Resilience to Climate Change in Morocco

Capacities Built in Mountainous Areas

INTERNATIONAL UNION FOR CONSERVATION OF NATURE – REGIONAL OFFICE FOR WEST ASIA

ACKNOWLEDGMENTS

This case study comes as part of the Social, Ecological & Agricultural Resilience in the face of Climate Change (SEARCH).

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SEARCH is a three year (2011 - 2013) regional project led by the International Union for the Conservation of Nature – Regional Office for West Asia and implemented in partnership with ten organizations (CEDARE, PHG, AWO, CEOSS,UAWC, BDRC, SPNL, MADA Association, Abdelmalik Essadi University, IUCN MED and ATED) from the five countries mentioned above and is supported by the IUCN Global Water Program in Switzerland and the Centre for Development and Innovation (CDI) - Wageningen in the Netherlands.
The objective of the project is to increase social and ecological resilience in watershed ecosystems of the Mediterranean Region in the face of climate and other drivers of change. Among the results that the project aims to accomplish is joint development and application of practical tools and guidelines (i.e. the toolkit) with policy makers to contribute to regional, (sub-)national and sector strategies and plans for climate change adaptation, water resources management, poverty reduction and economic development.

This case was produced with the support and commitment of the SEARCH partners and team. They are:

- The Abdelmalek Essaâdi University in Morocco
- The Association Talassemtane pour l'Environnement et le Développement in Morocco

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INTRODUCTION

The Kingdom of Morocco

The Kingdom of Morocco is a constitutional monarchy with an elected parliament. It is bordered by the Mediterranean to the north, Algeria and Mauretania to the east, Mauritania to the south and the Atlantic Ocean to the west. The total landmass of Morocco is approximately 710,850km^2. Morocco's location between two climatic zones, the anticyclone of the Azores (to the West) and the Saharan depression (to the southeast), yields great spatial and temporal climate variations, (UNFCCC, 2001). It is a Mediterranean climate in the north and Saharan in the south.

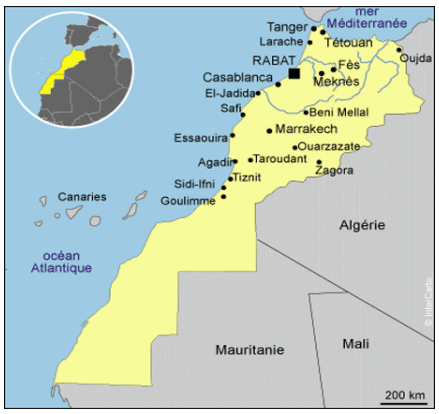

Figure 1: Map of Morocco

Limited economic activities, lack of social services, weak infrastructure and top-down governmental approach to decision-making are among the most important factors affecting development in Morocco. Population is estimated to be 33 million, widely distributed between several urban centers and rural areas.

The principal geographic features of Morocco can be summed up as follows:

- A large extension in latitude (from 21° to 36° north) which places the country between two climate zones: temperate in the north and tropical in the south.
- An important seafront (more than 3,400km of coastline) which has an effect on the climate, commercial exchanges, fishing activities and tourism, as well as on coastline urbanization.
- Extended high altitude mountainous areas, with peaks culminating to more than 4,000m in the Atlas mountain ranges, constituting a water reservoir for the country.

This setting has a considerable impact on water resources, agricultural production and the whole plant cover of the country. Water resources, characterized by spatial and temporal scarcity and irregularity, are under increasing pressures from population explosion, the expansion of irrigated agriculture and urban, industrial and tourism development activities, (UNFCCC, 2001).

Oued el Kebir Watershed

Oued el Kebir Watershed is located in the mountainous area of Tangier-Tetouan Region (NW Morocco). Historically populated by Jbala tribes, Tangier-Tetouan Region has about 3 million inhabitants and a surface area of 1258km^2. There are three types of landscapes in the region: coastal and urbanized areas, Atlantic plains and hills areas and mountainous areas. Only mountainous areas in this region are of concern to this project. The demonstration site in these areas was selected as a pilot area for encompassing several common features with other mountainous landscapes in North Africa (Rif and Middle Atlas in Morocco, Tell in Algeria, Kroumirie in Tunisia).

The estimation of current population of Oued El Kebir Basin (form data of Communal Development Plans of Rural Municipalities) is about 14,342 inhabitants, with a density of 64 inhabitants / km^2. Average rate of illiteracy in this area was estimated to be 66.1% in 2004

with no more than 1.2% of population with graduate level of education. Mean poverty rate (expenditure per capita below 320 Euros/year) was 31% compared to 14.2% at national level in 2004 and mean rate of vulnerability to poverty (expenditure per capita between 320 and 476 Euros/year) was 21.4% compared to 15.9% at national level in 2008. The human development index (rate of child mortality, level of education and expenditure per capita per year) is mainly below 0.50 and social development index (access to water, electricity and roads) is between 0.15 and 0.45.

Rural municipalities are the basic decentralized entities constituted by an elected council responsible of local democratic management. Each rural municipality has a president elected by the political majority of the council. They constitute with other rural and urban municipalities a provincial council and a regional council, but, until the new constitution of 2011, these territorial collectivities were still lacking decentralization and executive power. It is supposed that with actual constitution municipalities would be empowered and regional level strengthened with an elected government and more competencies.

At each rural municipality, a communal development plan (PCD) is developed, through a participatory approach, for a period of six years. Introducing climate change considerations within the PCD in territorial planning is being promoted by different institutions (besides SEARCH project), including a framework for resilient PCDs currently proposed by a project of UNDP in Morocco.

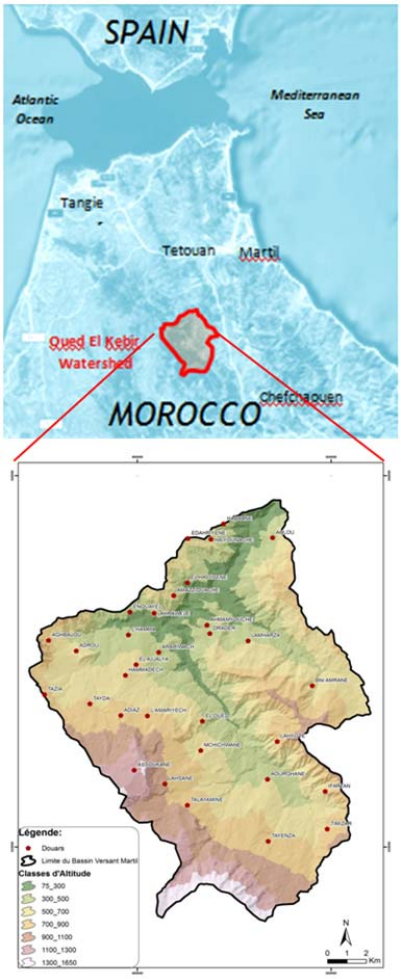

Figure 2: Map of the watershed area

Climate Change in Morocco

Drought and precipitation scarcity in Morocco are expected to reduce surface and subterranean water resources availability by 10-15% in 2020. Likewise, floods were recurrent in the last two decades with more intensity in North Morocco. Moreover, it is acknowledged that the average increase of temperature during the past decades was higher than 1°C even though this increase seems to be slower in the northern part of the country. Equally, the trend of decrease in precipitation is general, but it is discrete in the Tangier-Tetouan Region, due to its location.

Compared to other areas of the south and east of Mediterranean region, the climate of NW Morocco (SEARCH project's site) is influenced by the Atlantic Ocean and dominated by humid and sub-humid Mediterranean bioclimatic conditions. Spatial variability of such climatic conditions is also evident due to the physiographic heterogeneity of this mountainous area, in comparison with the monotonous arid landscapes dominating the South and East of the Mediterranean. However, statistical downscaling results -obtained

by SEARCH- indicate a trend of annual temperature increase of 1.5°C by 2050. At the opposite, with an optimistic scenario, annual precipitation shows a trend to diminution by 70mm in 2050.

Figure 3: SEARCH project site in Morocco

RESILIENCE TO CLIMATE CHANGE

Social, Economic and Environmental Change

Before the 20th century, social ecosystems were self-sufficient agro-forest systems where hamlets had been generally located near a water source and surrounded by irrigated crops, extensive pluvial agriculture and shrubland in a matrix of Mediterranean forest. Studies of landscape change and dynamics indicate that there are historical oscillations from diversified agro-forest systems to agricultural systems with degraded land, depending on physical conditions and pressure from urban centers, leading to development of commercial products and overexploitation of resources. (Taiqui & Cantarino, 1997; Taiqui, 2005). Agricultural systems are related to important increase of deforestation, expansion of agriculture, intensification of soil erosion and land degradation (Taiqui, 1997).

This vulnerable agricultural social ecosystem is expanding regardless of quality of soil or adequate agricultural conditions and without consideration to climate change and risks of increased intensity and magnitude of extreme meteorological events. With declining forests, cannabis cultivation is pushing the system to the verge of ultimate concern at which it will no longer be able to support and sustain human habitation.

At Oued El Kebir watershed, there are two main social ecosystems: Agro-forest systems at the right side of the river and deforested agricultural systems at the left side. Sandstone substrates dominate forested systems while heavy slopes, soft materials and consequently soil erosion processes prevail in deforested systems. Statistical comparisons have showed that rate of literacy and indices of human and social development are significantly lower in deforested systems, confirming that physical and social vulnerability are related.

To develop and pilot a climate resilience framework in Morocco based on joint learning, participatory planning, capacity building and testing in demonstration sites, the Abdelmalek Essaadi University (UAE), Talasemtane Association for the Environment and Development (ATED), and the IUCN ROWA entered in a partnership to work in the Oued el Kebir Basin. These SEARCH (**S**ocial, **E**cological & **A**gricultural **R**esilience in the face of **C**limate **Ch**ange) partners, along with representatives from other local organizations, focused on giving the local communities as well as other stakeholders the skills and knowledge necessary to anticipate potential climatic hazards, enabling them to have a realistic vision of the future and, thus, to be better prepared to face climate change. In the context of mobilizing different stakeholders and coordinating between them at different levels, the project team adopted a charter that specifies modes of

participatory work. It is based on effective communication between its members and third-party partners, collective work as well as design, planning, implementation, evaluation of activities and project documentation.

To achieve this, SEARCH conducted a vulnerability assessment with the participation of local inhabitants, the representatives of the six rural communes surrounding the basin and relevant governmental agencies. The appraisal confirmed that the local community lacks resilience and is exposed to harsh weather fluctuations. Its livelihoods rely exclusively on climate-sensitive and easily damaged natural resources.

Following that, participants reached a shared vision for 2020 consisting of:

- Improved living conditions of the population by building and improving the infrastructure (roads, electricity, water…) and providing access to basic social services and various economic activities.

APPROACHES AND METHODOLOGY

Through participatory planning, different scenarios were elaborated based on importance and probability of occurrence. These scenarios stress the need to diversify sources of income, to valorize agricultural and forest products, to adopt rainwater harvesting technologies and to prevent soil erosion and landslides. Among the participatory approaches utilized:

1. Consultation where stakeholders and other parties have been consulted for exchange of information about different aspects related to the project. Modes of consultation and kind of data and information submitted were variable based on consulted stakeholders. This consultation also included a gender sensitive survey with local communities to investigate preferences about agricultural activities for income generation.
2. Participation that was conducted mainly through meetings with local communities and watershed and steering committees. Main results were a joint assessment of vulnerability, a shared vision for resilience, prioritization of adaptive measures and implementation of pilot actions.
3. Project partnership is encompassing a range of public agencies and local governance institutions and characterized by a high level of local involvement offering gender-sensitive training to inhabitants.
4. Self mobilization by which local communities were expected to adopt adaptive actions by their own means or using their improved capacities acquired through SEARCH (associations formed, links with other stakeholders established, possibilities of funding discovered …).

Similarly, several methodologies and tools were used and achieved tangible outcomes:

1. PRA/RAAKS (Participatory Rural Appraisal/Rapid Appraisal of Agricultural Knowledge Systems) that were used at local and watershed levels in the visioning, assessment and strategizing steps of the planning cycle and led to the identification of stakeholders/gender and their roles and importance in facilitating solutions.

2. Problem tree building during visioning at local and watershed levels, where problems were identified and visions formulated.

Figure 4: Problem tree building

3. **Stakeholder analysis** by country team leading to identification and ranking of 12 core stakeholders according to their sensitivity to climate change and relevance for project activities.

4. **CRiSTAL (Community-based Risk Screening Tool – Adaptation and Livelihoods)** used with local community showing locals' perception of climatic risks and allowing assessment of livelihood resources, climatic impacts, adaptive measures and their feasibility and sustainability.

5. **CVCA (Climate Vulnerability and Capacity Analysis)** used with watershed committee and with local communities to asses livelihoods, climatic risks, actual adaptation and alternative strategies.

6. **Scenario building** with watershed committees and local communities, leading to prioritization and ranking of factors affecting the realization of vision.

DEXIRA (Resilience Assessment) which is a qualitative model specifically developed by SEARCH in Morocco to allow the possibility for multi-stakeholder platforms to assess the progress of their work on increasing resilience.

ACHIEVEMENTS AND LESSONS

The overall objective of SEARCH Morocco was to contribute in developing and piloting a resilience framework for local action planning capacities and methodologies to increase climate change resilience through joint learning (planning and testing by stakeholders in the demonstration site). The results achieved could be summarized in the following four points:

1. **Technical and management capacities were built** through research-action, taking into consideration local priorities and national policies. Beneficiaries were key stakeholders implicated in country team and watershed and steering committees. They were able to apply appropriate tools for assessing climate change risks and vulnerability of local communities and identify ways to cope with such risks and vulnerability as well as the necessary institutional change processes. Agents of development represented in the country team and committees (from ministries and public institutions) have become more susceptible to local communities' taking ownership of, and accountability for, the management of ecosystems.
2. **Participatory approach adopted at all steps of the process** and led to the above results. At community and watershed levels, particular outcome is the proposal of Resilient Community Development

Plans as an update of Community Development Plans. At national level, an important outcome is participation in the process of development of Territorial Climate Plan and the project of creating a center of competencies on climate change in Tangier-Tetouan Region.

Figure 5: Participatory approach

3. **Two pilot projects were implemented** in target area for later replication in similar landscapes: 1) introduction of a household rainwater harvesting technique adapted to fit rough slopes and sub-humid areas of deforested agro-systems experiencing water shortage during summer; and 2) launching an aromatic plants cultivation project in a region known for its overexploited natural resources and where aromatic plant cultivation is not practiced.
4. **Sharing valuable information and knowledge** at all levels. Structured attention was engendered to document the methodologies and learning processes. The new insights, opportunities, lessons learned and obstacles overcome were also captured for publication.

One of the main strengths of the project was the "technical team" that gathered the main stakeholders to actively participate in day to day decisions at a technical level. For this particular case the involvement was assured by: 1) the institutions' involvement from the beginning to ensure synergic priorities and real decision making and 2) two-level participation, at directive level (regional directors) and at technical level (technical team itself and appointed focal points for the project).

INSTITUTIONALIZATION AND DISSEMINATION

The technical team has constituted a real plate-form for joint learning between stakeholders and was very efficient in conducting the process internally and at the field, including facilitation of workshops and meetings with local communities and other stakeholders at different sub-national levels. Nevertheless, its role in institutionalizing SEARCH approaches for resilience has been limited. At municipality level, approaches for resilience assessment were largely appreciated, pilot actions were monitored by local authorities and there was a clear expression of interest in piloting "resilient municipal development plans" proposed by SEARCH.

Important progress has been done to disseminate and upscale experiences and outputs of the project. Furthermore, at regional level, capacity building as core component of SEARCH outcome and advocacy message was capitalized as to meet other national initiatives, allowing the region to be selected to coordinate, jointly with Marrakech Region, an ambitious project dedicated to the creation of a center of expertise on climate change. In this project, the way is now open to the University to promote the institutionalization of the SEARCH approaches. Importantly, a special initiative to upscale participatory adaptation planning approaches is under way by the project partners UAE and IUCN-ROWA.

RESILIENCE ASSESSMENT

With the completion of SEARCH life cycle nine inputs have changed in the Moroccan pilot site leading to changes in

the components of the resilience framework:

1. Increased government contribution (through funds by Morocco Green Plan).
2. Increased income sources (enhanced fruit trees and aromatic herbs plantation).
3. Promotion of integrated land use planning (elaboration of a tool kit to integrate climate change and land use planning in municipal development plans).
4. Partial improvement of domestic water supply (domestic rainwater harvesting).
5. Increased technical experience available (through trainings on aromatic herbs planting and through constructing rainwater harvesting systems).
6. Development of CBOs (increased number of CBOs by creating one association of farmers and two women groups, empowerment of one agricultural women cooperative).
7. Introduction of a process of facilitation and leadership that had been absent (through a technical team involving key stakeholders working with communities, CBOs, municipalities and others).
8. Enhancement of cooperation between local organizations.
9. Capacity building (training farmers on new agricultural practices, publishing learning documents, exchanging information and facilitating group processes).

Components of resilience that have changed were “diversity” (from very low to medium) mainly because of a slight increase of income sources, “capital and innovation” (from low to medium) due to the introduction of a rainwater harvesting technique and improvement of “technical experience available and self-organization” (from low to medium) at local and intermediate levels. As for “overall resilience,” it has shifted from ‘very low’ to ‘low’.

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