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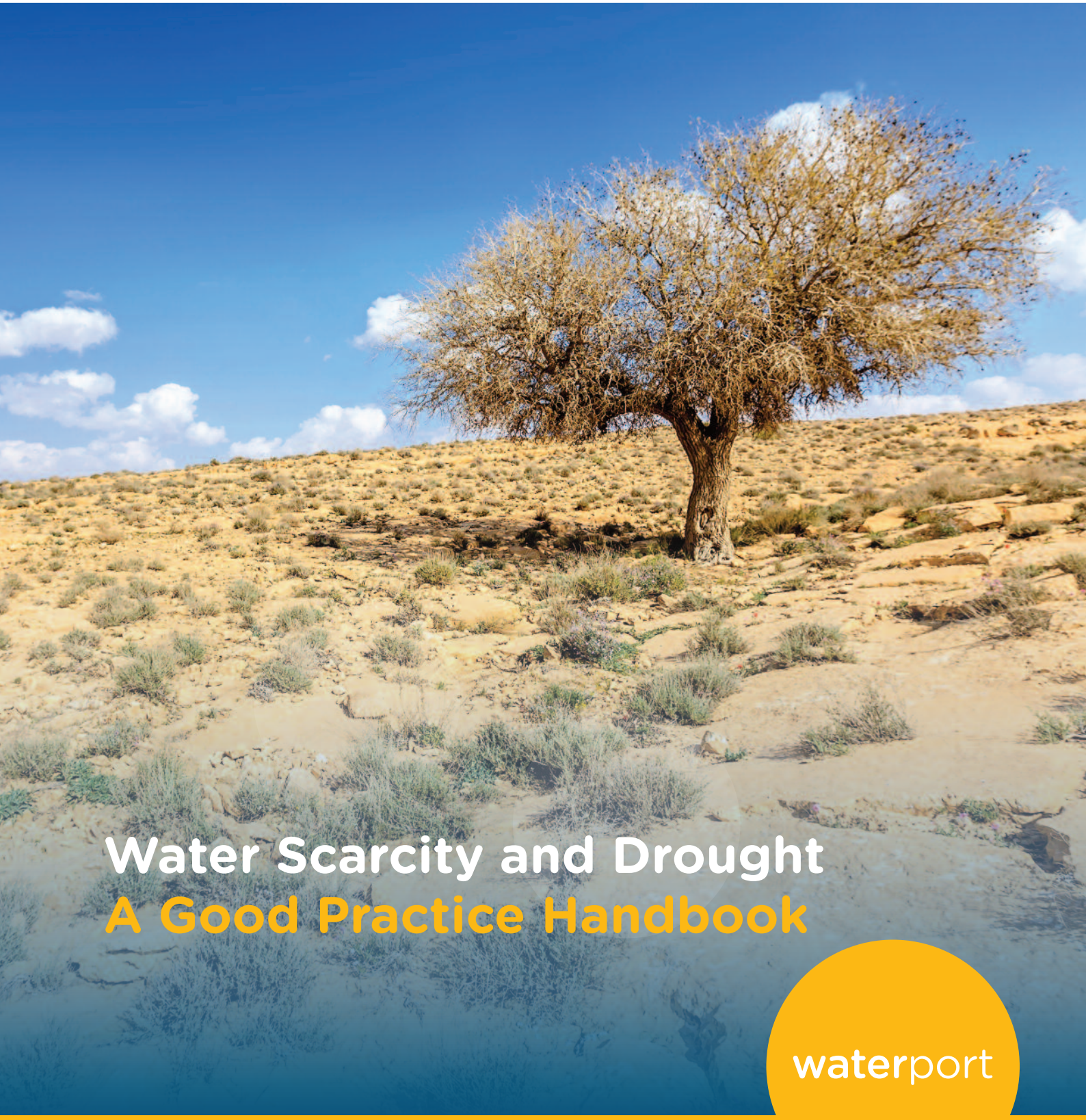

Water Scarcity and Drought
A Good Practice Handbook

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REGIONAL ENVIRONMENTAL CENTER

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WATER SUM
Sustainable Use of Transboundary Water Resources and Water Security Management

WATER POrT
Water Resources Management Good Practices and Knowledge Transfer

May 2017

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The collection of good practices related to water scarcity and drought presented in this handbook can also be accessed online in the WATER POrT E-Practicum, a database of good practices on water scarcity and drought management that can offer valuable lessons and prospects for replicability.

http://watersum.rec.org/e-learning/

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Introduction

Climate change is expected to affect sustainable development, economic growth and society throughout the world. Water is a key issue in the Middle East and North Africa (MENA), where there is already significant pressure on water supply. According to climate predictions, this pressure will increase in the future. Drought, water scarcity and various types of floods are foreseen by several models as a result of the expected increase in heatwaves and extreme precipitation patterns. Seasonal irregularities and aridity will cause more frequent serious water stress in the entire region, contributing to the degradation of ecosystems and agriculture, and therefore impacting human life. In response to such predictions, the countries of the MENA region are drawing on experiences to date, lessons learnt and exchanges with institutions and stakeholder groups to help them identify, test and potentially replicate efficient climate adaptation solutions. As illustrated by the case studies in this handbook, it is not necessarily huge investments alone that can bring results: there are many other solutions and approaches that can contribute to combating the existing and increasingly serious future negative impacts of climate change. Both small-scale projects and big investments have a role to play in regional climate adaptation.

The present handbook contains 30 good practice examples that have been identified within the WATER SUM project. A good practice is an initiative or project that has been successfully carried out and that is potentially replicable (in terms of methods, processes or even concrete measures) by other bodies facing similar climate change–related challenges. The handbook is therefore a valuable tool for identifying relevant experiences in the fields of climate change, drought management, water demand management, and communication and participation. Examples of national and local projects have been collected not only from the MENA region, but also from areas with similar hydrometeorological and climatic conditions, in order to provide a wider range of potential options and to showcase local actions and transboundary/international collaboration initiatives.

Chapter 1 – **Climate Change**

The six good practices in this chapter address the complex issues related to climate change. They include analyses of current impacts, forecasted trends and preparedness possibilities, and cover technical solutions with a focus on water harvesting solutions and water saving techniques in the agricultural sector. Further study of the results and reports of the bigger projects is recommended, as these higher-budget projects were able to undertake detailed assessments, evaluations and projections that can be of regional or national value, serving as one of the pillars for the development of integrated climate adaptation strategies and programmes.

1.1 CASE STUDY

Adaptation to Climate Change to Sustain Jordan's Millennium Development Goal (MDG) Achievements

PERIOD January 30, 2009 – February 28, 2013

LOCATION Zarqa River Basin, Amman, Jordan

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local government/municipalities; NGOs and CSOs; regional government; scientists; universities; water companies; water authorities; industry/business; national government

RESULTS OBTAINED

- Water safety plans (WSPs) were drafted to protect drinking water safety.
- Critical laboratory equipment was procured and installed in the water testing labs of the Ministry of Health.
- Adaptation capacity in the area of food security was strengthened through the identification and dissemination of climate-resilient techniques, such as conservation agriculture.
- A model farm re-using treated wastewater was created as a training and demonstration centre.
- Piloted interventions to showcase awareness campaigns and training programmes enhanced the capacities of local communities, young people, decision makers and professionals.
- Health vulnerability assessments were conducted and a national adaptation strategy and action plans for health protection in the context of climate change were drafted.
- Capacity to adapt to climate change was strengthened in the Zarqa River Basin, where extensive studies were conducted to assess and model climate change impacts on water quality and availability, and to identify adaptation measures addressing these impacts.

SUCCESS FACTORS

- The relevant ministries and the government recognised that climate change poses real risks, which is essential for successful climate change management.
- The project focused on enabling stakeholders.
- Identifying the appropriate policies, legislation and institutions was critical, particularly regarding the long-term impact and sustainability of achievements.
- Active participation on the part of project staff and stakeholders contributed to the project's success.

INDICATORS

- Percentage of water supply systems meeting national drinking water quality standards
- A revised drinking water quality management system (DWQMS)
- Number of WSPs developed
- Number of male and female staff trained to work with the upgraded DWQ system
- Number of stakeholders trained in using different operational approaches
- Number of men and women trained in integrated water resources management (IWRM)

REPLICABILITY AND APPLICABILITY

Similar programmes can be applied in other regions where social and economic conditions are comparable to those in Jordan. The need for an integrated and sustainable climate change management action plan must also be acknowledged.

TOTAL COSTS USD 4 million

CASE DESCRIPTION

Jordan has made strategic advances towards the achievement of the Millennium Development Goals (MDGs), including the reduction of the poverty rate from 21 percent in 1997 to 14 percent in 2005 (MDG 1); the achievement of an adult literacy rate of 97 percent (MDG 2) and an infant mortality rate of 24 per 1,000 (MDG 4); and the provision of 97 percent of the population with access to water and 65 percent with access to sanitation (MDG 7). However, these achievements are compromised by crippling water scarcity and aggravated by climate change, bringing about additional threats to health, food security, productivity and human security.

1.1 continued

The programme helped Jordan to address the key strategic issues outlined above by achieving:

- sustained access to improved water supply sources, despite increased water scarcity induced by climate change; and
- strengthened adaptive capacity in the context of health protection and food security to climate change under water scarcity conditions.

Key activities implemented to achieve these two goals included:

- upgrading the national DWQ system to provide comprehensive national coverage;
- developing and demonstrating five different WSPs;
- designing and implementing a training programme on DWQ management for all levels;
- providing critical supplies and equipment for the DWQ laboratory networks of the Ministry of Health;
- identifying minimum household water security requirements for health protection;
- developing national policy and legislative policy instruments on securing minimum water requirements for health;
- establishing model farms using treated wastewater to increase capacity for adaptation to climate change;
- designing and implementing a training programme on IWRM for the Ministry of Water and Irrigation, national NGOs and other stakeholders;
- developing, in close partnership with the Ministry of Water and Irrigation, a water education and awareness programme focusing on curricula, resource manuals, the training of trainers and in-service training for teachers; and
- designing and establishing an environmental and water resources centre for advocacy education and capacity building.

REFERENCES

Website of the MDG Achievement Fund:
www.mdgfund.org/program/adaptationclimatechangesustainjordan%E2%80%99smdgachievements

MDG Achievement Fund — Country Fact Sheet for Jordan:
www.mdgfund.org/sites/default/files/Jordan%20Joint%20Programme%20Fact%20Sheet_1.pdf

MDG Achievement Fund — Final Evaluation. Adaptation to Climate Change to Sustain Jordan's MDG Achievements:
www.mdgfund.org/sites/default/files/Jordan%20-%20Environment%20-%20Final%20Evaluation%20Report.pdf

MDG Achievement Fund — Final Narrative Report. Adaptation to Climate Change to Sustain Jordan's MDG Achievements:
www.mdgfund.org/sites/default/files/Jordan%20-%20Environment%20-%20Final%20Narrative%20Report.pdf

MDG Achievement Fund and United Nations Development Programme, Hashemite Kingdom of Jordan — Adaptation to Climate Change in the Zarqa River Basin. Development of Policy Options for Adaptation to Climate Change and Integrated Water Resources Management:
www.jo.undp.org/content/dam/jordan/docs/Publications/Enviro/MDGF-CC/Development%20of%20Policy%20Options%20for%20Adaptation%20to%20Climate%20Change%20and%20Integrated%20Water%20Resources%20Management%20(IWRM).pdf

1.2 CASE STUDY

Climate Change Risk Management in Egypt

PERIOD October 14, 2008 – April 15, 2013

LOCATION Egypt

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local government/municipalities; NGOs and CSOs; regional government; scientists; universities; water companies; water authorities; industry/business; national government

RESULTS OBTAINED

- In 2012, over 40,000 taxis were scrapped and replaced with new energy-efficient cars.
- The Eurasian Economic Union (EEU) initiated market dialogue in three targeted sectors to promote solar water heaters and evaluate various incentive schemes.
- A plan to reduce energy consumption in public buildings was approved, and international contracts for carbon trading projects were issued.
- The Clean Development Mechanism (CDM) Awareness and Promotion Unit facilitated the import from Ukraine of an environmentally friendly charcoal kiln.
- In the water sector, the modelling of various climate change scenarios was supported. The programme provided resources to develop forecasting capacity, including the training of staff. As a result, the long-term forecast analysis of climate change impacts on water flows became more accurate.
- The documentary film "The Future of Climate Change in Egypt" was produced.

SUCCESS FACTORS

Critical to the success of the project was the fact that both the ministry and the government acknowledged climate change to be a real risk and pledged full support. In addition, the comprehensive action plan covered the largest possible area and was implemented on as many levels as possible.

INDICATORS USED

- Supreme Energy Council (SEC) decrees issued requiring mainstream GHG mitigation measures through energy efficiency and renewable energy
- Number of CDM projects registered
- Energy intensity
- Generation of CO_2 per capita
- Endorsement and adoption of a national climate change adaptation plan
- Number of Nile Basin Initiative (NBI) water resources management programmes and projects, as well as decision support systems facilitating successful Regional Circulation Model (RCM) adaptation and application
- Number of successfully adopted stress-tolerant crop varieties and proposed cropping patterns in selected locations
- Crop yield per unit volume of water for selected crops

REPLICABILITY AND APPLICABILITY

Similar programmes can be applied in other regions where there is a need to develop sustainable climate change management action plans. The programmes covered a wide range of technical, economic and social areas and integrated the results of multiple projects, including the provision of relevant staff to be trained. Members of cooperating organisations and institutions should be responsive in taking the necessary steps towards assessment and development.

TOTAL COSTS USD 4 million

CASE DESCRIPTION

The aim of the joint programme was to help Egypt to align its national climate risk management and human development efforts to pursue the achievement of the Millennium Development Goals (MDGs) in the face of climate change risks. In this context, the project aimed to reduce poverty and mitigate climate-related risks by combining mitigation and adaptation under one integrated climate risk management programme. Special attention was given to the most vulnerable populations in the country through two complementary approaches:

- mainstreaming GHG mitigation into national policy and investment frameworks, including increased CDM financing opportunities; and
- enhancing the country's capacity to adapt to climate change.

1.2 continued

The programme sought to build the awareness and capacity of key decision makers and development actors to support the systematic integration of climate change considerations into relevant policy, regulatory, institutional and operational frameworks. Activities implemented within the programme included:

- defining capacity needs for the technical secretariat;
- compiling relevant existing studies and information;
- preparing energy policy papers;
- coordinating activities among ministries on the implementation of SEC decisions;
- synergising the implementation of SEC decisions with ongoing national initiatives;
- assessing existing policies (climate screening and proofing);
- assessing adaptation capacity needs and gaps using a gender-sensitive methodology;
- carrying out a macro-economic analysis of the cost of climate change on coastal zones using a gender-sensitive methodology;
- advocating for the adoption of developed adaptation policies and strategies;
- reviewing hydrological and statistical models in the Nile Forecast Centre;
- analysing the PRECIS regional climate modelling system (via the RCM), in cooperation with the Royal Dutch Meteorological Institute and in communication with the UK Met Office;
- identifying and assessing expected outputs from the RCM;
- identifying and assessing climate risk management measures for UN development programmes and operations;
- developing guidelines for reducing climate change impacts;
- identifying appropriate media communication channels;
- developing a national communication strategy on climate change;
- raising awareness among policy makers and the general public; and
- incorporating climate change impacts and scenarios within Nile Basin Initiative water resources management projects, as well as introducing a decision support system.

REFERENCES

MDG Achievement Fund — Climate Change Risk Management in Egypt:
www.mdgfund.org/content/climatechangeriskmanagementegypt

MDG Achievement Fund — Country Fact Sheet Egypt:
www.mdgfund.org/sites/default/files/Egypt%20Joint%20Programmes%20Fact%20Sheet.pdf

1.3 CASE STUDY

Adaptation to Climate Change–Induced Water Stress in the Nile Basin

PERIOD December 2009 – May 2013

LOCATION

Africa, Nile River Basin, Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local government/municipalities; regional government; water companies; water authorities

RESULTS OBTAINED

- Improved knowledge and information, analytical tools and best practices.
- Strengthened institutional capacity for adaptation.
- Increased willingness on the part of governments to mainstream climate change adaptation into policy and decision making and overall river basin development strategies.
- Sharing of information and advice facilitated by the knowledge platform.
- Discussion among countries of adaptation options, especially those concerning transboundary water resources management.
- Increased scientific knowledge to enable science-based policies and planning for adaptation to climate change–induced water stress in the Nile River Basin countries.
- Improved adaptive capacity of local communities to reduce vulnerability to climate change–induced water stress.
- Increased number of communities implementing adaptation actions.

SUCCESS FACTORS

- The respective competencies of the implementing and executing partners.
- On-the-ground actions and cost-effective strategies.

INDICATORS USED

- Number of scenarios developed and integrated into national development plans and water resources management policies
- Availability of continuous and reliable predictions related to floods and other potential risks and impacts

REPLICABILITY AND APPLICABILITY

The regional framework developed by the Danish Hydraulic Institute (DHI) can be applied in similar large or transboundary river basins and can readily be used in smaller basins to evaluate national or local climate impact assessments for water resources, water resource management and/or the evaluation of climate adaptation measures and options. Results from the Blue Nile Basin in Ethiopia can easily be replicated in similar drought-prone areas because of the practical and sustainable approaches that were used. Communities would need additional support for replication and upscaling. For modelling, the following data types are needed: river-network topography; a precipitation time series; a digital elevation model; water-level discharges along rivers/channels; and a water-demand time series for all water users.

TOTAL COSTS USD 3.5 million

CASE DESCRIPTION

The Nile River is a crucial resource for the economy of eastern and north-eastern Africa. Agriculture, energy production and livelihoods in general all depend strongly on the river. The region is facing increasing water scarcity, high population growth, watershed degradation and the loss of ecosystem services.

The United Nations Environment Programme, in collaboration with the DHI, developed an assessment methodology including themes, tools, criteria and indicators for selecting hotspots linked to scenario development. The framework sought to improve regional knowledge and information based on adaptation strategies and transformative policies to manage the shared resources of the Nile Basin. A vulnerability assessment report identified the need for climate change adaptation methods that build the resilience of vulnerable sectors and ecosystems in the region. The purpose of the study was to extend the knowledge and information base and to aid critical policy intervention that complements and strengthens ongoing efforts to address the challenge of managing water resources in the area.

1.3 continued

The overall project goal was to build the resilience of ecosystems and economies in Nile Basin countries that are most vulnerable to climate change–induced water stress. This was achieved through technical, policy and financial interventions to boost adaptive capacity and by piloting adaptation in hotspots.

The DHI and the Hadley Centre for Climate Science and Services of the UK Met Office developed a modelling framework to support climate adaptation on a regional scale. The project assessed climate change impacts and the basin's potential to adapt to floods and droughts. The framework combined a regional-scale climate modelling approach with distributed hydrological modelling using MIKE HYDRO software, both to assess the impacts of climate change on water resources and to provide the capability to evaluate adaptation measures on a regional scale. Using this framework, the DHI carried out an assessment of the impacts of increasing water demand and climate change on the water resources of the Nile River Basin, drawing from a wide range of indicators.

REFERENCES

United Nations Environment Programme — Nile River Basin. Adaptation to Climate Change–Induced Water Stress in the Nile Basin. Summary for Decision Makers: www.unenvironment.org/resources/report/nile-river-basin-adaptation-climate-change-induced-water-stress-nile-basin-summary

Nile Information System — Knowledge Base for the Nile Basin: http://nileis.nilebasin.org/

United Nations Environment Programme — Final Evaluation of the UNEP Project "Adapting to Climate Change–Induced Water Stress in the Nile River Basin": http://wedocs.unep.org/bitstream/handle/20.500.11822/230/Terminal_evaluation_of_the_UNEP_project_Adapting_to_climate_change_induced_water_stress_in_the_Nile_river_basin.pdf?sequence=1&isAllowed=y

1.4 CASE STUDY

Enhancing the Capacity of Turkey to Adapt to Climate Change

PERIOD June 12, 2008 – February 29, 2012

LOCATION Seyhan River Basin, Turkey

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local government/municipalities; NGOs and CSOs; regional government; scientists; universities; water companies; water authorities; industry/business; national government

RESULTS OBTAINED

- Increased capacity of government officials, civil society and universities to make efficient use of current policies and develop new ones in the context of climate change.
- Participatory vulnerability analysis workshops held in 11 provinces, and related methodology disseminated.
- Water savings achieved for six companies in the Seyhan River Basin.
- Capacity of end users improved to respond to early warnings.
- Approximately USD 1.9 million distributed to 18 community-based climate change adaptation projects in the Seyhan River Basin.
- 230 person/days of monitoring field visits.
- First use of an econometric model in presenting the impacts of climate change on animal husbandry.
- Demonstration irrigation systems established on 2,218 hectares of land.
- Future impacts of climate change on water resources, forests, ecosystem services and animal husbandry in the basin identified.
- Activities resulted in water savings of 800,000 m^3 per year, savings in energy consumption, reduced carbon footprints, better-quality production, and reduced volumes of waste, wastewater and hazardous chemicals.

SUCCESS FACTORS

- Key partners played a critical role through their expertise, professionalism, commitment, technical knowledge, flexibility and contacts.
- Workshops were held in 11 provinces, along with training sessions to raise public awareness on adaptation to climate change.

INDICATORS USED

- Number of pilot projects selected and adaptation measures implemented at local level, with a special focus on gender analysis.
- Number of adaptation measures implemented at local level, with a special focus on gender analysis.
- Number of workshops conducted on adaptation to climate change.
- Number of workshops conducted on procurement and the project implementation cycle.
- Number of workshops on best practices implemented locally
- Number of experts engaged and trained in climate change adaptation, increasing coherence in Turkey's positioning with respect to climate change negotiations.
- High-level government acknowledgement of the adaptation plan developed during the joint programme.
- Development of a business plan for an eco-efficiency centre.
- Number of staff trained in data management related to managing climate risks.
- Number of references to climate change adaptation or climate change risks in UN programming framework and projects.
- Number of staff trained on climate change issues.
- Number of focal points in each relevant agency.
- Number of priority cross-cutting projects on climate change identified and reviewed.
- Number of tests of screening tools.

REPLICABILITY AND APPLICABILITY

The programme can be repeated in any country where there are sufficient qualified people to carry out related duties. The programme covers a wide range of technical, economic and social issues. The members of cooperating organisations and governments should be

1.4 continued

responsive to the suggestions, instructions and recommendations of the project team. There should be some level of public awareness of the impacts of climate change, and a clear willingness on the part of the state and administrative authorities to participate.

TOTAL COSTS USD 7 million

CASE DESCRIPTION

This joint programme supported the development of capacities for managing climate change risks to rural and coastal development in Turkey. This was achieved by developing proposals for government consideration on mainstreaming climate change adaptation into the national development framework, building capacity in national and regional institutions, piloting community-based adaptation projects in selected vulnerable coastal areas, and integrating climate change adaptation into the UN programming framework in Turkey. Capacity was developed at the systemic, institutional and individual level, building on existing policy and institutional frameworks in order to ensure sustainability.

Joint programme pilot actions served as catalysts for introducing community-based adaptation principles; building capacity in vulnerable rural regions; developing public–private partnerships to mobilise resources for addressing climate change risks and aligning the efforts of the United Nations Country Team on emerging climate change issues.

REFERENCES

MDG Achievement Fund — Enhancing the Capacity of Turkey to Adapt to Climate Change: www.mdgfund.org/program/enhancingcapacityturkeyadaptclimatechange

MDG Achievement Fund — Country Fact Sheet Turkey: www.mdgfund.org/sites/default/files/Turkey%20Joint%20Programmes%20Fact%20Sheet_1.pdf

1.5 CASE STUDY

Water Management Model for the Niger River Basin

PERIOD 2006 – 2007

LOCATION Niger, West Africa

TARGET GROUPS

Environmental authorities; farmers; local government and municipal authorities; regional government; water companies; water authorities; national government

RESULTS OBTAINED

- A decision support system (DSS) was applied independently by the Niger Basin Authority, both during and after the project.
- The construction of two major dams in the river basin was initiated shortly after the project.

SUCCESS FACTORS

The DSS is able to clearly predict the consequences of possible developments in the catchment.

INDICATORS USED

- Applicability of DSS results as a basis for decision making on dam construction.
- Capability of local staff to apply the system.

REPLICABILITY AND APPLICABILITY

The DSS and modelling tools are general and can be applied to any river basin.

TOTAL COSTS EUR 740,000

CASE DESCRIPTION

The project was carried out by the water consultants DHI and BRLi. A decision support system (DSS), including a river basin model, was developed, primarily to support decisions on dam construction. The system is used to analyse the potential effect of major dams that have been proposed in different countries within the river basin to meet the increasing demand for urban water supply, irrigation and hydropower. Long time series of rainfall runoff from the sub-catchments along the river were calculated based on available precipitation data, including the period of persistent drought that occurred in the early 1980s. Special efforts were made to describe the hydrological processes in the inland delta in Mali, where much water is lost as evaporation during its slow progress through the delta. The model enables the countries and the Niger Basin Authority to take informed decisions on the future development of the basin. In-depth training has been provided to selected Niger Basin Authority staff, and a dedicated user interface has been developed to enable model application for a larger group of stakeholders and to provide customised outputs for the detailed analysis of results.

An economic model was further developed to enable a cost/benefit analysis of scenarios. This included an assessment of the economic benefits, such as the production of crops and power, and an assessment of impacts on river navigation, the environment etc.

REFERENCES

DHI Group website: www.dhigroup.com/

MIKE Hydro Basin DSS: www.mikepoweredbydhi.com/products/mike-hydro-basin

1.6 CASE STUDY

Adaptation to Climate Change through Improved Water Demand Management in Irrigated Agriculture by the Introduction of New Technologies and Best Agricultural Practices (ACCBAT)

PERIOD December 2012 – December 2015

LOCATION Jordan, Lebanon, Tunisia

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local government/municipalities; NGOs and CSOs; regional government

RESULTS OBTAINED

- Increased water use efficiency and increased availability of conventional water resources through the use of treated wastewater in irrigated agriculture.
- Enhanced institutional capacity within the Lebanese, Jordanian and Tunisian partner institutions at the level of managerial and extension services regarding the use of an integrated approach in irrigated agriculture and the development of a training strategy.
- Enhanced technical know-how of farmers with regard to integrated agricultural resources management and production methods, and increased awareness about the economic and ecological advantages of the implemented solutions.
- Enhanced regional and international cooperation between Lebanon, Jordan, Tunisia and Mediterranean countries on water, the use of treated wastewater, and environmental issues related to agriculture.
- Enhanced public awareness of water saving, the re-use of treated wastewater in agriculture, and environmental issues in Lebanon, Jordan and Tunisia.
- Greater public acceptance of the use of treated wastewater in agricultural production.

SUCCESS FACTORS

- The active participation of farmers and external agents, and the successful introduction and implementation of best agricultural practices on the pilot farms.
- Increased public acceptance of the use of treated wastewater in agricultural production.
- Enhanced cooperation on water-related concerns between Lebanon, Jordan, Tunisia and Mediterranean countries.

INDICATORS USED

- Number of improved irrigation systems and pilot farms established
- Number of pilot projects for treatment plants
- Number of trained farmers and extension agents
- Quality parameters of treated wastewater

REPLICABILITY AND APPLICABILITY

The project can be repeated in any country where the level of re-use of treated wastewater in agricultural irrigation is low, mainly for reasons of quality; and where irrigation and production methods are wasteful and inefficient and do not follow best agricultural practices. One precondition for implementation is a needs assessment conducted through individual farm surveys, meetings and questionnaires to farmers. The assessment of the training needs of external agents and technical experts requires the establishment of demo farms and the piloting of new technologies.

TOTAL COSTS EUR 4.99 million

CASE DESCRIPTION

The ACCBAT project aimed to reduce the use of fresh, good-quality water in irrigated agriculture in order to preserve it for direct human consumption. The two main approaches chosen to reach the objectives of the project were improved water demand management, and increased water resources availability through the re-use of treated urban wastewater. These are good practices to follow in countries subject to water scarcity, and they also serve to mitigate the impacts of global climate change. International experts took part in trainings, participated in research activities and contributed to the final dissemination of results.

The project aimed to improve agricultural practices with a view to increasing water use efficiency, and to promote the use of non-conventional sources such as

1.6 continued

treated wastewater and salt water. With these aims in mind, the following areas and treatment plants were selected for the pilot project:

- In Tunisia: the Beni Khiar and Nabeul treatment plants, which supply the irrigated area of Oued Souhil; the neighbourhood of Beni Khalled and Haouaria (region of Cape Bon) for irrigation with non-conventional water resources; and the region of Mahdia for irrigation with brackish waters.
- In Jordan: the Ramtha (Irbid region), Al Salt (Balqa region) and Madaba (Madaba region) treatment plants, situated in the west and north-west of the country.
- In Lebanon: the Ablah wastewater treatment plant, Zahleh District, in the Beqaa Valley.

REFERENCES

Description of the ACCBAT project:
www.enpicbcmed.eu/sites/default/files/accbat_final_report_en_0.pdf

ACCBAT project website: http://accbat.eu/

Chapter on ACCBAT in Selection of ENPI CBC MED Projects — Mediterranean Stories. People Cooperating across Borders (page 30):
http://water-drop.enea.it/sites/default/files/newsfiles/mediterranean_stories_environmental_sustainibility_0.pdf

Presentation on the ACCBAT project:
http://cmsdata.iucn.org/downloads/ensiap_accbat_sharmelsheikh_may_13_2015.pdf

Chapter 2 – **Drought Management**

This chapter focuses on projects implemented at both local and international level. Drought occurs at a regional level, affecting different areas with greater or lesser severity. It is extremely important for stakeholders to detect and identify the early symptoms of drought, as early interventions can prevent potentially devastating impacts on water systems and agriculture. One of the case studies in this chapter presents the principles, structural set-up and operational perspectives of a regional drought management system implemented in several countries in Central and Eastern Europe. Another study highlights the drought management guidelines that were prepared in order to assess potential adaptation goals. The third project focuses on possible ways to tackle climate-related challenges, including drought phenomena at local level.

2.1 CASE STUDY

Drought Management Centre for South East Europe (DMCSEE)

PERIOD April 2009 – March 2012

LOCATION

South Eastern Europe (Albania, Bulgaria, Croatia, Greece, Hungary, Former Yugoslav Republic of Macedonia, Montenegro, Serbia, Slovenia

TARGET GROUPS

Agricultural authorities; environmental authorities; local government/municipalities; regional government; scientists; university students; water companies; water authorities; national government

RESULTS OBTAINED

- A drought monitoring system was established.
- A website was created, including a web-based GIS client for the exchange of spatial information and the provision of common regional maps.
- A common methodology for drought risk assessment was developed and adopted.
- Drought risk and drought vulnerability maps for the region were developed, using GIS techniques.
- Capacity-building trainings were organised and a training manual published.

SUCCESS FACTORS

Success was due to the quantity and quality of collected meteorological and topographical data (e.g. on precipitation, air temperature and land use); and exemplary cooperation between consortium members.

INDICATORS USED

- Number of studies on historical drought impacts and drought management
- Creation of drought risk maps based on GIS functionality
- Number of hits per month on the website
- Number of administrative and private sector actors and individuals in interactive communication within the product dissemination system
- Number of relevant articles published in the press and other media (television, radio)
- Number of staff training events and conferences attended
- Number of staff members with increased capacity
- Number of publications produced
- Number of national seminars implemented for end users in multiple sectors (e.g. agriculture, water utilities, hydro-energy)
- Number of training manuals produced
- Number of improved local policies and instruments
- Number of uniquely developed strategies adopted

REPLICABILITY AND APPLICABILITY

The project can be implemented in any country and region where historical data on rainfall, temperature and land use are available in sufficient quantity and quality. Other preconditions are political commitment (in terms of capacity building and the participation of local government) to sustainable operability, the legal status of the DMCSEE project, and effective dialogue with all stakeholders during the project.

TOTAL COSTS EUR 2,233,595

CASE DESCRIPTION

It has become evident over the past few decades that all countries in South Eastern Europe are affected by droughts, which are becoming increasingly long-lasting and severe. Since 1998, a series of meetings and workshops had been held at European and sub-regional levels, at which the need was expressed for a Balkan drought monitoring centre. The main aim of the DMCSEE is to improve drought preparedness (by carrying out risk assessments and establishing early warning systems) and to help reduce the impacts of droughts.

The following activities were carried out towards the project objectives:

- preparing regional drought monitoring, analysis and early warning products (to be available on a near real-time basis);
- assessing regional vulnerability (mainly concerning agriculture) to drought impacts (information for inclusion in any early warning system); and
- promoting and improving drought preparedness in partner countries through the organisation of training sessions and national seminars.

REFERENCES

Website of the DMCSEE: www.dmcsee.org/

Chapter 2 Drought Management

2.2 CASE STUDY

Strengthening National Capacities to Manage Water Scarcity and Drought in West Asia and North Africa

PERIOD 2013–2015

LOCATION

Jordan, State of Palestine, Morocco, Egypt, Mauritania, Sudan (West Asia and North Africa)

TARGET GROUPS

Agricultural authorities; environmental authorities; local government/municipalities; NGOs and CSOs; regional government; scientists; universities; national government

RESULTS OBTAINED

- Increased awareness and knowledge of tools and methodologies on the part of national planners, policy makers and stakeholders in transition countries, enabling them to develop conflict-sensitive ex-ante drought management plans.
- Increased capacity of institutions in pilot project countries in West Asia and North Africa to develop and implement conflict-sensitive ex-ante drought management plans.

SUCCESS FACTORS

Success depended on the active participation and commitment of all stakeholders in the project pilot countries to learning about methods related to drought management.

INDICATORS USED

- Number of users of tools, techniques and components of ex-ante drought management strategies
- Number of users of early warning systems
- Number of users of drought vulnerability maps among national planners, policy makers and stakeholders to monitor and forecast weather patterns
- Number of national experts in countries in transition settings who can use the tools and techniques to develop conflict-sensitive ex-ante drought management plans
- Number of stakeholders participating in the project's pilot countries

REPLICABILITY AND APPLICABILITY

The project can be implemented in water-sensitive countries and regions where:

- gap analyses of drought management have been carried out or need updating;
- drought and water scarcity management plans have either not been elaborated on a national scale or require updating; and
- there is a need to reinforce stakeholders' knowledge about tools, methods and drought management plans.

TOTAL COSTS USD 570,000

CASE DESCRIPTION

The project was implemented in response to the call for urgent action from the Rio+20 Conference on Sustainable Development to take effective measures to deal with drought and water scarcity, as well as to develop disaster risk reduction and community resilience through such means as technology transfer, capacity building, regional support initiatives and extension training programmes.

The main activities were:

- assessing and mapping out existing knowledge and practices, and identifying critical gaps in ex-ante drought management for water-scarce countries in West Asia and North Africa;
- organising an expert advisory group meeting to discuss the findings of the analytical report, gather further information, and assess the experiences with and the status of methodologies for conflict-sensitive ex-ante drought management for countries in transition in West Asia and North Africa; and
- producing a guidelines package on conflict-sensitive ex-ante water scarcity and drought management strategies for national planners, policy makers and stakeholders, designed to increase the capacity of national planners and policy makers in countries in transition settings in the West Asia and North Africa region, in order to formulate and implement long-term water scarcity and drought management strategies and prevent conflicts associated with water scarcity and drought from escalating into violent confrontation and/or exacerbating conflicts that derive from other sources.

REFERENCES

United Nations Sustainable Development Knowledge Platform — Project summary:
https://sustainabledevelopment.un.org/index.php?menu=1691

United Nations — Partnerships for the SDGs. Project summary:
https://sustainabledevelopment.un.org/partnership/?p=2310

2.3 CASE STUDY

Mediterranean Drought Preparedness and Mitigation Planning (MEDROPLAN)

PERIOD 2003–2007

LOCATION

Mediterranean region: Spain, Cyprus, Greece, Italy, Morocco, Tunisia

TARGET GROUPS

Agricultural authorities; environmental authorities; local government/municipalities; NGOs and CSOs; regional government; scientists; universities; national government

RESULTS OBTAINED

- *Drought Management Guidelines* published in print, website and CD versions.
- Tutorial for the *Drought Management Guidelines* published on the website and CD.
- Technical annexes to the *Drought Management Guidelines* produced in print, as a pdf for download from the website, and CD.
- Improved understanding of drought phenomena and their social, economic and environmental impacts.
- The transfer and exchange of know-how, technology, information and expertise.
- Strengthened institutional capabilities and raised awareness and commitment levels.

SUCCESS FACTORS

- Reaching out to a wide range of stakeholders while avoiding the use of scientific or technical language that can be hard for a non-specialist to understand.
- The guidelines were adopted by the countries, which resulted in a better understanding of the causes of drought and its social and environmental impacts.
- The project successfully linked science, policy and social issues, and strengthened institutional and civil capabilities to improve drought and water scarcity risk management.

INDICATORS

- Rate of transfer of know-how and technology
- Rate of exchange of information and expertise
- Level of institutional capabilities
- Level of public commitment mobilised

REPLICABILITY AND APPLICABILITY

One precondition for the replicability of the project is the availability of meteorological data, hydrological data and existing information on drought and drought mitigation plans. Other important preconditions are political and economic support, as well as stakeholder willingness to test the guidelines in a new setting.

TOTAL COSTS EUR 3,057,268

CASE DESCRIPTION

The MEDROPLAN project focused on the understanding of drought and its impacts on the economy, the environment and society. Activities included the transfer of know-how, technology and expertise, institutional strengthening and public awareness raising. Participative and educational activities involved stakeholder groups, regional policy makers, resource management planners and regional scientists.

The objectives of MEDROPLAN were to develop guidelines on drought preparedness plans and to set up a network for drought preparedness in Mediterranean countries.

The published guidelines offer an integrated approach to drought from a risk management perspective, contributing to minimising the impacts of drought on the population and resources. The final version of the guidelines was translated into six languages.

Project activities included:

- mapping organisations and institutions working with meteorological and hydrological data, or on water resources management and drought mitigation;
- collecting, reviewing and analysing existing information on drought and drought mitigation plans in Mediterranean countries and around the world;
- analysing drought risk analysis in six partner countries; undertaking drought identification studies; and collecting and analysing best practices on drought mitigation in partner countries and other countries;
- publishing guidelines on drought preparedness plans;
- verifying and testing the *Drought Management Guidelines* through six projects in partner countries;

2.3 continued

- preparing a framework document proposing the setting up of a drought preparedness network in Mediterranean countries; and
- disseminating the guidelines and model plan to Mediterranean countries to help them formulate their own plans.

REFERENCES

MEDROPLAN team contacts:
http://projects.iamz.ciheam.org/medroplan/contact.htm

Euro-Mediterranean Information System on Know-How in the Water Sector — MEDROPLAN:
www.emwis.org/initiatives/medaeau/fol719001/fol033012

MEDA Water programme and projects:
http://uest.ntua.gr/archive/medaware/MEDA_Water_programme_200609.pdf

2.4 CASE STUDY

Roots Up: A Multifunctional Greenhouse to Grow Food and Collect Water

PERIOD May 2015 — January 2016

LOCATION

The village of Teda, 20 km south of Gondar, Amhara, Ethiopia

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local and municipal government authorities; regional government; scientists; students and universities; national government

RESULTS OBTAINED

- Construction of greenhouses.
- Training institute for farmers.
- Involvement of smallholder farmers in the fight against soil erosion and drought, which remain a constant threat in the Ethiopian highlands.
- Trainings on soil building, water management and greenhouse maintenance

SUCCESS FACTORS

The originality of this project was its ability to connect farmers with academics, agricultural experts and designers. Their effective teamwork fuelled innovation, which is how the idea of a greenhouse combining crop production and water harvesting could be developed.

The fact that the greenhouses are easy to build and "low tech" is crucial to the project's success. One farming family can build its own greenhouse, while neighbours can help to build and maintain one for a whole community. Year-round access to water makes these communities more self-reliant.

INDICATORS USED

- Number of trained farmers

REPLICABILITY AND APPLICABILITY

The greenhouses are suitable in different regional areas with diverse climatic conditions. They are also suitable for dry areas located next to the coast. In this case, the greenhouses would be designed for dew collection.

TOTAL COSTS

Each greenhouse costs from USD 500, depending on the location and the materials available.

To build one greenhouse for one community would cost a total of USD 960, including the materials and training costs.

CASE DESCRIPTION

Based in Gondar, in northern Ethiopia, Roots Up was established to support family farming as a viable model of agriculture. Smallholder farmers in the highlands face several challenges, such as climatic hazards, low yields and food insecurity.

To meet water needs, Roots Up introduced a multi-functional greenhouse that allows farmers to grow food and collect water. The greenhouse is an affordable technology that accumulates sufficient water reserves to provide year-round irrigation.

The greenhouse serves multiple purposes to suit different climatic conditions. It is designed to efficiently capture dew, fog and rainwater, depending on the area. The low-tech greenhouse is made to serve communities who live in harsh climatic conditions and who face soil erosion and recurrent droughts.

Located in wetlands or next to the coast, the greenhouse can collect dew that forms on a plastic film when the temperature drops at night, which is then collected by gutters. The collected water can then be used for irrigation, and is also safe for drinking.

REFERENCES

Roots Up project description:
https://inhabitat.com/roots-ups-dew-collector-greenhouse-provides-veggies-and-water-in-ethiopia/

Chapter 3 – **Water Demand Management**

Water demand management is being addressed in increasingly sophisticated ways in more or less developed regions throughout the world. As water scarcity and drought are significant problems in the MENA region, and are forecast to increase in severity, current approaches must be analysed, taking into consideration the demand side in addition to the supply side, which has historically been the focus of attention. Water demand in the context of traditional water management practice is currently being given greater attention in the MENA region, bringing with it opportunities for improved water scarcity management. Countries in the region face the crucial challenges of developing flexible solutions and ensuring rational water allocation. The good practices in this chapter are offered as tools to help stakeholders and include the presentation of a decision support system implemented in the form of a "serious game".

3.1 CASE STUDY

From Irrigated Agriculture to Solar Energy Farming in the Azraq Basin, Jordan

PERIOD 2010–2014

LOCATION Azraq Basin, Jordan

TARGET GROUP Farmers

RESULTS OBTAINED

- Farmers installed a 100 kWh capacity photovoltaic power plant on one Jordanian dunum of farmland.
- Income from the power plant is equal to 1,000 m^2 agricultural field income, translating into a net income of EUR 1,000 for farmers equipped with solar energy technology. This is four times higher than their maximum income from agricultural labour.

SUCCESS FACTORS

- Wide involvement of farmers.
- Interest in new technology generated among farmers.
- Clear cost benefits for farmers.
- Possibility of supplemental income for farmers.

INDICATORS USED

- Reduction in amount of pumped groundwater used for drinking water
- Reduction in Jordan's dependence on fossil fuels and gas imports

REPLICABILITY AND APPLICABILITY

This type of project can be implemented in areas where agricultural costs (mostly for irrigation) can be replaced by other income-generating activity (e.g. solar energy production). Contracts must be made between farmers and network operators concerning the price for feeding energy into the national power network. Farmers also require technical support (as they will be new to solar energy production) as well as sufficient financial assistance to start with.

TOTAL COSTS USD 120,000

CASE DESCRIPTION

The Azraq Basin is one of the most important sources of groundwater in Jordan. The highland groundwater aquifers (and the Azraq Basin in particular) are heavily over-pumped by as much as 200 percent of renewable capacity, and salinity levels are increasing. Irrigated agriculture uses almost half of the abstracted groundwater. In light of increasing water scarcity in Jordan and growing competition for water resources, there is increasing pressure to reduce water consumption in the agricultural sector.

The Azraq Groundwater Management Action Plan included the measure "solar energy farming", which is based on creating non-water-consuming economic alternatives. In this case, it meant the introduction of decentralised grid-tied solar energy plants to replace water-intensive agricultural production. This was done to ease pressure on the single water resource and sustain the region's socioeconomic structure. The solar farming pilot project, implemented by the Ministry of Water and Irrigation aimed to motivate farmers to invest in a solar project on their property, which in turn would demonstrate the viability of solar farming as an alternative source of income. Electricity generated from photovoltaic systems could be sold to the electricity utility, providing an alternative income stream for farmers.

REFERENCES

GIZ German Cooperation — Jordan (project description): www.accwam.org/IAP/2/Jordan.html

3.2 CASE STUDY

Autonomous Desalination System Concepts for Seawater and Brackish Water in Rural Areas with Renewable Energies: Potentials, technologies, field experience, socio-technical and socioeconomic impacts (ADIRA)

PERIOD 2003–2008

LOCATION Egypt, Morocco, Jordan, Turkey, Cyprus

TARGET GROUPS

Agricultural authorities; environmental authorities; local government/municipalities; NGOs and CSOs; regional government; scientists; water companies; water authorities; industry/business; national government

RESULTS OBTAINED

- A large variety of small-scale autonomous desalination (ADS) technologies powered by renewable energy implemented through an integrated approach.
- Field experience acquired in all project phases.
- Technical knowledge about sustainable ADS concepts transferred.
- Social-technical implementation strategies developed.
- Know-how transferred to other regions and countries.
- Handbooks published.
- Economic and legal masterplans developed for target countries.
- Training and dissemination materials developed.
- Workshops delivered.
- An active expert network created.s

SUCCESS FACTORS

- The careful planning and execution of each phase.
- Rather than developing new desalination technologies, existing concepts were adapted from various suppliers using renewable energy.
- Decisions were based on cost/benefit analyses, providing the most reliable input on technical, economic and environmental aspects.
- Know-how was transferred via workshops and a handbook.

INDICATORS USED

- Capacity of renewable water supply systems
- Level of availability of required information for each location in the survey areas (optimum desalination technology, economic operation scheme etc.)

REPLICABILITY AND APPLICABILITY

The project can be implemented in any country or region that depends on seawater or brackish water. In rural areas in such countries and regions, autonomous desalination (ADS) can be a tool to overcome water shortage problems.

The preconditions for project implementation are:

- the collection, evaluation and assessment of data on water resources (e.g. data availability and type of water);
- an analysis of the current water supply infrastructure and future plans;
- rural homes not connected to water pipelines;
- an analysis of freshwater demand and the capacity needed for domestic, community and industrial use, and for agriculture (frequency, usage, quantity and quality);
- a general description of water supply problems in certain areas; and
- an assessment of water quality requirements, according to WHO.

TOTAL COSTS EUR 3.41 million

CASE DESCRIPTION

The objective of the ADIRA project was to develop concepts for supplying rural areas with freshwater derived from seawater or brackish water. The aim was to alleviate water shortages in areas with scarce water resources.

The project assessed water supply conditions in rural areas in the target countries and selected suitable sites and operators for pilot installations. At the same time,

3.2 continued

institutional obstacles to the implementation of autonomous desalination were identified. Technical information for the design and construction of each unit was collected, and training and awareness-raising events were organised for designers, installers, future operators and water users.

More than 10 autonomous systems were installed in Turkey, Egypt, Morocco, Cyprus and Jordan. Each system was tested for technological reliability. Finally, local stakeholders and authorities received assistance in developing concrete plans for operating the installations and transferring technology to the new sites.

REFERENCES

Euro-Mediterranean Information System on Know-How in the Water Sector — ADIRA: www.emwis.org/initiatives/medaeau/fol719001/fol121532

Ulrike Seibert and Gisela Vogt: ADIRA project description: http://gwri-ic.technion.ac.il/pdf/IDS/102.pdf

3.3 CASE STUDY

Stakeholder Participatory Sustainable Water Management at Farm Level (MEDWA)

PERIOD 2004–2008

LOCATION Jordan, Palestine

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local government/municipalities; NGOs and CSOs; regional government; scientists; universities; water companies; water authorities; industry/business; national government

RESULTS OBTAINED

- Improved visibility of the socioeconomic benefits of regional cooperation.
- Know-how concerning sustainable irrigation water management transferred between European and Mediterranean countries.
- Greater public awareness and education on challenges and opportunities in the water sector.
- Cooperative pilot and demonstration projects implemented to increase the quantity and quality of water for irrigation purposes.
- Water associations and well cooperatives established, with a special emphasis on women's empowerment.
- A transparent and concise structure established for project management, controlling and reporting.

SUCCESS FACTORS

- Access to relevant national and international know-how made it possible to extend the knowledge base of interest groups and final consumers via professional training. This knowledge and awareness was at the core of project activities.
- A combination of hard technical measures and soft socioeconomic approaches helped solve complex problems.

INDICATORS USED

- Increase in stakeholder interaction in irrigation water management
- Increase in stakeholders' technical and know-how capacities
- Number of sustainable infrastructure and demonstration projects
- Number of sustainable associations and corporate and cluster structures
- Number of training courses
- Number of training manuals and brochures
- Number of cooperative pilot projects on wastewater treatment and irrigation networks
- Number of demonstrations of irrigation and brackish water technologies
- Number of reservoirs (communal and individual) constructed
- Number of water cisterns constructed and renovated
- Number of production wells rehabilitated
- Number of permaculture domestic gardens established
- Number of individual household wastewater treatment units installed
- Number of water associations and cooperatives established and trained
- Number of annual stakeholder forums conducted
- Number of national pools available for the international transfer of water technologies and know-how
- Number of exchange visits
- Number of conferences on irrigation water management

REPLICABILITY AND APPLICABILITY

The project is replicable in any country where:

- farmers use more water than is required for crop irrigation;
- farmers do not follow irrigation schedules, thus affecting plant growth and production;
- farm irrigation systems need redesigning and improving to reach optimum efficiency; and
- farmers are willing to adopt new technology and improve their irrigation systems.

3.3 continued

TOTAL COSTS EUR 5.49 million

CASE DESCRIPTION

The objective of the project was to improve on-farm irrigation water management and farm outputs. The project involved farmers in decision making, which ultimately led to the creation of water user associations and cooperatives.

The project tackled the problem of delivering irrigation water of an acceptable quality and included interventions in the relationship between water suppliers and farmers. As these two parties have different interests, the project supported communication between them. Water storage facilities were built and small-scale wastewater treatment was introduced at the village level to increase the availability of water resources.

The project motivated farmers to form water user associations and cooperatives, through which they can exchange views, experiences and good practices. It also strengthened stakeholder and community capacities, with a special emphasis given to the decisive role of women in the organisations. Women have been responsible for most of the agricultural activities in these regions, but, because of tradition and lack of know-how, they are marginalised and largely excluded from decision-making processes.

The MEDWA project provided training in institutional capacity building, and organised activities in the fields of information exchange and the transfer of know-how and technology. The project combined two approaches — socioeconomic and technical — towards solving the multifaceted problems of water management in Jordan. The main goal was to ensure comprehensive and sustainable regional development.

The project started with the definition and systematic inclusion of local/regional and national interest groups. It then sought to establish a know-how and technology base for further implementation in technical and non-technical trainings, as well as to demonstrate and pilot activities and equipment (irrigation networks, collective wastewater treatment, construction of common and individual reservoirs and cisterns, rehabilitation of production wells etc.).

REFERENCES

MEDWA project presentation:

http://hispagua.cedex.es/sites/default/files/especiales/proyectos/medwa_docs/medwa_poster.pdf

Euro-Mediterranean Information System on Know-How in the Water Sector — MEDWA project presentation: www.emwis.net/initiatives/medaeau/fol719001/fol316340/Presentation_Brussels_MEDWA_Final.pdf

3.4 CASE STUDY

Regional Coordination on Improved Water Resources Management and Capacity Building Programme (RCIWRM)

PERIOD

Phase 1 (Jordan, Lebanon, Morocco, Tunisia) June 2011 – May 2015

Phase 2 (Egypt) July 2012 – November 2016

LOCATION Egypt, Jordan, Lebanon, Morocco, Tunisia

TARGET GROUPS

Environmental authorities, local government/municipalities; NGOs and CSOs; regional government; scientists; universities; water companies; water authorities; national government

RESULTS OBTAINED

- Water Information System Platform (WISP) hardware purchased and installed.
- Scholarships for advanced study or work experience in environmental remote sensing or other appropriate fields selected in each beneficiary country (e.g. irrigation mapping, flood monitoring and forecasting, forest fire monitoring, locust early warning, flood mapping).
- Local stakeholder training workshop held.
- Regional and international workshops and conferences held.
- Regional project data portal developed and put into operation (according to GEF International Waters LEARN guidelines).
- Agreement reached on technical models to be developed and transferred to each country.
- Modelling results applied by technical line agencies and stakeholders.
- An online national portal established to share data across stakeholder institutions.
- A regional project portal established.
- National drought results integrated into one regional drought report.

SUCCESS FACTORS

- Regional coordination and communication are important for the exchange of knowledge, identification of common issues and discussion of regional solutions.
- The involvement of a group of countries, rather than an individual country, meant that workshops and training courses were more efficient and the quality of interaction higher.
- The countries all spoke the same language and shared many common geographical problems.

INDICATORS USED

- Total number of operational models and WISP tools adapted
- Number of local stakeholder training workshops
- Number of regional and international workshops and conferences
- Number of researchers and stakeholders trained under the project (overseas and local)
- Number of consultant services provided by NASA/the International Centre for Biosaline Agriculture (ICBA) team

REPLICABILITY AND APPLICABILITY

The replicability of such a programme requires the interest and commitment of potential beneficiary groups. It can be carried out in areas where information systems require improvement and where certain institutions lack high-tech, professional tools for capacity building in the management of shared water resources.

The adoption, customisation and application of the models require the development of highly specialised skills for a small number of international experts to be directly involved in project implementation. Technical support and the transfer of high-tech tools are also necessary for success and sustainability.

TOTAL COSTS USD 5.644 million

CASE DESCRIPTION

The programme aimed to improve water resources, agricultural management and planning within and across beneficiary countries (Lebanon, Jordan, Egypt, Tunisia and Morocco), based on quantitative and spatial-based decision-making tools using advanced technology (including geographic information systems, data assimilation and modelling techniques).

3.4 continued

The programme was a multi-country adaptable mechanism financed through a Global Environment Facility (GEF) grant. Financing covered the technical assistance, hardware and software infrastructure required to build the capacity of the involved governments to improve local and regional water resources and agricultural management. There were three components involved in programme implementation.

Component 1 Improved Water Resources and Agricultural Management

- Purchase, installation and implementation of WISP tools and related ancillary equipment in the participating countries. The tools included remote sensing equipment, land surface models and land data assimilation systems that could be operated without relying on ground-based data, and that were not therefore bound by geographical constraints and political boundaries.
- Application of WISP tools to pertinent research issues related to local and regional water resources (such as identifying drought-prone and flood-prone areas, estimating groundwater fluxes and evapotranspiration, and monitoring climate change impacts and crop yield estimates).

Component 2 Capacity Building and Project Management

- Capacity building for implementing WISP at local level.
- Local workshops to share results with stakeholders.
- Participation in international conferences and study tours on environmental remote sensing.
- Funding of graduate fellowships.
- Development of a national online portal to share data across stakeholder institutions.
- Project management.

Component 3 Regional Integration and Cooperation

- Organisation of quarterly workshops with regional stakeholders.
- Development of an online portal to share regional results.
- Generation of annual regional reports on applications of regional significance (e.g. estimating recharge rates of over-subscribed shared aquifers, formulating responses to droughts and floods at regional level and encouraging a more coordinated approach to managing transboundary water resources).

REFERENCES

RCIWRM website:
www.rciwrm-awc.org/

RCIWRM presentation:
www.rciwrm-awc.org/Files/Publicationen_2014-07-22_05-32-29-704148.pdf

RCIWRM Final Seminar of ReGoKo GEF Grant:
http://planbleu.org/sites/default/files/upload/files/Regional_Coordination_Improved_Water_Resources_Management.pdf

World Bank Independent Evaluation Group — Implementation completion report:
http://documents.worldbank.org/curated/en/935661467034683710/pdf/ICRR-Disclosable-P117170-06-27-2016-1467034661388.pdf

3.5 CASE STUDY

Sustainable Concepts towards a Zero Outflow Municipality (Zer0-M)

PERIOD January 2005 – December 2007

LOCATION Morocco

TARGET GROUPS

Environmental authorities; local government/municipalities; NGOs and CSOs; regional government; scientists; universities; water companies; water authorities; industry/business; national government

RESULTS OBTAINED

- In El Attaouia, Morocco, the Zer0-M project implemented greywater treatment and solar water heating for a public bath and hammam. The treated greywater was used to irrigate green areas of the town, for which an irrigation system was built. The solar heater for the hammam replaced 50 percent of the firewood demand.
- The re-use/recycling concept gained public acceptance.
- The quantity of freshwater used and the cost of water were reduced.
- Information, know-how and technology were exchanged.
- Trainings and demonstration centres were established for the identification and solution of problems.
- Trainings and optimum design resulted in risk reduction and improved hygienic conditions.
- Integrated management ensure the sustainable use of project achievements.

SUCCESS FACTORS

- Targeted transfer of technology
- Training
- Implementation of small-scale and real-scale examples and virtual studies

INDICATORS USED

- Number of pilot plants
- Quantity and quality of re-used wastewater
- Quantity of green areas irrigated by treated greywater

REPLICABILITY AND APPLICABILITY

This kind of project can be implemented in any small community where the required infrastructure can be installed. It can be adapted to areas where households, industries and/or public institutions can provide treated greywater for low-grade water use. The implementation and sustainability of the application also require sufficient training. Analysis of the potential level of applicability on a case-by-case (municipality) basis is recommended, as greywater production (quantity) depends on consumer behaviour and on other factors.

TOTAL COSTS EUR 225,000

CASE DESCRIPTION

Morocco has about 5,000 hammams that could provide treated greywater for low-grade water use such as domestic use and unlimited irrigation. The hammams consume an estimated 1.7 million tonnes of firewood every year — an amount that could easily be halved merely by installing solar collectors on the roofs of the buildings. The intent behind this pilot project was to demonstrate the potential for local greywater collection and treatment and the use of solar power to heat water.

Zer0-M aimed to test and refine concepts and technologies for the closed-loop use of all water flows in small communities — that is, for the creation of "zero outflow" municipalities.

The project also aimed to develop and demonstrate solutions for local water management that can reduce pressure on water resources under conditions of scarcity. The main goal was to demonstrate that low-cost, efficient solutions are available for the adequate treatment of used water so that it can be reused safely for new purposes.

The key idea behind Zer0-M was to integrate water supply, wastewater treatment and re-use. Wastewater re-use systems were developed accordingly to minimise freshwater consumption. The best-quality freshwater is reserved for high-grade use (i.e. drinking), while wastewater is treated specifically for the planned purpose of re-use. The separation of wastewater into different fractions is one option to ease treatment. In this way, all resources that are found in the wastewater (water and nutrients) can be re-used. The intent here was to introduce "low-tech, high-concept" solutions

3.5 continued

tailor-made for small communities. The use of non-conventional water resources was an important factor in this innovative concept.

Wastewater is now being treated in a constructed wetland planted with reeds and roses, which not only cleans the water but creates a beautiful area along the road in the middle of a small town. This is a new, low-cost and robust approach to localised water treatment at the point of production and re-use.

REFERENCES

Euro-Mediterranean Information System on Know-How in the Water Sector: Project description:
www.emwis.net/initiatives/fol060732/proj554102

3.6 CASE STUDY

Integrated Water Resources Management in Burkina Faso

PERIOD 1999

LOCATION Burkina Faso, Nakanbé River Basin

TARGET GROUPS

Water companies; water authorities; citizens

RESULTS OBTAINED

Modelling illustrated that power production at the Bagré reservoir may be increased significantly by revising the operation of upstream reservoirs, so that evaporation losses are reduced while water supply and irrigation remain unchanged.

The local authorities gained a good understanding and command of the applied technology for water resources planning and management. Although the applications clearly showed the potential benefits of changes in reservoir operation, they were not (at least to our knowledge) implemented by the authorities.

SUCCESS FACTORS

- Demonstration of possible increases in hydropower production without reducing the reliability of water supply for other users.
- Independent application of the modelling tools by associated staff.
- Suitability of the applied technology for use by local authorities in the overall management of water resources in the basin.

INDICATORS USED

- Annual hydropower production
- Evaporation losses from reservoirs
- Modelling capability for local staff

REPLICABILITY AND APPLICABILITY

The modelling tools are general and can be applied to any constellation of reservoirs and water users. One precondition for project replicability is the availability of topographical, meteorological and hydrological data on the pilot area.

TOTAL COSTS DKK 456,000

CASE DESCRIPTION

The Nakanbé River is of great national importance for Burkina Faso, as it provides water, irrigation and hydropower to a large population. New reservoirs have been constructed in the basin within the last decade to increase water abstraction, particularly for Ouagadougou, and the total storage capacity in the basin is now more than sufficient to meet present demand.

A model of the Nakanbé River basin was created under the country's programme for integrated water resources management (GIRE), using the MIKE-Basin simulation model. The main objective of the modelling was to analyse water management scenarios in the context of reservoir construction and operation by making it possible to predict the consequences of natural and anthropogenic changes in the basin. The model was applied to highlight the problem of large evaporation losses and inefficient reservoir management, test possible solutions to conflicts, and identify improvements in the overall management of water resources in the basin.

Further applications included:

- the seasonal forecasting of water storage in reservoirs;
- the identification of optimal rule curves for the operation of the Loumbila Reservoir for safe water supply to Ouagadougou; and
- scenario forecasting for the combined utilisation of the new Ziga Reservoir and the Loumbila Reservoir.

REFERENCES

DHI Group:
www.dhigroup.com/

DHI Group — Dams and reservoirs:
www.dhigroup.com/areas-of-expertise/surface-and-groundwater/dams-and-reservoirs

3.7 CASE STUDY

Integrated Water Resources Management in the Middle Olifants River Basin, South Africa

PERIOD 2006–2010 and 2012–2015

LOCATION Middle Olifants River catchment

TARGET GROUPS

Water companies; water authorities; citizens

RESULTS OBTAINED

- Decision support tools were developed (e.g. a web-based risk assessment tool).
- A detailed water resources model was produced, including water quality aspects.
- A mobile online laboratory was established to monitor water quality and compliance with legal regulations.
- The water policy reform achieved positive impacts.
- Water intervention measures were introduced, especially in the field of wastewater treatment (e.g. a vacuum rotation membrane [VRM] pilot facility).
- Operations and maintenance guidelines and refurbishment concepts were developed (e.g. for wastewater treatment plants to increase cleaning efficiency).
- The HUBER VRM® membrane bioreactor was demonstrated and tested in the project region.

SUCCESS FACTORS

- Expertise on the part of the project partners. (Integrated water resources management [IWRM] requires the involvement of representatives from different water-related areas — in this case the environment, engineering, ecology, management, water resources modelling, research, information systems and analysis.)
- The involvement of water departments, universities and wastewater technologists.

INDICATORS USED

- Economic impacts of IWRM
- Effects of more efficient water use
- Impacts of transaction costs on the success of water policy reforms and water quality

REPLICABILITY AND APPLICABILITY

The successful implementation of IWRM depends on the creation of suitable local structures. These structures must include the technical and legal working conditions necessary to ensure the sustainable operation and maintenance of water facilities, but also economic incentives and sources of financing at the local level.

TOTAL COSTS Not declared

CASE DESCRIPTION

The Middle Olifants project area is a river catchment to the north-east of Pretoria, with a large number of high-intensity water consumers: households, large-scale farming, mining (including one of the largest platinum mines in the world) and tourism. High water demand results in the over-exploitation and pollution of water resources. During dry periods, downstream water users sometimes have to reduce consumption to prevent harm to the population and the environment (e.g. in the Kruger National Park). Many wastewater treatment plants are not operational, so untreated wastewater further impairs water quality.

The main aim of the project was to develop an IWRM plan to help water users reduce their consumption. The main research objective was to increase the added value of all water-related activities in a sustainable manner.

The complete management concept produced by the IWRM South Africa programme comprised three main modules: a water resources module (WRM) for calculating the amount of available water, taking into account water quality aspects; a water allocation module (WAM) governing water distribution; and a water intervention measures module (WIM) featuring technical and institutional measures for improving the situation in the target area. The WIM also includes a water franchise concept for initiating technology transfer from experienced water supply utilities to local companies.

REFERENCES

Middle Olifants South Africa — IWRM project description:
www.iwrm-southafrica.com

3.7 continued

German Federal Ministry of Education and Research — IWRM
www.bmbf.wasserressourcen-management.de

Research for Sustainable Development (FONA):
www.fona.de

FONA. IWRM — From Research to Implementation:
www.fona.de/mediathek/pdf/130710_IWRM_Broschuere_Inhalt_englisch_barrierefrei_final.pdf

Institute of Environmental Engineering and Management, Witten/Herdecke University:
www.uni-wh-utm.de

University of Bonn, Center for Development Research Annual Report 2007/2008:
www.zef.de/uploads/tx_zefportal/ZEFNews/zef_ar_2007-2008.pdf

3.8 CASE STUDY

Development and Deployment of the Nile Basin Decision Support System

PERIOD 2009–2012

LOCATION Addis Ababa, Ethiopia

TARGET GROUPS

Local government/municipalities; regional government; water companies; water authorities; industry/business; national government

RESULTS OBTAINED

- Conceptual design and technical specification of the decision support system (DSS), based on a detailed assessment of user needs.
- Stakeholder training and awareness workshops.
- Nile Information System, a web-based knowledge and information management system, developed to support information sharing and communication between the Nile Basin Initiative (NBI) partners.

SUCCESS FACTORS

- Highly participatory consultancy, with extensive stakeholder consultations in all NBI member countries.
- Detailed technical specifications of system functionality requirements, models, tools and system components.
- Instructive trainings and workshops.

INDICATORS USED

- Number of Nile Basin DSS users
- Number of participants at trainings and workshops

REPLICABILITY AND APPLICABILITY

An assessment of potential users, data availability, decision support needs and training needs is recommended before implementation. The DSS and modelling tools are general and can be applied to any river basin where government support for creating the DSS is available.

TOTAL COSTS USD 3,587,306

CASE DESCRIPTION

The Nile Basin DSS is an analytical tool developed by the Nile Basin Initiative (NBI). The DSS is a computer-based platform for communication, information management and the analysis of water resources. It provides a framework for sharing knowledge, understanding river system behaviour, evaluating alternative development and management strategies, and supporting informed decision making.

The DSS was designed to meet the requirements of complex water resources planning. It provides diverse toolsets for data processing, modelling, scenario management, optimisation and multi-criteria decision making. It also offers tools for integrating environmental, social and economic objectives, which greatly facilitate multi-sector water resources planning at the river basin level.

The DSS is a generic system that can be applied at different scales, such as at national and transboundary levels. It can be installed either within an institutional set-up (thereby allowing multiple access to its central database and toolset) or as a standalone solution.

The project included the design, development, adaptation, testing and deployment of the DSS at the regional, sub-regional and national levels, as well as proof of concept, training and continued support after the final deployment of the system.

REFERENCES

Nile Basin Initiative website — Project description: www.nilebasin.org/~nileba5/index.php/87-information-hub/26-nile-basin-decision-support-system-nb-dss

Nile Basin Decision Support System — Helpdesk and User Community Portal: http://nbdss.nilebasin.org/support/home

Nile Basin DSS project leaflet: http://nileis.nilebasin.org/system/files/NBDSS-Brochure_Donors_Final.pdf

3.9 CASE STUDY

Economic Impact of Agrometeorological Assistance, Cap Bon, Tunisia

PERIOD June 2004 – May 2005

LOCATION Nabeul, Cap Bon, Tunisia

TARGET GROUPS Farmers, agricultural authorities

RESULTS OBTAINED

The better use of phytosanitary products resulted in recorded daily water savings of 10 to 25 percent. The savings are an effective way to adapt to climate change–induced rainfall shortages.

SUCCESS FACTORS

- Excellent collaboration between the National Meteorological Institute (INM) and the regional agricultural development office CRDA Nabeul, based on a collaboration agreement that defined the obligations of each party (the governor of Nabeul also contributed support).
- Involvement of the Tunisian Union of Agriculture and Fisheries (UTAP).
- Adherence on the part of farmers to jointly agreed objectives, towards which trainings were an important contribution.

INDICATORS USED

- Range of water savings
- Instructions followed successfully by farmers
- Number of people trained
- Successful knowledge transfer through trainings

REPLICABILITY AND APPLICABILITY

The project can be duplicated without difficulty in other areas of Tunisia — mainly in the centre of the country where aquifer over-exploitation is likely to have huge impacts as a result of climate change.

TOTAL COSTS EUR 40,000

CASE DESCRIPTION

This agrometeorological assistance project was developed to help farmers in the region with operational decision making. Agrometeorological information can play a key role in the good management of water resources, including water use optimisation for irrigation and for phytosanitary treatment. One of the reasons for choosing the Cap Bon region in the north-east of Tunisia as the pilot site is the range of high-volume water users. The 10 farmers who participated in the project worked on areas ranging between 2 and 257 hectares, growing several different crops (e.g. potatoes, grapes, citrus fruits, tomatoes and strawberries).

Agrometeorological information was provided to farmers in regular reports sent around every five days. The reports included daily data on temperature, air humidity and rainfall, for example. The second section of the report was devoted to weather forecasting — mainly two-day or three-day forecasts related to temperature, humidity, wind direction and velocity, rain, extreme weather events etc. The project also included a training component for farmers and CRDA agents and the Tunisian Association for Agriculture and Fishery.

REFERENCES

H. Baccour, M. Slimani and C. Cudennec (2012). “Structures spatiales de l’évapotranspiration de référence et des variables climatiques corrélées en Tunisie.” *Hydrological Sciences Journal*, 57 (4): 1–12.

3.10 CASE STUDY

Agricultural Demonstration Pilot in the North-Western Sahara Aquifer System (SASS)

PERIOD 2012–2014

LOCATION

Governorate of Medenine, Smar Region, 12 km north-east of Medenine in the south of Tunisia

TARGET GROUPS

Agricultural authorities; farmers

RESULTS OBTAINED

- Tenfold increase in revenue per hectare for olive trees and other crops.
- Better use of water.
- Improved soil protection against salinisation, which is an alternative solution to the over-exploitation of aquifers.

SUCCESS FACTORS

- High level of involvement of farmers and the Tunisian administration.
- Establishment of a local monitoring committee.
- Meetings with technical bodies, preparation of discussions, acceptance of follow-up specifications, good record keeping and making information available to the project.

INDICATORS USED

- Water productivity (cubic metres per hectare)
- Water consumption per hectare

REPLICABILITY AND APPLICABILITY

The success of the pilot suggests that farmers in Tunisia's Djeffara Basin can learn from the successful experience to produce high volumes of good-quality olives and winter vegetables. The pilot can be replicated throughout the area of the Djeffara, which is subject to strong over-exploitation and salinisation risk. Project replication could also help to ensure that development in the region is maintained.

TOTAL COSTS EUR 50,000

CASE DESCRIPTION

The pilot project focused on irrigated agriculture based on a controlled water supply for olive and vegetable crops, working with farmers and local technicians.

The development of sustainable family-scale irrigated agriculture (on plots of 1.2 hectares), based on a mixed system of olive and vegetable crop cultivation, efficient water use and the desalination of brackish water, created high added value. The project led to:

- the development of a plot plan for appropriate crop rotation;
- the acquisition of two greenhouses and a drip irrigation system;
- the acquisition, installation and commissioning of a water desalination plant;
- the installation of an irrigation network;
- the construction of a storage basin for desalinated water; and
- the acquisition and installation of an electric pump to distribute water for irrigation purposes.

REFERENCES

Observatoire du Sahara et du Sahel (OSS) (2014). *Socio-Economic Aspects of Irrigation in the SASS Basin: Better Water Valorisation for Sustainable Management of the Basin*. Tunis.

OSS (2014). *Pilotes de démonstration agricoles dans le bassin du SASS. Vers une agriculture durable et rentable au Sahara*.

OSS website: www.oss-online.org

3.11 CASE STUDY

Improvement of Irrigation Water Management in Jordan and Lebanon (IRWA)

PERIOD 2003–2007

LOCATION Jordan, Lebanon

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local and municipal government authorities; NGOs and CSOs; regional government

RESULTS OBTAINED

- Rehabilitation of part of the Litani riverbed.
- Litani River Authority (LRA) strengthened in Lebanon.
- Farmers' water management skills improved through training.
- Increased efficiency of the irrigation systems in the central and southern Jordan Valley.
- Increased water stocking of facilities at an on-farm level.
- National Centre for Agricultural Research and Technology Transfer (NCARTT) strengthened in Jordan.
- Enhanced cooperation between the two countries in the domain of water.
- High number of trained farmers (480 individuals).

SUCCESS FACTORS

- High level of technical and background knowledge of the implementers.
- Media coverage, workshops, conferences, Farmers' Days, skills trainings and demonstrations during the project implementation period.
- Deep involvement of stakeholders, and the interest and openness of owners, farmers and researchers.

INDICATORS USED

- Availability and quality of irrigation water
- Share of irrigated land
- Water unit cost
- Rate of crop production and income generated
- Number of volunteer farmers participating in the programme
- Nitrogen utilisation rate during the fertilisation and fertigation process
- Utilisation rate of mixed treated water

REPLICABILITY AND APPLICABILITY

The project can be implemented in any other country where local partners have sufficient capacity in terms of facilities and available human resources. The project implementation requirements are data on the quality of soil and irrigation water, and laboratories equipped with the necessary measurement tools to store and interpret the data. A pre-assessment of the number of interested farmers, professionals and stakeholders taking part in the programme is also important. Furthermore, participants need to be open-minded and willing to change their practices to manage water more efficiently.

TOTAL COSTS EUR 6.29 million

CASE DESCRIPTION

The IRWA project aimed to optimise irrigation efficiency and farm outputs in areas along the Litani River between Qaraoun Lake and the village of Bar Elias in Lebanon, and in the central and southern Jordan Valley in Jordan.

In Lebanon, project work focused on the rehabilitation of the Litani River to control inundations and soil erosion. At the same time, the project established an agricultural service centre in the Bekaa Valley to support the Litani River Authority in its daily operation. In Jordan, an upstream filtering system was installed in one of the pumping stations along the King Abdullah Canal, which improved the quality of irrigation water. The IRWA also upgraded the Laboratory for Soil and Water Analysis at the Deir Alla Research Station.

Field trials of on-farm filtration techniques were conducted to guide farmers in acquiring appropriate technology. Extension agents from both countries (a combined total of 14) received advanced on-the-job training.

The main project objective was to ensure that farmers were able use available reclaimed water safely and efficiently, considering that reclaimed water contains

3.11 continued

significant amounts of nutrients. Given that Jordan is an extremely water scarce country, the use of reclaimed water for agricultural use is vitally important.

Implementation was carried out in two phases. In the first phase, demonstration trials for data collection were carried out over three years, leading to the elaboration of recommendations. The recommendations were followed out in the second phase.

The project concluded, having supplied 3,000 farm units (1,500 farmers) with reclaimed water for irrigation.

REFERENCES

Euro-Mediterranean Information System on Know-How in the Water Sector — Summary of IRWA project: www.emwis.org/semide/PDF/20051205_IRWA/

3.12 CASE STUDY

Domestic Rooftop Rainwater Harvesting: A Village Case Study

PERIOD 2013

LOCATION

Village of Madgyal, District of Sangli, State of Maharashtra, India

TARGET GROUPS CSOs and citizens

RESULTS OBTAINED

- Water demand data collected.
- Real estate data collected.
- Possible harvested amounts of rainwater for individual households quantified.

SUCCESS FACTORS

- Wide participation in the socioeconomic survey.
- Strong commitment from local people to implement the rooftop water harvesting system.

INDICATORS USED

- Number of households for which water scarcity has decreased
- Number of barrels installed
- Annual amount of harvested and stored water

REPLICABILITY AND APPLICABILITY

The methodology can be applied in semi-arid areas, where average annual rainfall is greater than 300 mm and drought periods longer than 90 days, to calculate possible amounts of harvested rainwater for individual households. A socioeconomic survey is required beforehand, aimed at determining household water demand. No big investment is required to carry out these activities.

TOTAL COSTS Not declared

CASE DESCRIPTION

A collaborative research project was developed with the aim of introducing affordable technologies for capturing and retaining rainwater runoff, including runoff from rooftops, and using this water to supplement household needs in a drought-prone area.

The research stressed the extent to which the adoption of such technologies can help in conserving water resources in semi-arid regions in developing countries, while at the same time helping to alleviate poverty by improving the quality of life of women and children in these regions. Rainwater harvesting systems were developed based on the results of the research. The systems were designed to enable poor households in the community to supplement their water supply needs, as well as to engage in small-scale backyard gardening. Improved water security can extend cropping seasons, ultimately enhancing food security and contributing to poverty reduction.

The research was based on a socioeconomic survey of the study area's real estate conditions and water demand. Properties were classified, and possible amounts of harvested water were calculated accordingly.

REFERENCES

Pandurang D. Jankar and Maheshkumar M. Bhanuse (2013). "Domestic Rooftop Rainwater Harvesting: A village case study." *International Journal of Research in Engineering and Technology*, Vol. 2, No. 12.

http://esatjournals.net/ijret/2013v02/i12/IJRET20130212008.pdf

Chapter 4 – **Communication and Participation**

This chapter features eight local and international projects, including awareness-raising initiatives. One educational project addresses the topic of personal climate responsibility, while others deal with issues at basin level. The latter case studies provide information not only on potential achievements, but also on the demonstrated results of water-saving solutions implemented in response to the increasing threat of water scarcity. Experiences gained via field installations are accessible on the given project website. Readers looking for broader sources of information are recommended to access the Euro-Mediterranean Information System on know-how in the water sector. This website contains a huge number of projects related to water management and communication, as well as reports of trainings in the water sector, and directs readers towards the relevant project-specific sites.

4.1 CASE STUDY

Euro-Med Participatory Water Resources Scenarios: Improving Long-Term Access and Rights to Water for Local Populations in Egypt, Jordan and West Bank/Gaza (EMPOWERS)

PERIOD 2003–2007

LOCATION Egypt, Jordan and West Bank/Gaza

TARGET GROUPS

Agricultural authorities; environmental authorities; local government/municipalities; NGOs and CSOs; regional government; scientists; universities

RESULTS OBTAINED

- Integrated management of local drinking water supply implemented in pilot areas.
- Local water resources and water demand management (quantity and quality) implemented in catchment areas and islands.
- Prevention and mitigation of the negative effects of drought and equitable management of water scarcity.
- Increased level of irrigation water management.
- Use of non-conventional water resources.
- Preparation of national and local scenarios for the period until 2025 that enable precise objectives to be set and actions to be taken for sustainable water management.
- Establishment of an integrated water information management system in the Balqa Governorate in Jordan.

SUCCESS FACTORS

- Increased recognition of the issue and of the need to share responsibilities.
- Stakeholder dialogue for the effective identification, assessment and addressing of water management problems.

INDICATORS USED

- Number of water development plans per participating region
- Quantity of valuable information and knowledge shared at regional level
- Extent of increase in the influence of different stakeholders in decision making on the use and management of often scarce water resources
- Extent of vertical and horizontal linkages and information flows

REPLICABILITY AND APPLICABILITY

Improving water governance requires financial resources, monitoring systems for information collection and sharing, monitoring systems for the inclusion of marginalised groups, and good stakeholder facilitation.

The project can be implemented in any other country where:

- stakeholder participation and dialogue are weak;
- water scarcity and joint water resources are issues; and
- there is a need to improve knowledge on the potential use of non-conventional water resources.

TOTAL COSTS EUR 4.8 million

CASE DESCRIPTION

EMPOWERS was a four-year regional programme in three countries that reflected a range of water issues found in the MEDA region (EU member states and other countries bordering the Mediterranean). Egypt has a relatively high per capita availability of water, with demand exceeding supply. Jordan and the West Bank/Gaza are among those countries with the world's lowest per capita water availability. In the West Bank and Gaza, water scarcity is further compounded by Israel's control over access to water. Common features are the lack of involvement of all stakeholders, the centralised nature of management, and the fragmentation of responsibilities among many players.

The project had four specific objectives that were achieved within the implementation period. These were to:

- increase the influence of stakeholders — particularly the poorest and most marginalised — on the planning and decision-making process for the use and management of water resources;
- enhance vertical and horizontal linkages and information flows between water stakeholders;

4.1 continued

- demonstrate the effectiveness of the approach through pilot projects; and
- document the learning process.

EMPOWERS put the above strategies into practice through the design and development of innovative examples in selected pilot areas at the district and community level in the governorates of Balqaa (Jordan), Beni Suef (Egypt) and Jenin (West Bank/Gaza).

REFERENCES

Euro-Mediterranean Information System on Know-How in the Water Sector — Description of EMPOWERS project:
www.emwis.org/initiatives/medaeau/fol719001/fol199548

Sustainable Water Management Improves Tomorrow's Cities' Health (SWITCH) research partnership:
www.switchurbanwater.eu/outputs/pdfs/WP6-3_PUB_Case_Study_Empowers.pdf

4.2 CASE STUDY

Euro-Mediterranean Information System on Water Sector Know-How (EMWIS/SEMIDE)

PERIOD 2003–2007

LOCATION

Algeria, Egypt, Morocco, Tunisia, Turkey, Israel, Jordan, Lebanon, State of Palestine, Syria

TARGET GROUPS

Agricultural authorities; environmental authorities; farmers; local government/municipalities; NGOs and CSOs; regional government; scientists; students/universities; water companies; water authorities; citizens; industry/business; national government

RESULTS OBTAINED

- Information sharing developed.
- High-level political commitment achieved.
- Partnership strengthened.
- Framework website created allowing easy access to information on water issues. Information is searchable by resource, documentation and topic.

SUCCESS FACTORS

- Many countries and experts joined the information sharing platform.
- Access to the EMWIS is open to everyone interested in water management issues.
- Broad Internet access makes data readily available.
- The EMWIS reflects a real need and strong demand on the part of all project partners.

INDICATORS USED

- Number of website visitors
- Number of projects available on the website
- Number of countries that joined the EMWIS network

REPLICABILITY AND APPLICABILITY

The project can be implemented in any country or region with good computer and Internet access. Project implementation requires website development and thematic structure (e.g. regarding the kind of data and information to be made available and shared). These data and information should be uploaded and made freely available to the public.

TOTAL COSTS EUR 3.33 million

CASE DESCRIPTION

The EMWIS was an initiative of the Euro-Mediterranean Partnership. It provided a strategic tool for exchanging information and knowledge in the water sector among and within the Euro-Mediterranean Partnership countries. All the countries belonging to the Union for the Mediterranean (UfM) were involved:

- the 27 EU member states; and
- 16 Mediterranean partner countries (Albania, Algeria, Bosnia and Herzegovina, Croatia, Egypt, Jordan, Israel, Lebanon, Mauritania, Monaco, Montenegro, Morocco, the State of Palestine, Syria, Tunisia, Turkey).

The EMWIS sought to facilitate access to existing information in the water sector. It promoted the sharing of useful information from different institutions and stimulated the development of cooperation programmes at regional and national levels.

The EMWIS portal (www.emwis.net) makes available initiatives and projects related to the water sector, and is searchable by:

- institutions — types of institutions and people involved;
- documentation — existing centres and their organisation and the means and technologies used for processing, accessing, consultation and dissemination, standardisation and quality certification;
- training — existing organisations, programmes, location, trainers, methods, training materials and quality certification;
- research and development — existing organisations, programmes, people involved, means and technologies, publications, partnerships and funding sources; and
- data administration — existing organisations and databases, methods used for data gathering and checking, and publications.

4.2 continued

The portal provides validated water information in a decentralised way. The project supported and encouraged partners in the Mediterranean area to establish their own water information systems. The information was not stored in a common database but remains at the level of the providers. Each information source guarantees the quality, updating and reliability of the information. This approach is now being followed in Latin America (SIAGUA), and Africa (AWIS).

The EMWIS has a central technical unit and a national focal point in each country. The technical unit is based in France and is a permanent structure. The national focal points are small teams within a public or semi-governmental organisation in charge of the collection and dissemination of information related to the water sector. Together with the national focal points, the technical unit prepares implementation strategies and annual action plans, and supports the national focal points in their implementation.

REFERENCES

Euro-Mediterranean Information System on Know-How in the Water Sector — International portal: www.emwis.net

4.3 CASE STUDY

Integrating Climate Change Adaptation into Development Planning

PERIOD June 2013 – December 2013

LOCATION Tunisia

TARGET GROUPS

NGOs; agricultural authorities; local government/ municipalities; scientists; students/universities; water companies; water authorities

RESULTS OBTAINED

- 15 people trained as future trainers.
- Very good collaboration between trained people.
- Development of knowledge about climate change and on how to cope with the challenge.
- Trainees developed and initiated projects for their own institutions.

SUCCESS FACTORS

- Good cooperation and synergy between the technical support projects of GIZ and the Water, Climate and Development project (WACDEP) implemented by the Global Water Partnership–Mediterranean.

INDICATORS USED

- Number of people trained

REPLICABILITY AND APPLICABILITY

The project can be replicated for the staff of other ministries and institutions (especially regional commissions involved in agricultural development) if there is sufficient recognition of the need to integrate climate change adaptation into development planning. Trainees should be familiar beforehand with climate change adaptation methods and techniques that are used in their country and communities.

TOTAL COSTS EUR 40,000

CASE DESCRIPTION

The main objective of the project was to train senior managers on how to integrate climate change adaptation into development planning. The training was based on a Tunisian water-sector case study in the Barbara basin, which is located in north-west Tunisia, where people lack a water supply.

The training took place in two stages: a theoretical stage and a practical element involving the specific example of water resources in the Barbara basin, for which a specific training report was prepared. Field visits to the Barbara basin dam and the village of Barbara also took place. The training was based on manuals developed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), based on a 2009 manual produced by the Organisation for Economic Co-operation and Development.

REFERENCES

Global Water Partnership – Mediterranean: www.gwp.org/en/GWP-Mediterranean/

4.4 CASE STUDY

My Climate Change Responsibility

PERIOD December 2013 – December 2016

LOCATION Tunisia

TARGET GROUPS

Citizens; NGOs and CSOs; local and municipal government authorities

RESULTS OBTAINED

- 60 eco-delegates trained on climate change.
- 1,500 students informed about climate change.
- 30 teachers informed about climate change.
- 1,600 people informed about the impacts of climate change on water, agriculture, biodiversity and the economy.

SUCCESS FACTORS

- A favourable context of educational reform.
- Students motivated by the integration of new "active education" teaching methods.
- Strong involvement of the Ministry of National Education, and personal interest on the part of the minister of education.

INDICATORS USED

- Number of students trained as future trainers of students at their schools
- Number of inspectors trained
- Number of educational staff trained
- Number of people informed about climate change

REPLICABILITY AND APPLICABILITY

The project can be implemented in any secondary school where the lesson framework is sufficiently flexible to allow the inclusion of trainings for students, teachers and inspectors. Available capacity is also necessary in terms of teachers and other human resources.

TOTAL COSTS EUR 30,000

CASE DESCRIPTION

The aim was to raise awareness among schoolchildren and improve their environmental behaviour in relation to climate change and its impacts on water, agriculture and biodiversity.

Specific objectives were to:

- encourage and strengthen individual and collective daily behaviour that contributes to climate change mitigation and adaptation; and
- strengthen the role of young people in tackling the adverse impacts of climate change in their environment (school, neighbourhood, home etc.) and involve them in raising awareness levels in their respective institutions.

4.5 CASE STUDY

Capacity Building for Water Security and Climate-Resilient Development

PERIOD June 2014 – February 2015

LOCATION Tunisia

TARGET GROUPS

Agricultural authorities; environmental authorities; local government/municipalities; NGOs; regional governments; national government

RESULTS OBTAINED

- 12 people trained.
- 4 heads of department trained and informed about climate change and its impact on the water sector.

SUCCESS FACTORS

- An open-minded attitude on the part of the main decision makers. One of the most effective ways to manage climate change impacts is to reach real decision makers who can apply the knowledge acquired in their everyday work, projects and decisions.
- A mentorship programme, which contributed to an effective learning process.

INDICATORS USED

- Number of people trained that passed United Nations Institute for Training and Research (UNITAR) exam
- Number of superiors informed and advised

REPLICABILITY AND APPLICABILITY

The project can be replicated in other departments and agencies in other countries that are involved in water resources management. An important precondition is the preparation of the framework and training materials. Experts should also be involved as mentors.

TOTAL COSTS EUR 70,000

CASE DESCRIPTION

This project was related to the capacity-building programme "Safety in Water and Climate Change Resilient Development", which was developed to support the Water, Climate and Development Programme (WACDEP) implemented by the Global Water Partnership – Mediterranean (GWP-Med). A technical framework was developed and training materials were prepared. The framework is a tool to help integrate water security and climate resilience into development planning processes, focusing on the prioritisation of investments and financing strategies. To supplement the theoretical and practical training, field visits were organised and a mentorship programme was established, meaning that each participant was assigned a mentor to support them in new knowledge applications.

The project also included training for managers and heads of department.

The training programme comprised five workshops held over 16 days in the course of one year. Participants were awarded certificates after successfully completing a final examination.

REFERENCES

Global Water Partnership — Mediterranean: www.gwp.org/en/GWP-Mediterranean/

United Nations Institute for Training and Research: www.unitar.org

4.6 CASE STUDY

Institutional and Social Innovations in Irrigation — Mediterranean Management (ISIIMM)

PERIOD 2003–2007

LOCATION
Morocco, Egypt, Lebanon, Italy, France, Spain

TARGET GROUPS
Agricultural authorities; environmental authorities; local government/municipalities; NGOs and CSOs; regional government; scientists; students/universities; water companies; water authorities; citizens; national government

RESULTS OBTAINED

- Common knowledge and understanding of social and institutional irrigation management achieved, and adapted institutional tools created.
- New perspectives developed for irrigation policies and innovation at local level through the elaboration of guidelines and documents synthesising the 11 ISIIMM river basin cases.
- Organisation System for Information and Research on Irrigation and Societies (OSIRIS) and communication products developed.
- Training and dissemination achieved through website and distance learning.

SUCCESS FACTORS

- Willingness on the part of farmers to improve their practices and water management techniques by sharing their own experiences and learning from each other.
- Involvement of scientists and development professionals.
- The learning process covered the whole range of collective water management issues.
- Considerable efforts made to disseminate results through books, films, newsletters, guides and other media.

INDICATORS USED

- Number of organisations involved
- Number of farmers involved
- Negotiation agenda with institutions
- Number of training workshops and exchange seminars (local and national)
- Number of field visits with farmers, managers of public organisations and canal managers
- Legal recognition of the water management role of irrigators in their local context
- Participation in water regulatory bodies, such as watershed agencies
- Existence of conflict resolution legislation among irrigators, and between the different users of other resources
- Willingness of irrigation administrations to exchange ideas and scientific research

REPLICABILITY AND APPLICABILITY
The project can be implemented in any country where farmers, the managers of public organisations and canal managers are interested in irrigation development. It requires the training of a group of professionals as professional project managers/experts for future projects.

TOTAL COSTS EUR 5.7 million

CASE DESCRIPTION
The aims of the ISIIMM project were to share experiences and knowledge and to build new perspectives for sustainable water management in Mediterranean agriculture. The project helped rural communities to adapt to problems resulting from water-related pressures through institutional changes.

The ISIIMM project worked on 11 case studies within the river basins of six Mediterranean countries. The project developed its main activities with the full participation of its target groups. It involved local partners, water users, development agents, researchers, NGOs, public services and administrations in the development of water management strategies and action plans. It also discussed institutional arrangements for the sustainable

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management of water resources with the aim of transitioning to new water-sharing behaviours and institutional innovations.

A wide range of training workshops and seminars were held. These activities allowed the target groups to gain a better understanding of the problems in Mediterranean irrigation management and enabled them to solve these in more suitable ways.

The main activities were:

- facilitating coordination between water managers and other actors in each river basin;
- strengthening institutional capacities and training in irrigation water management;
- promoting a better understanding of the key mechanisms through project partner networks;
- identifying solutions to water-related conflicts;
- organising information developed through the OSIRIS, which underpinned the different dimensions of the ISIIMM project; and
- exchanging information and transferring know-how.

The project was implemented in three main phases:

1) Statements on case studies
2) Thematic and exchange seminars
3) Dissemination and final outputs

The first phase, devoted to national and local case studies, involved drawing up a statement of conditions and aims for each river basin and country using a participatory approach and based on existing documentation and a scientific perspective from ISIIMM project experts. The approach also assessed institutional organisation and practices.

The second and third phases focused on social and institutional innovations through 15 bilateral and trilateral seminars between the six partner countries (Egypt, France, Italy, Lebanon, Morocco and Spain). Most of the seminars were held in the MEDA countries and were complemented by field visits with farmers, managers of public organisations and canal managers.

REFERENCES
Euro-Mediterranean Regional Programme for Local Water Management:
www.isiimm.agropolis.org/index.php

Solutions for Water platform:
www.solutionsforwater.org/solutions/isiimm-institutional-and-social-innovation-in-irrigation-mediterranean-management-case-study-egypt-france-italy-lebanon-morocco-spain

4.7 CASE STUDY

Aqua Knowledge and Innovation Transfer for Water Saving in the Mediterranean Basin (AQUAKNIGHT)

PERIOD December 2011 – December 2014

LOCATION Cyprus, Egypt, Greece, Italy, Jordan, Tunisia

TARGET GROUPS

Water companies; water authorities; local government/ municipalities; environmental authorities; scientists; students/universities

RESULTS OBTAINED

- International best practices were applied for evaluating and controlling water losses.
- A manual of best practices for reducing commercial water losses was developed.
- Water utility capacities to reduce water losses were increased.
- Best practices on the control and management of water losses were disseminated.

SUCCESS FACTORS

- A leak management approach was adapted to the specific technical, economic, environmental and social characteristics encountered on site.

INDICATORS USED

- Number of pilot projects implemented
- Experience and knowledge transferred in relation to the management of water distribution networks

REPLICABILITY AND APPLICABILITY

The project can be implemented in all countries and regions where water loss is inadequately controlled due to lack of integration of appropriate technologies and methodologies, inadequate analysis of water consumption and loss in the Mediterranean region, insufficient training of water practitioners, and/or a lack of case studies in the Mediterranean basin. It can also be implemented where there is support for the transfer of knowledge and the possibility to implement good practices that can be replicated as needed.

TOTAL COSTS EUR 1,999,129

CASE DESCRIPTION

Many countries in the Mediterranean region face water scarcity, which is expected to worsen as a result of increased demand (due to population and economic growth) and climate change. This is particularly true for Mediterranean partner countries, where water problems are exacerbated due to the aridity of the region. The main goal of the AQUAKNIGHT project was to facilitate the transfer of best practices adopted in EU countries, optimise the performance of water networks, and reduce water losses.

AQUAKNIGHT aimed to facilitate dialogue between water institutions and operators from different regions in the Mediterranean area, and to promote sustainable solutions for tackling water scarcity in the region. Effective water resources management can help defuse domestic and international water-related conflicts. The specific objectives of the project were to:

- develop parallel pilot projects in Mediterranean partner countries (Egypt, Jordan and Tunisia) and EU Mediterranean partner countries (Cyprus and Italy) to facilitate the transfer of experiences related to the management of water distribution networks;
- build the capacities of technical staff in the field of water management, and provide knowledge and tools to improve water system management and reduce volumes of non-revenue water;
- promote synergies and collaborative actions for tackling water scarcity in the Mediterranean basin, involving EU and Mediterranean partner countries; and
- transfer knowledge from EU Mediterranean countries to Mediterranean partner countries on best practices and state-of-the-art techniques for efficient water management.

REFERENCES

Project overview:
www.gisig.eu/aquaknight/project-overview/

Manuel Sapiano, Ministry for Energy and the Conservation of Water, Malta (2013). *Establishing links with EU-funded projects related to POM implementation*:

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https://circabc.europa.eu/sd/a/12cbb7cf-b9e3-418c-b1e7-6bbaa778c85a/6-Projects-Sapiano-MT.pdf

Cross-border Cooperation in the Mediterranean (ENPI CBC MED) — AQUAKNIGHT project summary:
www.enpicbcmed.eu/documenti/29_153_20111228170753.pdf

Cross-border Cooperation in the Mediterranean (ENPI CBC MED) — Mediterrean Stories:
http://water-drop.enea.it/sites/default/files/newsfiles/mediterranean_stories_environmental_sustainibility_0.pdf

4.8 CASE STUDY

Water Development Resources Opportunity Policies for Water Management in Semi-Arid Areas (Water-DROP)

PERIOD December 1, 2013 – December 31, 2015

LOCATION

Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Malta, State of Palestine, Portugal, Spain, Syria, Tunisia

TARGET GROUPS

National governments; local authorities; NGOs; scientists; environmental authorities; water authorities

RESULTS OBTAINED

- A decision support system for water cycle management integrated with a geographical information system (DSS-GIS) adopted and implemented in the four target areas.
- Normative proposals developed for water management, leading to the progressive harmonisation of legislation on the issue at the Mediterranean level.
- Better water cycle management achieved in the target areas, including the re-use of water in Palestine, the economically improved management of the Italian Torre Flavia area (Rome), more efficient water use in three Jordan communities of the Al-Balqa Governorate, and reduced risk of water pollution in selected Lebanese rivers and coastal areas.

SUCCESS FACTORS

- The effective strategic involvement of multi-stakeholder partnerships (including the need for setting up public-private synergies), their participation in the shaping of national policies, and their promotion of an understanding and acceptance of water management practices.
- A balanced polycentric and multilevel approach in the framework of participatory governance mechanisms (which should be the basis for every strategic path related to the water sector).

INDICATORS USED

- Number of trained technicians in the water sector
- Number of participants in national roundtables and the drafting of roadmaps
- Quality of water cycle management

REPLICABILITY AND APPLICABILITY

The project can be implemented in all countries and regions where water management is a key priority and where the main problems include the mismanagement of water resources, insufficient training of water practitioners and/or lack of water sector case studies. It can also be implemented where there is support for knowledge transfer and where the implementation of good practice examples has support from relevant authorities.

TOTAL COSTS EUR 1,989,519

CASE DESCRIPTION

Because water management is a key priority for most Mediterranean countries, and because most of their water problems are due to the mismanagement of water resources and the lack of coherence among water policies, the Water-DROP project aimed to develop an integrated water resources management (IWRM) approach at the Mediterranean basin level for managing related cross-sector issues through the strengthening of multi-stakeholder partnerships — primarily with public and private actors.

The project developed an integrated DSS-GIS approach to water cycle management. Capacity was built by introducing a new tool and approach, and through the realisation of pilot actions in four countries (Italy, the State of Palestine, Jordan and Lebanon). The pilot actions developed different aspects of the project: marine water and freshwater monitoring, water treatment, water governance, and cost/benefit analyses.

Water-DROP also offered training courses for technicians in the water sector and sought to make a lasting impact in terms of public awareness of water issues by encouraging teachers and schools to reach out to students. The project involved the participation of a wider spectrum of stakeholders by holding national roundtables and drafting roadmaps to transfer knowledge on water management. To ensure the harmonisation of water management policy and norms, Water-DROP established a Mediterranean task force to address issues on a transnational basis.

The main project activities were:

- elaborating a database on water cycle management;

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- organising training courses for technicians in the water sector;
- raising awareness, with a focus on teachers and schools;
- organising national roundtables and drafting roadmaps for transferring results to stakeholders; and
- setting up the Mediterranean Task Force for the normative harmonisation of water management.

REFERENCES

ENPI CBC MED projects — Mediterranean Stories: http://water-drop.enea.it/sites/default/files/news-files/mediterranean_stories_environmental_sustainibility_0.pdf

Water-DROP project leaflet: www.iucn.org/sites/dev/files/import/downloads/brochure_water_drop.pdf

Euro-Mediterranean Information System on Know-How in the Water Sector — Project summary: www.emwis.org/initiatives/fol060732/water-development-resources-opportunity-policies-water-management-semi-arid

Water-DROP project presentation: water-drop.enea.it/sites/default/files/newsfiles/Brizio-bello%20WP5%20Actions%20and%20awarness%20campaigns.pdf

Water-DROP project — Integrated Water Resources Management. Guidelines for the Mediterranean Basin: http://water-drop.enea.it/sites/default/files/newsfiles/IWRM14-06-2016_0_0.pdf

Water-DROP website: http://water-drop.enea.it/

The regional project **Sustainable Use of Transboundary Water Resources and Water Security Management** (WATER SUM) addresses water-related challenges and promotes regional cooperation in the Middle East and North Africa (MENA) through two project components: Water Resources Management Good Practices and Knowledge Transfer (WATER POrT); and Water Security (WaSe). The WATER POrT component focuses on building skills and transferring knowledge on integrated water resources management in order to promote sustainable development and climate adaptation. The WaSe component supports the introduction of local water security action plans to help communities withstand asset scarcity and tackle environment-related conflicts.

The overall objective of the WATER SUM project is to promote and enhance the sustainability of managing water resources in beneficiary countries in the MENA region in order to halt the downward spiral of poverty and to reduce biodiversity loss and environmental degradation. The main expected impact is institutional and behavioural change in water governance and utilisation patterns. This will be achieved through the successful transfer of knowledge and skills to all participating actors in the water management arena. Additional impacts related to improving water security are also significant in terms of overall environmental security. It is therefore vital to build partnerships in order to address environmental asset scarcity, environmental risks or adverse changes, and environment-related tensions or conflicts, as this is the most effective means for delivering development and conservation targets to local communities and beyond.

The WATER SUM project brings high added value, as it provides beneficiary countries with a structured opportunity to boost their development, share new methods for improved water management, improve planning at all levels of governance, and address unemployment and poverty.

Project duration: **April 2014 – March 2018**
Total project budget: **EUR 7.27 million**

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The REC is an international organisation with a mission to assist in addressing environmental issues. The REC fulfils this mission by promoting cooperation among governments, non-governmental organisations, businesses and other environmental stakeholders, and by supporting the free exchange of information and public participation in environmental decision making.

The WATER SUM project is financed by the Government of Sweden and implemented by the REC.

watersum.rec.org