Effectiveness of current policy frameworks in mitigating climate-induced risks relating to human security and conflict – case study on Morocco

Contract number:	SSH-CT-2010-244443
Work Package:	WP4
Partner responsible:	Ecologic Institute
Deliverable author(s):	Katriona McGlade and Isabelle Turcotte
Planned delivery date:	
Actual delivery date:	03 September 2012
Dissemination level:	Public

Abstract

This case study provides an overview of the current policy framework in Morocco for addressing the impacts of climate change on water, conflict and human security. It presents insights into the effectiveness of Moroccan policies and examines actors' expectations and demands for a future policy framework.

Acknowledgement

The authors would like to thank the interviewees who participated in this study - their contributions have been invaluable. Interviewees' contributions were in a personal capacity and not on behalf of the institutions to which they are affiliated. Furthermore, the conclusions of this report are the responsibility of the authors and do not necessarily represent the views of the interviewees.

Table of Contents

INTRODUCTION **6**

1 BACKGROUND **6**

1.1 WATER RELATED IMPACTS OF CLIMATE CHANGE 6

1.2 WATER SUPPLY AND DEMAND 9

1.3 AWARENESS OF CLIMATE CHANGE ISSUES 12

1.4 IMPACTS OF CLIMATE CHANGE ON HUMAN SECURITY AND AWARENESS OF THREATS 14

1.5 IMPACTS OF CLIMATE CHANGE ON CONFLICTS 17

1.6 CONCLUSIONS 19

2 POLICY FRAMEWORK ON WATER AND CLIMATE CHANGE **20**

2.1 OVERVIEW OF THE CURRENT POLICY FRAMEWORK 20

2.1.1 Climate Change *20*

2.1.2 Water *21*

2.1.3 Agriculture *25*

2.1.4 Human Development *26*

2.2 EFFECTIVENESS OF THE CURRENT POLICY FRAMEWORK: INTERVIEWEES' ASSESSMENT AND SUGGESTIONS FOR IMPROVEMENT 27

2.2.1 Climate change *27*

2.2.2 Water *27*

2.2.3 Agriculture *35*

2.2.4 Human Development *39*

2.2.5 Conclusions *39*

2.3 EXPECTATIONS AND DEMANDS CONCERNING FUTURE POLICY FRAMEWORK (NATIONAL/INTERNATIONAL) 40

3 EVALUATION OF RESULTS 42

3.1 INSIGHTS ON RELATIONSHIP BETWEEN CLIMATE CHANGE, WATER AND HUMAN SECURITY 42

3.2 INSIGHTS ON THE RELATIONSHIP BETWEEN CLIMATE CHANGE AND WATER-RELATED CONFLICTS 45

3.3 INSIGHTS ON THE EFFECTIVENESS OF THE CURRENT NATIONAL/INTERNATIONAL POLICY FRAMEWORK 46

3.4 SOME FACTORS INFLUENCING EFFECTIVENESS 50

3.5 CONCLUSIONS 52

5 SOURCES 54

6 ANNEXES 59

Annex A: Morocco's river basins and water balances 59

Annex B: List of interviewees 60

Introduction

The purpose of this case study is to provide a review of the effectiveness of Moroccan policies and measures for addressing the impacts of climate change on water, conflict and human security. The case study is part of a series[1] and is based on the conceptual and methodological framework set out in the main report to which it is annexed.[2] It has been compiled through desk-based research and interviews with 17 people from a range of organisations, including actors from government and academia (current and retired) as well as from NGOs, international bodies, a think-tank and the private sector.[3] The study begins with an overview of the implications of climate change for water, conflict and human security in Morocco and awareness of these issues. It goes on to broadly describe current policies and programmes that address these thematic areas. Following this, based on interviewee inputs, the study assesses the effectiveness of the current framework to address these issues, as well as factors which impact its effectiveness. The case study ends by providing insights on the relationship between climate change, hydro-conflict and human security and on future of Moroccan policy on these issues.

1 Background

1.1 *Water related impacts of climate change*

With an arid to semi-arid climate, Morocco's water resources are naturally limited and irregular in time and space and the country experiences high temporal variability in precipitation and frequent droughts (Abdelfadel and Driouech, 2009). With projections for the coming decades foreseeing a warmer and drier climate, climate change will only exacerbate already challenging conditions for the management of water resources. Consistent with global warming trends, observations from Morocco's National Meteorological Directorate show rising temperatures, less precipitation, and an increase in drought, widening the gap

1 The case study is one of a series of case studies including Ethiopia, Israel and the occupied Palestinian Territories, the European Union and the United Nations.

2 Gerstetter, C., McGlade, K., Vidaurre, R., and Tedsen, E., Current policy frameworks for addressing climate-induced risks to human security and conflict – an assessment of their effectiveness and future perspectives, CLICO, 2012

3 See Annex B for full details of the interviews conducted.

between water supply and demand (ALM, 2012). According to the Intergovernmental Panel on Climate Change (IPCC), the trends observed over the last decades will accentuate in coming years (Rochdane et al., 2012).

Despite a slight cooling undergone in the 1970s, the average temperature in Morocco has risen significantly, by over 1^0C over the past 50 years, with the highest value of 1.4^0C in the south east region (Agoumi & Debbarh, 2006). Minimum and maximum temperature values are rising with expected average increases of 0.7^0C by 2015 and 1.8^0C by 2045[4] (INDH, GIZ, & MEMEE, 2006). Temperature rise will be accompanied by a reduction in rainfall over the entire territory, to varying degrees in different regions. At the national level, total annual rainfall is diminishing and is expected to decrease by about 4% in 2020 compared to 2000 levels (Ibid). The country has a historic experience of droughts but these have increased in frequency and length over the last decades[5,6] and have in some cases led to irrigation dependent agricultural systems having to cease production (Iglesias et al., 2005).

Although flooding is not a recent phenomenon in Morocco, its effects are now felt more strongly. This is due in part to demographic growth, economic boom and urban, agricultural, industrial and touristic development that have led to an increasing occupation of vulnerable zones (Abdelfadel and Driouech, 2009). From 1995-2010, Morocco has seen increasingly intense and frequent flood events (INDH et al., 2006) – some of the most severe impacts in recent times are highlighted in Table 1. Flash floods have been particularly damaging with important human and economic losses.[7]

Table 1: Severe flood impacts in Morocco 1995 – 2010[8]

Year	Number of people	Number of people	Economic costs (where

4 Temperatures are expected to rise between 0.4/0.6 °C in the South and 0.8/0.9°C in the East by 2015 and by 1.6 °C to 2 °C for the same regions by 2045 (reference period 1960-1990).

5 Of the twenty-two drought years in the twentieth century, ten occurred during the last two decades and included the three successive dry years of 1999, 2000 and 2001. AFED, Arab Environment: Future Challenges, 2009.

6 From 1976-2006, Morocco experienced severe and recurring droughts, characterised by an increase in the number of consecutive days without rain (INDH et al., 2006).

7 For example, the heavy rains reported in Morocco on 17 November 2002 killed 89 people in 24 hours. See http://reliefweb.int/node/130235. Retrieved 20 May 2012.

8 Statistics from http://www.preventionweb.net/english/countries/statistics/?cid=116. Retrieved 12 July 2012.

	affected	killed	given) in USD
2010	75,003	32	
2008	20,000	30	
2003	10,000	35	
2002	15,017	80	200,000,000
1996	60,000	25	55,000,000
1995	35,000	43	9,000,000

Overall, projections for 2020 point to a general decrease in the availability of water resources due to climate change with an average reduction of 10 to 15 % with the following consequences (MATUHE, 2001):

- A decrease in dam capacity (concentrated rainfall and accelerated siltation)
- A decrease in water levels and stream and river flows, leading to a decrease in the natural outlets for water tables and an increase in their salinity in the coastline areas.
- A deterioration of water quality.

Predicted sea-level rise will have important effects on Morocco. Not only does the country have an extensive coastline that stretches for around 3500km along the Mediterranean and the Atlantic; this zone is under high stress from human pressures and forms one of the main socioeconomic areas of the country (60% of the population inhabit the coastal cities, and 90% of industry can be found in this region (Snoussi, 2008). Morocco's rural coastal areas e.g. Nador and Berkane are also increasingly vulnerable to sea level rise and other climate change impacts such as storm surges, and coastal flooding. Some areas of the north coast are already eroding at a rate of 1 metre per year and the average global sea level rise (SLR) predicted by the IPCC (up to 59 cm by 2100) will exacerbate erosion (ALM, 2012).

Climate change impacts on water resources, namely more frequent and severe floods and droughts, reduced availability and quality of water, sea level rise, and salination of aquifers will therefore pose important challenges for Moroccan society and governance systems.

1.2 *Water supply and demand*

Morocco's water is contained almost exclusively within its own territory, and as such has no requirements for trans-boundary water management nor is it exposed to trans-boundary conflict over shared rivers or lakes as experienced for example in the case of the Nile. Within the current technical and economic conditions, the mobilisable hydraulic potential is estimated at 20 km^3: 16 coming from surface water and 4 from groundwater sources (Agoumi & Debbarh, 2006). In 2006, the total water demand stood at 13.45 km3 see Table 2 (CEDARE, 2006). Total demand is expected to rise to 15.69 km3 in 2020 (FAO, 2005). It was reported that in 2011, water supplies dropped to an all-time low (11.7 km^3), which resulted in a 15% deficit when compared with demand (IIED, 2011). A study carried out in the Rhereya watershed of Morocco's High Atlas region also shows that average annual unmet water demand will dramatically increase in this particular watershed in the coming decades. It also notes that current strategies proposed by decision makers would not be sufficient to ensure a balance between demand and supply under the pressure of socio-economic and climate changes (Rochdane et al., 2012).

Table 2: Water supply and demand in Morocco (in km3)

		Surface	**Groundwater**	**Total**
Available water resources 2011		19.00	4.00	23.00
Water use 2006	**Agriculture**	9.17	2.0	11.17
	Household and Industry	1.58	0.7	2.28

	Total	10.75	2.7	13.45

(Sources: Department of Water, Morocco, 2012 and FAO, 2005)

While, these numbers indicate that current and future demand remain well below the country's total mobilisable water potential, they fail to reveal the important disparities between river basins as demonstrated in Table 3 and and Annex A. Indeed, only three basins (Loukkos and Sebou) show a positive balance, and the others exceed their current capacity. At present, water availability varies between 180 m^3 per capita per year in water poor areas and 1850m^3 in water rich areas (Choukr-Allah, 2011). Only two basins (Loukkos and Moulouya) have a water availability per capita above 1000m^3/year, often defined as the threshold below which a region suffers from water scarcity (Falkenmark et al. 1989). One factor explaining this is that regions with higher water needs are not necessarily also water rich regions. The abstraction rate of groundwater resources is on average 114.1%, varying from 75.4% (Bouregreg basin) to 179.6% (Souss basin). The average abstraction rate of deep aquifers is 80.4% varying from 48.2% (Loukkos basin) to 130.1% (Tensift basin). It is expected that the current overexploitation of groundwater resources will worsen; by 2020 the exploitation rate of groundwater resources should reach 120.1% and that of deep aquifers 89.5% (FAO, 2005). The population growth rate of about 1.5% per annum has further negative impact on water availability (Zarhloule, 2009).[9]

Table 3: Water availability and use per river basin (all figures: m3/cap/yr)

Basin	**1999**	**2000**			**2020**		
	Water availability	Available resources	Water use	Water Balance	Available resources	Water use	Water Balance
Loukkos	1353	1060	655	+405	1280	1048	+232
Moulouya	1065	1230	1292	-62	1430	1631	-201

9 See Annex A for a graphical representation of river basins and water balances in Morocco.

Sebou	996	4080	2294	+1788	4940	3830	+1110
Bouregreg	109	495	570	-75	705	825	-120
Oum Er Rbia	1232	3590	3197	+393	3670	3825	-155
Tensiff	546	1247	1297	-50	1595	1617	-22
Souss-Massa	362	1015	1073	-58	1060	1201	-141
Southern Atlas	735	970	1121	-151	1350	1440	-90

(Source for 1999: Choukr-Allah 2011; Source for 2000 and 2020; Agoumi & Debbarh, 2005)

The degrading water quality is a growing problem which also contributes to reducing resource availability. According to the national department of water, in 2000-2001, the quality of surface waters observed was determined as 'good' in 46% of the monitoring stations, 'average' in 9%, and 'bad' in 45%. Most of the stations where bad quality was observed are located in water bodies affected by urban and industrial outflows. The analysis of surface water quality at the river basin level reveals that in the Souss and Bouregreg basins water quality is generally good while the highest numbers of stations where bad quality was recorded are in the Sebou and Loukkos basins. As for groundwater quality, in 2000-2001, the quality was good in 20% of the monitoring stations, average in 29% and degraded in 51%. The parameters responsible for this degradation are the strong mineralization of water and the presence of nitrates in high concentrations (DW, (2012)).[10] Morocco has been ranked amongst the countries least equipped to deal with water pollution and it is estimated that if nothing is done to address this situation, the volume of polluting effluents will triple by the year 2020 (Choukr-Allah, 2010).

In this way, it is clear that despite overall positive water balances, without management interventions, sufficient resources will not be equally available to all regions and all citizens in the future. An additional complication is that regions with

10 Evidence of a net deterioration of groundwater quality due to the practices of the irrigation management and fertilizers, in addition to groundwater recycling from pumping wells has been reported in Tadla, Morocco (Faouzi and Larabi, 2001).

higher water needs are in many cases not located in water rich regions. This need for redistribution and for measures to ensure this water is of sufficient quality where for domestic purposes, pose a number of challenges for policy makers.

In Morocco, irrigation accounts for 88% of water withdrawals, while domestic and industrial uses account for 8% and 4%, respectively (Hellegers et al. 2007). It follows that, given the impact of climate change on water resources, climate change will affect the agricultural sector and in turn the entire socio-economic fabric by lowering incomes and reducing food supply caused by crop failure or extreme events increasing in this way the food insecurity in the country. Over the years, agricultural GDP has fluctuated due to climatic variation and a drop in the agricultural sector's contribution to total GDP has been recorded (FAO, 2005). However, despite its relatively modest share of the national GDP (around 19%), agriculture is the main pillar of the Moroccan economy, employing around 40% of the population (World Bank, 2012). Climate change scenarios indicate that by 2030, the probability of experiencing a poor harvest is expected to reach a rate of 10% or more, and the reservoirs for irrigation water are expected to decline by over 25% (ALM, 2012). These impacts could materialise in the coming two decades, but are likely to escalate on a much larger scale towards mid-century (ibid). In this way, climate impacts on the agricultural sector will also have important physical effects for food and economic security.

1.3 *Awareness of climate change issues*

Morocco has ratified the United Nations Framework Convention on Climate Change and the Kyoto Protocol. In its first national communication in 2001, Morocco identified the following sectors as the most vulnerable to climate change: 1. Water resources (already reaching the limits of supply needs), 2. Agricultural production and Forestry and 3. Coastline zones and Fishing activities. The national communication identifies a number of adaptation projects currently being undertaken. The comments shared by the interviewees on climate change provide some insights on the level of awareness on the issue within the Moroccan society. They also point to some strengths and shortcomings within the current policies, which will be investigated more in depth in later sections. In addition, the interviewees' comments allow to discern between what one reads in official government publications and how climate change is really shaping the decision making process and actions on the ground level in Morocco.

Government

Some interviewees positively perceived Morocco's commitment to and awareness of climate change issues.

"We take (climate change) very seriously at the government level. Our meteorological competencies are recognised within North Africa and the Arab world. We have been very present and active at the international level; at each COP there is a delegation from Morocco."[11]

At the same time, other interviewees emphasised that although programmes for adaptation and mitigation existed, implementation was delayed and concrete action on the ground was not taking place. Some blamed this on the lack of real commitment from the government, others on the low level of awareness and know-how in local level civil servants.[12]

"While climate change may be a topic in the policy realm, it is not an important one from the point of view of technicians. It has begun to be discussed over the last few months. If climate change is only discussed at a higher level, things will not change on the ground. There is a 30-40 year old mentality that needs to be changed. The regulation is not always being respected. However we cannot say that (the regulation is) useless, but if it were better implemented and updated it could have greater impacts. Challenges to implementations are problems related to perspectives and mentalities"[13]

Public awareness

One interviewee shared insights from a survey on climate change perceptions carried out within one of his projects. He revealed that fishermen and rural populations had noticed that there were changes to their lives, but that they didn't necessarily relate this to climate change.[14] Another interviewee commented that ''climate change is a dilemma of the government, civil society is not very much concerned''.[15] Another interviewee commented that ''people who live in the (rural) regions know much more than us in the city, because they live the impacts of climate

11 Personal communication, Moroccan official, Water sector.

12 See also results from Abdul-Malak et al. forthcoming 2012.

13 Personal communication, NGO interviewee

14 Personal communication, interviewee from academia

15 Personal communication, interviewee from academia

change first hand: no rain no yield''.[16] Lastly, it was stated that people working in fisheries were concerned and are beginning to work on the impact of climate change.[17]

Concerning the level of awareness within the industrial sector one interviewee noted that ''perhaps there is a difference of attitudes in the government sector and the industrial sector in which climate change is seen as less of a priority''.[18] Generally, it was suggested that the industrial sector would only take action in a way that would contribute to its public image.

Finally, two interviewees, both from academia, stated that although there was climatic variation in Morocco, they did not ''believe in climate change'' and strongly criticised the international organisations' rhetorical discourse of climate change as being used to take the focus away from real issues, such as the problem of small farmers and the need for technical development of tools to deal with water scarcity.

1.4 *Impacts of climate change on human security and awareness of threats*

Insights gleaned from interviews highlight that climate change impacts on water resources can pose significant threats to human security. These threats and interviewee perceptions of these threats are detailed in the following section and relate to a number of issues: water quality, health, food, employment, financial stability and natural disasters.

As noted above, water quality is just as important, albeit less prevalent, as water quantity in the discussion of water scarcity. The shift to drier conditions in the last decades is increasing the pressure to secure safe water supply for basic needs during dry periods. Water quality has deteriorated as a result of successive droughts, in some cases reaching dangerous levels for human consumption and raising major risks to health[19] (Abdul-Malak & Fons, 2011). In addition, poor water quality exacerbates the water scarcity problem, since only 5% of discharges are treated in Morocco (World Bank, 2009).

16 Personal communication, ex-government official

17 Personal communication, interviewee from academia

18 Personal communication, Moroccan official, Water sector.

19 Health is essential to human security, since survival and protection from illness are at the core of the concept of wellbeing. (UNDP, 2009) p145.

Although 83% of the population has had access to an improved water source since 2010, with this figure increasing, this figure is composed of 98% of the urban population and only 61% of the rural population (World Bank, 2012).[20] The total volume of wastewater produced annually is estimated at 650 million m3; only 6% of which undergoes treatment. The rate of population with access to improved sanitation is estimated at 83% in urban areas (2002) and 41% for the totality of the rural population (2004). The rate of population connected through a sewerage connection is estimated at 81% in urban areas (2002) and 1,5% for the totality of the rural population (EMWIS, 2005).

Additionally, a range of water borne disease vectors are expanding northward which is expected to become a public health issue with the expected temperature increase (Abdul-Malak & Fons, 2011). Several interviewees remarked on these impacts, with one noting that there was a need to find alternative water supply solutions as insects often colonise reservoirs used to store water from the large dams.

Food security is a core element of human security. Agriculture in Morocco has always been a strategic sector for the socio-economic development of the country. Since the country's independence in 1956, the sector has undertaken many programmes, carried out development and reforms in order to ensure food security at the national level and contribute to economic growth. At the national level food security can be ensured with a combination of national food production and imports. Morocco's need for costly imports for cereals in times of drought will only increase with climate change. The competition for the best arable land and water will often result in the most vulnerable parts of the population being relegated to less fertile parcels and seeing their access to water reduced creating additional impacts on individual food security.

A significant rural-urban income gap persists in Morocco; 70% of households living below the poverty line are dependent on farming and pastoralism (One World, 2010). The majority of these farmers are reliant on rain-fed crops – only 10% of agriculture is irrigated - and are compelled by poverty to overuse their land (Abdul-

20 Figures from 2010. Access to an improved water source refers to the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, and rainwater collection. Unimproved sources include vendors, tanker trucks, and unprotected wells and springs. Reasonable access is defined as the availability of at least 20 litres a person a day from a source within one kilometre of the dwelling.

Malak & Fons, 2011). This latter factor makes the population very vulnerable to climate vagaries. Farmers in Morocco are already faced with environmental problems including fragile soils and land and water degradation. They must now increasingly cope with income losses and food shortages due to growing water scarcity caused by climate change. While commercial farmers have the technical and financial means to address these challenges in the short-term, small-scale farmers are particularly vulnerable.[21]

It was noted that problems could also arise after two or three consecutive years of drought when rural to urban migration was also noted to increase, in some cases this has led to oases being more or less abandoned which can have feedback effects causing the oases ecosystems to be degraded. Rural to urban migration is however an important adaptation and coping strategy in Morocco, and is enabled and supported through social solidarity and the use of extended family networks. However, a breakdown of these networks through increased modernisation and mobility in Moroccan society may mean a reduction in the buffer that Moroccan social links would ordinarily provide for ensuring human security.

"(People survive drought through) solidarity, unfortunately this is decreasing as the population moves and becomes more urbanised and loses connections to each other."[22]

The rural population, most of which is employed in agriculture, represented 43% of the total population in 2010 (World Bank, 2012).[23] Temporary domestic migration involving seasonal agricultural workers from the South has been occurring for a long time, however permanent migration is a more recent and growing phenomenon. For small farmers, highly unpredictable precipitations coupled with increased competition for access to water can lead to having to look for alternative sources of income and migrating to the city. Yearly, 1.2% of the rural population leaves for the cities. Thus although population growth was reduced in recent years, it has been noted that urban consumption will continue to grow and that food needs will add further pressure on available resources; whereas per capita available resources decreased between 1993 and 2007 by 12% in Morocco (Garrido and Iglesias, 2009). Further problems for human security could be caused by a lack of sanitation and access to basic services. Another interviewee noted the need to

21 In the mid and longer term, larger commercial farming will also be increasingly vulnerable to water scarcity and soil depletion.

22 Personal communication, Mokhtar Jaait, ONEP.

23 Figures from 2010.

ensure that "during bad years in term of agriculture we provide jobs for people to make a living, we have to manage the immigration towards the city so that people don't just gather in slums''.[24] The remaining rural populations face problems such as a smaller working age population, exodus of the young, no one to take over cultivation of the lands, and the disintegration of the traditional family (OSS, SDC, & CDE, 2002)

On many occasions, interviewees brought up the problem of the individuals and companies building in zones of high flood risk. Although this is not generally permitted, there were said to at times be special derogations or illegal settlements in flood plains or dried up river beds. One interviewee remarked that while the government was trying to raise awareness, laws and sanctions were often insufficient to keep people from settling in high risk zones, a phenomenon also taking place in coastal regions.[25] This type of settlement activity naturally leads to there being substantial and negative impacts on human populations when floods, and particularly flash floods, strike.

All of the issues discussed above (i.e. water quality, health threats, food production, employment, financial stability and awareness and protection from natural disasters) are important elements of human security. Ensuring human security will be increasingly challenging with the predicted impacts of climate change on water resources, as resources diminish the potential for conflicts between users will increase and these issues will also increasingly become source of conflicts. The next section further discusses how climate change and water resources can have an impact on conflicts in Moroccan society.

1.5 *Impacts of climate change on conflicts*

The scarcity of water in an arid and semi-arid environment, which is increased by climate change, economic growth, population growth and increase in per capita consumption and urbanisation can create conditions which raise a high potential for conflict: competing users: water sharing/distribution, new legislation and the development of new water works (Barnett & Adger, 2007; Vidaurre et al., 2010). Recent studies also demonstrate that tensions, competition and conflict around

24 Personal communication, Moroccan official, Water sector.

25 Personal communication, anonymous interviewee, Moroccan think tank.

natural resources are prevalent in pastoral areas and suggest that these tensions are likely to increase as more people compete for fewer resources (IISD & IUCN, n/a). Morocco is well accustomed to dealing with droughts, however, their increasing frequency raises concerns. In rainy seasons when pastoralists move into different community areas in search of water and pasture for livestock, there is little impact as there is sufficient pasture to be shared. With prolonged or repeated drought, problems were said to arise, although interviewees did not tend to elaborate on this or view this as a new phenomenon which merited much attention.

For another interviewee however, the potential outcomes of climate change for the population in general and its policy implications were clear:

"Within a couple of years, climate change impacts (will) generate conflicts over diminishing resources. The government should be prepared to manage these conflicts. Many scientists have explained that our government couldn't meet the social demand in terms of employment, access to opportunities, protecting property, etc. Morocco can suffer maybe from political disintegration in the future if the impact of climate change is not managed efficiently or the government doesn't develop adaptation plans to minimise impacts on society and development."[26]

The limited capacity to cope with socio-economic and agricultural demands in periods of recurrent or consecutive drought events can lead to unbalanced distribution of water resources creating a source of conflict among users in Morocco (Abdul-Malak & Fons, 2011).

"People in Morocco depend on agriculture for their everyday lives. Water scarcity impacts that directly, impacts them economically. This can rapidly create conflicts linked to desertification, loss of arable land, problems of migration, etc...When there is pressure on the system it generates conflicts. There are limited resources. All ingredients are there to generate social conflict."[27]

As noted above, Morocco has experience of periodic migration in times of drought from rural to urban areas. This can lead to increased solidarity in the short term, but some interviewees felt it could also create conflicts. In a recent climate adaptation workshop carried out in the north of the country, stakeholders noted that the level of solidarity would shift to a situation of 'less solidarity – conflictive' if resources

26 Personal communication, Mohamed Behnassi, Ibn Zohr University

27 Personal communication, Yassir Benabdallaoui, UNDP (United Nations Development Program) Morocco

became more depleted in the medium to longer term (Abdul Malak et al, 2012). Thus whilst the short term effects of drought may promote solidarity in the short-term, there may be challenges for the future if this type of migration continues.

One element of concern is whether the government has sufficient mechanisms in place to tackle any future conflicts which may arise in relation to climate change impacts:

"The government should be prepared to manage these conflicts. Many scientists have explained that our government couldn't meet the social demand in terms of employment, access to opportunities, protecting property, etc. Morocco can suffer maybe from political disintegration in the future if the impact of climate change is not managed efficiently or the government doesn't develop adaptation plans to minimise impacts on society and development."[28]

Despite the awareness of interviewees that scarcity of water resources could lead to conflict in the future, there was little evidence of current deep or widespread conflict in Morocco. Some lower level incidences of conflict are described under the analysis of the current policy framework in chapter 2.

1.6 *Conclusions*

Although it is clear that climate change will have important physical impacts on freshwater resources there does not appear to be a widespread awareness of what this will mean beyond the natural variability that Morocco experiences. In many ways, this lack of awareness may be attributed to the fact that Morocco does not have an "objective" problem of water supply: even without artificially producing water, the overall water balance in 2020 in Morocco is predicted to be positive. With increased capacity from desalination and wastewater reuse, the water balance will further improve. The key challenges therefore lie in the use and redistribution of these resources which are spatially unequally distributed. Furthermore, the fact that there is a high temporal variability in precipitation means that storage capacity will be key to harnessing the country's full water potential. The hydro-impacts of climate change on sea-levels and floods are in need of substantial research to improve information and awareness on areas of potential concern. The high numbers of the population affected or even killed by floods in recent years indicate that current systems in place for their prevention and management are likely to be insufficient.

28 Personal communication, Mohamed Behnassi, Ibn Zohr University

It is difficult to isolate the relative importance of the physical impacts of climate change from natural variability as well as from non-physical factors such as water management, flood prevention and risk reduction, social systems, water availability and storage, although it can highlight problems in these areas. However, with regards to climate change exacerbating conflict or threats to human security, it appears that inadequate governance systems rather than physical impacts may be a key determining factor. The policy framework to address these physical impacts is discussed in the following chapter.

2 Policy framework on water and climate change

This chapter begins with an overview of policies and programmes in Morocco which address water and climate change. It is followed by a summary of interviewees' assessment of the policy framework's effectiveness and their suggestions for its improvement. In a final section it examines the expectations and demands of interviewees for a future policy framework.

2.1 *Overview of the current policy framework*

In a previous screening of the Moroccan policy framework, no policies were found which directly addressed human security, conflict or the nexus of these issues with climate change and water resources (Gerstetter et al, 2011). However, policies addressing climate change adaptation, management of water resources and agriculture can have an impact on human security and conflict and related issues such as vulnerability and resilience. This section therefore provides a broad overview of policies and programmes in Morocco which address climate change adaptation and management of water resources highlighting their consideration or impact on human security and conflict where possible.

2.1.1 Climate Change

The National Plan for the Fight against Climate Change (Plan national de lutte contre le réchauffement climatique (PNRC)), approved in 2009, seeks to reinforce government action to deal with climate change. Coordinated by the Ministry of Environment it brings together all sectors affected by climate change. At the operational level, the strategy provides for a yearly inventory of greenhouse gas emissions and technological networks to measure climatic indicators. The PNRC will also focus on capacity building for actors involved in climate change studies as well as increasing general public awareness of climate change. Morocco has not developed an adaptation strategy or overriding policy. However, it is involved in a

number of project based actions to adapt to climate change, many of which fall under Morocco's participation in the global 'Community-Based Adaptation program' financed by the Global Environment Facility's Trust Fund's Strategic Priority on Adaptation, the focus of which remains on capacity building, knowledge communication and research although some have the potential to concretely increase adaptive capacity (Zubrycki et al. 2011). Natural reserves such as oases are being affected by lack of water and new programmes are being developed to improve the resilience of the natural habitat for the benefit of the communities. This is primarily carried out through the 'Adaptation au changement climatique au Maroc: Pour des Oasis résilientes' (PACC-Oasis) programme sponsored by UNDP. Despite the emergence of such efforts to adapt to climate change, Morocco lacks detailed strategic planning of adaptation action at the national level (Adpation Partnership, 2011).

2.1.2 Water

As noted above, Morocco experiences an unequal distribution of rainfall in space and time and has suffered droughts with increasing frequency, often several years in succession. The pressures on renewable and non renewable water resources have forced the government to explore different solutions for ensuring water security. There are many tools that are to hand to address the balance of water supply and demand such as reduction of leaks, progressive pricing, systematic metering and public awareness campaigns which in the case of Rabat-Casablanca have led to a slowing in water demand during the past fifteen years despite high urban growth (Plan Bleu, 2012). According to several interviewees from the water sector, the potential of wastewater reuse, notably for irrigation, is recognised but is currently only implemented on a small scale. The potential of this resource is estimated to reach 1 500 million m^3 by 2020 (FAO, 2005). Desalination is limited to Saharan regions in the South of Morocco (FAO, 2005). To ensure that water needs are permanently met, and to manage the water contribution of wet years for preparing for drier years, the government has invested in costly water transport projects. This entails hydraulic projects on a grand scale, in 2005 Morocco counted: 104 large dams, medium and small dams, 67 barrages or water catchments, 13 water transfer works between river basins, an important extraction network and wells (FAO, 2005). Lastly, Morocco's agricultural policy is focused on reducing water consumption with subsidies for farmers to switch to drip irrigation.

One interviewee described how Morocco had carried out a switch to a demand management approach in the water sector, motivated by economic reasons as well as a concern for sustainable use of water resources and addressing climate change.

In addition to water pricing, the interviewee noted that awareness campaigns by public utilities were successful at reducing water consumption from 130 to 70 L/capita/day.[29]

Box 1: Water rights and management in Morocco

Water rights in Morocco are derived from a variety of sources, including customs, modern laws, and Shari'a rulings. There are rights associated with ASAP (Privileged Farmers Associations/Associations Syndicales Agricoles Privilégiées), rights conceded to the autonomous water distribution state-controlled companies, ancient water rights recognised and registered as well as recognised but not registered (Ouassou et al., 2005). Ouassou et al. have characterised the current water management context as one where "the Administration is still largely in charge of the formulation of policies (…) and the legislative control is not very well developed''. This description is indeed consistent with a lot of interviewee comments. Increasingly, NGOs and civil society are supporting change towards increasing stakeholder's involvement and weight in the decision making process. In the development of irrigation projects, only recently, through the framework of the Water Users Associations Law in 1990, ("Association des Usagers de l'Eau Agricole", AUEA) have users been granted a voice in the decision making process (Oassou et al., 2005).

The late King Hassan II launched a dam policy in the late 1970s with the objective of irrigating 1 million hectares by 2020. This policy led to progress in developing the country's water resources, where today over 1.5 million hectares are irrigated. However, significant disparities exist between basins, and predictions for the future suggest increasing scarcity as the population grows (OECD, 2007). This ''aggressive dam building program'' has been criticised as benefiting only the modern sectors; government-financed irrigation geared to exports benefits a small land-owning elite while traditional agriculture (over 90% of the farmers) remains essentially untouched by government policies (Howe, 2005).

In Morocco, the first text concerning modern water legislation dates back to 1914 (Ouassou et al., 2005). At the time water considered as a public good and could not

29 Personal communication, Mokhtar Jaait, ONEP

be privatized (with some exceptions concerning traditional rights) (Ouassou et al., 2005). The laws started to be reviewed seriously only in 1990 which led to the adoption of the 1995 law called "Loi sur l'Eau – Water Law". Within this main water legal frame, water is still recognized as a public good. Important innovations are: the establishment of a mechanism for the recovery of costs (via abstraction charges and a water pollution tax based on the polluter pays principle) and the introduction of the concept of river basins as the functioning unit of water management (NATO, 2004). The law reinforces water quality protection by defining environmental mandates and reinforcing sanctions and penalties. The Water Law provides a comprehensive framework and an efficient juridical tool to develop more considerable efforts for integrated water management in order to make them compatible with aspirations of socio-economic development of Morocco in the 21 century (Abdul-Malak & Fons, 2011). The main points of the Water Law are introduced in **Fehler! Ungültiger Eigenverweis auf Textmarke.**2.

Box 2: Main points of the 1995 Water Law

- An extension of the public ownership of water and the imposition of a time limit of 5 years to any claim on private water rights.
- The introduction of River Basin Agencies (Agences des Bassins Hydraulique), as the main entity in charge of water issues at the river basin level.
- The official recognition of planning by the State of availability and allocation as the main instrument of decision about public infrastructure, water allocation and water transfer. The water basin master plan is to be prepared by the river basin agency and submitted to the SCWC (Superior Council for Water and Climate) for formal adoption. It then becomes the master plan for water management (includes goals in terms of quality).
- The introduction of new taxes (RIVER basin charge), based on water abstraction, and pollution taxes based on the contribution to the stream pollution. These taxes will, inter alia, cover subsidies to reduce pollution.
- The introduction of new instruments to deal with pollution and drought – fees for polluters, subsidies for investment to reduce pollution and exceptional power to the administration for dealing with drought.
- The formal introduction of the National Hydrological Plan, to be presented to

the SCWC, to solve allocation conflicts and make recommendations.

In 2000, Morocco introduced its National Water Strategy (or Plan National de l'Eau) and established several new public agencies dedicated to securing water supply including the National Office of Potable Water (Office National de l'Eau Potable, ONEP). The strategy entailed heavy investments towards the construction of dams, increasing water supply capacity and large-scale irrigation systems to secure water for urban and agricultural demands. The water plan encourages the management and development of the supply by increasing the use of non-conventional water resource, including desalinization of 400 Million m^3 per year, the reuse of treated wastewater at a rate of 300 Million m^3/year and efficient uses of rainfall water harvesting (Choukr-Allah, 2011).

A new national water strategy was devised in 2009, and should enable Morocco to meet the water demand until 2030, notably by mobilising additional investment estimated at 7.5 billion EUR (9.3 billion USD) over the 2009-2030 period. The new strategy contains six action plans, one of which addresses the efficient management of water demand. The expected impacts of this strategy include more sustainable use of water resources through a change in consumer habits and improvement in irrigation techniques, as well as development of high-value added cultivation methods. This strategy will be implemented within a contractual and consultation framework, which outlines the responsibilities of stakeholders. In this connection, agreements will be signed between the Secretary of State for Water and Envrionment (SEEE) and the 16 regions of the country. Consequently, the strategy, which primarily aims at saving water and increasing the value of every m^3 of water produced, is fully consistent with the objectives of the new strategy (ADB, 2009).

The Department of Water developed the National Plan against Floods (NPF) (Plan National contre les Inondations (PNI)). The PNF identified 390 priority centers for which prevention measures are to be realized before 2020. Under this plan Morocco developed a forecasting and flood warning system. The country intends to develop a geographic information system with data on natural and technological hazards across the country, called "GIS-Risk". To realize a "whole-of-society" approach to managing the risk of disaster, Morocco is taking steps towards the creation of a National Platform for Disaster Risk Reduction to support policies for building

resilience to disasters[30] In most river basins, flood risks are currently communicated and coordinated with the Ministry of the Interior and river basin agencies work with local authorities to alert the population on time. Special measures of prevention have been taken in the Ourika basin as this region is a particularly high risk area and a fully integrated approach has been piloted in this basin.

2.1.3 Agriculture

Morocco's challenge will be to produce more food in even drier conditions. The Plan Maroc Vert (PMV) is Morocco's policy response to the challenges of climate change and food security. It aims to increase the agricultural sector's competitiveness through modernization and integration into the world market whilst at the same time supporting human development objectives. The PMV is based on two pillars 1) the development of a modern agricultural sector based on private sector investment in high productivity/high value added sub-sectors, and 2) the modernisation of production with a social impact targeting small farmers through public investment in social initiatives and aggrégation (creation of cooperatives) to build solidarity and combat rural poverty.

Several programs were designed to support the PMV's implementation. The National Irrigation Water Saving Programme (or Programme National d'Économie d'Eau en Irrigation (PNEEI)), formulated in 2009, is considered the primary tool in implementing the PMV. With a budget of US$ 4.4737 billion, it aims at the conversion of 550,000 ha to drip irrigation by 2020. (Le Matin, 2011). The project will intervene in 3 water basins (The Oum Rbia, the Moulouya, and the Loukkos). The project will finance the construction of irrigation infrastructure covering about 20,000 ha, as well as irrigation water development measures and capacity building activities for the stakeholders involved. It will directly affect 5,853 farms, with a target population of almost 30,000 inhabitants. The first loan to support the implementation of the PMV, of 150 million EUR (186 million USD), was approved by the World Bank in March 2011 (World Bank, 2012).

30 http://www.euromedcp.eu/index.php?option=com_content&view=category&layout=blog&id=909&Itemid=688&lang=en. The Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters -- the world's blueprint for creating resilient communities -- encourages the establishment of National Platforms for Disaster Risk Reduction. These are multi-stakeholder organizations aimed at improving national coordination in disaster risk management and reduction.

Climate change threatens to jeopardize the gains originally expected under the PMV. The government of Morocco was quick to respond to this alert in an effort to climate proof the PMV with the project "Integrating Climate Change in the Implementation of the Plan Maroc Vert". The latter will finance adaptation measures for small farmers in five regions. Ten pilot projects, targeting about 2500 small farmers, will be launched through which farmers will benefit from training and awareness activities. The project, funded by the Special Climate Change Fund (SCCF) and supervised by the Global Environmental Facility (GEF) Secretariat, will also provide training and awareness activities at an institutional level for over 200 staff of institutions involved in the implementation of the PMV (The Financial, 2011).

In addition to the PMV, and as mentioned above, Morocco has a number of insurance schemes which are available to assist farmers in times of hardship however, the take up of these schemes is still rather low. It has been suggested that this is due to low revenue generation by farmers which in turn does not allow them to join an insurance plan or invest in mutual insurance. In this way, the PMV may help to increase farmers income which could in turn develop insurance uptake in rural areas. (Oxford Business Group, 2009).

2.1.4 Human Development

Human development is connected to human security in a number of ways. It represents an attempt to reduce the vulnerability of populations to shocks by providing citizens with greater opportunities for education (which can increase economic security) and access to food, water and sanitation (which contributes to health, food and water security). Launched in 2005 by King Mohamed VI, the main objective of Morocco's National Human Development Initiative (INDH) was the reduction of socioeconomic deficits by satisfying the fundamental needs of the poorer parts of the population via the following four axes of implementation (Abdesslam, 2011): 1) The fight against rural poverty; 2) the fight against urban social exclusion; 3) the fight against vulnerability; and 4) intersectoral programmes. For the period 2006-2010, a budget of 10 billion MDH (1 billion USD) was dedicated to financing NIDH programmes (state budget 60%, development cooperation 20%, local communities 20%). In 2005, 1,104 projects were realized, for a total cost of nearly 600 million MDH (67 million USD). For the period 2006-2010, more than 200,000 actions and development projects were initiated for a total budget exceeding 13 billion MDH (1.5 billion USD) (Abdesslam, 2011). The NIHD gives significant weight to the issue of water; Morocco has implemented a series of strategies to increase access to water in urban and rural areas. For example, policies implemented by the operators in Casablanca, Rabat, Tangier, and Tetouan allowed

low-income families in peri-urban settlements to have access to a water connection. The connection ratio is expected to reach 100 per cent by 2015 (OECD, 2007).

2.2 *Effectiveness of the current policy framework: interviewees' assessment and suggestions for improvement*

Key policies which address climate change, water and human security have been outlined above. The following section examines the adequateness of these policies for addressing the challenges Morocco faces and suggestions for where these could be improved upon based on input from interviews.

2.2.1 Climate change

Interviewees generally did not comment much on the Moroccan policies relating to climate change adaptation, mainly attributable perhaps to the fact that the government has yet to develop a strategy for climate change adaptation. However, the strategy for rehabilitation and protection of oases was seen to be a useful step forward, both in terms of protecting Morocco's cultural heritage and ecosystems as well as for supporting livelihoods and reducing migration to urban centres. Most concerns were connected to specific activities in relation to water or agricultural policy.

2.2.2 Water

Morocco has a historically strong water sector that has grown in capacity and is often able to share its expertise with other countries in the region. As one interviewee remarked*:*

> *"Morocco is quite stable and advanced in the water sector, it has strong institutions which master and even export their expertise and savoir faire. Since independence Morocco has taken up the issue of water. There are many engineers and other professionals within the government as well as in the private sector. So (we have) strong institutions and knowledge."*[31]

This expertise is primarily focused on the management of droughts. One interviewee remarked that ''in the 1990s we realised that droughts had to become part of our management scheme in general, because they were becoming so

31 Personal communication, Hasane Belguenani, European External Action Service EU Delegation Morocco

common."[32] Another went so far as to declare Morocco "champions" at tackling droughts.[33]

One of the most iconic policies for tackling Morocco's water problems has been the dam policy. An interviewee working for an international organisation in Morocco remarked that this policy is sometimes presented as a great success story in terms of water management, but that it has been rather controversial and can also be criticised in many aspects.[34] The interviewee highlighted that although some see this policy of dam expansion as an adaptive strategy, as noted in numerous studies, dams have several problems: limited life-span (c.50 years), eutrophication, siltation, reduction of outflow to the sea, location restrictions due to geological suitability.[35] One interviewee highlighted that despite national action on drought through dam construction policy, there was a lack of action at the river basin level in terms of promoting water retention or ecosystem based measures such as increasing plant cover.[36]

Although adopted nearly two decades ago in 1995, an interviewee working for a national water supplier commented that the Water Law only began to be implemented between 2000 and 2003, and that a lot therefore remains to be done. The Water Law provides for penalties and the establishment of a 'water police' to halt any illegal water abstraction or acts which might affect water quality. Yet, an interviewee from academia commented that the Water Law is still not being fully applied and respected. He mentioned that in some cases, the government is failing to fight illegal activities that erode water resources e.g. with regards to the digging of illegal wells by farmers in river beds where the latter has been dried of its resources.

Another interviewee, also from academia further noted that although environmental laws require local authorities to establish wastewater treatment plants, thus far, few have actually done so and the dumping of untreated waste water into rivers and seas is still commonplace in a number of cities.[37] An interviewee from an NGO stated

32 Personal communication, Moroccan official, Water sector

33 Personal communication, Abdelaziz El Maghraoui: FAO Morocco

34 Personal communication, Yassir Benabdallaoui: UNDP (United Nations Development Program) Morocco

35 Personal communication, Sehhar El Ayachi, Institut Agronomique et Vétérinaire Hassan II

36 Personal communication, Hasane Belguenani, European External Action Service EU Delegation Morocco

37 Personal communication, Mohamed Behnassi, Ibn Zohr University

that the problems of pollution will only worsen as the availability of water is further reduced.[38] Furthermore, the interviewee stated that while a protocol to evaluate the chemical status and the bacteriological status of water exists, Morocco does not have the capacity or expertise to deal with this theme (i.e. there are no experts in this field in universities and the river basin agencies do not address this).

At the level of flood management, several interviewees noted that there was also a need for progress. As noted above, there have been important impacts on the population and the economy but it does not appear to have been a priority thus far, particularly in the context of climate change adaptation. Furthermore, the lack of land management and enforcement of controls leads to people often building homes where they should not (i.e. on flood plains).

The ensuing damages from these floods can lead to mutual accusations between affected populations and the authorities. An interviewee from an NGO which had carried out a perceptions analysis amongst communities remarked that the state risk management program is slow and only triggered when the disaster is very important.[39] Communities involved in the perceptions analysis had felt abandoned by the state. Another study has also highlighted this conflict where the affected population may accuse the authorities of not taking due action to warn them about the floods and to protect their properties while the authorities accuse them of having settled in flood plains despite warnings (CEDARE, 2006). The previous interviewee explained that the management of natural disasters has not been considered a priority when compared to the process of national development (e.g. road construction, electricity and access to drinking water).

An additional area of concern in relation to hydro-impacts is the current lack of policies for addressing sea-level rise in Morocco, despite the growth of industry and population size in coastal areas. However, only two interviewees mentioned this issue briefly, with most interviewees focused on policies for water scarcity and water use with occasional mention of the need to address floods. One interviewee who preferred not to be identified highlighted some of the difficulties which include a lobby which is pro-coastal development, erosion due to exploitation of coastal resources such as sand, and the cross-over of the competences of several ministries:

38 Personal communication, NGO interviewee

39 Personal communication, NGO interviewee

"Many studies say that Morocco is not protected against the risk (of sea-level rise), a law for the coast is being developed...it has been worked on for the past 7 years, to stop people from building within 200m of the coast, but people are lobbying against it so it's not going very fast. It's a very complex subject in Morocco: a lot of concessions were granted to certain operators to take the sand from the beaches for construction materials, and now we realise it's problematic. There are (also) many ministries that are involved on the coasts; it's difficult...to manage (tourism, ministry of interior...)."[40]

Systems for water management in Morocco can be roughly divided into two categories: community management of resources (usually in rural areas) according to traditional systems; and official water management mechanisms supported and instituted by the government (usually in urban areas). Which system of water management (or combination of these systems) is used depends upon the area in question:

"In areas with strong agricultural potential, access to water, especially underground water, is managed by the river basin agencies, but simultaneously there is weak control of the quantity used. Big farms are owned by political elite so the control is not so strong. In some rural areas with less agricultural potential, the government is not as present. The communities manage their resources according to traditional systems and mechanisms. So in the zones with high agricultural potential you have the river basin agencies and the political elite, in zones with poor potential you have the traditional systems."[41]

Government-led water management and sectoral conflicts

Although conflicts at local level between those upstream and downstream of government planning were mentioned, most conflicts seem to occur between different sectors, in particular between agriculture and tourism which compete strongly for water use. The tourism industry is well developed in Morocco and is the second strongest sector in the country. However, overconsumption of water by this sector is becoming a cause of alarm especially in coastal and dry regions. Deficient statistical data for the tourism industry in Morocco make it hard to assess the size of the problem. A study in the framework of the Medsat II Programme, an EU Commission initative from 2006, led to several conclusions: 1. Golf courses are

40 Personal communication, anonymous interviewee, Moroccan think tank

41 Personal communication, Mohamed Behnassi, Ibn Zohr University

consuming huge amounts of water (although authorities do not consider golf courses as touristic facilities and their activities do not figure on the list of touristic activities), 2. Water consumption in luxury hotels is particularly high and most of these resorts consume water from private water wells that are not necessarily subject to tariffs or control, 3. A part of water consumers in the tourism sector are not listed among legal consumers because they fall in the category of non-classified and non-structured hotels, mainly for internal tourism (Europa Jaratouna, 2009).

"People are interested in investing (in the tourism sector), because they are helped by the state. The state almost gives the land away (for free) and there are many advantages for the investor (...) to the point that developers were not thinking of the future. We prefer that the government subsidise energy/water savings in the sector..."[42]

However, an interviewee noted that if Morocco continues to push for touristic development in a vision that does not consider other sectors or the consequences on water this will lead to conflicts. Further conflicts can also be found between the agricultural and industrial sector e.g. regarding responsibility for water pollution and overuse of high quality water resources. Despite these conflicts, most interviewees did not raise concerns:

"it is very normal, there is less water, there is increasing pressure, so there are conflicts between users: agriculture, drinking water, conflicts between regions, etc. It's perfectly normal. (It's) between sectors mostly."[43]

To avoid the development of conflict, mechanisms for '*arbitrage*' are in place and the country has instituted the *Conseil Supérieur de L'Eau (*The Higher Council for Water and Climate - CSEC) which provides a forum for consultation and support for all stakeholders in the water sector. The CSEC is responsible for formulating the general guidelines of the National Policy on Water and Climate and attaches particular importance to the distribution of water between user sectors, the transfer of water and provisions for the use and protection of water resources. Furthermore, the process through which water is allocated - although fought over by various sectors - prioritises drinking water over other uses. This means that even in times of water scarcity, water security is ensured for the population. Still, many interviewees

42 Personal communication, ex-government official

43 Personal communication, Moroccan official, Water sector.

also spoke of certain case where this does not happen. One interviewee mentioned an example which appeared to undermine the functioning of this allocation system:

"I have an example (in Ouazarzate). There was a golf course that was built but there was no water, they were taking water from the dam. They also had villas around the golf course. That was obviously problematic. There was another conflict in Marrakesh, we cut off water for the population to be able to feed the tourism sector. But that is just during crisis periods. We give priority to certain districts and others are cut off for a few hours (during summer notably)."[44]

Another invoked the situation in the Sebou basin where ''water is not shared equitably; there are places where people have access to water only a few hours per day''. They added that ''sometimes drinking water is used for agriculture instead of drinking purposes, which it shouldn't be''.[45]

Nevertheless, another interviewee highlighted that Morocco's institutions were able to settle these disputes:

"For example, in Marrakesh there was a conflict between the tourism sector and the department of water which considered there were not enough resources to respond to that high demand. There was an intervention from the prime minister who said 'we will not stop tourism but the sector does have to contribute to the water sector by recycling water for agricultural purposes'."[46]

Water user associations

Despite the existence of water controls executed by, inter alia, the water police, effective implementation and enforcement appears to present something of a challenge at the local level. A few interviewees remarked on the fact that although the state installed canals for irrigation and water meters, people were unwilling to pay and simply broke the pipes and meters meaning that the canals are often in a bad condition. One policy was to create water user associations (known as AUEAs). These are intended to foster farmer involvement and participation in irrigation management and to protect equipment and infrastructure. However, one interviewee described the AUEAs as 'ghost associations' which often do very little in reality. Although, this person conceded that these could work in oases and

44 Personal communication, ex-government official

45 Personal communication, NGO interviewee

46 Personal communication, Hasane Belguenani, European External Action Service EU Delegation Morocco

mountainous areas, they stated that these do not function in modern irrigated zones. According to the interviewee, this failure was due to the fact that these organizations were created through the World Bank providing credit conditioned by the adoption of a participative development process. In this way, the interviewee concluded that the organisations had been created on paper and had been a waste of financial resources: 'we built canals knowing that they would be destroyed'.[47]

Community management of resources and local-level conflicts

One interviewee commented that the exhaustion of water resources was creating social problems in socially and ecologically precarious regions and that government projects were only making things worse. *"With all the dams that have been built, oases have no more resources. To be able to develop certain sectors we are sacrificing others."*[48] Another interviewee added that ''we need to invest to conserve traditional systems of environmental management''.[49] One interviewee spoke of his work in the region Rachidia, where, he said, small farmers did not live well. In the mountains upstream of the oasis, an aquifer flows under what used to be vacant land. Here, commercial palm farmers had installed pumps to exploit the aquifer for their drip irrigation system, significantly diminishing water availability for the downstream inhabitants of the oasis.[50]

Furthermore it was noted that "*In our culture we are used to sharing everything. We want to capitalise on ancient habits. Our grandparents were not as selfish as we are today"*[51]*.* Other interviewees pointed out that in order to help avoid water scarcity and conflict over this scarcity, there was a need for balance between modern solutions and traditional management systems and beliefs. The oases are rural areas usually managed by local communities through traditional systems for water sharing and distribution. In the oasis people manage their water themselves. This management is increasingly with the help of government and sometimes river basin agencies and the current programme for adaptation to climate change in Morocco is targeted at these areas. The object is to protect local livelihoods and the natural environment whilst drawing benefits from its resources. In the oases, a prioritised

47 All personal communications from an interviewee from academia.

48 Personal communication, anonymous interviewee, Moroccan think tank

49 Personal communication, Sehhar El Ayachi, Institut Agronomique et Vétérinaire Hassan II

50 Personal communication, interviewee from academia

51 Personal communication, Mokhtar Jaait, ONEP

system is used for water use, beginning with palm trees which form the core of these ecosystems.

However, one interviewee noted that where there are different communities sharing the same resource, competition can create conflict: *"That is why the government tries to pay attention to the oases and protect the communities living in these areas because it's a human security question."* Another remarked that: *"in the oases there is an ancestral system to share water resources, people cooperate. If there are conflicts you will find often the wise man of the village (the older men) to settle disputes."*[52]

At the community level, there appear to be smaller-scale incidences of conflict over water extraction. For example: "*On a much more local scale there are often problems, disagreement over the use of a water source for the construction of a well."*[53] It was also noted in interviews that where irrigation was insufficient in summer months, private wells are often drilled, similar to the above case in the oases. This is, under normal circumstances, not permitted, however, illegal wells continue to be constructed in the face of poor implementation of compliance mechanisms.

"This creates problems with local communities. Especially with regards to property rights, in Morocco it is difficult to speak of private ownership of water resources, the law forbids ownership of water resources, but it is true that in rural areas a lot of people have their own wells."[54]

Some sources report that the social fabric is weakening considerably in Morocco (OSS et al., 2002). Ancient social order which favored a community approach to conflict resolution is threatened by the growing tendency towards individualism. Modern requirements, both legal and bureaucratic, concerning conflicts are inconsistent with the oral rules that once governed tribal relations (Ibid). For example, earth canals, which are an ancient irrigation system, were replaced by cemented ones in the lowlands. Whereas in the prior system, farmers were collectively responsible for management and maintenance, they have lost a great deal of control over management in the latter. In addition irrigation methods have changed substantially to methods such as spray, drip, or central spindle.

52 Personal communication, Mohamed Behnassi, Ibn Zohr University

53 Personal communication, Hasane Belguenani, European External Action Service EU Delegation Morocco

54 Personal communication, Mohamed Behnassi, Ibn Zohr University

Another interviewee gave an example in Marrakesh, where the land is collectively owned by tribes and people live on a very small income. In consultation with the tribes, the ministry of interior approved a transaction, through which the tribes did receive some money, to rent the land to a privately owned company. However, the interviewee remarked that the tribes had not realised that this deal would lead to the depletion of water resources by the new owner.[55]

The same interviewee explained how in summer, when water for irrigation is scarce, people upstream are first to irrigate and people downstream must wait. Farmers with sufficient means build wells (illegally) or build retention basins (which they fill up to the detriment of downstream users) and later pump the water out to use in their drip irrigation systems. The many small landowners (2-4 ha) for whom these solutions are too expensive, see their access to water being diminished.[56]

2.2.3 Agriculture

Agriculture is importance crucial source of income for a high proportion of the population in Morocco. This means that differences in climatic conditions are of crucial socioeconomic importance and have a key role to play in food security. Interviewees perceptions focused mainly on the PMV, the key agricultural policy in Morocco. Interviewees saw the following strengths of this policy:

- It can help to address food security whereby small farmers receive support to enhance production in order to secure their own food security and to sell their surplus on to *agrégateurs* (entrepreneurs).

- The need to reduce agricultural water use is supported by the PMV through subsidies for farmers to switch to drip irrigation.

- Another academic explained that in some regions, crops can no longer survive the climatic conditions and that the cash crops promoted by the PMV were able to support the livelihoods of these farmers. Although the interviewee recognised that this did not help with food sovereignty or self sufficiency, they saw the potential for Morocco to make money from this and pay to import those crops that they needed for themselves e.g. wheat.

55 Personal communication, interviewee from academia

56 Personal communication, interviewee from academia

A number of weaknesses of the PMV were also pointed out:

- An interviewee from academia felt that although the state provides a lot of subsidies for drip irrigation, it was only the larger producers who were able to benefit from this.
- Furthermore, as with the illegal drilling of wells described above, there are problems with control of water resources for agricultural use. This interviewee explained that in the summer, there is not enough water to irrigate with – this leads to people building wells and although overexploitation of aquifers is not allowed, 'we let it slide'.[57]
- If Morocco does not achieve the expected economic benefits of selling its cash crops, people will need to diversify their income or else their human (food and economic) security may be compromised.
- The agricultural products are not subsidized by the government, and so there is uncertainty and instability in the price they will fetch on the markets.
- Agricultural labour is becoming more expensive.
- Insurance to compensate for climatic uncertainty is insufficiently developed.
- there is a lack of taxation in agriculture for both small and large farmers.
- Furthermore, the PMV was perceived by some interviewees as benefiting some stakeholders more than others; above all large industrial farmers, with not enough support for smaller farmers.
- An interviewee from an NGO also expressed serious misgivings concerning the PMVs environmental characteristics: "The Plan Maroc Vert is scary; they are promoting large agriculture without having studied the impacts of this program. (It will lead to) the overexploitation of water resources and of soils. (There was) a similar plan in Spain and the results were disastrous. We are recreating the same mistake instead of learning from it. (The PMV) is

57 Personal communication, interviewee from academia

beneficial for Europe (…) but how beneficial is it for us, apart from the income from exports."[58]

- In a further personal comment during the field research, another NGO interviewee remarked that the PMV was very similar to the Common Agricultural Policy of the EU.[59]

The interviewee comments highlight that the PMV has some potential to increase Morocco's agricultural sector through value-added products and a focus on cash crops for export to the EU and other new markets. If farmers can gain higher prices for their produce this could help to ensure greater economic security in the short term. However, it is not clear that this policy will benefit smaller farmers who will not be exporting. In the medium to long-term, there is an additional risk that such highly intensive production will lead to negative environmental impacts such as the depletion and or pollution of water resources (if policies for water protection and mangement are not fully implemented as noted above), degradation of soils and desertification and thus an overall negative impact on Morocco's ability to produce food for its own population. At the same time, this policy enables other countries and the EU to increase their own food security without experiencing negative environmental impacts in their own territory. Furthermore, crops for export depend on external markets. In the case of the current economic crisis and the subsidies provided by the EU to its own famers under its Common Agricultural Policy, the PMV may not be effective in providing economic stability for Moroccan farmers, even in the short term.

Cultivation of narcotics

On more than one occasion, interviewees spoke of the production of cannabis that takes place. The drug is a major contributor to Morocco's GDP and is probably Morocco's main source of foreign currency (Chouvy, 2005). Despite the potential that the growth of such crops could have to exacerbate conflict and degrade the environment there was little said by interviewees to suggest that this was a specific area of concern. Chouvy & Laniel (2006) provide insights from Kenza Afsahi, whose doctoral thesis is on the cannabis farming economy in the Rif Mountains of northern

58 Personal communication, NGO interviewee

59 Personal communication, NGO interviewee

Morocco. Afsahi notes that this economic activity ''has grown considerably over the last twenty years, (and) has permitted the maintenance of a type of socio-economic and political status quo''. However, Afsahi warns of the 'time bomb' created by the entrenched tolerance of the cannabis plant. The Rif region is believed to home the world's largest acreage of cannabis cultivation. Yet it is also one of the most unsuitable regions for intensive agriculture which makes the production of most crops other than cannabis not worth the effort.

"Farmers don't look for other more drought resistant crops as this requires money. (Cannabis) production is being extended and forests are being cleared for this purpose. There is no crop which could replace marijuana as it is not lucrative enough and it would take too long to replace with other crops which would need time to establish themselves e.g. olive trees."[60]

Nevertheless, any increase in pressure from the government to eradicate the drug crop coupled with climate change may activate new conflict constellations by the increased pressure on urban areas.

"*When they stop allowing it, there will be mass movement towards the city. It's a ticking bomb. People are holding on to the land as much as they can, but they are starting to feel the lack of water. Rivers have been dried up completely then they dig in the river beds and dig illegal wells."*[61]

Insurance schemes

As noted above, there are some measures in place to compensate people for drought related agricultural losses and to create employment. One interviewee noted however that these compensation funds are not fully comprehensive. Although there is a scheme for drought, no insurance exists for floods, either for those who farm or indeed for ordinary citizens:

"Currently, the only form of insurance against natural disasters is the fond de solidarité, which is not the best, nothing exists for floods and earthquakes. The

60 Personal communication, interviewee from academia

61 Personal communication, Sehhar El Ayachi, Institut Agronomique et Vétérinaire Hassan II

credit agricole also manages an insurance scheme for farmers in times of drought, which works more or less well."[62]

2.2.4 Human Development

Human development has been a key focus of Morocco's national policy framework and has seen some successes in terms of its contributions to human security and human rights. One interviewee mentioned that:

> *"The INDH has been relatively successful at enhancing many human rights (e.g. education, health). Over the last years, a significant portion of rural areas have benefited from funding and small scale projects to access jobs, generate revenues, access education, build hospitals, and develop grassroots projects."*[63]

Nevertheless, this interviewee went on to remark that due to the limited resources available, the framework was not able to cover the entire territory. Furthermore, according to the Arab Development Report (UNDP, 2009), human security is a prerequisite for human development, and its widespread absence in Arab countries has held back progress on this account.

2.2.5 Conclusions

Overall, interviewees in Morocco had a high level of confidence that the country would be able to face the challenges of reduced water availability. This is in part due to the policy framework in place and in part due to the technical capacity developed through historical experience of drought. Nevertheless, it is not clear that the country is equipped to address the challenges presented by floods or sea-level rise. Much focus has been placed on agricultural policy, although it seems that measures taken so far under the Plan Maroc Vert have been targeted at the growth of the sector, in particular with regards to agribusiness – rather than for ensuring national food security or livelihoods of small farmers (although these are part of the policy's stated aims).

62 Personal communication, NGO interviewee

63 Personal communication, Mohamed Behnassi, Ibn Zohr University

2.3 *Expectations and demands concerning future policy framework (national/international)*

This section details the expectations and demands of interviewees on the development of the future policy framework. Demands were mainly focused on changes to existing policies and so tended to be centred on human development, water, agriculture and other sectoral policies rather than on the development of new policies for conflict or human security. Nevertheless, as noted above, these policies are nonetheless important for these issues in that they can be effective in contributing to the overall stability and welfare of Moroccan citizens.

National policies

Most interviewees noted that the government is concerned with the potential effects of climate change and has a political will to take action. On the other hand, a few interviewees feared that the climate change agenda detracted attention and funding from more pressing matters such as human development and assistance with technology transfer, seed purchase and access to markets for small farmers.

Morocco has developed a certain capacity to address risks from drought. However, several people noted that flood awareness and policies to address floods were still emerging, particularly in relation to climate change activities which tend to be focused above all on mitigating the impacts of drought. To improve civil protection, interviewees highlighted the need for regulatory reforms to find and formalise solutions; to integrate risk prevention in land use planning; and to carry out information campaigns to make it clear which zones present a high risk for building.

These interviewees also noted the need for training of competent people to reinforce collaboration and information exchange along with capacity building to prepare authorities and citizens to enable fast responses to catastrophes and risk. One interviewee highlighted how television has played an important role in developing public perceptions and raising their demands and expectations based on the responses they have seen to floods and other crises abroad.[64] Another few interviewees raised the point that even at the level of senior civil servants where awareness of climate change impacts tends to be higher, there is a need to pass on information regarding the latest research and help ensure that policy makers and politicians fully understand the longer term consequences of action/non-action

64 Personal communication, NGO interviewee

rather than simply reacting to catastrophes and crises e.g. floods, extreme drought. Furthermore, one interviewee remarked that local NGOs are not yet playing the role they should be and that these should be better trained.[65]

Indigenous and traditional mechanisms for water management (e.g. rainwater harvesting) can be highly suitable for adapting to scarcity of resources and some interviewees were keen to see encouragement for the preservation and sharing of such knowledge-systems and techniques. The potential of alternative water management strategies such as waste water reuse was commented upon as a way of addressing increasing pressures on freshwater. However, it was mentioned by some interviewees that efforts were still needed for raising public awareness concerning use of alternative water sources.

It was noted by a few interviewees that the financial advantages granted to the private sector in sectors such as tourism and agriculture should be halted as these had led to unsustainable growth at the expense of the environment and resources. On the issue of water pollution from the industrial sector, one interview expressed that there is no need for new mechanisms to address the issue of water quality, but rather a need for more resources. He suggested that training sessions with simulation exercises would help the relevant groups react more efficiently in emergency situations.[66] Water pollution is still an ongoing issue in Morocco and one interviewee highlighted the need for conserving the water quality in upstream areas of basins which is still at acceptable levels.[67]

International policy support

Morocco's geographic location means that a number of requests for the development of the policy framework were addressed to the EU. Whilst the support the EU offers Morocco undoubtedly provides a gamut of benefits, both financial and otherwise, one or two interviewees showed reservations in this regard. Although the PMV can be seen as being beneficial to Europe in terms of access to agricultural products, one interviewee felt that this was simply a transposition of the EUs Common Agricultural Policy, which was not necessarily the optimal policy solution for a developing country such as Morocco. Another interviewee felt that it was not clear what the real benefits and impacts of the PMV were for Morocco given that

65 Personal communication, Sehhar El Ayachi, Institut Agronomique et Vétérinaire Hassan II

66 Personal communication, Hasane Belguenani, European External Action Service EU Delegation Morocco

67 Personal communication, NGO interviewee

Spain had carried out a similar policy with serious environmental consequences. The interviewee therefore highlighted the need for the EU to share experiences of programmes that have been less successful in their own territory before promoting their roll-out in other countries.[68]

In Morocco, international donors have sponsored a variety of small-scale projects reviving both traditional techniques such as rainwater harvesting or supporting the development of modern drip-irrigation technologies. These small scale initiatives to adapt to climate change can be extremely effective. However, an interviewee in Morocco remarked that this support needs to be systematised and continuous rather than focused on scattered interventions.[69]

Other interviewees noted the need for practical support for Moroccan agriculture to sell its products on international markets and a competitive advantage from the EU for its products to compete with its highly subsidised agricultural sector. A few interviewees saw the role of the economy as a factor that impacted migration into the EU from Africa. One mentioned that if Morocco was to be expected to halt migration there would be a need for both finance and additional supportive measures e.g. for the livelihood diversification of fishermen to avoid them facilitating illegal passage of immigrants to the EU.[70] Another interviewee even noted that as the 'guardian of Europe' it was not possible for Morocco to obtain security for itself and that the flow of migrants was rather a global security issue for which infrastructure (e.g. to provide food and water) needed to be developed in cooperation with all countries.[71]

3 Evaluation of results

3.1 *Insights on relationship between climate change, water and human security*

Human security is a concept that is not clearly or explicitly dealt with by Morocco's policy framework. Nor has it been connected in policy or government discussions to climate change impacts on water. On at least three occasions interviewees explicitly

68 Personal communication, NGO interviewee

69 Personal communication, NGO interviewee

70 Personal communication, interviewee from academia

71 Personal communication, Mokhtar Jaait, ONEP

stated that human security is not integrated in Morocco's policy. This may simply be due to perceptions or connotations linked to the term:

> *"There are many internal debates in Morocco where people are asking themselves if they should approach food and human security from a development or security angle. Some say security is not a positive term, nor oriented towards opportunities but rather risk protection, (conversely the term) development is both. Human security has a ''problem'' connotation, human development just sounds more positive."*[72]

This interviewee, from a think tank, was the only one to highlight the "practical and operational" aspects of human security, which made it "perfectly suited for informing public policy making''. Another interviewee remarked that they found the term human security helpful, and that it was being increasingly used, particularly in light of developments in the Arab world with regards to diminishing resources and increasing pressures increase potential for conflict. Indeed they noted that:

> *"The relation between climate change, food security, health security and water security is an area which is evolving very fast and I consider it will be the main focus of developing countries in the coming years or decades."*[73]

However, it was suggested that while the concept may be useful itself it is not widely accepted or integrated at the decision making level:

> *"Human security is not very present in official communications in Morocco. The topic is limited to certain researchers...it has not provided as a strong argument in negotiations or to attract cooperation funds."*[74]

Indeed, human development was mentioned by many interviewees as an important part of the government's strategy, and the National Initiative for Human Development (INDH) often appeared when discussing human security. One

72 Personal communication, anonymous interviewee, Moroccan think tank.

73 Personal communication, Mohamed Behnassi, Ibn Zohr University

74 Personal communication, anonymous interviewee, Moroccan think tank. This also lends support to research which has found that despite high-level political statements, on the whole, the EU and the UN are not currently pursuing the integration of human security concerns in concrete policies and programming (McGlade and Tedsen, 2012a and 2012b, forthcoming).

interviewee found that the government's focus on human development had made it more receptive to human security:

"I think the government is more receptive than before to the human security paradigm (…) Environmental catastrophes and shortages are affecting the economy and society in morocco. When the king came to power in 1999, he (…) put man at the centre of the development process (with the INDH). (…) this sensitivity to (mankind) (…) is commonplace amongst decision makers. Human security is a paradigm shift that is yet to be completed (but) it will be easier to make that shift in Moroccan than in other countries because we have been working on human development for a long time."[75]

Although the concept of human security is not widely used, a growing receptiveness to the concept in line with the goals of overall human development can be observed. In addition, a number of policies and programmes can contribute to ensuring elements of human security despite not being named as such. This can be through civil protection or sub-aspects of human security such as national security, economic security, food security or water security.

"We never really looked at climate change and human security as a theme, but when we talk about water, agriculture, natural disasters, we are talking about security."[76]

Indeed chapter 2 provides details of a number of relevant policies such as early warning systems for disasters, insurance schemes and adaptation in oases which contribute to ensuring human security. The Moroccan government has also shown itself to be ambitious when it comes to ensuring access to drinking water and is increasingly able to provide its population with water security. Although it is important to note that Morocco is a developing country with a wide variety of basic challenges which it is seeking to meet in, for example, education and health and which may be of higher policy importance, there remain serious gaps in its ability to ensure human security which should be addressed. These include but are not limited to the need to protect water quality from pollution, the rolling out of integrated disaster response systems for all river basins, the implementation of land-use planning and expansion of insurance schemes to reduce the impacts of flooding, and the development of national level adaptation policy. In addition, it is not yet clear whether the PMVs approach to agriculture will bring the hoped for

75 Personal communication, Mohamed Behnassi, Ibn Zohr University

76 Personal communication, Yassir Benabdallaoui, UNDP (United Nations Development Program) Morocco

benefits in terms of food and economic security given the reliance on already financially ailing markets such as the European Union.

3.2 *Insights on the relationship between climate change and water-related conflicts*

In general, interviewees perceived current levels of conflict to be fairly low. Comments made regarding conflict related above all to the inter-sectoral conflicts detailed in section 1.5. Nevertheless, there was certainly an awareness of the potential for conflicts to develop in future. Owing to the complex and interrelated nature of the issues at hand, this section presents insights on the relationship between climate change and water related conflicts in the form of 'trajectories' which examine how these issues may be interlinked.

Scarcity is not always a result of decreasing natural resources, but can also be viewed as a constructed situation that arises from inequalities in distribution (e.g. Sen, 1991). Interviewees remarked how environmental impacts would lead to less resources and problems with ecosystems creating scarcity of resources and likely conflict. The main thread that was drawn was the following:

> *Lack of water or persistent drought → Overexploitation of water resources → Impacts on agricultural livelihood of rural population (→ Migration or change in social network) → Conflict*

Nevertheless, this trajectory was not based on particular examples, but rather on interviewees' perception that these issues are interlinked and would create problems in the future.

Although it has been said that fundamental trade-offs between the consumptive use of water involved in expanded food production and the water requirements of other sectors and ecosystems need to be clarified (Marquina, 2004), the mechanisms for settling these disputes have nonetheless been put in place through the CSEC. What is less clear is how Morocco intends to equip itself to address community level conflicts and the potential that these may be aggravated if water resources become scarce. Although conflicts within communities have thus far tended to be at a low level and generally solved through traditional mechanisms, the country has not yet equipped itself to fully address current and potential conflicts of interest.

3.3 *Insights on the effectiveness of the current national/international policy framework*

There is an increasing consciousness of the impacts of climate change amongst policy makers and technical professionals in Morocco. Amongst some independent interviewees however, climate change was very much perceived to be part of the historical pattern of drought and flash floods, rather than as an additional challenge. Adaptation policy is still very much in a developmental phase and is currently focused on interventions at the oasis level rather than the development of a national policy framework such as a National Adaptation Programme of Action (NAPA). The policy framework with regards to water management is rather well developed in Morocco owing to its long history of tackling drought. Environmental legislation and human development programmes are also fairly well developed and compatible with many international and EU policy objectives. Nevertheless, implementation of this legislation is poor, as highlighted by the relatively low placing of Morocco in the HDI for example. Interviewees highlighted the frequent gap between the national discourse and the practical level impacts of policies.

3.3.1 Climate change

Besides securing natural habitats, the PACC-Oasis strategy has the additional aspect of securing populations' livelihoods and survival in oases rather than seeing them migrate to urban centres. Although interviewees did not make the direct link between this policy and reduced conflict, this policy can be effective in reducing pressure on urban areas for jobs and resources and can thus be interpreted as having a positive impact on human security. More might be done in terms of climate change adaptation: Morocco has developed a high level of technical competence in water and agricultural technologies such as drip irrigation, which should improve its ability to adapt and increase resilience. However one interviewee noted that there is a lack of training to translate this technical know-how into for concrete adaptation policies or consultation with policy-makers. In this way, Morocco's technical capacity does not always provide the protection to populations that it could.

3.3.2 Water

Although water policies have increased Morocco's water access, the dam building that has been engendered as part of this policy framework has been criticised for being too limited to supply management and water transfer and neglecting social and environmental issues (Minoia & Brusarosco, 2006). The rapidity of construction

was noted by many interviewees to have resulted in high levels of siltation and structural inadequacies. The 1995 Water Law recognises water as a public good, establishes a mechanism for cost recovery (via abstraction charges and a water pollution tax based on the polluter pays principle[77]) and establishes river basins as the unit of water management (NATO, 2004). It has been recognised as providing a comprehensive framework and an efficient juridical tool to develop more considerable efforts for integrated water management (Malak and Fons, 2011). Despite the apparent regionalisation under the Water Law, large control of water management has been described as being held by the Moroccan administration (Ouassou et al., 2005).

The Water Law has created an institutional framework for IWRM in Morocco, but 16 years after having been passed the law it is still not fully implemented (Abdul-Malak & Fons, 2011). Thus, development of river basin authorities and the involvement of stakeholders in these processes is still in progress e.g. through the recent involvement of Water Users Associations (AUEAs) in irrigation projects (Ouassou et al. 2005).[78] However, one interviewee described the AUEAs as having been created through a superficial process to respond to the needs for participatory development processes and as such resulted in the creation of 'ghost associations' with little real value.[79] Yet there appears to be some level of participation in the decision-making over water allocation which is done in consultation between different groups of water users. Interviewees conceded that there can at times be inter-sectoral debate and low level conflict over this water allocation. Nonetheless, water security (drinking water and sanitation) of citizens takes precedence over other uses such as agriculture or industry.

Under its National Water Strategy (Plan National de l'Eau) of 2000, Morocco began large investments in the construction of dams, increasing networks for water supply and large-scale irrigation systems to secure water for urban and agricultural demands. Nevertheless, these have been criticised for being too limited to supply management and water transfer and neglecting social and environmental issues (Minoia, P., & Brusarosco, A. 2006). On the other hand, the interviews conducted

77 However, some Moroccans argue that these charges are against Islamic principles prohibiting water trading. Farmers also dispute these charges and delay payments claiming that they represent a high percentage of agricultural inputs. As a consequence, the rates of water charges collection are low in many areas (CEDARE, 2006).

78 Water Users Associations: Association des Usagers de l'Eau Agricole, (AUEA)

79 Personal communication, interviewee from academia

with employees within the ministry charged with water policy and from the national office for drinking water and sanitation (Office National Eau Potable Maroc assainissement) highlighted that Morocco has been implementing programmes to address this criticism. One interviewee noted the success of recent public awareness campaigns to increase water saving and to sensitise the public regarding the use of alternative water supplies. Furthermore, these interviewees highlighted a change in focus towards demand management (e.g. incentives for efficient water use, progressive pricing, awareness raising, polluter pays principle) to improve water security.

3.3.3 Agriculture

The Moroccan government has focused on agriculture as a key pillar of securing its economic development and food security through the Plan Maroc Vert (PMV). Some interviewees found this to be a balanced policy which addressed both the needs of economic development whilst at the same time supporting smaller farmers. Major positive impacts on rural development, and hunger and poverty alleviation as well as efficient water use have been attributed to the PMV (World Bank, 2011). However, the PMV raised criticism from a number of interviewees. It is perceived as having several negative aspects such as benefiting some stakeholders more than others, and as potentially having negative effects on the environment (e.g. through pollution and salination).[39] Furthermore, some interviewees expressed the view that the PMV was not useful for securing food sovereignty or self sufficiency as its benefits were concentrated within a small land-owning elite who produce for export. In addition concerns regarding exposure to world markets have been highlighted in interviews and beyond.[80] Although the PMV has a pillar dedicated to support for smaller farmers, these interviewees felt that smaller farmres did not truly benefit from these policies.[81] Although the PMV did not initially take concerns of climate change into account, it has since designed a strategy for the integration of climate change through which it intends to support adaptation measures in pilot projects funded by the UNs Special Climate Change Fund (SCCF) and supervised by the Global Environment Facility (GEF) Secretariat. Nevertheless, this has still to be put in place and questions remain as to whether the most vulnerable portions of the population will be protected.

80 The World Bank (2011) has noted that the liberalisation of the trades in agriculture will contribute to seriously disadvantage local producers in the domestic market.

81 See also Howe, M. (2005).

3.3.4 Human security

When asked about the policy framework for addressing human security, many interviewees mentioned the National Initiative for Human Development (INDH), launched in 2005. Although Morocco may have a number of policies for addressing environmental or other concerns, it was human development, education and social factors which were most often raised as a bottleneck to progress and policy implementation. Several interviewees noted that the Moroccan government places value on the UNs Human Development Index (HDI) and that it often feels frustration that despite its policymaking efforts it still lags behind the regional average. The INDH has a strong link with the MDGs and places a focus on access to drinking water, and expects connection levels to reach 100 per cent by 2015 (OECD, 2007). Comments during field research highlighted the political will for the INDH to succeed. Although it is too early to evaluate the policy's impact on poverty and inequality reduction, preliminary results are positive in terms of poverty and vulnerability reduction. A survey conducted in 2009 revealed that some 50% of households are of the opinion that INDH projects improved their living conditions (Abdesslam, 2011).

Civil protection measures were commented on by one interviewee in relation to flood risk. He noted that there is currently only one river basin to have developed an integrated approach to addressing flood risks. Currently, response times to extreme events such as flash floods were not perceived to be sufficiently rapid by this interviewee, due to the need for capacity building and awareness-raising to improve responses at the local level. Another interviewee remarked that there were not sufficient measures in place to prohibit populations and businesses from constructing in flood plains. However, the National Plan against Floods (PNI) has identified 390 priority centers for which prevention measures are to be carried out by 2020. Insurance schemes were also highlighted as a current measure to help prevent risks to human security from disasters. Nevertheless, although these insurance schemes cover drought, they do not yet cover floods and furthermore focus on compensation rather than prevention.

In summary, Morocco has developed relevant legislation and policies for improving water security and a technical capacity to manage water supply in the face of droughts. Adaptation, particularly in terms of water scarcity and drought can no doubt be addressed with relevant technical measures. However, it was remarked that there may be a need to develop coordination between experts and policy makers on this front. Beyond water policy, the PMV has met with substantial criticism and interviewees were not unanimous as to whether this policy would

benefit Morocco in terms of food security or economic growth. Human security concerns were generally understood by interviewees in terms of human development (e.g. access to drinking water and sanitation) and civil protection. Above all else however, it was felt by interviewees that the most crucial challenge for Morocco was to address the question of human development and economic growth.

3.4 *Some factors influencing effectiveness*

The following section highlights some of the factors seen to impact the current policy framework in Morocco and some of the contributing factors.

As mentioned above, there are a number of problems regarding the implementation of environmental policies in Morocco, despite the fact that on paper, these may be, well crafted strategies. This was attributed by one interviewee to the fact that Morocco has tended to create and implement policies in an attempt to attract donor support:

"Morocco has discovered the importance of developing international laws into policies and mechanisms as a way to mobilise international funding for its own development projects. We receive huge international funding which should be dedicated exclusively to environmental protection whilst in the mean time the government tries to orient this funding to development projects where environment is not so mainstreamed."

The same interviewee remarked that that due to the number of more urgent challenges for Morocco's socioeconomic and political development, environmental issues are not systematically mainstreamed in decision-making processes.

"Morocco has ratified many international conventions (...) but we are not very efficient. Often (...) actions are taken to answer a demand (from the international community) rather than a need. It's more a compromise than a real will to change things. Often Morocco is a good student on many aspects but if you look deeper, change is not operational"[82]

A recurrent comment from interviewees related to the need for awareness of environmental issues from which real commitment for implementation and enforcing compliance could emerge (as opposed to actions that are carried out to please the international community).

82 Personal communication, NGO interviewee

"we would like to see the laws and regulation well respected, well implemented. To see that people, users and decision makers well aware of the problem, because right now understanding is limited (...) I am also pessimistic concerning the application of the law, everything is delayed."[83]

With regards to the lack of awareness, one interviewee noted that:

"local authorities are contributing substantially to pollution and environmental degradation (but) when you evoke this subject with (them), the first argument that is given is that they lack significant financial, technical and human resources in order to implement environmental law. But it's not always true. Because a large part of local budget and funding is spent on other projects which are not as productive. So it's a question of choices made by authorities not a question of resources."[84]

Furthermore, this interviewee remarked that pollution and contamination of water posed risks to human security but that the 'water police' and river basin management plans did not have sufficient resources to address the issue.[85]

Although awareness campaigns have been successful for reducing water demand, there was still found to be a lack of public awareness about the collective responsibility to manage and share water in a sustainable way:

"Water used to be managed by different groups and communities, many people were involved, but now it is a public good, managed by River Basin Agencies in a centralised way. Its working slowly, but it is still difficult to get people to accept that they have to pay to use and pollute water. "[86]

From interviews, it appears that the government has something of a laissez-faire attitude with regards to the illegal urbanization of high risk zones. It was suggested therefore that stricter implementation of disaster risk management plans, insurance schemes and integrated planning were necessary for reducing the risks of water related disasters to Moroccan populations.

In this way, it can be concluded that although policies may be well developed, in order for them to be effective for ensuring human security and avoiding conflict,

83Personal communication, Sehhar El Ayachi, Institut Agronomique et Vétérinaire Hassan II

84 Personal communication, Mohamed Behnassi, Ibn Zohr University

85 Personal communication, Hasane Belguenani, European External Action Service EU Delegation Morocco

86 Personal commmunication, interviewee from academia

they must also be bedded within a broader framework where more basic human development such as education and overall well-being is assured and where there is an understanding and awareness at all levels of government and civil society of the need for the policies that have been developed.

Indeed, participative governance, transparency, and capacity-building are important elements at all points of the policy cycle to ensure that policies will be effective for ensuring human security. Many interviewees provide encouraging comments on these issues:

"The right to water is a recognized one (…). The population puts pressure on the government so that they find solutions. You can't imagine the level of freedom of people. They can come here and demand things or protest, the population can organize via opposition parties or others."[87]

"There is a democratisation of the society, people are expressing themselves. The more so the more the potential for conflict rises, because people will protest against situations they see as disloyal or not good. Before they accepted without saying a word, not anymore, and even less in the future" [88]

"The state favors participatory politics, it's not like when we first became independent, now the population participates in the planning process...When we make a 'schema national d'aménagement du territoire' (integrated land use plan) we promote the involvement of all departments (and) there is public participation of the local or national entrepreneurs in the debates that take place before the elaboration of these schemes."[89]

3.5 *Conclusions*

Overall it could be said that Morocco's policy framework provides it with a number of tools with which to face many of the challenges that climate change will present in the future. It has experience of dealing with climatic variability in space and time and has developed extensive technical capacity for water management to deal with this variability. Furthermore, the country has a policy framework which seeks to address many issues pertinent to human security and development. Nevertheless,

87 Personal communication, NGO interviewee

88 Personal communication, Yassir Benabdallaoui, UNDP Morocco

89 Personal communication, ex-government official

Morocco still has much to achieve with regards to the implementation of the policy challenges it has set itself. Interviewees commented above all on the need for increased levels of awareness of physical impacts of climate change on water resources and the implications of water pollution as the keys to unlocking the potential of what looks to be a relatively well developed policy framework. If this thematic awareness does not permeate the structures of government and civil society, policies will not be fully implemented and Morocco may jeapordise its ability to ensure human security for its citizens.

On the other hand, if fully implemented, policies such as the Plan Maroc Vert for agricultural development although theoretically presenting some benefits for economic security, presents a number of pitfalls whereby the human security of more vulnerable farmers and rural communities could be compromised due to the reliance on external markets and climatic conditions. In addition, there could be a number of negative environmental consequences in the longer term from this policy which may lead to an overall negative impact on aspects of human security such as health and food security.

With regards to water-related conflict, the government has established methods for inter-sectoral water allocation and there is a history of local water resource management at community level. Nevertheless, the impacts of climate change, human induced pollution and over exploitation of water resources will continue to pose a threat to Morocco's water and human security if they are not sufficiently managed and will place additional pressure on water management mechanisms.

Furthermore, and beyond the implementation of the existing policies there is a need to address new challenges, such as ensuring that flood protection including insurance and disaster response programmes are further developed. Sea-level rise, although a longer term challenge is one which the government must now examine with increasing priority in its integrated coastal zone management plans. Above all, rather than continuing with current more piecemeal efforts, Morocco now needs to develop a strategic approach to climate adaptation, which takes into consideration not only drought impacts but sea-level rise and floods as well as their implications not only for the economy but for the environment, and human security.

5 Sources

Abdelfadel, A. and Driouech, F., Paper from the 5th World Water Forum in Istanbul, *Climate change and its impacts on water resources in the Maghreb region*. Retrieved 20 May 2012 from, from http://portal.worldwaterforum5.org/wwf5/en-us/worldregions/MENA Arab region/Cons

Abdesslam, B. (2011). *Social determinants and health equity in Morocco*. World conference on social determinants of health, Rio de Janeiro 2011. University Mohamed Ier, Morocco. Retrieved from http://www.who.int/sdhconference/resources/draft_background_paper12_morocco.pdf

Abdul-Malak, D., & Fons, J. . (2011). *In depth assessment of national policies - Morocco*. Centre for Ecological Research and Forestry Applicaiton, European Topic Centre.

ADB. (2009). *National Irrigation Water Saving Programme Support Project (PAPNEEI)- Kingdom of Morocco*. African Development Bank. Retrieved from http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Morocco%20-%20The%20National%20Irrigation%20WAater%20Saving%20Programme%20Support%20Project%20%28PAPNEEI%29%20EN_01.pdf

Agoumi, A., & Debbarh, A. (2006). *Ressources en eau et bassins versants du Maroc: 50 ans de développement (1955-2005)*.

Alkire, S. (2003). *A Conceptual Framework for Human Security*. Centre for Research on Inequality, Human Security and Ethnicity (CRISE), University of Oxford.

ALM, The Adaptation Learning Mechanism. http://www.adaptationlearning.net/morocco/profile Accessed 15 May 2012

Barnett, J., & Adger, W. N. (2007). Climate change, human security and violent conflict. *Political Geography*, *26*, 639–655.

Burma Rivers Network. (2010). Social impacts: displacement. Retrieved May 7, 2012, from http://www.burmariversnetwork.org/key-concerns/social-impacts.html

CEDARE. (2006). *Water conflicts and conflict mechanisms in the Middle East and North Africa region*. Centre for Environment and Development for the Arab Region and Europe.

Choukr-Allah, R. (2010). Wastewater Treatment and Reuse in Morocco: Situation and Perspectives. CIHEAM. http://ressources.ciheam.org/om/pdf/b53/00800770.pdf

Choukr-Allah, R. (2011). Comparative study between Moroccan water strategies and WFD. *Options Mediterrannées*, *98*.

Chouvy, P. A. (2005). Morocco said to produce nearly half of the world's hashish supply. *Geopium.org*. Retrieved from http://geopium.org/276/morocco-said-to-produce-nearly-half-of-the-worlds-hashish-supply

Chouvy, P. A., & Laniel, L. (2006). *Drug production and state stability*. Centre for International Studies and Research (CNRS). Retrieved from http://www.ceri-sciences-po.org/archive/sept06/rapport_ceri_sgdn.pdf

Vidaurre, R., Berglund, M., and Meyer-Ohlendorf, N. (2010). *Climate Change, Hydro-conflicts and Human Security: Achievements of and Gaps in Current Policies*. First CLICO (Climate Change, Hydro-Conflicts and Human Security Policy) Policy Brief.

DW (2012). Ressources en eau. Department of Water, Morocco, http://www.water.gov.ma/index.cfm?gen=true&id=12&ID_PAGE=41

EMWIS (2005), Local water supply, sanitation and sewage, Country report, Morocco. Euro-Mediterranean Information System Know-How in the Water Sector. http://www.emwis.org/countries/fol749974/semide/PDF/Sogesid-morocco

Europa Jaratouna. (2009). Tourism eating up water resources in Morocco. Retrieved April 25, 2012, from http://www.eurojar.org/en/euromed-articles/tourism-eating-water-resources-morocco/5460

Falkenmark, M., J. Lundquist and C. Widstrand (1989), "Macro-scale Water Scarcity Requires Micro-scale Approaches: Aspects of Vulnerability in Semi-arid Development", Natural Resources Forum, Vol. 13, No. 4, pp. 258–267.

FAO. (2005). *L'irrigation en Afrique en chiffres- Enquête Aquastat-Maroc*. Food and Agriculture Organization of the United Nations.

FAO. (2011, March). Ex-ante Carbon balance tool. EX-ACT newsletter no. 2. Retrieved from http://www.fao.org/fileadmin/templates/ex_act/pdf/Newsletter/newsletter_EX-ACT_Jan-March2011.pdf

Faouzi, M. and Larabi, A. (2001). Problematic of the water table rising, salinity and nitrate pollution of the Beni-Amir phreatic aquifer (Tadla, Morocco). Ing Eau Agric Territ., 27: 23-36.

Gerstetter, C., Kampa, E., McGlade, K., Timeus, K., (2011) Review of international and national policies and institutional frameworks, CLICO.

Gerstetter, C., McGlade, K., Vidaurre, R., and Tedsen, E., (2012) Current policy frameworks for addressing climate-induced risks to human security and conflict – an assessment of their effectiveness and future perspectives, CLICO.

Hellegers, P. J. G. J., Perry, C. J., & Petiguyot, T. (2007). Irrigation Water Pricing.

Howe, M. (2005). The long shadow of King Hassan II (pp. 16–17). Oxford University Press.

Iglesias A., L. Garotte, F. Flores, and M. Moneo. (2005). Challenges to Manage the Risk of Water Scarcity and Climate Change in the Mediterranean. Water Resources Management.

IIED. (2011). Better economics: supporting adaptation with stakeholder analysis. International Institute for Environment and Development. Retrieved from http://pubs.iied.org/pdfs/17105IIED.pdf

IISD, & IUCN. (n/a). *Herding on the Brink Towards a Global Survey of Pastoral Communities and Conflict*. International Institute for Sustainable Development, International Union for Conservation of Nature. Retrieved from http://www.disasterriskreduction.net/fileadmin/user_upload/drought/docs/Herding%20on%20the%20Brink.pdf

INDH, GIZ, & MEMEE. (2006). *Adaptation aux changements climatiques*. Initiative nationale pour le développement humain, Secrétariat d'État auprès du Ministère de l'Énergie, des Mines, de l'Eau et de l'Environnement, chargé de l'Eau et de l'Environnement.

Le Matin. (2011). Agriculture durable. Lente reconversion au goutte-à-goutte 17.04.2011. http://www.inra.org.ma/docs/webactualit%C3%A9s86.pdf

MATUHE. (2001). *First communication- United Nations framework convention on climate change*. Ministère de l'Aménagement du Territoire, de l'Urbanisme, de l'Habitat et de l'Environnement. Retrieved from http://unfccc.int/resource/docs/natc/mornc1e.pdf

McGlade, K., & Tedsen, E., *Effectiveness of current policy frameworks in mitigating climate-induced risks relating to human security and conflict – case study on the UN* (forthcoming, 2012a).

McGlade, K., & Tedsen, E., *Effectiveness of current policy frameworks in mitigating climate-induced risks relating to human security and conflict – case study on the EU* (forthcoming, 2012b).

Minoia, P., & Brusarosco, A. (2006). *Water Infrastructures Facing Sustainable Development Challenges: Integrated Evaluation of Impacts of Dams on Regional Development in Morocco*. Fondazione Eni Enrico Mattei. Retrieved from http://www.feem.it/userfiles/attach/Publication/NDL2006/NDL2006-105.pdf

NATO Science Series: IV: Earth and Environmental Sciences, 2004, Volume 37, Section IV, 175-185

Ouassou, T. Ameziane, M. Belghiti, A. Ziyad and A. Belhamd (2005), Morocco, Options Méditerranéennnes, Série B, No. 51., http://www.iamz.ciheam.org/options/om_b51/PDFs/CHAP%2005-Ouassou.pdf

OECD. (2007). *African Economic Outlook: Morocco*. Organisation for Economic Co-operation and Development. Retrieved from http://www.oecd.org/dataoecd/27/14/38562905.pdf

One World. (2010). Morocco Climate Change, a OneWorld briefing. Retrieved May 7, 2012, from http://uk.oneworld.net/guides/morocco/climate-change

OSS, SDC, & CDE. (2002). *Moutnains and lowlands: enemis or partners-example of the High Atlas, Morocco*. Sahara and Sahel Observatory, French Academy of Agriculture.

Oxford Business Group. (2009). Morocco 2009 (Report)

Plan Bleu, (2012). Water in the Mediterranean: Examples of Good Practices. Retrieved May 20 2012, from http://www.planbleu.org/themes/eauUk.html

University of Fribourg, Centre for Development and Environment. Retrieved from http://www.dendrolab.ch/download/articles/PDF_Hoher_Atlas_E.pdf

Rachid, M. (2004). *Water Institutional reforms in Morocco*. Department of Social Sciences, Agronomy and Veterinary Medicine, Institute Hassan II, Rabat, Morocco.

Rochdane, S., Reichert, B., Messouli, M., Babqiqi, A., & Khebiza, M. Y. (2012). Climate Change Impacts on Water Supply and Demand in Rheraya Watershed (Morocco), with Potential Adaptation Strategies. *Water*, *4*, 28–44.

Sen, A., *Poverty and Famines: an Essay on Entitlement and Deprivation* (Oxford: Clarendon Press, 1991)

The Financial. (2011). GEF grants US$4.35M to Morocco to help small farmers adapt to Climate Change. Retrieved May 7, 2012, from http://www.finchannel.com/news_flash/Corporate_Social_Responsibility/87218_GEF_grants_US$4.35M_to_Morocco_to_help_small_farmers_adapt_to_Climate_Change/

UNDP. (2009) Arab Human Development Report. Challenges to Human Security in the Arab Countries.

US Foreign Commercial Service. (2011). *Water Management Sector in Morocco* (Doing Business in Morocco: 2011 Country Commercial Guide for U.S. Companies U.S. Foreign Commercial Service). Retrieved from http://www.usegyptcouncil.org/wp-content/uploads/2012/02/Water-Management-Sector-in-Morocco.pdf

Vidaurre, R., Berglund, M., Meyer-Ohlendorf, N. (2010). CLICO Policy Brief: Climate change, hydroconflicts and human security: achievements of and gaps in current policies.

World Bank. (2009). Integrating Climate Change in Development Planning and Disaster Prevention to Increase Resilience of Agricultural and Water Sectors. Retrieved May 7, 2012, from http://www.adaptationlearning.net/project/integrating-climate-change-development-planning-and-disaster-prevention-increase-resilience-

World Bank (2012). Employment in Agriculture in Morocco Retrieved 20 May 2012 from http://data.worldbank.org/indicator/SL.AGR.EMPL.ZS

World Bank. (2012). Projects - Morocco : First Development Policy Loan in support of the Plan Maroc Vert. Retrieved May 7, 2012, from http://web.worldbank.org/external/projects/main?pagePK=64312881&piPK=64302848&theSitePK=40941&Projectid=P116557

Zarhloule, Y. (n.a.). *Water as parameter of cooperation between Morocco and Algeria: the case of Angad-Maghnia transboundary stressed aquifers of Bounaïm-Tafna basin*. University

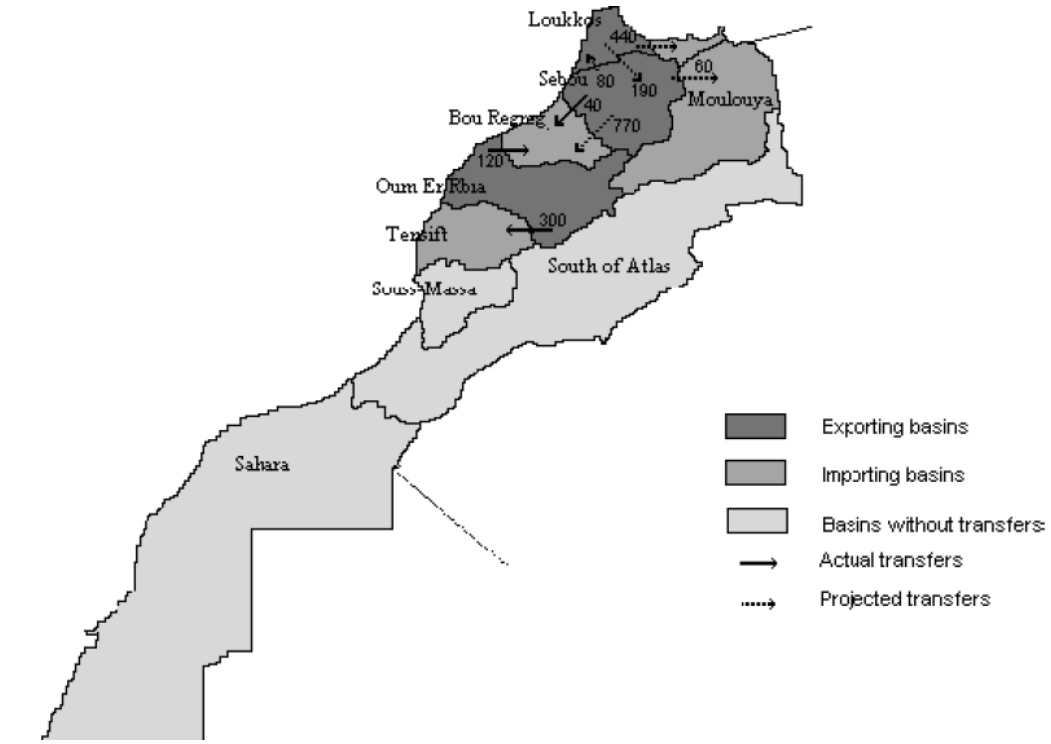
Mohamed I, Hydraulic Agency of Moulouya Basin. Retrieved from http://www.siagua.org/archivos_adjuntos/documentos/marruecos_algeria.pdf

Zarhloule, Y. (2009). Fresh Water as a Strategic Component of Economic Development: case of Morocco. *University Mohamed I, Morocco*. Retrieved April 25, 2012, from http://itca.hcp.ma/forum/Fresh-Water-as-a-Strategic-Component-of-Economic-Development-case-of-Morocco_m69956.html

Zubrycki, K., Crawford, A., Hove, H., Parry J-E. Review of Current and Planned Adaptation Action: North Africa, International Institute for Sustainable Development Adaptation Partnership, 2011.

6 Annexes

Annex A: Morocco's river basins and water balances



Source: Doukkali (2005)

Annex B: List of interviewees

Mohamed Behnassi: Ibn Zohr University

Yassir Benabdallaoui: UNDP (United Nations Development Program) Morocco

Hasane Belguenani: European External Action Service EU Delegation Morocco

Redouane Bouaicha: Secretariat of State in Charge of Water and Environment

Abdeslam Dahman Saidi: Targa-AIDE – (National-level NGO working on sustainable development issues)

Maria de Lope: World Wildlife Foundation

Mohammed Rachid Doukkali: IAV (Institut Agronomique et Vétérinaire Hassan II)

Fatima Driouech: Maroc Meteo

Sehhar El Ayachi: IAV (Institut Agronomique et Vétérinaire Hassan II)

Abdelaziz El Maghraoui: FAO Morocco

Meryem El Medani: World Wildlife Foundation

Mourad Errarhib: Friedrich Ebert Stiftung

Noureddine Filali Boubrahmi: Maroc Meteo

Mokhtar Jaait: International Institute for Water and Sanitation, Office National de l'Eau Potable (ONEP)

Abdellatif Khattabi: ENFI National School of Forestry and Engineering

Abdelkader Lahmidi: Ex-Director of National Directorate for Land Use Planning

Mohamed Raqui: Retired Professor, Institut Agronomique et Vétérinaire Hassan II

Hassan Sebbar: Ex-Minister of Tourism

Ulrich Storck: Friedrich Ebert Stiftung

Abdeslam Ziyad: Secretariat of State in Charge of Water and Environment

Anonymous interviewee from a Moroccan think tank.