Contractor: Hellenic Centre for Marine Research

JRC-IRP No.937804

Lot 9 Landscape elements for water retention (LWR) in a Mediterranean environment

Factsheet

A Large-Scale Nature-Based Solution in Agriculture for Sustainable Water Management: The Lake Karla case

Ioannis Panagopoulos and Elias Dimitriou

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General
National Id:
Greece_08
Site name:
Lake Karla Water Body (GR0816L000000002H)
Summary:
The project refers to a new Nature Based Solution (NBS) project in agriculture, a water retention project, the already established 'Karla' reservoir in Central Greece, a unique example at European scale, of a lake ecosystem which was dried and now is restored. The lake is located in a water scarce area and its water management is expected to maximize the efficiency of water provision in agriculture and biodiversity enhancement. The reconstructed Lake Karla serves as a multi-purpose project to combat water scarcity, increasing crop yield production and respective agricultural income in the surrounding area, securing the full coverage of the water supply needs of the closest city of Volos, improving the status of groundwater resources, developing a natural shelter for biodiversity and emerging recreation and touristic opportunities. The main success factors are the positive attitude of decision makers, the full support from stakeholders (mainly farmers) and the positive public perception. The construction and operation costs can be recovered to a high degree through the provision of the abovementioned services and an effective governance plan can ensure the sustainability of the project.

The in-depth description of the case study:
Final_Report_JRC-937804_HCMR.pdf
NUTS Code:
Θεσσαλία (Thessalia)
RBD code:
GR08
Transboundary: 0
Data provider: Yiannis Panagopoulos and Elias Dimitriou, HCMR
Source(s):
http://www.limnikarla.gr/en/
http://www.fdkarlas.gr/History.aspx
http://www.greekexperience.gr/portfolio-item/karla-lake/
NWRM(s) implemented in the case study:
http://nwrm.eu/measure/wetland-restoration-and-management
Longitude:
22.80 (22o46'47'' to 23o51'50'' E)
Latitude:
39.50 (39º26'49'' to 39º32'03' N)

Site Information
Climate zone: warm temperate dry
Mean rainfall: 560
Mean rainfall unit: mm/year
Average temperature: 16.3 ºC
Mean runoff: -

Mean runoff unit: -
Type: Case Study Info
Light or indepth?: In-depth

Monitoring maintenance
Monitoring impacts effects: 1
Monitoring location: Unknown
Monitoring parameters: Monitoring of water quantity and quality is supposed to be carried out by the Management authority of the Lake Karla.

Performance
Performance impact estimation method: Water budget (including natural inflows, outflows and water uses)
Performance impact estimation information: Water availability in the lake and water provision

Biophysical impacts
Information on retained water: The volume of retained water was increased due to the collection of runoff waters from the natural catchment and diversion of Pinios river flows into the reservoir
Information on increased water storage:
The lake (reservoir) increased the retaining of water for longer period enabling full water use and infiltration/percolation and recharge of aquifers. The capacity of the reservoir approaches 200 hm^3 of water.
Information on runoff reduction:
The measures improved the control of Pinios winter flows as the water volume of the river is reduced due to the diversion with the potential to decrease the intensity and frequency of winter floods downstream. Natural runoff from the surrounding streams is also well managed through its collection into the lake.
Water quality overall improvements:
Positive impact-WQ improvement
Information on Water quality overall improvements:
Groundwater salinization is decreased due to no abstractions (full irrigation from Lake Karla). Saltwater intrusion in the subsoil is decreased.
Soil quality overall soil improvements:
Positive impact-SQ improvement
Information on Soil quality overall soil improvements:
Rich soil formation in wetland borders, maintain soil fertility and stability all around the lake and resistance to saline water intrusion, avoid salinization, avoid salt water intrusion in the subsoil, enrich the aquifers increasing groundwater availability.

Lessons, risks, implications...
Key lessons:
The retention project is based on the principal of changing the area's morphology (constructing the reservoir and enhancing runoff trapping from precipitation, surrounding streams and Pinios river). Pinios river peak flows are slightly attenuated, flooding events and land inundation around

the lake's area are avoided after the construction of the project. Groundwater recharge is increased. The ability of the project to address water scarcity in the area through the elimination of groundwater over-exploitation, while raising environmental quality at the same time, is a key success factor. Moreover, the project created a pleasant natural environment. The lake acts as a shelter for a variety of species (fish and birds). Residents and tourists can now use the area for recreation (walking, biking, sightseeing, birdwatching) and interaction with nature. This has a great value in the area.

Success factor(s):

Type	Role	Comments
Attitude of decision makers	main factor	High willingness to complete and operate the project
Attitude of relevant stakeholders	main factor	The active involvement of stakeholders, especially the Management Body of Lake Karla and local farmers was of critical importance
First operation of the project	main factor	The ability of the project to meet the irrigation needs and the desired water productivity during its first operation year (2019) was a key success factor. This is also the case for the presence of numerous bird and fish species in the lake the last years.

Financing:

Type	Comments
EU-funds: 3rd Community Support Framework (CSF)	Operational Programme "Environment"
National funds: National Strategic Reference Framework (NSRF) 2007-2013	Operational Programme of the Region of Thessaly structural funds

Barrier:

Type	Role	Comments
Other	main barrier	The main implementation barrier was the delay in the completion of secondary works around the reservoir such as irrigation networks
Other	secondary barrier	Specific tourism investments such as viewpoints and information spots have been vandalized once

Driver:

Type	Role	Comments
Other	main driver	Sustainable agriculture was the main driver. Effective and efficient irrigation with adequate water quantities that ensure agricultural income, maintenance of the local population and motivation of population return

Financing share:

Socio-economic

Direct benefits information:

The direct benefits include combating water scarcity, increasing crop yield production and agricultural income by securing irrigation water needs, securing urban water needs, developing a natural shelter for biodiversity and emerging recreation and touristic opportunities.

Ancillary benefits information:

Ancillary benefits include the increase of infiltration / percolation and recharge of aquifers; this water can be used for different purposes, the reduction of the flood risk, the mitigation of soil degradation, the improvement of the micro-environment as well as the aesthetic restoration of the affected area. The aesthetic improvement of the area has positive societal impacts.

Costs investment:

€245000000

Costs investment information:

This amount includes the fixed capital cost, infrastructure, construction (including labor) and landscape rehabilitation.

Costs capital: -

Costs land acquisition:

€46500000 (included in the investment cost)

Costs land acquisition unit:

€ (total value)

Costs operation maintenance:

The annual operational/maintenance cost of the project has been estimated as 1-3% of the investment cost thus being 2.45-7.35 M€/y

Costs total information:

Annual Equivalent Cost: €15000000 for a 50-y lifespan

Ecosystem improved biodiversity: 1

Information on Ecosystem improved biodiversity:

Numerous birds, Six fish families and 13 species. Designation as Natura 2000 site.

Information on Ecosystem provisioning services:

Provision of drinking water to Volos city and of irrigation water to 9000 hectares of cropland

Ecosystem impact climate regulation:

No information available

Information on Ecosystem impact climate regulation:

The micro-climate and micro-environment is positively affected by the implemented project; however the degree of impact was not assessed

Policy, general governance and design targets

Policy description:

The project tackles two problems at the same time and enhances the mitigation of others. Retain water during the wet period and delivers it to agricultural and urban uses during the high demand periods. In parallel, it improves biodiversity and increases recreational opportunities.

Part of wider plan: 0

Policy pressure:

Policy requirement directive:

Policy impact:

Policy wider plan:

Policy area:

Policy target:

Target purpose
Irrigation water provision
Urban water provision
Peak flow reduction
Improved Biodiversity

Design & implementations
Application scale: Basin
Installation date: 2000-2010
Lifespan: 50
Age: 10
Performance timescale:
Area (ha): 38 km^2.
Area subject to Land use change or Management/Practice change (ha): > 12000 ha (including the Karla's area of 3800 ha and the irrigated area of 9000 ha.
Design capacity description:
The project was designed to irrigate 9000 ha of irrigated land, cover the urban supply needs of Volos city and storing permanently water to recharge groundwater and support biodiversity.
Constraints:
Financial delays both during the construction of the project and now resulting to less than optimum operation, malfunctions and inadequate security of equipment/infrastructure.

Favourable preconditions:
The necessary preconditions are the poor climate/hydrologic conditions and the fact that population is favourable to the change.
Design contractual arrangement:
Design consultation activity:
Design land use change:
Design authority: Ministry of Environment

Authority type	Role	Name	Comments
Ministry	Determination of design and operation details of the project and financing	Ministry of Environment	The Ministry of Environment and Energy and its local branch in the Region, the Regional Water Authority of Thessaly, is the investor who designed the project and sets the rules (defining volumetric prices of water use).
Local	Implementation	Management authority of Lake	The Managing Authority

Authority type	Role	Name	Comments
authority	and Monitoring	Karla	or Management Body of the Eco-Development Area of 'Karla–Mavrovouni–Kefalovriso–Velestino–Neohori' was established with the scope to protect, conserve and manage the area’s natural and cultural resources