



Adaptation is...

Protecting coastal communities in northern Morocco

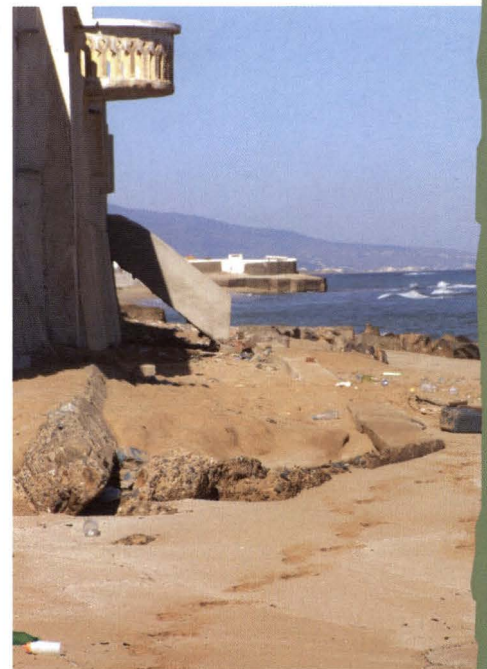
"Our coastlines are highly coveted. All those affected must be involved in finding solutions to the many pressures they face."

Fouad Zyadi, Morocco's Ministry of Land Use,
Water and Environment (MATEE)

Morocco's rural north east coast is increasingly vulnerable to the effects of climate change – sea level rise, storm surges, and coastal flooding. An international research team led by Morocco's *École nationale forestière d'ingénieurs* is working in two neighbouring provinces to integrate a better understanding of climate change impacts within development plans and land use guidelines to meet the region's many competing needs.

The challenge: Growing pains on a changing coastline

Wedged between the Rif Mountains and the Mediterranean Sea, the provinces of Nador and Berkane cradle a number of rural enclaves that depend on fishing, farming, and livestock raising. Centuries of isolation have preserved local language and tradition, but life is hard. Surveys in some communities show average farm household incomes of as little as \$540 per year. Support from overseas relatives keeps many families out of poverty, but does little to create jobs.

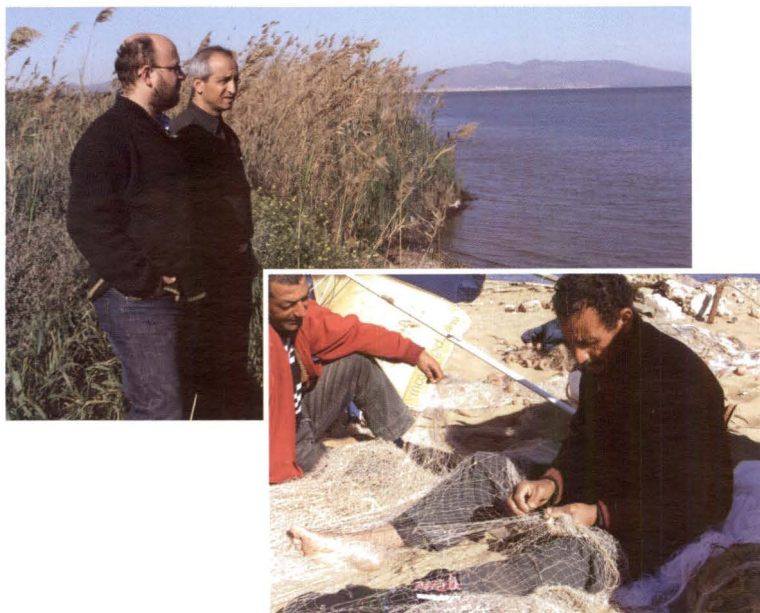


Coastal vulnerability

Up to **59 cm**: IPCC estimate of average global sea level rise by 2100

1 metre per year: rate of erosion in some areas of Morocco's north coast

3: number of wetlands protected by the Ramsar Convention that lie in the study zone



While the southern Mediterranean may draw tourists, the coastal landscape is changing. A new highway will soon run the length of Morocco's north coast. Development pressures are destroying wetlands that act as natural buffer zones against flooding and erosion. As climate change brings more severe and frequent storms and rising seas, the very assets that attract more tourists and investment are threatened. According to Fouad Zyadi of the Environment Ministry, several Moroccan beaches have already been lost to erosion.

Farmers and pastoralists, meanwhile, are coping with less rain, even as the water table grows saline from the incursion of sea water. Water scarcity is now a chronic problem in Morocco, with several consecutive years of drought in this century. In coastal Nador and Berkane, the rains are more frequently torrential when they do come, adding to erosion of the fragile mountain soils.

The idea: Factoring climate change scenarios into development plans

From the front, the row of houses looks inviting, with latticed balconies in typical North African style. When originally built, these homes were set over 20 meters back from the sea. Today, the effects of rough seas can be seen in the crumbling stairwells that lead onto a beach that has all but disappeared.

These are only the most visible sign that land use guidelines from past decades don't meet the reality of coastal changes underway.

Local authorities and national ministry officials are all too aware that the wellbeing of this region depends on protecting natural resources. Both a local action plan for integrated coastal zone management and a new national law on coastal zones are in the works. But to date, there has been little solid information on what climate change may bring, or how local communities might adapt.

Researchers led by Morocco's Ecole nationale forestière d'ingénieurs (ENFI) aim to fill that gap, and widen participation in planning. They are doing this in part by pooling their knowledge of climate data analysis, coastal dynamics, and social research to produce a range of possible scenarios that can inform planning choices.

Cover: A balcony overlooks the sea that is now eroding the foundation of this home.

Page 2: Project leader Abdellatif Khattabi and IDRC program officer Guy Jobbins survey the coastline.

Local fishermen repair their nets. These fishermen earn between \$40 and \$60 per week.

Page 3: Researcher Naima Faouzi (in jacket) with representatives of local womens' associations in Berkane.

Local women like Yamina diversify their income with beekeeping and handicrafts.

Page 4: This tourism development near the mouth of the Moulouya River is hampering wetland drainage.

Photos: IDRC/M. O'Neill

According to project leader Abdellatif Khattabi, ministry and provincial authorities have been doing land planning without a roadmap of coastal dynamics. "This project will add that knowledge," he says, "using among other data, aerial surveys dating back to the 1980s to give a picture of how the coast has changed in the last two decades."

Understanding what resources local people rely on, and how they see themselves as vulnerable to climate change is an important part of the picture. ENFI is working with the Faculty of Education at Canada's University of Moncton and the Coastal Union (EUCC) to develop processes to involve local stakeholders, and raise their awareness of the issues.

ENFI, Morocco's Mohamed V University (Institut scientifique de Rabat) and Italy's Interdepartmental Center of Research in Environmental Science are contributing their understanding of Mediterranean coastal vulnerabilities. Expertise in climate change modeling is contributed by the National Meteorological Directorate, and the Potsdam Institute for Climate Impact Research. National and regional officials

in environment, agriculture, education, health, tourism, forestry, water and land

planning departments are actively involved, as are locally elected representatives and civil society groups.

The skill and knowledge of these partners will be pooled to produce a range of scenarios depicting the likely effects of different planning choices on climate sensitive resources. These scenarios will show what the future could be like over decades or centuries, given specific sets of assumptions. These assumptions include trends in demographics, energy demand, industrial activity, greenhouse gas emissions, and land use, as well as the long term behavior of the climate system.

On the ground:

Pinpointing vulnerabilities

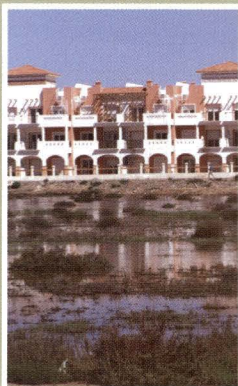
Naima Faouzi is used to seeing few women at formal meetings of rural representatives. So she reaches them wherever they can be found, on this Saturday at a sale of local craft to mark International Women's Day.

"This is one of the most conservative regions of Morocco," she explains, "and mindsets around gender are difficult to change."

As a social science researcher examining how people may be vulnerable to climate change, she believes it is particularly important to reach women, who have limited voice in local decisions, and even less control over the land they depend on.

Through household surveys, the team is assembling a picture of community life and agricultural production, what resources people depend on for these activities, and their understandings of climate change. This in turn will help more clearly predict how vulnerable they may be to changes in water quality and availability, or loss of arable land. The team also organizes workshops with local representatives to get input, while sharing data and overall progress.





Issues for policy and planning

- What land use regulations can best protect coastal zones?
- How can shrinking freshwater supplies be conserved and fairly shared?
- What investments can help farmers adapt?
- What kinds of tourism development protect natural resources?

Surveys so far indicate that local people are aware of climate change and link it to the rising temperatures, drought, torrential rains, and flooding the region has experienced in recent years. They worry about how climate change will affect farming, fishing, and tourism, and they expect it will directly affect their families over the next 30 years.

Climate projections for the region confirm their worries. Consistent with global warming trends, Morocco's National Meteorological Directorate has recorded observations showing rising temperatures, less precipitation, and an increase in drought, widening the gap between water supply and demand. Average temperatures are expected to rise between 2 and 5 degrees Celsius by the end of this century, while rainfall is predicted to decline 20 to 30 per cent.

Looking ahead: Framing policy choices for a more secure future


In the fertile lands near the Moulouya river mouth conservation area, farmers used to

grow market vegetables, but have been switching to salt tolerant cereals because of increasing salinity in the aquifers. This is an adaptation strategy that may help local farmers.

But many look across their fields at another kind of development strategy and wonder. Where a juniper forest used to buffer the river valley, a new tourism mega-project is near completion. Set on low-lying wetlands near an eroding shoreline, the development and the new road serving it are already hampering wetland drainage. This 27,000 bed development, with golf courses and swimming pools, is one possible vision for the region, based on large-scale tourism.

Saaidi El Hosseine, President of Boudinar rural commune, has a different vision for the future of his community, one of the poorest and most isolated in the region. El Hosseine thinks small-scale agro-tourism, hosted by individual families, could work hand-in-hand with traditional livelihoods in farming, fishing and cattle raising.

For IDRC program officer Guy Jobbins, the value of the research led by ENFI lies in helping local people and policymakers make these choices:

"Here we see many competing pressures in a limited amount of coastal space. It is important to bring stakeholders into processes shaping decisions, to ensure the benefits of development are fairly shared and protected from the effects of a changing climate. Choices made now will shape the region's future." 

Mary O'Neill

"Moroccan coastal management: Building capacity to adapt to climate change through sustainable policies and planning" is a research project led by Morocco's Ecole nationale forestière d'ingénieurs, with support from the **Climate Change Adaptation in Africa (CCAA) research and capacity development program**. The CCAA program is jointly funded by Canada's International Development Research Centre and the United Kingdom's Department for International Development.

For more information, visit: www.idrc.ca/ccaa and www.accma.un.ma