Integrated Water Resources Management in the Lower Jordan Rift Valley

Sustainable Management of Available Water Resources with Innovative Technologies

SMART

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Recommendations and Guidelines for integrated water resources development and management in the Lower Jordan Valley

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1. Introduction

Deliverable 5.5 builds mainly on the results of WP4 on water resources planning for the representative catchment clusters, and presents guidelines for integrated water resources development and management in the Lower Jordan Valley (LJV). The transfer of the suggested IWRM implementation concept, tools and water technologies to neighboring areas of the valley is being discussed in this context. The guidelines will also refer to the results achieved under the SMART-MOVE sub-project SALAM.

2. Objectives

According to the SMART-MOVE Description of Work (DoW) D5.5 focuses on the following main objectives

- Present recommendations and guidelines for the integrated development and management of water resources in the Lower Jordan Valley, taking the results of the regional subproject SALAM into account
- Present a conceptual approach for integrated water resources planning in the LJV
- Discuss the transfer of the suggested IWRM implementation concept, tools and water technologies

3. Recommendations and Guidelines towards Sustainable Water Development

For the sustainable development of water resources in the Lower Jordan Valley both sides of the Jordan River and upgrade of the existing water resources systems, a generalized participative water resources planning approach has been developed within SMART-MOVE, based on the Integrated Management of Water Resources (IWRM). The standardized and clearly structured procedure ensures transparency of the decision making process and, therefore, acceptance of the suggested water development plans. The planning concept has been developed in close cooperation with the regional stakeholders and decision makers. The stepwise approach leads to the development of water plans on basin level with high robustness against hydrological variability and extreme events, taking the social, environmental and economic performance into consideration. Figure 3.1 presents a flow chart of the water resources planning approach:

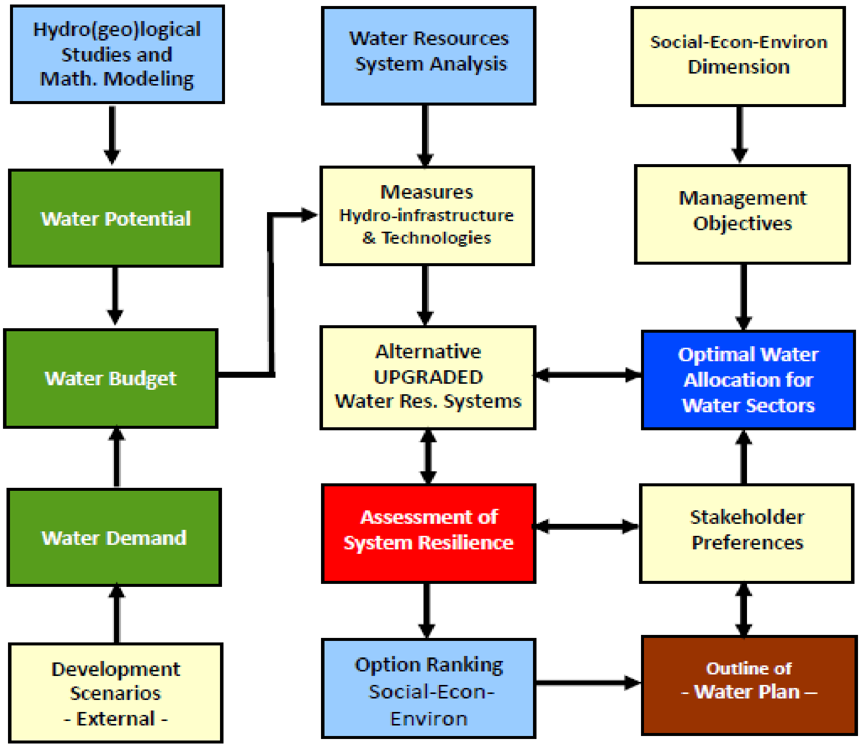

Figure 3.1: Water Resources Planning Approach (Rusteberg, 2018)

The approach has been built on an engineering point of view and as such it concentrates on the identification and dimensioning of so-called structural IWRM measures to improve the resilience, robustness and performance of the water resources system. Following the planning approach, an integrated water plan is developed which identifies the required hydro-infrastructural and technological interventions for sustainable system upgrade and operation. The transparency and standards of the suggested planning approach may serve as basis for any negotiation between the partner countries on the transboundary management of their water resources. The step-wise procedure requires the consolidation of the water budgets based on different scenarios for socio-economic development and climatic conditions during the planning horizon of 20 years. Further steps relate to the analysis of the water resources system to identify potential measures for the upgrade of the existing hydro-infrastructure as well as stakeholder consultations on the development goals, water management objectives and selection of representative technical (water supply), socio-economic and environmental indicators. Alternative IWRM-strategies are being defined as combination of potential hydro-infrastructural interventions. The impact of those strategies on system resilience (water demand coverage, water deficit, water supply reliability) may be accessed by the Water Evaluation and Planning System WEAP (weap21.org) and Groundwater modeling.

The IWRM strategies should be compared in technical (water supply), socio-economic and environmental terms. Due to the drought and water scarcity conditions in the LJV, special attention has been given to the impact on the system resilience, taking dry climate scenarios into account. The quantification of the following water supply indicators is recommended: Total water supply delivered, un-met demand, demand coverage and water supply reliability. Further details with regards to the approach and indicator assessment are provided in the Project deliverables D4.1, D.4.4 and D4.5 (Rusteberg et al., 2018a,c,d).

The above presented water resources planning and IWRM implementation concept is a generalized approach which may be applied to any region where water scarcity is prevailing and where the improvement of the resilience robustness of the water resources system against drought events and high hydrological variability is a major water management challenge. The application and transfer of the developed WEAP and Modflow models to neighbouring basins has been ensured by training courses in Palestine and Jordan. Details on the the development of the WEAP models and further tools are presented in the aggregated project deliverables D4.2-4.3 (Rusteberg et al., 2018b).

The reuse of wastewater is still quite expensive, if facilities for wastewater collection and treatment are not properly developed. The transfer of treated effluent to strengthen irrigation development is a promising solution for the LJV which will reduce the usage of freshwater resources. The implementation of deep wells in the Karst aquifer systems of the mountain areas is to be questioned due to the high water cost, but could be used to strengthen drinking water supply in the urban areas.

The SMART-MOVE studies show that Managed Aquifer recharge (MAR) implementation is a compulsory water management measure to counteract, on the one hand, the permanent lowering of groundwater levels in the shallow aquifer in the Lower Jordan valley region and, on the other hand, to strengthen the necessary development of irrigated agriculture at the important agricultural lands in the LJV. But it became obvious that managed aquifer recharge can only be successfully implemented as part of an integrated water resources management. For this purpose, the remaining water potential of local water resources must be fully and efficiently utilized. Further details are provided in the project deliverable D2.1.1 and D2.1.2 (Walter et al. (2018), Salman (2017)).

By implementing the suggested structural measures to activate the remaining local water potential as well as of adjacent areas, the water supply security and resilience of the water resources systems can be significantly improved over periods of drought so that the implementation of all measures is strongly recommended from that point of view. The studies also prove the positive social impact of all interventions due to the above reason. Preliminary studies on water cost and cost-benefit relations indicate the economic viability of the suggested measures (Rusteberg et al.; 2018d).

But it also became evident that even after implementation of all measures, the steadily increasing water demand cannot be fully covered, so that additional water imports into the study area will be necessary to enable sustainable development.

The Technical Advisory Committee of the Global Water Partnership defined Integrated Water Resources Management (IWRM) "as a process, which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems," . Emphasized that water should be managed in a basin-wide context, under the principles of good governance and public participation (GWP,2000,2003). However, this monitored a long the way of implementation in the LJV areas in order to assure the good governance and to formulate road map, The Good governance and road maps will be used as a vehicle for essential development and institutional reform, which requires adequate political and legal arrangements, application of best practices and well established institutions (Tamimi, 2009).
The SMART-MOVE project showed the importance of application the following guidelines of sustainable development of water resources: transparency and social acceptance, developing flexible, workable , community based IWRM strategies as key issues for the sustainable development of the LJV.

To achieve a sustainable water development, all social, economic and environmental aspect should be taken into consideration it is further suggested to transfer the effluents by pipes, instead releasing them directly into the Wadis, to avoid further pollution and degradation.

To prove the effectiveness of MAR schemes new projects should monitor and quantify accrued costs and benefits before, during and after implementation. The current data do not allow for a detailed analysis. The main missing information is the volume of water reaching the groundwater. The costs comprise capital costs, operational costs as well as social and environmental costs before, during and after the implementation of a MAR scheme.
The inelastic demand for water reflects a weak response on behalf of farmers in case of increasing the prices of irrigation water from tube wells; hence, prices policy could not be used to control the irrigation water used from tube wellsFarmers opt for different options to cope with recent change in policy and regulations, some of those options coincide with the intended policies such as reduce water abstraction, land fallowing, investment in water saving

technologies, changing of cropping pattern, selecting of less water consumptive crops. Other coping measures are selling excess water below the quota to neighbours, manipulation of water meters, and drilling illegal well near the legal one to irrigate the unlicensed irrigated areas.

Faced with the difficulties in enforcing water abstraction limits and in view of the negative impacts of over-pumping of these critically valuable groundwater resources, the water policy in Jordan needed to move towards the introduction of new water management approaches. Recognizing the fact that the reduction of agricultural water use in the highlands is a politically difficult and challenging task, the strategy followed is based on participation of the water users, MWI, and other relevant stakeholders in the exploration of management options and the development of an action plan to implement the options ultimately selected. One of the successful options to overcome groundwater depletion and the associated costs, governments may support managed aquifer recharge (MAR). MAR is the purposeful recharge of water to aquifers for subsequent recovery or environmental benefit, such as rainwater harvesting (RWH), infiltration ponds, or check dams. These are considered in this paper, as they generate water supplies from sources that may otherwise be lost due to runoff

If the state would go for reducing groundwater pumping to preserve and protect the groundwater resources from depletion. The state's immediate concern is to protect famers' income and their social status. In other words, any measure of irrigation water supply reduction should be achieved without negative socioeconomic impacts on farmers. Based on this principal, farmers are requesting to tie the measures for groundwater pumping reduction with appropriate compensation of surface water from WAJ, or in kind money transfer or support on agricultural marketing to compensate the reduction of cropped area with a higher sale value.

To increase the water sector supply reliability in the coming short run future, decisions makers have to take into considerations that there will be more frequent drought years and the water supply is expected to be decreased, based on that the policy makers and decision makers should investigate all ways and means to increase water supply, and under the current circumstances finding new water resources using cost effective desalination is the only way to satisfy the increased the future water demand in the region. This means to encourage future demands for additional water, rather than a more appropriate focus on improved efficiency, recycling, and reuse.

SALAM

First, it has to be stated that the water problem in the Lower Jordan Valley can only be solved through a combination of solutions such as those suggested in SALAM, as none of the water transfer solutions, as a single solution, will be able to resolve the future expected water deficit problems and at the same time satisfy the political constraints and interests of Israel, Palestine and Jordan. In the following, some specific considerations are listed with regard to the building and evaluation of alternative regional water strategies:

An integral transboundary water strategy is needed to solve the acute water problem in the Middle East and to ensure the sustainable development of the LJV, which can be described as a combination of SALAM WPOs in conjunction with Water-SWAP as well as Water-Energy-SWAP agreements.

The prioritization, consolidation and combination of SALAM WPOs is less technical and will strongly depend on economic and political considerations. Therefore, implementing a regional water strategy requires the continuous work together with the partner countries, building the strategy and required agreements on the basis of mutual trust created by BMBF financed multi-lateral SMART projects over 20 years of research cooperation.

Water SWAP between the partner countries promotes cross-border cooperation in the water sector and is therefore an important confidence-building measure. This is evidenced by the existing agreement between Israel and Jordan to provide Jordanian groundwater in the south in exchange for Israeli water from the Lake Tiberias in the north. Water-SWAP is a very cost-effective and thus economic measure, since water surpluses are used locally across borders in form of a trade, as explained above. Water swaps can prevent long-distance, and costly, transfer of water.

Therefore, a regional water strategy should necessarily include an identification of potentials for water swaps and expansion of the existing Water-SWAP agreement between Israel and Jordan. In the case of SALAM-WPO 3 it became clear that such an agreement between Israel and Palestine would be mutually beneficial. As mentioned above, SWAP agreements contribute to the reduction of political tensions and, therefore, should be considered in any integral water strategy for the region.

A Water-Energy SWAP between the Jordan and Israel would be mutually beneficial, too and also a confidence-building measure, as it creates a mutual dependence on the services of the partner country. This refers, in particular, to the production of solar energy on the Jordanian side in exchange for water stored in the Sea of Galilee. Appropriate concepts should be developed and part of an integrated water strategy for the region.

In principle, as already indicated, in addition to economic aspects, political considerations play a very important role in the implementation of a regional water strategy. On the Jordanian and Palestinian side, there is concern about losing political independence by depending on water supply from Israel. A mutual and fundamental mistrust between the Arab world and Israel certainly plays a role here as well.

The SALAM WPOs 1, 2, 3 and 5, as well as SWAP agreements between the partner countries, thus form an integral part of a regional water strategy to cost-effectively cover Jordanian and Palestinian water needs in short and mid-term, while keeping dependence from Israeli water supply as low as possible, guaranteeing the required political acceptance. None of the above water transfer options is dispensable. While SALAM WPOs 2 and 3 focus on meeting water needs in the Palestinian areas in the West bank and the Gaza Strip, SALAM WPO 1 can only cover parts of Jordanian water need and of the state capital, but not of the northern part of Jordan. SALAM-WPO 5, on the other hand, through its sustainable management of the Sea of Galilee, will be able to cover the remaining water shortages on the Jordanian side as well as provide water throughout the Jordan Valley.An important component of a future water strategy for the region is the sustainable management and reuse of the enormous volumes of wastewater resulting from drinking water imports.

Finally, it should be stated that, depending on the regional development objectives as well as the political and economic constraints, including the financing of construction works, a set of alternative water strategies need to be developed to be able to offer implementable solutions in accordance with the current political and economic priorities. For example, in order to protect the Dead Sea additional water will be required. The feasibility of such solutions, in addition to environmental considerations, will depend on current economic and political objectives as well as the willingness of the international community to support such a regional development goal.

We therefore recommend a modular implementation concept, which enables a gradual expansion of the required water infrastructure in order to adapt to new political priorities and development goals, if necessary.

More detailed information on the SALAM achievements and specific stakeholder recommendations is provided by the aggregated deliverable DS6-8 of the SALAM sub-project, entitled “Development of a Regional Water Strategy and Recommendations towards its implementation” (Rusteberg et al., 2019).

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