s) of the need and its national significance</td>
<td>The need affects not only the Province of Rieti but the most of artificial lakes in the Italian territory. The theme of the sediment management is of great concern in the Italian territory where there are a large number of dams built for irrigation and for hydroelectric power. Most of these reservoirs were built more than 40 years, a long time ago that involves the retention and accumulation of a high amount of sediment. The management of the continuity of the sediments along the waterways means ensuring the conditions appropriate to the hydro-morphological dynamics of aquatic ecosystems in order to allow the achievement of the quality of surface water in accordance with the regulations.</td>
</tr>
<tr>
<td>Brief summary of the need of knowledge or problem (background, current knowledge, ...)</td>
<td>The management of sediments in reservoirs is one of the objects of new Italian and European regulations about water management. These rules have defined the methods and deadlines for the preparation of appropriate management plans of the reservoirs for large dams.</td>
</tr>
</tbody>
</table>
why the knowledge is needed) | The management plans are an indispensable tool for the management of reservoirs to develop integrated approaches related to managing of natural resources. This plan is also important to manage the mitigation of natural hazards such as floods and debris flows, and increase cooperation in the environmental protection.

The phase of the NoK | Analysis

Target groups | Managing Authorities and Public Administrations (Natural parks and reserves, Regions, Provinces, Municipalities); owners and plant managers

Involved bodies and organizations | Managing Authorities and Public Administrations (Natural parks and reserves, Regions, Provinces, Municipalities); Environmental Agencies and Associations; Universities; owners and plant managers.

Activities | Studies and analysis; Meetings, Questionnaires and Interviews; Public consultations and round tables.

The possibilities resulting from a Good Practice for the Need | The employment of the management plans of artificial lakes is as an indispensable tool for proper hydraulic risk prevention and hydro-ecological restoration of sediments in water bodies.

Apply strategic policies and tools for the integrated management of the transport of sediments in reservoirs and artificial lakes in order to improve the ecological status of aquatic and riparian ecosystem.

References to the NoK (publication, report, website, …) | [http://www.registroitalianodighe.it/](http://www.registroitalianodighe.it/)

Contact person(s) | Maurizio Rosati, Paolo Magi, Alessandro Masci, Paolo Turin, Marco Simone, Elisabetta Bolognini
5. **GOOD PRACTICES (GP)**

5.1 **Good practices proposed and shared by partner regions**

The following are Good Practices proposed by partner regions, which have been subdivided into five categories: The list of the 17 good practices identified and updated to 17 September 2014 (www.lakeadmin.savonia.fi) is the following:

**Table 5-1: – List of the Good Practices identified by Partner Regions (updated to 17 September 2014)**

<table>
<thead>
<tr>
<th>N.</th>
<th>Partner</th>
<th>Title of GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P7 LBCDA Lake Balaton Region, HU</td>
<td>Integration of shoreline management and spatial planning in the Balaton Region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shoreline is the area of lakes where the growing social demands of recreational and economic use of lakes and external loading from the catchment area meet the highest diversity and biological productivity. Littoral areas are of fundamental importance in lake ecosystems. Use of shoreline for instance for recreation, boating or residential areas causes needs for maintaining proper functioning of the lake and shore zone ecosystem and habitats in or close to protected areas should be protected for biodiversity. Important elements in management of the shoreline in Lake Balaton area have been settled through a series of actions: 1) special regulations were set to provide the legal framework to achieve the objectives, 2) corresponding spatial plans were produced to guide restoration and development activities, 3) landscape management plan was prepared to ensure and facilitate implementations. This procedure started in 2002 and is still ongoing.</td>
</tr>
<tr>
<td>4</td>
<td>P1/SYKE/FI</td>
<td>Multi-criteria assessment in comparison of options in lake restoration planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>An approach based on multiple criteria decision analyses (MCDA) has been used in Finland both locally and regionally. Main criteria defining the priority of a lake to be restored have been 1) state of the lake which defines the need for restoration or management 2) degree of recreational use and 3) potential of local participation. The basic analyses can be carried out by a straightforward spreadsheet weighing the criteria by their importance. The cases can be initially prioritized based on the sums of lake specific scores and the result can be further elaborated by MCDA. The evaluation method is transparent. It may also improve the initial planning of local stakeholders when they know what kind of information is needed from the lakes and which criteria are considered for funding decisions. Elements of the approach were also included in national guidance material for implementing the Water Framework Directive in Finland.</td>
</tr>
<tr>
<td>5</td>
<td>P1/SYKE/FI</td>
<td>Mapping for presenting eutrophication pressures of lakes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In lake management it is important also to visualise the reasons behind problems. An important phase in restoration planning is to evaluate needs to reduce external nutrient load and relative importance of internal loading compared to external loading. For this purpose, series of maps were used in Satakunta region in Finland. Classification of ecological status of lakes was complemented with data of comparison between the modelled from the current external loading and the current phosphorus concentration of the lakes. A worse state than predicted by the pressure was considered as indication of internal phosphorus loading of a lake and to be a reason to screen in-lake restoration measures. Pressure maps provide a rapid visual image of external and internal loading of waters. Information supports participation to the procedure. The practice will also be adopted into the national level in the implementation of the Water Framework Directive.</td>
</tr>
<tr>
<td>6</td>
<td>P1/SYKE/FI</td>
<td>A practical tool for evaluation of reductions of diffuse phosphorus loading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A practical spreadsheet tool for determination of cost-effective measures to reduce phosphorus loading and to build cost-effective combinations of measures at catchment scale in Finland. The tool consists of 1) gathering the input data (P loading, potential of measures and reduction rates of measures for P) from the study area, 2) entering the inputs into the tool, 3) comparing single measures for their cost-effectiveness and 4) building cost-effective combinations of measures. The tool can be used to assess costs and effects of mitigation measures at catchment scale for instance when planning programmes of measures for the river basin management plans. It gives a price tag for local or regional estimates of water protection costs and facilitates estimates of an achievable phosphorus reduction rate. Furthermore, it supports better allocation of costs.</td>
</tr>
<tr>
<td>N.</td>
<td>Partner</td>
<td>Title of GP</td>
</tr>
<tr>
<td>---</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>7</td>
<td>P1/SYKE/ FI</td>
<td>Stakeholder participation and feedback</td>
</tr>
<tr>
<td>8</td>
<td>P2/Savonia/FI</td>
<td>A flexible education-model to help management planning for stakeholders</td>
</tr>
<tr>
<td>9</td>
<td>P5/EMU/EE and P1/SYKE/ FI</td>
<td>Lake restoration guidance material in native language</td>
</tr>
<tr>
<td>10</td>
<td>P1/SYKE/ FI and P5/EMU/ EE</td>
<td>Monitoring for investigation and surveillance of lake restoration cases</td>
</tr>
<tr>
<td>11</td>
<td>P7/LBDCA/H U</td>
<td>Integrated regional on-line monitoring system</td>
</tr>
<tr>
<td>N.</td>
<td>Partner</td>
<td>Title of GP</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>12</td>
<td>P3/University of South Bohemia/ CZ</td>
<td>Evaluation of the secondary losses caused by protected piscivorous birds - the great cormorant</td>
</tr>
<tr>
<td>13</td>
<td>P3/University of South Bohemia/ CZ</td>
<td>Assessment of contamination with passive samplers and juvenile fish analyses</td>
</tr>
<tr>
<td>16</td>
<td>P2/Savonia/FI</td>
<td>Efficient and environmentally good use of manure for protection of watercourses</td>
</tr>
<tr>
<td>19</td>
<td>P7/LBDCA/HU</td>
<td>Waste water treatment of small villages by on-site household units</td>
</tr>
<tr>
<td>20</td>
<td>LP/SYKE and P4/Alleroed/DK</td>
<td>Restoration of eutrophic temperate lakes by biomanipulation</td>
</tr>
</tbody>
</table>

A set of indicators and methods was established for the evaluation of eligible secondary losses caused by hunting cormorants. The balance between the nature protection, here presented by protection of the cormorants by law, and the necessity of compensation of economic losses caused by the bird, is one of the significant issues in sustainable pond management and is of a dramatically increasing importance. Both, the questions of biodiversity and nature protection as well as economic issues have to be considered. The Czech Republic, the Region of South Bohemia in particular, can offer more than 20 years of experience in the field, as it were the early 90s when the problem emerged in quite an urgent scale.

### Novel approaches for evaluation of ecological quality for restoration efforts

- Passive samplers and juvenile fish analyses are useful to study and monitor also restoration cases where contamination by hazardous substances occurs.
- Techniques and approaches open new possibilities for monitoring.
- Passive sampling is able to achieve results in circumstances where point sampling cannot monitor the total impact.

### Measures to reduce external loading and other pressures

- Over half of the phosphorus and nitrogen load of Finnish watercourses is coming from agriculture. The prices of artificial fertilizers have risen in recent decades. In the few regions like North Savo, where animal husbandry, especially dairy cattle farming, is highly concentrated, it is important that farmers with animal husbandry emphasise good handling of manure. If animal farms have a surplus of nutrients in manure in relation to their own measured need, a farm to farm collaboration by a "Manure Bank" is one solution. Farms with only crop growing can obtain organic fertilizers from the excess of animal husbandry, both agricultural pollution and nutrient loading to lakes and rivers and costs of crop growing can be reduced. Moreover, contracts and cooperation between nearby farms in manure and slurry treatment (like separation) and spreading can enhance remarkably the utilization of nutrients.

### Restoration for wide response in ecological quality and for complex needs of use

- Biomanipulation can reduce ecological, economic and health nuisances caused by blooms of cyanobacteria in lakes and increase biodiversity in wetlands and small waterbodies. Mass removal of cyprinids and/or favouring of piscivorous species has been successfully used in Denmark, Finland, Czech Republic, the Netherlands and other European countries for more than two decades in restoration of eutrophic lakes. However, less successful cases or failures are also known.

The Danish experience has shown that a successful biomanipulation may have an impact also in highly eutrophic lakes. Methods of cormorants and fish removal have been developed in Finland since the 1990s and today they are routinely used even in larger lakes (>100 km²). Biomanipulation is not a
<table>
<thead>
<tr>
<th>N.</th>
<th>Partner</th>
<th>Title of GP</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>P8/ West Regional Authority/IE</td>
<td>Control of Aquatic Invasive Species in Ireland, CAISIE</td>
</tr>
<tr>
<td>23</td>
<td>P6 Pelion D.C/GR</td>
<td>Re-watering of a drained very large lake in Greece</td>
</tr>
<tr>
<td>24</td>
<td>P6 Pelion D.C/GR</td>
<td>Planning the multi-purpose use of reservoir (consists of GP22 and GP30 of the GP list evaluated in May-June 2013)</td>
</tr>
</tbody>
</table>
5.2 Context analysis for the Province of Rieti

This section reports on correspondences found between the five Needs of Knowledge requirements (NoKs) identified for the partner regions of the Province of Rieti, and the Good Practices (GPs) proposed by the various partners of the LakeAdmin project, to be implemented for Lake Salto and Lake Turano.

Table 5-2: Correspondence between Needs of Knowledge (NoK) – Good practice (GP)

<table>
<thead>
<tr>
<th>NEEDS OF KNOWLEDGE (NOK)</th>
<th>GOOD PRACTICE (GP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Poor level of environmental education of local actors as an integral part for the</td>
<td>A flexible education-model to help management planning for stakeholders</td>
</tr>
<tr>
<td>sustainable development of lake areas by preventing unsustainable land use, excessive</td>
<td></td>
</tr>
<tr>
<td>consumption of natural habitat and species, space pollution;</td>
<td></td>
</tr>
<tr>
<td>2 - Lack of a sustainable land use model for the integrated management of the natural,</td>
<td>Integration of shoreline management and spatial planning in the Balaton Region Mapping for presenting eutrophication pressures of lakes</td>
</tr>
<tr>
<td>cultural, economic and social potential of the lake areas devoted to foster the touristic</td>
<td>A practical tool for evaluation of reductions of diffuse phosphorus loading Monitoring for investigation and surveillance of lake restoration cases</td>
</tr>
<tr>
<td>attractiveness of the territory;</td>
<td>Integrated regional on-line monitoring system Efficient and environmentally good use of manure for protection of watercourses</td>
</tr>
<tr>
<td>3 - Training need of public employees on assessment methodologies for the evaluation of</td>
<td>Multi-criteria assessment in comparison of options in lake restoration planning A flexible education-model to help management planning for stakeholders</td>
</tr>
<tr>
<td>the socio-economic values of nature, in order to let the benefits linked to the</td>
<td></td>
</tr>
<tr>
<td>preservation and the improvement of lakes coming out, interpret these results and</td>
<td></td>
</tr>
<tr>
<td>communicate them to relevant stakeholders for a better allocation of public and</td>
<td></td>
</tr>
<tr>
<td>private financial resources;</td>
<td></td>
</tr>
<tr>
<td>4 - Lack of a sustainable management plan to run professional and game fishing</td>
<td>Stakeholder participation and feedback</td>
</tr>
<tr>
<td>5 - The verification of management plans for artificial lakes, with a specific focus</td>
<td>Planning the multi-purpose use of reservoir</td>
</tr>
<tr>
<td>for the management and treatment of sediments</td>
<td></td>
</tr>
</tbody>
</table>

The work plan envisages that each partner should adopt at least one good practice from those made available among all the partners.

With regard to the Province of Rieti, NoK N° 4 was chosen, as this gap in knowledge is filled by implementing GP N° 7, one of the good practices listed by partner states. “Stakeholder participation and feedback” has been put into practice through shared participation with local stakeholders, as is described in the section below.
6. TRANSFER OF THE GOOD PRACTICE IN THE PROVINCE OF RIETI

The Province of Rieti identified Good Practice N° 7 - “Stakeholder participation and feedback” - proposed by Syke - Finnish Environment Institute (Finland), as an instrument filling Need of Knowledge N° 4: “Lack of a sustainable management plan to run professional and game fishing” for the Province of Rieti, with particular reference to the lakes of Salto and Turano.

As part of the process of transferring Good Practice N° 7, some cues were also taken from an analysis of GP N° 4, “Multi-criteria assessment in comparison of options in lake restoration planning,” particularly when it came to identifying the stakeholders.

6.1 Good Practice (GP) n. 7 - Stakeholder participation and feedback

The good practice described by partner P1 (SYKE) was transferred to Lake Salto and to Lake Turano by means of a process of participation with local stakeholders.

This Good Practice arises from the need to have clear definitions for the participation of public bodies in financing lake recovery, and has been applied to lake management in many areas of Finland.

Good practices have evolved from the long tradition of lake management in Finland: joint regional working groups are made up of local and regional authorities, various local stakeholders such as owners or concessionaires of lakeside and water areas, sports fishers’ associations, volunteers and environmental or farmers’ organisations.

Representatives of the main local stakeholders and beneficiaries are invited to steering groups which are geared to promoting the commitment of those concerned to creating measures for good management of the lakes and to facilitating dialogue between the parties concerned and the authorities. This may have the added benefit of increasing voluntary work and local financing of lake management. It is necessary to attain consensus over the measures for lake management between concessionaries or associations of the lake areas, each of whom may be responsible for applying their part of the measures or for financing agreements. Setting up participatory routines may further promote the public hearing in implementation of the Water Framework Directive.

Because every situation of application for a participation process is unique, the practices and methodologies by which it is applied have to be tailored to each specific situation. However, a general methodological approach can be shown by listing the consecutive order of individual stages. Beierle and Cayford (2002) break down participatory planning into five principal stages:

1. determination of the requirements for public participation;
2. identification of process objectives;
3. response to planning requirements;  
4. selection and modification of the process;  
5. evaluation of the process.

6.1.1 Description

The Good practice is put into effect at the local level through a participation process in which representatives of all interested parties are invited to attend meetings with the management authorities. These meetings aim to use an open and shared approach to identify and plan measures for tackling emerging issues.

6.1.2 Objectives

The Good practice aims to promote the commitment of local actors and beneficiaries in their management of the lake, to facilitate dialogue between those affected and the authorities, and to increase and expand voluntary interventions and local financial agreements for protecting the lakes.

6.1.3 Application

In summary, the various stages of the participatory processes were:

- the identification of both public and private stakeholders;
- the organisation of various meetings with the stakeholders to create working groups with the object of identifying local issues and requirements; the identification of actions to be implemented to resolve these emergent issues and of methods for implementing the actions and commitments by the stakeholders to resolve any conflicts
- drawing up meeting reports and planning documents

The Table below shows the schedule of meetings that have already taken place with their attendees, who were identified from among the local stakeholders and beneficiaries.

Table 6-1: Chronological schedule of meetings held and/or planned for the participation process

<table>
<thead>
<tr>
<th>MEETINGS DATES</th>
<th>ACTORS</th>
</tr>
</thead>
</table>
| September 12, 2013 | Mayor of Petrelia Salto;  
| | Mayor of Marceletti;  
| | Mayor of Pescorocchiano;  
| | Mayor of Varco Sabino;  
| | Mayor of Castel di Tora;  
| | Mayor of Colle di Tora;  
| | Mayor of Ascrea;  
| | Mayor of Rocca Sinibalda;  
| | Mayor of Paganico |
### 6.1.4 Target Groups

It emerged that the main area of conflict between administrative bodies and local stakeholders in the management of Lake Salto and Lake Turano was constituted by fishing activities.

Professional fishery in Lake Salto had, in fact, already been suspended up until 2011 by a directive of the Executive of the VI District of the Province of Rieti dated 21 September 2009 and by Provincial Council Resolution N° 186 of 21 September 2009.

These provisions were cancelled by the Regional Administrative Court of Lazio in its ruling N° 02307/2011 of 14 March 2011.

Numerous disputes have therefore recently arisen with the reopening of professional fishing on Lake Salto, including requests by sports fishers, by professional fishers and the bodies regulating fishery at the local level - the Fishery Department (Settore Pesca) of the Province of Rieti.

Sporting fishers object to the use of nets on Lake Salto. Citing Regional Law N° 87 of 07 December 1990, the “Regulations for the protection of fish assets and for regulation of the practice of fishing in inland waters in Lazio”, protestors argue that the use of nets causes a depletion of fish stocks that is unsustainable for the lake.
The local press has headlined these disputes in various articles (see, among others, the articles at www.matchfishing.it and www.carpoline.it).

Figure 6-1: Protest demonstration against professional fishing in Lake Salto - 2011 (Source: www.matchfishing.it). To be seen in the photo: A t-shirt bearing the slogan ‘Stop Professional Net Fishing in Lake Salto’

In light of these various disputes between local administrators and user groups, the stakeholders identified during the participation process were:

- Italian Rangers Corps;
- FIPSAS – Italian Federation of Sport Fishing and Underwater Activities;
- ARCHIPESCA - Italian Sport Fishing Association;
- ITALPESCA - Italian Sport Fishing Association;
- CCIAA – Chamber of Commerce and Industry;
- UNCI - Professional Fishering Association;
- Montain community authorities;
- Province of Rieti – VI Department (Environmental Department);
- Province of Rieti – I Department (Fish and Hunting Department);
- Mayor of: Petrella Salto; Marcetelli; Pescorocchiano; Varco Sabino; Castel di Tora; Colle di Tora; Ascrea; Rocca Sinibalda; Paganico;
- Monti Navegna and Cervia Natural Reserve.

6.1.5 Duration of Operation

The participation process was begun in September 2013 and is currently ongoing. The process, that has been developed also during 2014 (last meeting will take place on 15 December 2014), is expected to conclude in March 2015.
6.1.6 Bodies and Organisations Involved

The organizing body for the process is the Province of Rieti. The following organizations have been involved in the process:

- **Province of Rieti – VI Department (Environmental Department):** the Environmental Department is the lead Sector in charge of the management of the Lake-Admin Project since it has a specific competence in the field of water management more than all other competencies for the preservation and conservation of nature and biodiversity and the care of territory. Since the lake-admin project in the Province of Rieti was focused in the field of management of 2 lakes and taking into consideration that the management of the lakes involves more activities/sector of interest that has to be regulated (as for example touristic activities, economic activities, fishing activities and so on), for the better planning of the plural use of the lakes we have to reach and involve the competencies of the other departments of the Province of Rieti who is in charge to manage the Fish Sector.

- **Province of Rieti – I Department (Fish and Hunting Department):** this Sector has the power of the modification and adoption of the fishing regulation. Since the Province of Rieti intends to adopt the GP 7, began the participation procedure with the relevant stakeholders in order to change the fish regulation in the Province including just the outcomes of GP 7;

- **Lazio Region;**
- **Monti Navegna and Cervia Natural Reserve;**
- **Italian Rangers Corps;**

6.2 Outcomes

The participation process with lakeside communities affected by the LakeAdmin project produced a list of common objectives shared by local authorities with the aim of enhancing Lake Salto and Lake Turano. These objectives are indicated as “emergent requirements at the local level”.

A change to the regulation of fishing at a local level has also been proposed in order to overcome the conflict of interests between professional fishers and sports fishers, as well as to safeguard local fauna and the lake environment.

6.2.1 Local needs

Within the participation process with lakeside communities affected by the LakeAdmin project,
joint objectives have been identified that aim at enhancing the lakes of the Province of Rieti, with a focus on Lake Salto and Lake Turano, to which the project refers. The following text is drawn from the document that resulted from the participation process involving the local mayors.

### 6.2.1.A Protecting and Promoting Natural Assets

**Actions aimed at the conservation and enhancement of biodiversity**

The following actions aimed at the conservation and enhancement of biodiversity were identified during the process involving local stakeholders:

- the drafting of a detailed plan of fishing management with the identification of specifically approved fishing methods as well as of usable equipment and its characteristics;
- the adoption of management protocols for the hydroelectric watershed to reduce fluctuations in the lake’s water level, particularly during the breeding season of phytophilic species;
- activities of monitoring and containment of invasive alien species;
- identification of lake areas to be dedicated as zones of fish repopulation, with the establishment of fishing prohibitions or areas dedicated to no-kill fishing only;
- monitoring and checks on the abundance of populations and reproductive efficiency of the main species which are of fishery and/or wildlife interest;
- repopulation with fish species of commercial fishery interest;
- reduction of the amount of nutrients deriving from point source discharge outlets through their relocation or through improvement in purification treatments;
- reduction of the nutrient load by increasing good farming practices aimed at curbing the amounts of nitrates and phosphates in widespread circulation.

**Supporting aquaculture, including organic practices**

The following actions aimed at supporting aquaculture practices including organic methods were identified during the process involving local stakeholders:

- enhancement and stimulation of the consumption of local fish produce

**Actions to reduce habitat fragmentation and to maintain ecological and functional corridors around Lake Salto and Lake Turano**
The following actions aimed at protecting connectivity between the region’s lakes were identified during the process involving local stakeholders:

- the creation, maintenance and betterment of the connectivity between the regional ecological network and the lake environment

**Restoration of specific lake habitats to support sustainable fish stocks**

The following actions for restoring lake habitats and support sustainable fish stocks in the lakes of partner regions were identified during the process involving local stakeholders:

- reconstruction and/or creation of spawning grounds, including artificial ones, for phytophilic and lithophilic species;
- creation and placement of twig bundles and twined wood mattresses to increase spawning grounds for perch;
- re-naturalisation and/or placement under protection of portions of lake shoreline of particular interest as fish habitat;
- the creation of floating islands;
- enhancing the natural features of shoreline woodlands;
- increasing the natural features of riverbank habitats.

**Interventions to improve the conditions and standards of offers and enjoyment of the heritage in areas of natural beauty**

The following actions aimed at improving the conditions and standards of offers and enjoyment of the natural heritage in the lake areas of partner regions were identified during the process involving local stakeholders:

- spreading the use of ecological transportation methods on the lake: e.g. electric-powered boats;
- construction of cycle paths;
- reorganisation of trail paths;
- creation of connections between the two lakes;
- reorganisation and construction of mooring jetties
- creation of facilitated areas with informative signposting;
- renovation of existing structures;
- enhancement of river banks;
- localised and selective clearings among some tree species limited to short
stretches around rest places for the enjoyment of the views;
• improvement works to facilitate road access to the areas concerned;
• improvement of river areas.

Creation of innovative services and/or systems for enjoyment of the resources, including the use of advanced technologies

The following actions aimed at creating innovative services and/or systems for enjoyment of the lakes of partner regions were identified during the process involving local stakeholders:

• adoption of management models for integrated exploitation of the existing regional ecological network;
• definition of integrated management models for diversified use of the lakes;
• development of management, easy-access and promotional software and applications;
• access points (free Wi-Fi) and connected services.

6.2.1.B System for Integrated Tourism Development

To improve the competitiveness and attractiveness of tourist destinations through systematic and integrated enhancement of local resources and capacities

The following actions aimed at improving competitiveness and enhancing local resources of the lakes of partner regions were identified during the process involving local stakeholders:

• design creation and enhancement of the nature trails, cultural, artistic, historical and religious itineraries linked to the communities that have settled around Lake Salto and Lake Turano;
• recovery of the historic, artistic and cultural heritage connected with the geographical and social transformations induced by the watershed and dam works, including the creation of a “Dam Museum”;
• recovery and enhancement of the archaeological heritage and of the karstic phenomena present in the Lakes area;
• design, creation and enhancement of gastronomic itineraries “Lakeside Aromas” for the promotion of produce from fisheries, woodland and the forest floor and of the lake-area mountain cultures;
• bringing online itineraries between the various communities that inhabit the area of the two lakes;
• promote the inflow of tourists coming from other regions and especially from Rome;
• car- and bike-sharing services;
• implement trekking and hiking itineraries and bridleways;
• support for actions to promote and consolidate integrated offers of cultural and natural resources;
• creation of internet portals, information and informative points, develop channels for promoting and promoting local offers, aiming both at selective sustainable tourism (bearing in mind that the lakes are located 70 km from Rome) as well as high-end tourism;
• support for processes of aggregation and integration between businesses in creating unified offers for tourism, which may try out innovative models such as dynamic packaging, marketing networking, tourism information systems and customer relationship management.

6.2.1.C Human Capital Education and Training in the Salto and Turano valleys

The following actions aimed at training the human capital present in the lake areas of partner regions were identified during the process involving local stakeholders:

• training activities to raise competencies and qualification of the human capital for the management of innovative systems (training of personnel for the governance of Lake Salto and Lake Turano, operators in the sectors of training and management and control of assets: e.g. park wardens, administrators, professional fishers or others with commercial activities on the lake, for farmers of the lake areas to promote less mechanised and more innovative forms of agriculture tied to local resources; training for systematic ecological services and their control);
• training activities to qualify human capital working in the tourism sector, with particular attention to the managerial and entrepreneurial skills required for improving the tourism system: training for managers of hotel and restaurant facilities, training for local marketing operators; for young entrepreneurs who intend to work on the lakes with product and process innovation;
• actions aimed at increasing human capital in agriculture, fishery and aquaculture by means of a better definition of activities for informing, educating and consultancy, or system and support services (agro-meteorological networks, analysis centres, databases and multimedial facilities).
6.2.1.D Development and support of the lake production chain

The following actions aimed at developing and supporting the lake’s chain production were identified during the process involving local stakeholders:

- development of sectors and production chains with high growth potential or with a snowballing effect on other productive sectors
- relaunch of the readiness to invest in the productive system
- development of employment and production in local areas affected by the widespread crisis in productive activities
- support for structural and organisational improvements of agricultural, agrifood and non-food production chains
- increase in mobile informational services

6.2.2 Elaboration of a detailed Management Plan for Sport And Professional Fishing in Lake Salto and Lake Turano

The proposals for the management of sport fishing and professional fishery identified by local authorities for Lake Salto and Lake Turano may be summarised as follows:

- raising the legal sizes for catches of trout, rudd, carp and eel;
- obligation for a fish-catch record card;
- establishment of no-fishing areas;
- regulation of the approved equipment for professional fishing.

The text below is drawn from the - not yet definitive - “PROPOSAL FOR THE MANAGEMENT OF FISHING IN LAKE SALTO AND LAKE TURANO,” with modifications that arose from the meeting held on 18 September 2014. This proposal should become definitive by 15 December 2014, before which date a further meeting of the provincial fisheries council is scheduled. For fishing purposes, Lake Salto is classified as a “principal water”, for which reason - apart from amateur fishing both from boats and from the shores - professional fishing is permitted for holders of Category A licences. Fishing is regulated on the basis of Regional Law N° 87 of 7 December 1990, and, with respect to professional fishing, allowable equipment is set out by the Regional Administration with specific reference to Lake Salto and Lake Turano. The joint presence of amateurs and professionals, together with their common interest in safeguarding and increasing fish assets in Lake Salto, makes it expedient to draw up ad hoc regulations for that lake.
6.2.2.A **Sport fishing**

With regard to amateur fishing, the lake offers opportunities for various types from carp fishing to spinning, as well as fishing for bass or cyprinid both from the shore and from boats. All this, together with the unspoiled quality of the region surrounding the lake, offers opportunities for tourism in the watershed area, using initiatives linked to fishing. With regard to the current provisions of the law, some targeted interventions would appear to be appropriate to encourage fishing activities in the basin and at the same time to monitor and safeguard the fish-related interests of the lake’s community. Specifically, such interventions would involve:

1. raising some of the legal size for some species;
2. the obligation to hold a catch-record card.
3. the prohibition of fishing using pivot nets
4. setting up of no-fishing zones

**Legal size of fishes**

The raising of legal size for some species has been made necessary in view of the results obtained by the most recent census survey of fish populations.

It should be borne in mind that the criterion on which legal sizes for catching various fish species is that of ensuring that several exemplars reach the adult stage, thus guaranteeing for them at least one breeding season.

Having established the growth dimensions of various species, their correct legal size can be assigned. As we know that the European perch reaches its first year of sexual maturity aged 2 years, (Gandolfi et al., 1991), it follows that the legal size should be set at 18 centimetres.

With regard to the pike, bearing in mind that most males reach sexual maturity on completing three years of age and most females at four years of age (Gandolfi, 1991), and that at the age of four years they reach sizes of around 50 centimetres (1-2 kg in weight), a legal size of 70 centimetres is proposed. On the other hand, there appears no evident need to fix a maximum size of catch, as the present regulations do, above which fish should be set free. A first point is that for several species the fertility ‘yield’ for ‘older’ individuals, which are therefore larger in size, is lower than for younger individuals. In the case of the pike, at age 5-6 years, the policy would lead to increasing the proportion of individuals in the lake with low fertility but which are skilled predators and have, in addition, a strong tendency to cannibalism. Furthermore, in the census of November 2011, two pike measuring over 70 centimetres were caught who had barbs in their throats and parts of the lines cut by sports fishers who had freed the fish. The probability of a fish being able to expel such tackle and survive is low.

Apart from pike and perch, other legal size are considered inadequate, given the sizes that such
fish may reach. The following legal size for other fish are proposed:

- Pike (*Esox lucius*): from 30 to 70 cm (already in force since 2014!)
- European perch (*Perca fluviatilis*): 18 cm (confirmed)
- Tench (*Tinca tinca*): from 20 to 30 cm;
- Common carp (*Cyprinus carpio*): from 25 to 40 cm;
- Eel (*Anguilla anguilla*): from 25 to 40 cm;
- Brown trout (*Salmo trutta trutta*): 25 cm (confirmed)

**Requirement for a catch-record card**

To better understand which species are most fished for, and the main types of fishing practiced on the lake, it would be very useful to introduce a Catch-Record Card for amateur sports fishers, which is dedicated to the lake. This will supply the Province with statistical data on the quantities of fish caught, on the number of sports fishers, on the pressure of fishing in terms of days dedicated to this activity and thus on tourist exploitation of fishing on the lake.

**No-fishing zones**

The creation of no-fishing zones both for professionals and for amateurs has the dual function of alleviating the quantities of fish taken from some areas of the lake and ensuring the preservation of suitable spawning grounds for some fish species of particular value;

Two sites of “bio-recovery areas” have been proposed for Lake Salto and two for Lake Turano. The locating of these zones will be the subject matter of a joint proposal by stakeholders to be presented to the provincial fisheries committee, which is to sit by 15 Dec 2014.

**Ban on the use of pivot-balance nets**

The purpose of banning this piece of fishing equipment, which enables the operator to make large catches in short time spans, is to forestall the risk of over-fishing, which is at times also in violation of applicable legislation.

**6.2.2.B Professional Fishing**

Because of the equipment deployed and the quantities of fish caught, professional fishing has often been seen as a threat to the ecological balance of fish populations. In fact, if suitably regulated, professional fishing can become an instrument for maintaining and safeguarding fish populations and could also provide an opportunity for reinvigorating the local economy, if the catch - or at least part of it - were to go to benefitting local restaurant establishments. Professional fishery concentrates on catches of European perch and lake whitefish, which are the main species traded on the freshwater fish markets. However, trout and pike also represent,
albeit as a minor percentage, a part of the annual professional catch. Although it is a dominant fish in the lake, the roach is traded at a low price and is used above all in the production of feedstuffs. Professional fishermen with their work can also carry out a reduction of the population of the invasive Roach in the lakes. This action will be also developed in the IP - Guidelines drawn up by the Province of Rieti

These activities should be regulated appropriately so that the removal of fish does not compromise the status of fish populations in the lakes. For this reason, some stratagems for regulating professional fishing activities in Lake Salto are suggested, specifically with reference to:

1. areas where professional fishing is prohibited;
2. raising legal size for some species;
3. changes to allowable equipment;
3. setting up a database of catches

No-fishing zones

The same two sites already proposed as “bio-recovery areas” for Lake Salto and for Lake Turano will also apply for sports fishing. Finding locations for these zones will be subject matter of a joint proposal between stakeholders to be presented to the provincial fisheries committee which is to sit by 15 December 2014.

Legal size of fishes

With regard to legal size for some species, professional fishers are also to refer to the measures given in the above section on amateur fishing.

Changes to allowable equipment:

Professional fishing should be permitted using the following equipment:

1. standing, free-hanging nets known in italian as “altana (or oltana)” nets for coregonids

Description: a vertical net of various mesh dimensions, held upright by floats which can also function as marker buoys, and kept spread taught by metal rings or leaded line attached to its lower margin. It is used anchored or free, but may not be in contact with the lake bed.

mesh side: not less than 35 mm
maximum height of net: 8 m
maximum length of net: 35 m
maximum overall length: 900 m
2. **bottom-set nets**

Description: a vertical net of various mesh dimensions, held upright by cork floats - or buoyant rope - and weighted along the bottom margin by rings or leaded line to keep it in place. Used mainly for catching European perch.

- mesh side: not less than 25 mm
- maximum height of net: 2 m
- maximum length of net: 25 m
- maximum overall length: 900 m

3. **vertical long line for eels**

Description: a fish line furnished with multiple hooks - the use of a fish line armed with a maximum of 250 hooks is permitted - rather than lines without limitations on hook numbers.

4. **bertovello or cocullo (cone-shaped net)**

Description: this is a net used for catching species at the bed of the lake. It is permitted with the same characteristics already provided for in applicable regional (Law n. 87/1990) regulations on fishing

**Setting up a catch database**

Monitoring of the catch by professionals has proven indispensable in the management of fish resources. For this reason, it is planned to institute a provincial database. This database will be fed by the monthly catch data supplied by professional fishers who will note down their catches in the forms supplied by the Province. Totals will be transmitted at the end of the year.

**6.2.3 Initial implementation activities**

An initial catch-record card has been prepared for 2014, which will show the changes in the legal size for pike (just increased up to 70 cm) and the division of catches between river and lake (figure below).

This card will be reviewed at the end of the participation process, but it already represents a first tangible management measure by local administration in applying proposals that have emerged in the process of healing existing conflicts.
Figure 6-2: Catch-record card for the year 2014 – Province of Rieti
7. REFERENCES


CARLI B. et al. (eds). Clima e Cambiamenti Climatici. Le attività di ricerca del CNR. Consiglio Nazionale delle Ricerche: 613-616


Climate Change and the European Water Dimension. 2005. JRC. A report to the European Water Directors


Web sources

www.arpalazio.gov.it

www.isprambiente.gov.it