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“Sustainable Water Management through Common
Responsibility enhancement in Mediterranean River
Basins. ”

SWOT Analysis and Strategic Water Management Plan for Irminio River Basin



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TABLE OF CONTENTS

1. INTRODUCTION

- 1.1. BACKGROUND AND RATIONALE
- 1.2. WORK METHODOLOGY

2. SYSTEM INDICATORS

- 2.1. DESCRIPTION OF INDICATORS USED
- 2.2. TABLE OF INDICATORS USED

3. SWOT ANALYSIS

4. PROPOSED STRATEGIC MANAGEMENT PLAN

STRATEGY 1: OPTIMIZING THE USE OF WATER RESOURCES

ACTION PROGRAM 1.1. OPTIMIZATION OF WATER USE IN THE URBAN SECTOR.

PROJECT 1.1.1 INFRASTRUCTURAL OPERATIONS FOR REDUCING WATER LOSSES IN THE TOWN OF RAGUSA

PROJECT 1.1.2 INFRASTRUCTURAL OPERATIONS FOR SUPPLYING RURAL AREAS AND COASTAL ZONES (MARINA DI RAGUSA)

ACTION PROGRAM 1.2. OPTIMIZATION OF WATER USE IN AGRICULTURE.

PROJECT 1.2.1. INFRASTRUCTURAL OPERATIONS FOR INCREASING WATER AVAILABILITY IN AGRICULTURE

PROJECT 1.2.2. MANUAL OF GOOD PRACTICE FOR SAVING WATER IN AGRICULTURE

PROJECT 1.2.3. PROMOTING THE REUSE OF RECLAIMED WASTEWATER

ACTION PROGRAM 1.3. OPTIMIZATION OF WATER MANAGEMENT

PROJECT 1.3.1. WATER MANAGEMENT AGREEMENT AMONG DIFFERENT LOCAL AUTHORITIES

STRATEGY 2: POLLUTION PREVENTION AND CONTROL OF IMPACTS ON WATER RESOURCES

ACTION PROGRAM 2.1. PREVENTION OF POLLUTION BY DUMPING OF URBAN WASTEWATER.

PROJECT 2.1.1. UPGRADING OF WWTPS

PROJECT 2.1.2. ASSESSMENT AND CONTROL OF DISCHARGES OF DISPERSED VILLAGES.

PROJECT 2.1.3 RIPARIAN BUFFER STRIPS TO TRAP AND REMOVE NON-POINT SOURCE POLLUTANTS

ACTION PROGRAM 2.2. PREVENTION OF POLLUTION FROM AGRICULTURAL AND ZOOTECHNICAL ACTIVITIES.

PROJECT 2.2.1. IMPROVEMENT OF NUTRIENT AND PESTICIDES MANAGEMENT IN AGRICULTURAL FARMS

PROJECT 2.2.2 IMPROVEMENT OF WASTE DISCHARGES FROM ZOOTECHNICAL FARMS

STRATEGY 3: IMPROVEMENT OF LAND AND RISK MANAGEMENT IN THE BASIN

ACTION PROGRAM 3.1. ENHANCEMENT OF THE RESERVE AND SITES OF COMMUNITY IMPORTANCE

PROJECT 3.1.1. CREATING A "GREEN CORRIDOR" AMONG RESERVE AND SITES OF COMMUNITY IMPORTANCE

PROJECT 3.1.2. PROMOTION OF SPORTS AND LEISURE ACTIVITIES IN THE RIVER.

PROJECT 3.1.3. INFORMATION AND PROMOTION CAMPAIGN OF THE BASIN.

ACTION PROGRAM 3.2. APPLICATION OF AVAILABLE PLANS IN THE IRMINIO BASIN

PROJECT 3.2.1. CONTROL OF THE URBAN PLAN

PROJECT 3.2.2 APPLICATION OF THE HYDROGEOLOGICAL STRUCTURE PLAN OF THE BASIN

1. INTRODUCTION

1.1. BACKGROUND AND RATIONALE

The present report was drafted in the framework of the 1G-MED08-515 WATERinCORE project for the “Sustainable Water Management through Common Responsibility enhancement in Mediterranean River Basins”.

The WATERinCORE project is implemented under the transnational programme of European territorial cooperation MED (<http://www.programmemed.eu>), Priority Axe 2: Environmental protection and promotion of a sustainable territorial development, Objective 2.1: Protection and enhancement of natural resources and cultural heritage.

The project aims at the design, application and dissemination of a methodological frame for the integration of Local Agenda 21 principles in Water Resources Management in Mediterranean River Basins.

Within the framework of the 3rd component of the project —Water Management in the participants’ regions- Pilot River basin a list of Water Management indicators was formed (phase 3.3).

Based on a specific SWOT methodology, the data provided by the compiled list of indicators for the basin (deliverable of phase 3.4), an overall brainstorming about the situation of water management issues for the basin, the strong and weak points presented in the chapters of water management analysis (phase 3.1) and the European and national legal framework, established a SWOT Matrix, in order to identify the Strengths, Weakness, Opportunities and Threats in the study area (phase 3.4).

The evaluation of the data for the indicators, the implementation of a SWOT analysis per pilot basin and the conclusions derived from the SWOT matrix will finally develop a Strategic Water Management Plan for each pilot basin of the participant regions (phase 3.4). This plan will be put in the core of the negotiation tables during phase 5.1.

Within this context, ARPA developed a Strategic Water Management Plan for Irminio River Basin, which will be used as a basis for enabling stakeholders to actively participate in social dialogue in order to enhance their responsibility in water management.

1.2. WORK METHODOLOGY

Prior to the development of this Strategic Plan has been carried out the analysis of a system of indicators to monitor, assess and report on the current situation regarding water management. From the results obtained during data search and calculation of indicators, has undertaken the evaluation of these, in order to identify strengths, weaknesses, opportunities and threats in the study area in relation with water management. For this we have established a SWOT matrix and have looked at possible future scenarios, looking from management to behaviour of different environmental, social, economic and cultural vectors. The SWOT matrix is a kind of radiograph of the situation of water resources, its current status and future possibilities, which can draw some conclusions that will try to respond with different strategies. From the SWOT analysis and the results taken from the calculation of the indicators system, will develop a Strategic Plan that attempts both to maintain the strengths identified, as give response to problems identified, taking into account both the opportunities and current threats that face the management of water resources.

Thus, the Plan of Action will include a package of priority actions and integrated environmental policies to overcome all the deficiencies identified. Specifically, the document shall include:

- Strategic lines: will be proposed with relevant contribution of the municipalities involved in the project. Take into account the sectoral plans of existing local development.
- Program: develop specific areas within each strategic line, so that carried out actions or projects aimed at similar purposes.
- Projects: projects to be undertaken within each program will be the forecast of specific actions tailored to the actual needs and priorities section of the basin under study.

2. SYSTEM INDICATORS

This phase corresponds to the previous work of analysis of existing information and the updating and incorporation of the necessary information in order to establish the balance in accordance with project requirements WATERinCORE.

Information was updated by consulting various sources of documentation. Each of the sources used are defined in the section "data source" of the file for each of the indicators.

2.1. DESCRIPTION OF INDICATORS USED

The indicators are defined within the database of indicators of the study area, follow the structure established by the Project Management WATERinCORE.

The following is a summary of the records of the indicators defined:

2.2. TABLE OF INDICATORS USED

TABLE OF INDICATORS				
Indicator	Target Value	Calculated Value		Status and trends
Land use	Decrease of forest and semi-natural areas and increase of agricultural areas	From 2000 to 2006 the of forest and semi-natural areas decrease from 31.4 to 21.6 % of the area of the basin		In the Irminio basin the agricultural areas increased from 64.5 to 74.3 from 2000 to 2006, so the trend is unfavourable. ☹️
Population Density	Not defined a target value for this indicator	142.2 Hab/km² (Population data in 2010)		There has been a continuous growth of population in the study area and therefore the population density, mainly due to the increase of population in Ragusa municipality. ☹️
Plant communities	Plant communities with a composition close to the climax stage of potential vegetation of the area	In the Irminio there are localized species. The <i>dianthus rupicola</i> is a specie at risk. The alluvial soil is characterized by the <i>Platano-Salicetum pedicellatae</i> iblean typical specie that grows along the perennial river banks. It is characterized by <i>Platanus orientalis</i> and <i>Salix pedicellata</i> . In the marshland part the <i>Cyperetum longi</i> can be found. The submerged vegetation is represented by the <i>Zannichellietum obtusifolie</i> , an association typical of Iblean and Trapani area rivers. On the surfacing rocks, the <i>Oxyrrhynchietum rusciformis</i> can be observed. In addition, the <i>Quercion ilicis</i> can be found along the calcareous slopes, dominated by <i>Quercus ilex</i> and characterized by some species of particular interest such as: <i>Doronicum orientalis</i> , <i>Scutellaria rubiconda ssp. Linneana</i> and <i>Aristolochia longa var. microphylla</i> . On the sunny rock slopes aspects of Macchia can be found, such as <i>Oleo-Ceratonion</i> . Due to the degradation of the soil, the <i>Euphorbietosum dendroides</i> and the <i>Chamaeropo-Sarcopoterietum spinosi</i> can be found.		Generally there is a characteristic vegetation of degradation stages of the climax vegetation of the study area, close to the early stages of degradation in upland areas with steep slopes, mainly due to reduced anthropogenic influence. 😊
Elevation	Not defined a target value for this indicator	Maximum	986.75 m asl	There is a trend-stationary state due to the characteristics of the indicator. 😊
		Medium	470.0 75 m asl	
		Minimum	0 m asl	
Slope	Not defined a target value for this indicator	Average slope 20.6%		There is a steady state or trend due to the indicator characteristics. 😊

TABLE OF INDICATORS

Indicator	Target Value	Calculated Value		Status and trends	
Total water balance	A surplus of water in the study area.	Inputs	146.9 Mm³/year	In the study area shows a water average surplus of 6.6 Mm ³ /year, so the situation is considered stationary.	☹️
		Outputs	140.0 Mm³/year		
		Inputs- Outputs	6.6 Mm³/year		
Water table variation rate	Positive trend or increase in water level over the previous year.	NOT AVAILABLE DATA			☹️
Mean annual precipitation.	Average annual rainfall at the stations of Ragusa, Monterosso Almo, Scicli, Palazzolo Acreide e Modica	146.7Mm3/year (1921-2003) mm		The study area exhibits a mean annual precipitation which allows a reasonable amount of infiltration rate within the Irminio watershed area. It has to be noted a decreasing of the annual precipitation during the last years.	☺️
Runoff coefficient	Runoff coefficient corresponding to available water in the watershed	19%		The temporal reliability of the precipitation series guarantee just enough water availability in the watershed	☹️
Total annual water consumption	Consumption reduction over the previous year.	Potable use	7.3 Mm³/year	Agriculture is the sector that consumes more water.	☹️
		Agricultural	8.4 Mm³/year		
		Industrial	7.6 Mm³/year		
Water exploitation index	WEI <20%: water-nom stressed region.	40.3 %		The water exploitation index measures the relationship between water demand and water resources in the natural system and is defined as the annual average total deposits of fresh water, divided by the average annual freshwater resources. The result of this index is > 40% (calculated considering precipitation/runoff data in 1991-2003 and evapotranspiration data in 1980-2000).	☹️
	20% <WEI <40%: water-stressed region.				
	WEI > 40%: strong competition for water				

TABLE OF INDICATORS







Indicator	Target Value	Calculated Value		Status and trends	
Water discharge	Flows below those that produce flood risk.	Maximum flow rate from discharges structures of Santa Rosalia dam.	12740.7 m³/sec	Due to the fact that in the Irminio watershed the Santa Rosalia artificial reservoir was built, the maximum discharge was evaluated at the dam section of the hydrographic network. In the "Piano Stralcio di Bacino per l'Assetto Idrogeologico (P.A.I.)" three hypotheses of artificial flood propagation were considered: A: maximum discharge from bottom discharge structures (70.7 m ³ /s); B: maximum discharges from discharges structures (1240.7 m ³ /s in total, 1170.0 m ³ /s from superficial discharges structures and 70.7 m ³ /s from bottom discharge structures) C: hypothetic collapse of the dam in 1,75 hours.	
Sediment discharge	Not defined a target value for this indicator.	Sediment in the Santa Rosalia reservoir from 1964 to 2009	5.8 t/ha	Due to the fact that in the Irminio watershed the Santa Rosalia artificial reservoir was built, the sediment discharged in the reservoir were evaluated. The sediment discharge in the Santa Rosalia reservoir is in the range of the value set in the project of the dam.	
Production urban wastewater	Reducing the production of urban waste water from previous years.	Volume of sewage.	0,0169 m³/sec (Ragusa) plus 0.006 m³/sec (Giarratana)	Due to the organic load in term of BOD5 equal to 1070 tonn/year, the urban discharges have a significant impact on the water quality of the Irminio river.	
		Output per capita per day.	239 litros/hab / day		
Production of industrial wastewater	Reducing the production of industrial wastewater from the previous year.	NOT AVAILABLE DATA			
Population served by WWTP	Have a wastewater collection facility and treatment system by January 2006 in core with a top population 2,000 equivalent. habitants.	WWTP population.	95 %	The percentage of population served by WWTP (95%) is rather satisfactory.	
Industry wastewater treatment	All industrial wastewater have some kind of treatment.	NOT AVAILABLE DATA			

TABLE OF INDICATORS





Indicator	Target Value	Calculated Value		Status and trends	
Reused wastewater	Not defined a target value for this indicator.	Reused wastewater percentage	Significant	The urban wastewater treatment plant (WWTP) of Giarratana discharges in the Irmínio river above the dam and the WWTP of Ragusa discharges below the dam. A significant part of the treated effluent is used by the Irrigation Consortia for irrigation. 	
Population connected to water network	Percentage of population centers in the municipality connected to the grid > 98%.	Total population.	76,000 Hab.	The percentage of permanent population served by water supply networks (98%) is rather satisfactory. Tourism in some areas often generates water shortage conditions with a not satisfactory water supply service. 	
		Permanent population connected to water network.	98 %.		
		Not permanent population connected to water network.	90 % (Ragusa) – 95 % (Giarratana)		
Irrigated Area	Increased irrigated area belonging to a community of irrigators with respect to the total irrigated area.	Area under community irrigation	2,285 Ha	Water availability of the Irmínio watershed is sufficient to meet irrigation water consumption in the Consortium area 	
		Irrigated area	3,100 Ha		
		Percentage of the total irrigated area	74 %		
Ecological status of surface waters	Classification of ecological status according to the Italian law 152/1999	Mean quality class (CSEI, 2009) for Irmínio River stations	Upstream dam.	III	The ecological status of the Irmínio river was determined following the Italian law 152/1999. Pollution Level Indicators (P.L.I.) and Extended Biotic Index (E.B.I.) were compared in order to determine the Ecological state (E.S.) in different sections of the Irmínio river. The quality class III of the E.S. obtained for the Irmínio rivers corresponds to a modified environment. 
			Giacomo bridge	II	
			Iron bridge.	II	
			Water purifier	III-IV	
			S.Croce-Scicli Bridge	III-II	

TABLE OF INDICATORS







Indicator	Target Value	Calculated Value		Status and trends	
Chemical status of surface waters	Environmental Quality Standards for Priority Substances and other pollutants, of Italian law 152/1999	Environmental Status for Irminio river	Bad (2005-2006)	Following the Italian law 152/1999, is necessary to determine the chemical status in order to set the Environmental Status by using the data relative to the Ecological Status. For the Irminio river data for the Chemical status are not available. It was possible to determine the Environmental Status just for the year 2005-2006, because being the Pollution Level Indicators (P.L.I.) in the forth class, the Environmental Status is bad for each Chemical Status.	
Quantity of ground water.	Do not exceed the value of 0.8 in the oexploitation rate (IE). No artificial outflows (S) exceed the inflows (E) in any the aquifer systems	NOT AVAILABLE DATA			
Chemical status of ground waters	The bodies of groundwater shall not exceed the quality standards by various national or Community legislation, in particular Directive for human consumption.	NOT AVAILABLE DATA			
Bathing water quality	Quality values for bathing water are not exceeded in any bathing zone in the study area	NOT AVAILABLE DATA			
Water tariffs	Not defined a target value for this indicator.	See tables under "calculated values" of the information about the indicator.	The water tariff is in the range Italian water tariff.		
Cost recovery	Recovery of 80% of the costs of services.	The total cost recovery of water services reached 41.8 % for Giarratana and 80.8 % for Ragusa , being 61.0 % and 69.4 % for sewage-wastewater treatment for Giarratana and Ragusa respectively	The cost recovery (%) is calculated, per each water service, as the ratio between the revenue invoiced and the total costs. The data related to the sewage and wastewater treatment services are coupled. Data on irrigation service are not available. Since the revenues are less than total costs for all the water services of Giarratana and Ragusa, the cost recovery percentages are not satisfactory		

TABLE OF INDICATORS

Indicator	Target Value	Calculated Value	Status and trends
Water management authorities	Existence of authority responsible for water management.	<ol style="list-style-type: none"> 1. Ragusa Province 2. ATO Ragusa 3. Municipalities 4. ... 	<p>In the case of Irminio basin, there is not a local authority which is the unique responsible for the integrated management.; the competences are divided between different local authorities: Ragusa province, ATO Ragusa Public authority in charge of the integrated domestic water management in the Province of Ragusa, municipalities...</p>
Water bodies' naturalness	Not exceeded by 50% the percentage of sections included in condition categories with equal or greater to "strongly modified.	78% of Irminio river is heavily modified	<p>In the case of Irminio, the only part that can be considered as natural is the upper part of the river (up to the urban area of Giarratana) equal to 22% of the total length of the main river (Figure 1). The rest of the main river (from Giarratana to the mouth) can be considered as heavily modified due to:</p> <ul style="list-style-type: none"> - discharges of the urban wastewater treatment plan of Giarratana and Ragusa; - discharges structures; - wastewater treatment plant of Ragusa that is in the pertinence area of the Irminio river; - withdrawals by the Irrigation Consortium: Mussillo-Castelluccio, Giummarra and Irminio delta; - channels and pipelines of the Irrigation Consortium; - channelization of the main river close to the mouth.

3. SWOT ANALYSIS

The SWOT analysis was built in order to identify strengths and weaknesses in the Irminio River Basin (as internal factors) and opportunities and treats (as external factors).

In particular, strengths and weaknesses, were identified based on the indicators evaluated in the basin (deliverable of phase 3.4) and an overall brainstorming about the situation of water management issues for the basin.

Opportunities and treats, were identified based on the water management analysis (deliverable phase 3.1) and the European and national legal framework (directives, regulations and Laws), co-financing tools (European and national programmes), national strategic frameworks, developmental plans, water management plans...

SWOT MATRIX	
Weakness	Threats
<ul style="list-style-type: none"> ▪ Significant decrease of forest and natural areas and increase of agricultural areas. ▪ Significant urbanization trend in the basin, due to the population increase in Ragusa. ▪ High temporal variability of precipitation. ▪ Total annual water consumption and need are satisfied by using almost all the available water resources in the basin. ▪ WEI is equal to the limit that characterize stressed regions. ▪ Risk of overflows in the lower part of the Irminio basin due to the potential failure risk of the Santa Rosalia dam. ▪ High organic load in term of BOD₅, due to the urban and zoo technical discharges into the Irminio River ▪ Water shortage conditions in touristic areas of the basin (i.e. Marina di Ragusa) ▪ Small villages not served by water supply network ▪ Lack of adequate metering and tariff systems; high loss of supplied water ▪ Water from Santa Rosalia dam not completely exploited ▪ Extended Biotic Index values indicating a modified environment ▪ Cost recovery percentages (for water supply, sewage and wastewater treatment) not satisfactory ▪ Management competences divided by different local authorities ▪ High salinity of the aquifer and increase of seawater intrusion. ▪ Old and not adequately managed irrigation infrastructures. ▪ About 80% of the river is heavily modified ▪ Not available data on water table variation ▪ Not available data on sediment discharge ▪ Not available data on produced industrial wastewater and industries with treated WW ▪ Not available data on the chemical status of surface waters 	<ul style="list-style-type: none"> ▪ Lack of financial resources investments in infrastructure due to economic crisis (upgrading of wastewater treatment plants, rehabilitation of pipelines etc) ▪ No application of Spatial or Urban Planning to prevent urbanization in particular regarding touristic facilities and resorts; ▪ Ineffective control of water operation works by competent authorities ▪ Ineffective control of discharges in the Irminio river ▪ Very restrictive approach for treated wastewater reuse (MD 185/2003) ▪ Groundwater knowledge framework in Sicily is partially deficient in relation to the requirements of D. lgs. n. 30/2009 (Decree implementing Directive 2006/118/CE) on groundwater bodies identification and characterization. ▪ D.lgs. n. 30/2009 requirements on anthropogenic pressures and impacts analysis and risk characterization of groundwater bodies, are not completely fulfilled. ▪ The groundwater monitoring network, should comply with regulatory requirements. ▪ Delay of WFD application in Sicily ▪ Delay of CAP application in Sicily; in particular, the Sicily government adopted some measures in order to help farmers in implementing the CAP, but practically, farmers still did not receive the subsidies

Strengths	Opportunities
<ul style="list-style-type: none"> ▪ Presence of the Santa Rosalia dam ▪ Slight water average surplus that infiltrates of about 6.6 Mm³/year. ▪ High percentage (95%) of population served by Wastewater Treatment plants. ▪ Significant percentage of treated wastewater reused in the basin. ▪ High percentage of permanent population (98%) served by water supply networks. ▪ Water availability sufficient to meet irrigation water consumption in the Irrigation Consortium area ▪ Presence of the "Irminio river natural-forest reserve", (135 ha close to the mouth) and Sites of Community Importance ▪ Availability of a preliminary "master plan", in order to meet the water demand in the coast areas during summer period by using dam water resources 	<ul style="list-style-type: none"> ▪ Adequate water tariffs in the basin compared with the Italian situation ▪ Legislative Decree 152/2006 implementing the Water Framework Directive (Directive 2000/60/CE) ▪ Decree of the Ministry of the Environment No. 131/2008 defining the procedure for detection and typing of surface water bodies and procedures for risk assessment ▪ Decree of the Ministry of the Environment 56/2009 laying down the rules relating to network monitoring of surface water bodies. ▪ Legislative Decree 30/2009 implementing the Directive 2006/118/EC concerning the classification and monitoring of groundwater bodies. ▪ The river basin district management plan of Sicily was established in November 2009 (defined on the basis of existing plans in accordance with law 13/2009). In particular, in the case of Sicily, the management plan was drafted under the water conservation plan and the regional plan for the hydro-geological risk prevention ▪ In accordance with Article 5 of WFD, Sicily Region established a surveillance monitoring programme and an operational monitoring programme for each category of water body. Monitoring Plan will be for a six-year period, from 2010 to 2015. ▪ Common Agricultural Policy (CAP) associated with good practice for the maintenance of biodiversity, landscape, soil protection and water resources. ▪ Increase of the public interest for the sustainable management of the environmental, sports and recreational aspects ▪ Presence of a study for the treated wastewater reuse in Sicily (Sicily Region, Ordinanza 1300/2005)

The SWOT matrix provides a proposal of **general recommendations** that serve as a first response to the problems and improvement opportunities observed in the study area. Among these general recommendations can be noted:

- Define measures to manage better water for urban, industrial or livestock and primarily agricultural.
- Define measures to improve the quality of the river.
- Define measures to reduce the seawater intrusion and the salinity of the aquifer
- Improving the efficiency of water infrastructure for irrigation.
- Increase the treatment of urban and industrial wastewater and upgrade water treatment plants.
- Establish agricultural and zoo technical measures to eliminate sources of diffuse pollution.
- Increase the reuse of wastewater, especially in the field of agriculture.
- Enhance the cost recovery associated with the use made by each consumer.
- Defining priorities for investments in infrastructure.
- Involve and engage users and general public in matters related to water management.

From the SWOT analysis are going to develop **water management strategies** for pilot river basin. The strategies proposed can be classified into four types:

OFFENSIVE STRATEGIES (SO): including strengths to exploit opportunities.

- Management improving of the “Irminio river natural-forest reserve”, and CIS areas in the basin
- Realization of the existing master plan in order to meet the water demand in the coast areas during summer period by using dam water resources
- Implementation of measures to improve the urban use of reclaimed water in Ragusa and Marina di Rausa
- Increasing of wastewater reuse practice, particularly for irrigation
- Control of water use in irrigation, especially those not included in irrigation consortia (both public and private).
- Implementing of water connections between the Santa Rosalia dam and the Irrigation Consortium (district of Scicli)

REACTIVE STRATEGIES (SW): These strategies aim to overcome the weaknesses by taking advantage of opportunities.

- Improvement of forest lands through the use of existing aids and subsidies.
- Providing value to surface and hydro-geological resources in the area.
- Establishment of saving measures on agricultural land belonging to irrigation communities.
- Increased percentage of cost recovery in all sectors.
- Adequate information to the public about existing aids and management opportunities.
- Implementation of measures in order to reduce the diffuse pollution of the river by using buffer strips
- Upgrading of irrigation infrastructures aiming at modernization of agricultural exploitation of water resources and efficient water use
- Establishment of measures in order to reduce the diffuse pollution caused by agricultural and zootechnical areas
- Control of water use in irrigation by installing control volumes systems
- Promotion of organic and integrated farming.
- Creation of recreational areas related to the river, offering cultural, sporting and leisure larger.
- Elimination of fragmentation of competent authorities
- Control and authorization of boreholes to prevent illegal pumping

- Placement of hydrometers to private irrigation boreholes
- Use of technology for the collection and monitoring of water resources data

DEFENSIVE STRATEGIES (ST): Use strengths to avoid threats.

- Management of the Irminio river natural-forest reserve", and CIS areas in the basin in order to increase investments.
- Realization of the existing master plan in order to reduce WEI and to improve the quality of groundwater (by reducing exploitation)
- Upgrading of wastewater treatment plants of Giarratana and Ragusa in order to improve the quality of the effluents and fully achieve the Italian legislation limit for the disposal in watercourse
- Increasing of the wastewater reuse practice in order to implement guidelines that can help in the application of the Italian restrictive approach for treated wastewater reuse (MD 185/2003)
- Control of water use in irrigation, especially those not included in irrigation communities in order to implement CAP

ADAPTIVE STRATEGIES (WT): Reduce the weaknesses and avoid threats.

- Implementation of plans in order to control and planning urbanization, in particular regarding touristic facilities and resorts located in coast areas.
- Upgrading of irrigation infrastructures aiming at modernization of agricultural exploitation of water resources and efficient water use in order to apply CAP
- Implementation of measures in order to improve the water quality of the Irminio River
- Implementation of measures in order to better manage the water for urban use

4. PROPOSED STRATEGIC MANAGEMENT PLAN

This section contains the Proposed Action Plan developed on the basis of the results for each of the indicators carried out in connection with the values defined objectives, and to specify the activities to develop in the base area the strategies outlined in the SWOT analysis.

Regarding its structure, has followed a organization in strategic line, programs and projects.

We understand by the strategic lines the foreseeable major routes for environmental improvement and progression towards a model of sustainable development in the water cycle. These subject areas are created to group the actions of improve with a common aim, so that its implementation easier and to take into account their relationship.

Within of a strategic line of action are different programs. An action program responds to each of the various objectives pursued a strategic. Each program also brings together various projects with a common denominator. The fact that the actions are grouped by affinities, can promote synergy between them.

The projects are those works and concrete actions for resolve the deficiencies and incidents viewed during the work carried out.

In this way and as a synthesis of the above, the organizational structure of the Action Plan is structured in a hierarchy of proposals that include the following concrete areas.

- **Strategic lines:** to identify the major axes to consider for progression towards a model of sustainable development.
- **Action programs:** specific areas of activity within each strategic line.
- **Projects:** specific actions.

For each action or project has developed an information tab which details the following aspects:

- ◆ **Strategic lines:** in which is included.
- ◆ **Program of action:** to which it belongs.
- ◆ **Project:** concrete action to which it relates.
- ◆ **Aim:** aim to be achieved with the implementation of such action.
- ◆ **Description:** A brief summary stating that is the project.
- ◆ **Actions / Milestones:** Possible actions to consider during the project implementation.
- ◆ **Priority:** indicating the importance of implementing the action, establishing three levels.
 - *Low priority:* actions that are not essential but they represent a significant strengthening of the state of the studied catchment.
 - *Medium priority:* basic actions for improvement the state of the basin under study.

- *High priority*: essential actions, whether by mandatory rules, for necessity to address a major shortcoming, etc.
- ◆ **Estimated time/Frequency** proposed for the implementation of the action.
 - *Prompt*: implementation at a given time, indicating when it is considered that should be implemented (2011, 2012 ...).
 - *Continued*: for actions that must be continued over time indicating the frequency (annual, monthly, continuously, etc.).
- ◆ **Duration of implementation**: estimated time of project implementation.
- ◆ **Agents involved**: possible actors involved in the definition and implementation of the action.
- ◆ **Economic Estimate**: For each project proposed cost estimate, based on the concept of the general project.
- ◆ **Indicator**: definition of that parameter to assess the degree of compliance with the goals or objectives.
- ◆ **Standard reference**: if appropriate.
- ◆ **Execution Control**: indicating the level of development or implementation of the action. Specify year of the last control.
 - *Pending*: not started proceedings related to the action.
 - *Started*: they have made the initial phases of operation (phase project, starting conversations with others involved, the bidding process ...) but still no action has been awarded.
 - *Running*: This category is considered when the action or project is being developed.
 - *Completed*: you must specify the year of completion.
 - *Excludes*: when for certain reasons it is not deemed appropriate implementation of the project or action.
- ◆ **Comments**: Other issues considered important point and that are not established in previous categories.

According to the structure defined, the proposed Action Plan for Water Management has been raised about 3 Strategic lines and 6 Action Programmes organized as follows:

LINES STRATEGIES AND PROGRAMS OF PROPOSED ACTION
STRATEGY 1. OPTIMIZING OF THE USE OF WATER RESOURCES.
<ul style="list-style-type: none"> • Action Program 1.1. Optimization of water use in the urban sector.
<ul style="list-style-type: none"> • Action Program 1.2. Optimization of water use in agriculture.
<ul style="list-style-type: none"> • Action Program 1.3. Optimization of water management.
STRATEGY 2. POLLUTION PREVENTION AND CONTROL OF IMPACTS ON WATER RESOURCES.
<ul style="list-style-type: none"> • Action Program 2.1. Prevention of pollution by dumping of urban wastewater.
<ul style="list-style-type: none"> • Action Program 2.2. Prevention of Pollution from agricultural and zootechnical activities.
STRATEGY 3. IMPROVEMENT OF LAND AND RISK MANAGEMENT IN THE BASIN.
<ul style="list-style-type: none"> • Action Program 3.1. Enhancement of the reserve and the Sites of Community Importance • Action Program 3.2. Application of available plans in the Irminio basin

Once established and defined strategic programs that are structured Action Plan in the following sections define the various concrete proposals for projects that involve the highest degree of specificity for the objectives specified for each Action Plan.

Strategy 1: OPTIMIZING THE USE OF WATER RESOURCES.

The water is a relatively limited, essential to life that must be available not only in quantity but in quality. The principles that underpin this new culture of water are efficiency and optimizing consumption, second savings and finally, the integrated management to ensure the satisfaction of the claim under the criteria of quality and minimize impacts aquatic ecosystems.

Although during last years has reduced its consumption, mainly due to the economic situation, the general trend of increasing demand of water resources, both in the urban sector, as in the agricultural and industrial sector. In the Mediterranean region the highlight seasonality of rainfall and recurrent drought periods, this can cause complications in the supply of water. This strategic line is raised to comply with the general recommendation, drawn from the SWOT analysis to identify cost-saving measures in the consumption of water for urban, industrial, agricultural and livestock.

This line is composed of three Programmes of Action, to be distinguished according to water-consuming sectors, with particular attention to consumption in the agricultural, that accounts for over 90% of consumption

Action Program 1.1.Optimization of water use in urban areas.

Action Program 1.2.Optimization of water use in agriculture.

Action Program 1.3.Optimization of water management.

Unfortunately there are not available data on water use in industrial sector for the Irminio River basin

ACTION PROGRAM 1.1 OPTIMIZATION OF WATER USE IN URBAN SECTOR

Content

The main municipalities located in the Irmínio river basin are the towns of Giarratana and Ragusa. Moreover, there are several small and/or rural villages both in the inland and in the coastal areas (mainly Marina di Ragusa). The latter are highly populated during the summer periods, presenting a significant tourist flow. Actually, the main source of potable water is the groundwater from the Irmínio basin aquifer. Surface water of a big artificial reservoir (S. Rosalia dam on the Irmínio river) are now used for the domestic water supply of part of the town of Modica and for the irrigation of agricultural areas managed by the public "Consortium of Ragusa", organized into several districts and sub-districts. It is planned to use the water resources of S. Rosalia reservoir also for the potable water supply of the rural areas (by a new rural aqueduct) and the coastal zone of Marina di Ragusa. At this moment this is not possible due to the absence of hydraulic infrastructures connecting the dam with areas to be served (dot lines in figure 1).

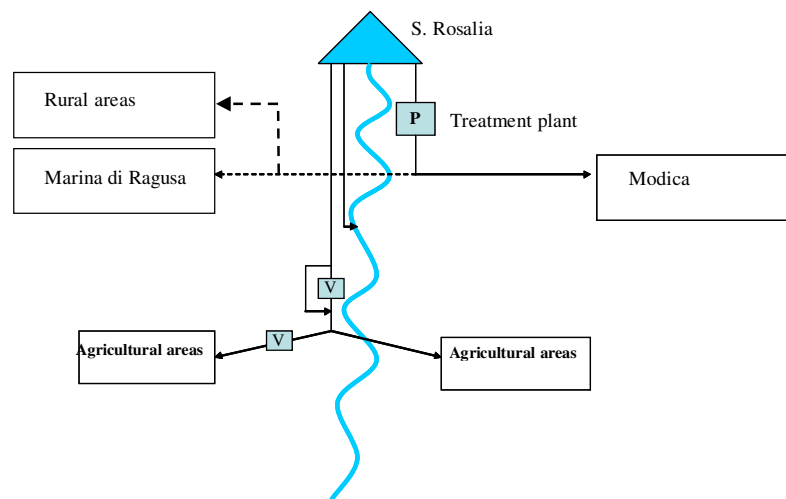


Figure 1 Lay-out of the water distribution system from the S. Rosalia reservoir

Objectives

Globally, the available water resources would be enough for satisfying the total potable water demand, but there are some critical points compromising the overall water system. In particular, at this moment, the potable water supply of the urban agglomerates located in the Irmínio basin is characterised by the following main problems, that will be solved by the proposed actions:

- Significant water losses in the distribution network of the city of Ragusa;
- Significant deficiencies in the service of metering and billing of water delivered volumes;
- Absence of hydraulic connections between the city of Ragusa (where the main groundwater sources are located) and the coastal zone of Marina di Ragusa (where the aquifer suffers quali-quantitative problems causing severe water shortage conditions during summer);
- Absence of public water supply systems of several rural villages;
- Absence of hydraulic infrastructures to exploit for potable use the surface water of S. Rosalia reservoir.

Proposed Projects

- Project 1.1.1 Infrastructural operations for reducing water losses in the town of Ragusa
- Project 1.1.2 Infrastructural operations for supplying rural areas and coastal zones (Marina di Ragusa)

⇒

PROJECT 1.1.1 INFRASTRUCTURAL OPERATIONS FOR REDUCING WATER LOSSES IN THE TOWN OF RAGUSA		Date: Oct.-2011
Purpose / Description		
<p>The water distribution network of the city of Ragusa is ancient and it is subject to huge water losses. Moreover, the metering and billing systems, where presents, are often not in operation due to the lack of maintenance. Due to these reasons is not possible to know the exact amount of water distributed to the population.</p> <p>Recent estimates highlighted that the water volume abstracted from the aquifer and entered to the Ragusa distribution system is about 13.5 Mm³ per year; the theoretical potable water demand is 8.0 Mm³ per year (considering a permanent population of 68,500 inhabitants); the total amount of invoiced water was about 4.2 Mm³ during the year 2007. This would lead to a percentage of water losses of about 69%. Obviously this is due to the water that effectively is lost from the pipes (real losses) and to the water that is not counted before the delivering (apparent or administrative losses).</p> <p>This situation causes a significant overexploitation of the aquifer and a relevant water wasteful. Moreover, the cost recovery of the water supply system is really far to be satisfied. A complete renewal of several parts of the distribution network and the installation of modern and reliable flow meters are then strictly needed and urgent.</p>		
Action to:		
1. Execution of maintenance and/or substitution works on the water distribution pipes.		
2. Installation of modern flow meters for all the users. Renewal of metering and billing systems.		
3. Installation of a remote control system to monitor and optimise the functioning of the distribution system.		
Reference standards	Agents Involved	Estimated time/frequency
<ul style="list-style-type: none"> - Law 152/2006, implementing the WFD 2000/60/CE. - Law 36/1994. - European directive on water drought. 	<ul style="list-style-type: none"> - European Union - Sicilian Region - Local Water Authority (ATO) 	Prompt: 2012 (expected time)
Priority	Economic estimate	Monitoring Indicator
High	Not estimated	Reduction of water losses; increase of invoiced water; improvement of water distribution efficiency
Execution Control	Observations	
Pending	Through this project are specified the actions to be taken in response to the recommendation to define measures for water saving in urban areas.	

PROJECT 1.1.2. INFRASTRUCTURAL OPERATIONS FOR SUPPLYING RURAL AREAS AND COASTAL ZONES (MARINA DI RAGUSA)		Date: Oct.-2011
Purpose / Description		
<p>In the Irminio river basin there are several rural and small villages that are still not served by the public potable water supply system. The total potable water demand not yet supplied amounts to about 0.52 Mm³ per year. Moreover, in the future, some expansion zones of Ragusa and Marina di Ragusa are already planned with a new potable water requirements of about 0.85 Mm³ per year (Ragusa) and 0.45 Mm³ per year (Marina di Ragusa). Finally, the coastal zone of Marina di Ragusa during summer presents a fluctuant population of about 30,000 non-permanent inhabitants (mainly tourists coming from the same province of Ragusa). The actual water sources of Marina di Ragusa are represented by groundwater the quality of which is compromised due to sea water intrusion and the presence of nitrate coming from the agricultural land use. Also from a quantitative point of view, these resources are not enough to satisfy the seasonal potable water needs of Marina di Ragusa, and this leads to chronic water shortage conditions.</p> <p>Although the total water availability of the Irminio river basin (considering both groundwater and surface water) would be amply sufficient to satisfy the water needs of all the domestic users, the absence of hydraulic connections from the S. Rosalia reservoir and the town of Ragusa, and from Ragusa to the rural areas and to the coastal zones (Marina di Ragusa) makes it impossible: i) to transfer the excess water from Ragusa aquifer; ii) to exploit the surface water resources of the S. Rosalia reservoir for water supply of rural villages, coastal areas and expansion zones.</p> <p>The construction of hydraulic infrastructures to convey water to the zones not yet served or with water shortage conditions is urgent and mandatory.</p>		
Action to:		
1. Construction of the hydraulic connection between the town of Ragusa and Marina di Ragusa (about 28 km). By this aqueduct the excess water from Ragusa could be transferred to the coastal zones.		
2. Construction of the hydraulic connection between the S. Rosalia reservoir and the town of Ragusa. Upgrading of the drinking water treatment plant. By this system the surface water coming from the S. Rosalia reservoir could be used to supply Ragusa, its expansion zones and the coastal areas (by means of the action 1).		
3. Construction of the rural aqueduct to supply the small villages not yet served by using the water of S. Rosalia reservoir.		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> - Law 152/2006, implementing the WFD 2000/60/CE - Rural Development Programme for Sicily 2007-2013. Law 36/1994. 	<ul style="list-style-type: none"> - European Union - Sicilian Region - Local Water Authority (ATO) 	Prompt: 2013 (expected time)
Priority	Economic estimate	Monitoring Indicator
High	25 Millions €	Increase of population supplied; improvement of water distribution efficiency; reduction of water shortage periods
Execution Control	Observations	
Pending	Through this project are specified the actions to be taken in response to the recommendation to define measures to fully meet the potable water requirements.	

ACTION PROGRAM 1.2 OPTIMIZATION OF WATER USE IN AGRICULTURE.

Content

The agricultural area of Ragusa is mainly supplied by the Irminio River withdrawals. The area is served by the distribution network of the public "Consortium of Ragusa", organized into several districts and sub-districts. The irrigation area of the Consortium, served with the surface water of the Irminio River, is the district "Scicli", 4.100 hectares wide, with an effective irrigated area of 3.100 hectares. Water distribution in the district and in its sub-districts is realized mostly through the "Castelluccio-Mussillo" network. The scheme of Figure 1 reproduces the complex irrigation water distributions to agriculture of the study area.

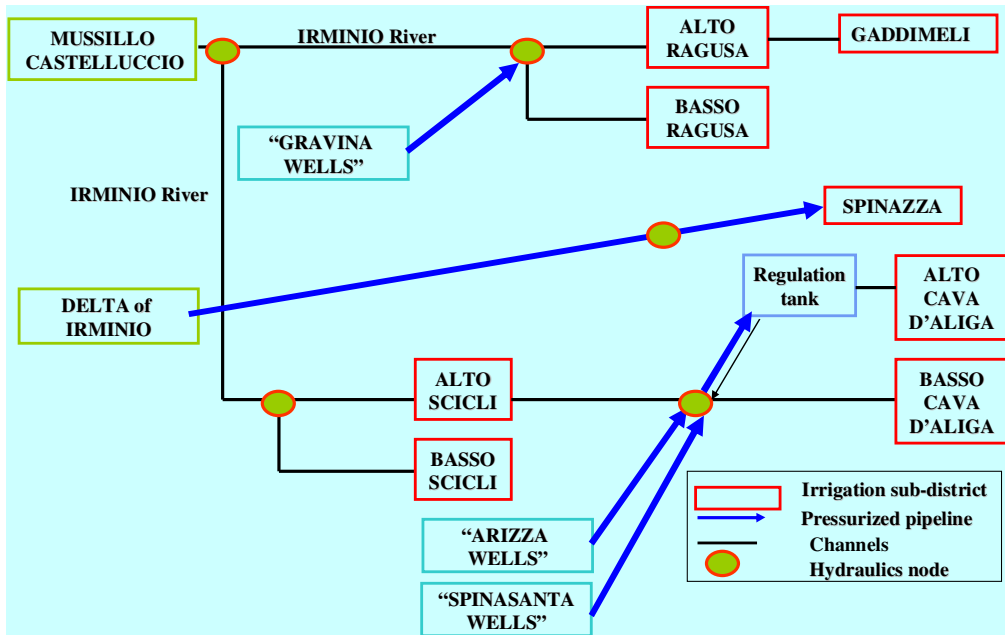


Figure 1 Lay-out of the irrigation distribution from the Irminio River at the "Scicli" district

As outlined by Figure 1, the irrigation district of "Scicli" is supplied by a complex interconnection of channels, pressurized pipelines and wells, which contributing to fulfil (partially or completely) the crop water requirements of the area. Following the scheme in Figure 1, the main water sources for the district of "Scicli" are:

- Mussillo Castelluccio springs: the derived annual volumes amount to $6,45 \cdot 10^6 \text{ m}^3$;
- Giummarra spring: the derived annual volume amounts to $1,65 \cdot 10^6 \text{ m}^3$;
- Irminio delta by water lifting: the derived annual volume amounts to $0,29 \cdot 10^6 \text{ m}^3$;
- Wells (Gravina, Arizza, Spinasanta): the numerous wells in the study area have an intermittent operation, thus the water amount that could be yearly extracted from them is in the order of $0,5 \cdot 10^6 \text{ m}^3$.

Objectives

Globally, available resources derived from the above mentioned sources are quite enough to fulfil crop water requirements of the study area (about $9 \cdot 10^6 \text{ m}^3$); however, optimization strategies aiming at improving the precarious distribution networks are highly requested. Then, the following paragraphs were addressed at pointing out the most relevant infrastructural and structural measures to be taken to improve the agricultural sector supplies by the Irminio River.

Proposed Projects

- Project 1.2.1. Infrastructural operations for increasing water availability in agriculture
- Project 1.2.2. Manual of good practice for saving water in agriculture
- Project 1.2.3. Promoting the reuse of reclaimed wastewater

ACTION PROGRAM 1.2. OPTIMIZATION OF WATER USE IN AGRICULTURE		
PROJECT 1.2.1 INFRASTRUCTURAL OPERATIONS FOR INCREASING WATER AVAILABILITY IN AGRICULTURE		Date: Oct.-2011
Purpose / Description		
<p>The variability of the irrigation area in the investigated territory of Ragusa is the result of several conflicting and/or integrating elements, that concern: the water supply availability at the S. Rosalia reservoir, the transformation of production activities; the presence of both public and private irrigation <i>consortia</i>.</p> <p>The distribution of water from the Irminio River to the irrigation district of "Scicli" is done mainly through irrigation canals, managed by the public agency "<i>Consortium of Ragusa</i>".</p> <p>The distribution network from the reservoir to the irrigation area needs of a substantial efficiency improvement. This may be realized through different actions (as in the follow) and a cooperation agreement between the different subjects acting in the territory, being the irrigation and potable supply networks strictly related.</p> <p>Therefore, the aim of this project is to put in evidence the needed modifications of the irrigation networks to reach and higher efficiency of the system and to optimize the use of the available water.</p>		
Action to:		
1. Realize a stable water intake (by using a bulkhead) from the Irminio River to supply the main irrigation network of "Castelluccio-Mussillo" serving the irrigation area; the existing intake is highly precarious and made by stones. This action would allow improving the derivation efficiency from the River for irrigation purposes.		
2. Realize storage tanks to better regulate the availability of water derived by the "Castelluccio-Mussillo" network. Actually the network supplies just 36% of the total water that would be derived from the River.		
3. Realize automatic water meter to check the effective amount of water distributed for irrigation. This action may allow to change the water rate adopted by the <i>Consortium</i> and mainly based on the irrigation area extent (hectares).		
4. Convert irrigation channels into pressurized pipelines in order to enhance the distribution efficiency of the districts Alto e basso Scicli and Alto e Basso Cava D'Aliga.		
5. Connect the S. Rosalia reservoir with the irrigation district of "Scicli". The irrigation network of "Castelluccio-Mussillo" could be connected with the irrigation network directly supplied by the reservoir through the "Scicli" tank. The action aimed to directly supply the irrigation district "Spinazza" avoiding water lifting from the Irminio delta.		
Reference standards	Agents Involved	Estimated time/frequency
<ul style="list-style-type: none"> - Law 152/2006, implementing the WFD 2000/60/CE - Rural Development Programme for Sicily 2007-2013. - Plan of measures for improving the financing of the agricultural sector. 	<ul style="list-style-type: none"> - European Union - Sicilian Region - Irrigation <i>Consortium</i>. 	Prompt: 2013 (expected time)
Priority	Economic estimate	Monitoring Indicator
High	Not estimated	Increase of the irrigated area; improvement of water distribution efficiency
Execution Control	Observations	
Pending	Through this project are specified the actions to be taken in response to the recommendation to define measures of saving in water consumption for agricultural use.	

ACTION PROGRAM 1.2. OPTIMIZATION OF WATER USE IN AGRICULTURE		
PROJECT 1.2.2. MANUAL OF GOOD PRACTICE FOR SAVING WATER IN AGRICULTURE		Date: Oct.-2011
Purpose / Description		
<p>The irrigation area supplied by the Irminio River is mostly managed by the public <i>Consortium</i> of Ragusa. The area needs of a substantial modernization of the irrigation systems both at <i>Consortium</i> and farm spatial scale. This modernization is focused on the reduction of water consumption and on the improvement of the irrigation methods.</p> <p>In the previous project (1.2.1) we have examined the main actions to obtain this improvement at <i>Consortium</i> level.</p> <p>This action is addressed to transfer at the farmers information and technology to enhance their way to irrigated.</p>		
Action to		
1. Study of irrigation systems in the districts supplied by the Irminio River and characterization by crop type. Analysis of basic information on the actual demand of the crop, control systems of resources, types of irrigation systems, best available techniques, amount of water consumption compared to the unit area irrigated.		
2. Propose improvements in the irrigation systems and farming practices, including the selection of crop types more resistant to water stress.		
3. Write, publish and promote the Manual of Good Practice for Saving Water in the Agricultural sector of the study area.		
4. Establish measures to replace out-of-date irrigation systems and use monitoring tools in supply, depending on priority and feasibility, through the measures set out in section 1.2.1. "Infrastructural operations for increasing water availability in agriculture".		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> - Law 152/2006, implementing the WFD 2000/60/CE - Rural Development Programme for Sicily 2007-2013. - Plan of measures for improving the financing of the agricultural sector. 	<ul style="list-style-type: none"> - European Union - Sicilian Region - Irrigation <i>Consortium</i>. 	Continued: continuously
Priority	Economic estimate	Monitoring Indicator
High	Not estimated	water saving measures; deficit irrigation strategies
Execution Control	Observations	
Pending	Through this project are specified the actions to be taken at farmer level in order to define measures of saving water consumption for agricultural use.	

ACTION PROGRAM 1.2. OPTIMIZATION OF WATER USE IN AGRICULTURE		
PROJECT 1.2.3. PROMOTING THE REUSE OF RECLAIMED WASTEWATER.		Date: Oct.-2011
Purpose / Description		
<p>Wastewater reuse (WWR) for irrigation is not yet fully developed, notwithstanding the effort for planning this practice and the high potential of WWR with relevant benefit both on watercourse reclamation and the increase of available water resources. According to the survey (CSEI, 2004) about 20 Hm³/year of reclaimed water could be available for the whole province with a total investments costs of about 60 Million of euro. Particularly, in the catchment of river Irmínio about 5.500.000 m³ per year of treated wastewater could be actually used, about 186.5000 m³ from Giarratana WWTP e 5.325.000 m³ from the WWTPs of Ragusa and its industrial area. The effluent disposal on Irmínio river has relevant effects on water quality as reported by monitoring activity of ARPA. The disposal of Giarratana WWTP, notwithstanding the low WW rate (mean value about 4 l/s) heavily affect quality of surface waters upstream the S. Rosalia reservoir, mainly during dry period (april-september) when the Irmínio is prevalent fed by effluents of Giarratana WWTP. The effluents of WWTPs of Ragusa and its industrial area (mean flow rate about 170 l/s), located in Contrada Luisia downstream the S. Rosalia reservoir, have a strong impact on water quality of Irmínio river up to the mouth, and in some cases affect the use for irrigation. Close to the mouth of Irmínio river is located the WWTP of Marina di Ragusa, the coastal hamlet of Ragusa. This WWTP, located about 70 m a.s.l., discharged treated effluents (a total volume of about 440.000 m³/year directly to the sea through a submarine pipelines. The periodically malfunctioning of this WWTP, mainly due to the high variabilità of organic and hydraulic loads, strongly affect the quality of sea water and the bathing close to the coastlines. All the above WWTPs have a high potential for WWR for irrigation both agricultural and landscape, but they need an upgrading in order to achieve both the standard according to the L.D no. 152/2006 for disposal in watercourses and the stringent ones for WWR according to the M.D. 185/2003. The upgrading of WWTPs of Giarratana and Ragusa is reported in project 2.1.1. In Irmínio catchment, the indirect WWR is actually practised since a long time, infact WW of Ragusa discharged in the river are withdrawn, several kilometers downstream for irrigation purposes by "Consorzio di Bonifica di Ragusa" and it is distributed by network Mussillo-Castelluccio. However, WWR systems in the Irmínio catchment should be properly planned and designed in order to improve the river water quality. The aquifer recharge with TWW could be a very appealing solution particularly in the coastal area close to the mouth, in order to control the sea intrusion caused by the overexploitation of groundwater resources, however according the L.D.152/2006 this useful option is not allowed in Italy. This Project includes the implementation of tertiary treatment downstreams the WWTPS by the construction of natural systems such us constructed wetland (Giarratana) or deep lagooning and WW reservoirs in the case of Ragusa and Marina di Ragusa. Wastewater should be reused mainly for agriculture, other purposes particularly in the coastal area should be the irrigation of gardens, parks, etc. It is also necessary to build a water network in order to distribute the reclaimed water of Marina di Ragusa and Giarratana. In the case of Ragusa, indirect WWR is suggested following a fully upgrading of WWTP (both municipal and industrial). This project is established as a complementary measure to the project 2.1.1. implementation Stations Wastewater Treatment (WWTP) so that consideration of the reuse of wastewater, is not conceivable without the upgrading of WWTPs and the assurance of their good management, especially in the municipalities of Ragusa and Marina di Ragusa where WWR is absolutely need. Industrial wastewater is conveyed to one of the Ragusa WWTPs which has a treatment system that actually is not able to achieve the standards requested by L.D no. 152/2006 issued according the UE Directive no. 271/91. This inefficiency of WWTP strongly affect the water quality of Irmínio river and increase the health risks of WWR for the users (farmers) and the potential consumers. The aim of this action is promote the WW reuse for agriculture in order to save conventional water resources and reduce the impact on Irmínio water quality and quantity. WW reuse in this area should be considered as an opportunity to reduce chemical fertilizers application, to save conventional water, than as a tool to achieve additional water resources</p>		
Action to		
1. Planning and design of WW reuse systems of Giarratana, Ragusa and Marina di Ragusa: evaluation of amount of reclaimed water to be used for irrigation by direct or undirect reuse; delimitation of area where reclaimed water can be used and design network for their distribution; evaluation of BAT to reclaim water for reuse according the Italian M.D.no. 185/2003.		
2. Health risks analyses of reclaimed water used for irrigation and definition of monitoring protocol of WW reuse effects on soil, aquifers, crops, users and consumers.		
3. Technical meeting among officers of Province of Ragusa that have competence in the field of water resources management and monitoring		
4. Information campaign among users and consumers in order to increase the social acceptance of WW reuse		
Reference standards	Agents Involved	Estimated time / frequency
Italian Decree of 185/2003, which establishes the legal framework for the reuse of treated water.	<ul style="list-style-type: none"> - City Council of Ragusa and Giarratana - ARPA - Water Agency for the Province of Ragusa (ATO Idrico di Ragusa) - Sicilian Region <i>Department for Water and Wastes – Department for Territory and</i> 	Prompt: 2013 (expected time)

<i>Environment</i>		
Priority	Economic estimate	Monitoring Indicator
High	<p>WW reuse system of Giarratana 1.216.000 € WW reuse system of Ragusa 3.980.000 € (including the WWTP upgrading); WW reuse system of Marina di Ragusa 3.050.000 € (including the WWTP upgrading);</p> <p>The estimated costs are referred to 2004 and not included VAT. The above estimate include the costs related also to WWTP upgrading</p>	<p>% of TWW water used</p> <p>Tons/year of BOD not discharged in the Irminio river;</p> <p>Tons of nutrients (N, P and K) potentially recovered by reclaimed water</p>
Execution Control	Observations	
pending	<p>Through this project are specified the actions to be taken in response to the recommendation to define measures of saving freshwater and to reduce the pollution of Irminio river.</p>	

ACTION PROGRAM 1.3 OPTIMIZATION OF WATER MANAGEMENT

Content

Agreements between local authorities and public or private companies managing water resources for both civil and irrigation sectors are highly requested in the area under study.

Several reports, meetings, studies have evidenced the importance to interconnect the distribution networks and the water sources (both groundwater as well as surface water) in the Irminio watershed area.

Objectives

The main objectives are:

- to release new water resources,
- to free water sources
- to optimize the use of the S. Rosalia reservoir stored availability.

Proposed Projects

Project .1.3.1. Water management agreement among different local authorities

PROJECT 1.3.1. WATER MANAGEMENT AGREEMENT AMONG DIFFERENT LOCAL AUTHORITIES		Date: Oct.-2011
Purpose / Description		
<p>The spatial distribution of both civil and irrigation water is the result of a long and complex series of transformation activities, public and private, often interconnected, dispersed in the study area. The main water sources for the area and the different users is the Irminio River and the S. Rosalia reservoir built on it. Recent studies, focused on the optimization of water distribution to fulfil as much as possible the users requirements, have indicated actions and interconnections between civil and irrigation networks (and thus between the local authorities managed the systems) to reach this objective. The proposed actions are evidenced in the follow:</p>		
Action to		
<p>- Interconnect S. Rosalia reservoir and the irrigation district of Scicli. In the proposal, two storage tanks "Ragusa" (located on the hydrological right of the Irminio River) and "Scicli" (located on the hydrological left of the Irminio River) will interconnect the irrigation networks "Castelluccio-Mussillo" and "S. Rosalia". This action could allow to supply directly the irrigation sub-district "Spinazza" without appealing to water lifting from the Irminio River delta.</p>		
<p>- Disuse the numerous wells (in most cases not in operation) supplying the irrigation district of "Scicli" and substitute them with the S. Rosalia reservoir storage water.</p>		
<p>- Derive 40 L s⁻¹ from "Giummarra spring" (irrigation source) to the existing urban reservoir "Castellana", located close to the WE border of Marina di Ragusa village. The action aims, at short-term, at increasing water availability for Marina di Ragusa, waiting for the bigger and more expensive infrastructural works, as foreseen in the action 1.1.2.</p>		
<p>- Use the S. Rosalia reservoir storage water to supply "Marina di Ragusa" and the rural villages not served by the civil water supply networks. With this action, some groundwater sources of poor quality could be disused (action 1.1.2).</p>		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> ▪ Legislative Decree 152/2006 implementing the Water Framework Directive (Directive 2000/60/CE) ▪ Legislative Decree 30/2009 implementing the Directive 2006/118/EC concerning the classification and monitoring of groundwater bodies. ▪ European directive on water drought. 	<ul style="list-style-type: none"> - European Union - European Union - Local Water Authority (ATO) 	<p>Prompt: 2013 (expected time)</p>
Priority	Economic estimate	Monitoring Indicator
high	Not estimated	Improvement of water distribution network; increase water availability for civil and irrigation sectors; reduce water shortage conditions in coastal zones.
Execution Control	Observations	
Pending	Through this project are specified the actions to be taken in order to optimize the use and the interconnection of water sources between irrigation and civil sectors. These actions aim at promoting agreements between the local authorities acting in this field.	

STRATEGY 2: POLLUTION PREVENTION AND CONTROL OF IMPACTS ON WATER RESOURCES

Human activities due to increased urban concentration, agricultural and zootechnical development in recent decades, are exerting a significant impact on water resources, rivers being particularly vulnerable to contamination, and consequently, the quality degradation of its water and biodiversity loss.

For this reason, we develop a series of action programs aimed at reducing water pollution and impacts on water resources. These programs are:

Action Program 2.1. Prevention of pollution by dumping of urban waste water.

Action Program 2.2. Prevention of pollution from agricultural and zootechnical activities.

ACTION PROGRAM 2.1. PREVENTION OF POLLUTION BY DUMPING OF URBAN WASTEWATER.

Content

Wastewater from urban treatment plants of Giarratana and Ragusa municipalities (respectively with 3.200 and 72.800 inhabitants and of the industrial area of Ragusa (ASI), are discharged in the Irmínio River. In particular, the WWTP of Giarratana discharging up the Santa Rosalia dam, can determine a risk for the potable use of the water. The WWTPs of Ragusa (urban and industrial) discharges in the Lusía district, making really worse the quality of the water in the river. Both the WWTP do not respect the limit fixed in the MD 152/2006, table 1 annex 5, for nutrients concentration (nitrogen and phosphorus). If the river will be classified as "sensible areas" the limit for the discharges will be even more restrict (table 2 annex 5 MD 152/2006). Moreover, some main sewer do not connected to the WWTP discharge in some affluents (at hydraulic right) of the Irmínio river (San Leonardo and Puzzo). Moreover, an other discharge from the industrial area reach the river in the Lusía district down the WWTP of Ragusa.

Objectives

- Adequate the discharge of treated urban (from Giarratana and Ragusa) and ASI wastewater to the MD 152/2006.
- Assess and control the discharges to the river of main sewer not connected to the WWTP.
- Promote measures to trap and remove non point source pollutants.

Proposed Projects

- 2.1.1 Project. Upgrading of WWTPs
- 2.1.2 Project. Assessment and control of discharges of dispersed villages.
- 2.1.3 Project. Creation of riparian buffer strips along the river

PROGRAMME OF ACTION 2.1. PREVENTION OF POLLUTION BY DUMPING OF URBAN WASTEWATER		
PROJECT 2.1.1. UPGRADING OF WWTPs		Date: Oct.-2011
Purpose / Description		
<p>Wastewater from urban treatment plants of Giarratana and Ragusa municipalities (respectively with 3.200 and 72.800 inhabitants and of the industrial area of Ragusa (ASI), are discharged in the Irmínio River. Both the WWTPs are activated sludge type and do not respect the limit fixed in the MD 152/2006, table 1 annex 5, for nutrients concentration (nitrogen and phosphorus). If the river will be classified as "sensible areas" the limit for the discharges will be even more restrict (table 2 annex 5 MD 152/2006). In order to adequate the WWTP discharges to the MD 152/2006 we propose an upgrade of both WWTP. In particular, we propose to implement natural treatment technologies (storage reservoirs, constructed wetlands and lagooning) as refining treatment in order to treat the wastewater before to discharge it into to the river or to allow the agricultural reuse. In particular, natural treatment technologies represent a more appropriate and sustainable solution for wastewater treatment of small-medium communities because of climatic conditions, geo-morphological features and land availability & cost.</p>		
Action to		
1. Implementation of a constructed wetland as refining treatment down the WWTP of Giarratana		
2. Implementation of a lagooning as refining treatment down the WWTP of Ragusa		
3. Project execution and commissioning.		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> ▪ Legislative Decree 152/2006 for discharges limits ▪ Decree of the Ministry of the Environment No. 131/2008 defining the procedure for detection and typing of surface water bodies and procedures for risk assessment ▪ Decree of the Ministry of the Environment 56/2009 laying down the rules relating to network monitoring of surface water bodies. ▪ In accordance with Article 5 of WFD, Sicily Region established a surveillance monitoring programme and an operational monitoring programme for each category of water body. Monitoring Plan will be for a six-year period, from 2010 to 2015. 	<ul style="list-style-type: none"> - Majors of the involved municipalities - Manager of ASI of Ragusa. 	Prompt: 2013 (expected time)
Priority	Economic estimate	Monitoring Indicator
High	0.62M€ plus VAT for Giarratana 2.50 M€ plus VAT for Ragusa	Ecological Status of surface water.
Execution Control		Observations
Initiated		Through this project the actions to be taken in response to the recommendation to control discharges of urban wastewater are specified.

PROGRAMME OF ACTION 2.1. PREVENTION OF POLLUTION BY DUMPING OF URBAN WASTEWATER		
PROJECT 2.1.2. ASSESSMENT AND CONTROL OF DISCHARGES OF DISPERSED VILLAGES.		Date: Oct.-2011
Purpose / Description		
<p>Considering the "Population served by WWTP in the Irminio basin" indicator and the total population in the basin, we have that a few thousand of people are not served by WWTP. This causes poor control of urban effluents and untreated sewage and consequently increases the contamination of groundwater and stream resources. Therefore the scattered villages in the Irminio basin will be identified in order to prevent pollution episodes and improve quality of life of people in the population involved. Similarly, we propose a Monitoring and Control action in order to verify the legal compliance of discharges detected and to establish a priority order. Moreover, we propose natural treatments as refining treatment for small communities. This technology could also permit the increase of treated wastewater reuse in the basin-</p>		
Action to		
1. Diagnosis of the situation of waste and untreated sewage in dispersed population centres.		
2. Defining priorities for urban waste water discharges potentially more polluting, depending on the population, degree of purification required, type of wastewater, economic limitations, etc. and analysis of the level of environmental pollution.		
3. Preparation and adoption of the measures to take, based on the volume and characteristics of discharges considered the best techniques for small communities scattered and viability. Between these measures can be applied natural treatments such as constructed wetland.		
4. Establishing controls and samples of urban wastewater discharges to ensure compliance with the law of the receiving environment.		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> ▪ Legislative Decree 152/2006 for discharges limits ▪ Decree of the Ministry of the Environment No. 131/2008 defining the procedure for detection and typing of surface water bodies and procedures for risk assessment ▪ Decree of the Ministry of the Environment 56/2009 laying down the rules relating to network monitoring of surface water bodies. ▪ In accordance with Article 5 of WFD, Sicily Region established a surveillance monitoring programme and an operational monitoring programme for each category of water body. Monitoring Plan will be for a six-year period, from 2010 to 2015. 	- Majors of the involved municipalities	Prompt: 2013 (expected time)
Priority	Economic estimate	Monitoring Indicator
Media	Not available	Population served by WWTP in the Irminio basin and Population in the basin.
Execution Control	Observations	
Pending	Through this project are specified the actions to be taken in response to the recommendation to control discharges of urban wastewater. Just as the strategy of operation of treatment plants in scattered villages.	

PROGRAMME OF ACTION 2.1. PREVENTION OF POLLUTION BY DUMPING OF URBAN WASTEWATER		
PROJECT 2.1.3. CREATION OF RIPARIAN BUFFER STRIPS ALONG THE RIVER.		Date: Oct.-2011
Purpose / Description		
<p>The Irminio river has a fairly good water quality down the Santa Rosalia dam; nevertheless, in correspondence of S. Leonardo and San Domenica quarry and Misericordia quarry affluents, the quality gets worse. These quarries drain most of the runoff of Ragusa and part of the not treated wastewater; for this reason the pollution load is very high in this section, worsening the water quality of the river, especially during the dry period. We propose to realize some riparian buffer strips along the river or to implement a constructed wetland. The area should be between the quarries and the "Ponte Ferro" site. A riparian buffer strip is a linear band of permanent vegetation adjacent to an aquatic system primarily intended to maintain or improve water quality by trapping and removing various non-point source pollutants (e.g., contaminants from herbicides and pesticides; nutrients from fertilizers; and sediment from upland soils) from both overland and shallow subsurface flow. The buffer design will take into account needed width, vegetation assemblage, layout, slope of adjacent lands, length and protection of water quality are also key design parameters.</p>		
Action to		
1. To localize all sources of pollution		
2. To build a GIS that helps to place buffer in the landscape, taking into account morphology and areas with high or low potential soil erosion		
3. To design length and width and to define vegetation characteristics		
4. To define a plan of maintenance		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> ▪ Legislative Decree 152/2006 for discharges limits ▪ Decree of the Ministry of the Environment No. 131/2008 defining the procedure for detection and typing of surface water bodies and procedures for risk assessment ▪ Decree of the Ministry of the Environment 56/2009 laying down the rules relating to network monitoring of surface water bodies. ▪ In accordance with Article 5 of WFD, Sicily Region established a surveillance monitoring programme and an operational monitoring programme for each category of water body. Monitoring Plan will be for a six-year period, from 2010 to 2015. 	<ul style="list-style-type: none"> ▪ - Majors of the involved municipalities ▪ - Head of the Ragusa province ▪ - Regional Forestry Corps 	Prompt: 2015 (expected time)
Priority	Economic estimate	Monitoring Indicator
Media	Considering a constructed wetland of 10-12 ha to treat a 0.30 m ³ /s of flow (part of the Irminio river) the cost is about 7.00 M€ excluding VAT	Ecological Status of surface water.
Execution Control		Observations
Pending		Through this project are specified the actions to be taken in response to the recommendation to control discharges of urban wastewater.

ACTION PROGRAM 2.2: PREVENTION OF POLLUTION FROM AGRICULTURAL AND ZOOTECNICAL ACTIVITIES	
Content	
	The pressure of intensive agricultural and zootecnical activities on the Irminio River basin is evaluated in terms of organic matter, fertilizers, pesticides and phytochemicals founded in the Irminio River. Monitoring campaigns have evidenced high levels of total nitrogen (> 900,000.00 t/year) and organic matter (>1,500 t/year) from zootecnical activities spread in the Irminio watershed area. Total fertilizers released in surface and ground water from intensive agriculture are in the order of 904.47 for total nitrogen and 285.04 for total phosphorous t/year thus contributing to spoil the natural environment of the River.
Objectives	
	This action aims at reducing the pressure of intensive agricultural and zootecnical activities on the Irminio River basin. The proposed actions include the organization of awakening campaigns to inform the farmers about the risks related to the overabundant use of fertilizers, pesticides and phytochemicals. Interactions between the different subjects (local authorities for the environmental protections) will be promoted by the organization of meeting and seminars. Runoff velocity and non point pollution transport can be reduced drastically by planting vegetative hedges, bunch grass, or shrubs on the contour at regular intervals. These hedges can increase the time for water to infiltrate into the soil, and facilitate sedimentation and deposition of pollution material by reducing the carrying capacity of the overland flow and by trapping the particles. Measures acting to reduce and/or prevent the River pollution due to the above mentioned activities, mainly due the untreated disposal of liquiid wastes of zootecnical activities, will be planned, preferably by the use of natural (lagooning, constructed wetlands, etc...) treatment systems or by a control activity on the disposal of manure on agricultural fields.
Proposed Projects	
	Project 2.2.1. Improvement of nutrient and pesticides management in agricultural farms Project 2.2.2 Improvement of waste discharges from zootecnical farms

PROJECT 2.2.1 OPTIMAL MANAGEMENT OF NUTRIENT AND PESTICIDES FROM INTENSIVE AGRICULTURE		Date: Oct.-2011
Purpose / Description		
This action aims at spreading information and knowledge about the Irminio River pressure (in terms of organic load, pesticides, phytochemicals, fertilizers) due to intensive agriculture. The project would create a motivated interaction between the different subjects (local authorities) acting for the environmental protection of the Irminio basin area. Guidelines will be realized to advise the farmers about the tolerable range of applied nutrient, organic load, phytochemicals, etc.. avoiding the risk of River pollution.		
Action to		
1. Identify the sources of pollution from intensive agriculture, discharging in the Irminio River		
2. Promote the reuse of municipal treated wastewater to reduce the need for fertilizers of the intensive agriculture in the basin		
3. Prepare guidelines advising farmers about the pollution risk of the River due to intensive agricultural activities		
3. Sign agreements with environmental bodies (i.e. environmental protection agency) and local authorities (municipality, Province) through which they get bids to prevent the River pollution		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> - Law 152/2006, implementing the WFD 2000/60/CE - Ministerial Decree 185/2003, for treated wastewater reuse - Article 5 of WFD, Sicily Region established a surveillance monitoring programme and a operational monitoring programme for each category of water body 	<ul style="list-style-type: none"> European Union Ministry of the Environment and Councillor of Environment and Land Planning European Union 	Prompt: 2015 (expected time)
Priority	Economic estimate	Monitoring Indicator
High	Not estimated	Reduction of pollution risk from intensive agriculture
Execution Control		Observations
Pending		This project aims at putting in evidence the problem of pollution from intensive agriculture in the Irminio River and at setting up strategies to control and prevent this issue.

PROJECT 2.2.2 REDUCTION OF WASTE DISCHARGES FROM ZOOTECNICAL ACTIVITIES		Date: Oct.-2011
Purpose / Description		
The project aims to promote the use of treatment systems (natural and/or intensive) to reduce the organic and nutrient wastewater loads from zootechnical activities of the study-area		
Action to		
1. Select the best operation modality to treat wastewater from zootechnical activities; conventional (classic aerobic systems, anaerobic systems, membrane filtration techniques) or natural (lagooning, constructed wetland, storage reservoir) may be employed to reach medium-high percentages of BOD, total N and total P removal. The technique selection depends on quantitative and qualitative wastewater features.		
2. Recycle treated wastewater from zootechnical activities within the industry; treated wastewater may be employed as washing water, or sanitary water.		
3. Promote the livestock in-farm housing to avoid isolated pollution sources.		
Reference standards	Agents Involved	Estimated time / frequency
- Legislative Decree 152/2006 implementing the Water Framework Directive (Directive 2000/60/CE) - Ministerial Decree 185/2003, for treated wastewater reuse - art. 21 of L.D. 152/2006; Sicilian regulation on the agronomical use of agro-food industries wastewater	European Union Italian Ministry of the Environment European Union – Sicilian Region	Prompt: 2015 (expected time)
Priority	Economic estimate	Monitoring Indicator
High	Not estimated	Reduce pressure from zootechnical activities on the Irminio river basin
Execution Control	Observations	
Pending	This project aims at introducing treatment systems (conventional or natural) to reduce the organic load and the total fertilizers discharges from zootechnical activities.	

STRATEGY 3: IMPROVEMENT OF LAND AND RISK MANAGEMENT ASSESSMENT

The strategy, aims at increasing the sustainable use of the Irminio River basin by the closer municipality and at reducing the hydrological risk. The first objective may be reached by spreading information on the River natural environment, by supporting school community visits at the River, by updating the services, including a new range of leisure, sport and culture related to water environment. In order to reach the second objective we propose the control of authorities in order to enforce the plans available in the basin.

Action Program 3.1. Enhancement of the reserve and sites of community importance

Action Program 3.2 Application of available plans in the Irminio basin.

ACTION PROGRAM 3.1 ENHANCEMENT OF THE RESERVE AND SITES OF COMMUNITY IMPORTANCE	
Content	
	In the Irminio river basin there are the "Irminio river natural-forest reserve" (135 ha close to the mouth) and Sites of Community Importance.
Objectives	
	The main objective is to increase the sustainable use of these areas.
Proposed Projects	
	Project 3.1.1. Creating a "green corridor" among reserve and Sites of Community Importance.
	Project 3.1.2. Promotion of sports and leisure activities in the river.
	Project 3.1.3. Information and promotion campaign of the basin.

ACTION PROGRAM 3.1. ENHANCEMENT OF THE RESERVE AND SITES OF COMMUNITY IMPORTANCE.		
PROJECT 3.1.1. CREATING A "GREEN CORRIDOR" AMONG THE RESERVE AND SITES OF COMMUNITY IMPORTANCE		Date: Oct. -2011
Purpose / Description		
<p>A "Green Corridor" is a strip of vegetation adjacent to an aquatic system that connects two or more larger patches of vegetation (i.e., habitat) and through which an organism will likely move over time..</p> <p>The creation of the "Green Corridor" that will join the reserve in the mouth of the Irmínio river and the sites of community importance located along the rivers from the Santa Rosalia dam to the south of Ragusa.</p> <p>Wildlife habitat and movement corridors in riparian zones are also an important consideration when determining widths. Appropriate designs for species conservation depends on several factors, including type of stream and taxon of concern</p> <p>Recommended widths for ecological concerns in buffer strips typically are much wider than those recommended for water quality concerns, often exceeding 100m in width</p>		
Action to		
1. Design of "Green Corridor" between the reserve and sites of community importance by using a GIS		
2. Determination of the measures necessary to adapt the "Green Corridor", including demarcation, expropriation, cleaning the area, uncontrolled disposal of waste deposits, clearing, improvement of the pavement, signage, revegetation, etc.		
3. Implementation of the actions defined for the adaptation of "Green Corridor" (paths, rest and recreation areas, bike lanes, pedestrian bridges, etc).		
4. Information and awareness campaign on the use of "Green Corridor."		
Reference standards	Agents Involved	Estimated time / frequency
Urban and town planning legislation in force. Legislative Decree 152/2006 implementing the Water Framework Directive (Directive 2000/60/CE) Decree of the Ministry of the Environment No. 131/2008 Decree of the Ministry of the Environment 56/2009	<ul style="list-style-type: none"> - Ragusa and Giarratana municipalities - Department of the Environment. - Department of Public Works. - Ministry of Culture. 	Prompt: 2015 (expected time)
Priority	Economic estimate	Monitoring Indicator
High		Km length of the "Green Corridor" created.
Execution Control		Observations
Pending		Through this project seeks to address the strategies for creating recreational spaces associated with the river, offering cultural, sporting and leisure larger.

PROJECT 3.1.2. PROMOTION OF SPORTS AND LEISURE ACTIVITIES IN THE RIVER IRMINIO		Date: Oct.-2011
Purpose / Description		
<p>Notwithstanding the presence of degraded areas, the environment of the Irminio watershed is still of high value and may allow the promotion of sports and leisure activities, mainly related to fishing.</p> <p>The main objective of the project is to evidence the improvement actions to make available for sport activities the Irminio River. This action could allow the citizens participation in different sport, and involve different areas around the River.</p>		
Action to		
1. Increase the operation efficiency of municipal wastewater treatment plants (WWTP _s) insisting in the Irminio watershed area in order to avoid the discharge of waste water with high pollution level. Promote the agriculture reuse of the treated wastewater.		
2. Remove extra discharges not directly collected by the public sewer system.		
3. Remove all the obstacles to the free fish circulation within the River (i.e. bulkheads, obstructions, weirs, etc...)		
4. Allow the minimum life flow of the River;		
5. Reduce the withdrawals for civil and irrigation purposes from the River;		
6. Qualify the River vegetation and increase the forest heritage of the watershed side;		
7. Increase the presence in the River of particular fish species (i.e. macrostigma trout, etc...)		
8. Sign agreements with sporting bodies such as the Councillor of Tourism, Trade and Sport of Ragusa Province, through which they get bids for the creation of sporting events.		
9. Organize sports days for adults and children.		
10. Create a catalogue or guide to indicate the existing sports activities.		
Reference standards	Agents Involved	Estimated time / frequency
<ul style="list-style-type: none"> - Law 152/2006, implementing the WFD 2000/60/CE - Ministerial Decree 185/2003, for treated wastewater reuse - Law 164/1998, implementing actions focusing on fishing and aquaculture 	<ul style="list-style-type: none"> European Union Councillor of the Environment Councillor of Tourism 	Prompt: expected time not valuable
Priority	Economic estimate	Monitoring Indicator
Media	Not estimated	Number of events people participating in recreational and sports activities.
Execution Control	Observations	
Pending	This project seeks to address the strategies for creating recreational spaces associated with the river.	

PROJECT 3.1.3 INFORMATION AND PROMOTION CAMPAIGN OF THE IRMINIO BASIN		Date: Oct.-2011
Purpose / Description		
The project aims to promote information, knowledge and fruition of the Irminio River basin. Citizens will be trained to respect the River's areas and to improve the conservation of the natural environment. The action is addressed to both population and school communities.		
Action to		
1. Prepare, publish and spread a guide of the Irminio River basin, which includes the main characteristics of the natural environment, information about the existing vegetation, knowledge on the different uses of the River water (civil, agriculture, industrial, environmental, etc...) and on services and activities promoted in the River area.		
2. Organize seminars, meetings to discuss about the main problems, attractions, activities promoted in the watershed.		
3. Organize a supporting group involved in the maintenance and enhancement of the irminio River and watershed within the municipality of Ragusa. The group should interact with all the subjects (public and private) involved in the River management.		
Reference standards	Agents Involved	Estimated time / frequency
- Legislative Decree 152/2006 implementing the Water Framework Directive (Directive 2000/60/CE) - Decree of the Ministry of the Environment 56/2009 laying down the rules relating to network monitoring of surface water bodies.	European Union Councillor of the Environment Councillor of Education	Continued: annual
Priority	Economic estimate	Monitoring Indicator
Media	Not estimated	Activities conducted per year to increase the knowledge on the Irminio watershed area
Execution Control		Observations
Pending		This project aims at improving knowledge on the Irminio River watershed problems, attractions and activities carried out.

ACTION PROGRAM 3.2 APPLICATION OF AVAILABLE PLANS IN THE IRMINIO BASIN	
Content	In the basin there is an hydrological risk related to the presence of the Santa Rosalia dam. Moreover, an increase of population in the Ragusa municipality and a decrease in the Giarratana municipality can be observed.
Objectives	The main objective is to reduce the hydrological risk and in general to push authorities in order to enforce available plans in the area.
Proposed Projects	<p>Project 3.2.1 Control of the urban plan</p> <p>Project 3.2.2 Application of the hydrological structure plan of the basin</p>

ACTION PROGRAM 3.2 APPLICATION OF AVAILABLE PLANS IN THE IRMINIO BASIN		
PROJECT 3.2.1 CONTROL OF THE URBAN PLAN		Date: Oct.-2011
Purpose / Description		
<p>Considering the indicator "population", an increasing of the population in Ragusa and a decreasing in Giarratana urban areas, can be observed. This gives a positive trend in the population of the Irminio river basis equal to 1.7% in 2001 (respect to the Census of 1991) and 5.0 % in 2010 (respect to the Census of 2001). This phenomena can influence also the economy of the basin. The problem was highlighted in the plans that drive the land use in the Ragusa Province. In particular, most part of the Irminio river basin is inserted in the "Mountain areas plan" of the "Provincial Town-and-country Plan" approved in 2003. The PTP gives some indications that also the Urban plan of the single municipality has to follow. The Urban plan of Ragusa is under review</p>		
Action to		
The Urban plans of the municipalities in the basin (Giarratana and Ragusa) should take into account the indication of the PTP		
The authorities should control people in order to enforce the plans in the area		
Reference standards	Agents Involved	Estimated time / frequency
Regional Law n.9 /1986	Councillor of the Environment Municipalities Province of Ragusa	Prompt: 2012 (to be updated)
Priority	Economic estimate	Monitoring Indicator
Media	Not estimated	Population Land use Economy
Execution Control	Observations	
Pending	This project aims to improve the socio-economic situation of the basin	

ACTION PROGRAM 3.2 APPLICATION OF AVAILABLE PLANS IN THE IRMINIO BASIN		
PROJECT 3.2.2 APPLICATION OF THE HYDROGEOLOGICAL STRUCTURE PLAN OF THE BASIN		Date: Oct.-2011
Purpose / Description		
<p>In the hydrogeological structure plan of the Irminio river basin the areas where there is a overflooding risk are reported . This includes some areas of the Giarratana municipality. Moreover the study on the effects of the artificial flood propagation due to the working of the discharges of the Santa Rosalia dam and the potential failure risk was compiled by the Sicilian Water Supply Agency in 1997. The map of overflooding risk related to the dam is reported also in the hydrogeological structure plan. In the plan some actions in order to reduce the risk are identified. We propose the following actions:</p>		
Action to		
Cooperation between authorities in order to enforce the hydrogeological structure plan in the area		
Capacity building and exchange Know how in flood management		
Information campaigns to citizens		
Emergency response plans		
Reference standards	Agents Involved	Estimated time / frequency
L. 183/1989 D.L. 180/98 L. 267/98 D.L. 279/2000 L. 365/2000	Councillor of the Environment Municipalities Province of Ragusa	Continued: annual
Priority	Economic estimate	Monitoring Indicator
Media	Not estimated	Applications of plans Controls
Execution Control		Observations
Pending		This project aims to reduce the hydrological risk