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Desertification and Migration: From Almeria I to Almeria II: Achievements and Policy Tasks

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Abstract

This paper addresses the debate on linkages between two complex processes: the *natural* and *anthropogenic* process of soil degradation in arid, semi-arid and subhumid drylands that leads to *desertification* and the social process of *forced migration* and it raises the open question whether desertification has been *one* (besides water scarcity, degradation and climate change) of *several environmental drivers for forced migration* in the areas affected by desertification.

The paper is structured in ten parts. After a brief personal introduction (1.) the two key concepts of desertification and migration are defined (2.) and drivers contributing to both processes are discussed (3.) and four models for analyzing the linkages between nature and humankind are reviewed (4.), before the process of ‘politicization’ and ‘securitization’ of both processes and the linkage between both is being assessed (5.) for the conferences in Almeria (1994) and Valencia (2003). The sixth part focuses on past changes of migration patterns in the North-western Mediterranean (especially Spain, Portugal and Italy) from a region of emigration in the 1950s and 1960s to a region of immigration since 1970 and for Spain especially since 1995. The seventh part addresses the projected climate change impacts for the Mediterranean during the 21st century that may further intensify the market driven desertification on its Northern shore and poverty driven desertification in the Maghreb. The *Millennium Ecosystem Assessment* suggested a shift from ‘reactive’ to ‘proactive’ strategies considered two scenarios most promising, a globalized strategy of *TechnoGardens* that will be illustrated for the potential of renewables in desertified drylands (PSA Almeria) and a specific *Adaptation Mosaic* that will be needed for poverty, market and climate change driven processes of desertification (8.). The paper ends with two proposals for Almeria III (2012-2020): a) to create a research network, cluster of excellence in research or research centre on both in Almeria in Andalucía (9) and for proactive policies of Spain within the EU, in cooperation with UNCCD as a contribution to UNESCO’s Decade on Education for Sustainable Development (2005-2014).

¹ The author expresses only his personal opinions and not the perspectives of the institutions he is presently associated with. The present paper relies on previous and ongoing work of the author on desertification (Brauch 2006) on migration (Brauch 1997, 1997a, 1997b, 2000/2001) and on the conceptualisation of security (Brauch 2003, 2005, 2005a) and on three forthcoming volumes in the Hexagon Series published by Springer (Brauch et al. 2007, 2007a and 2008). A biography of the author is available at with a comprehensive bibliography: <http://www.afes-press.de/html/brauch_en.html>. His keynote speeches and scientific talks on this issue are available on his download page at: <http://www.afes-press.de/html/download_hgb.html>.

1. Introduction: Question and Goal

The vantage point for addressing the assumed linkages between the *process of desertification* that is studied by several disciplines in the natural and life sciences (geographers, geologists, soil specialists, hydrologists and climate experts) and the societal process of *migration* that is studied by social scientists (political scientists, sociologists, psychologists, anthropologists) and lawyers (international and national law) is that of a political scientist who has worked on the inherent tensions between security problems and peace and has focused for some 30 years on hard and soft security issues.

Both new soft security issues of ‘desertification’ and ‘migration’ he addressed first in Spain. His first studies on ‘migration’ were published in Spanish in 1997 by the Spanish Foreign Ministry (Brauch 1997, 1997a, 1997b, 2000/2001). At a conference in Canterbury on the eve of 11 September 2001, Teresa Mendizabal (2003) sensitised the author on population and land-use changes and their impact on desertification in Southern Europe and in the Maghreb.

The Valencia conference on ‘desertification’ as a security issue (Kepner/Rubio/Mouat/Pedrazzini 2006), organized by Jose Rubio in December 2003, stimulated the author to conceptualize ‘desertification’ as a security problem not only for ‘national’ but also for ‘human security’ primarily in the environmental and societal but also in the political and economic dimensions of a widened security concept (Brauch 2003, 2005, 2005a, 2006, 2006a, 2006c). Here, he conceptualized ‘desertification’ also as a water, food, health and livelihood security issue.²

This paper addresses the manifold and complex linkages between both *natural* (desertification) and *social* (migration) processes in the context of the author’s PEISOR model on nature – human interactions and their societal outcomes that need an early recognition, anticipatory learning and proactive and preventive action (Brauch 2000, 2007). During these past 10 years both issues have been ‘*politicised*’ and migration has been ‘*securitised*’ (Buzan/Waever/de Wilde 1998) as a major soft security challenge in the Mediterranean and especially for Spain where besides an urgent response longer-term *proactive policy choices by the EU* are needed that address their root causes.

Following the ‘desertification synthesis’ of the Millennium Ecosystem Assessment (MEA) its two most promising *global* (TechnoGarden) and *regional* (Adapting Mosaic) *proactive scenarios* will be discussed with relevance for the theme of this symposium on ‘desertification and migration’.

The paper is structured in ten parts. After a brief personal introduction (1.) the two key concepts of desertification (2.) and migration (3.) are defined and key drivers contributing to both processes are discussed. Then four models for analyzing the linkages between nature and humankind are introduced (4.), before the process of ‘politicization’ and ‘securitization’ of both processes and the linkage between both is being assessed (5.) for the impacts of the conferences in Almeria (1994) and Valencia (2003) will be reviewed.

The sixth part focuses on past changes of migration patterns in the North-western Mediterranean (especially Spain, Portugal and Italy) from a region of emigration in the 1950s and 1960s to a region of immigration since 1970 and for Spain especially since 1995. The seventh part addresses the projected climate change impacts for the Mediterranean during the 21st century that may further intensify the market driven desertification on its Northern shore and poverty driven desertification in the Maghreb. The *Millennium Ecosystem Assessment* suggested a shift from ‘reactive’ to ‘proactive’ strategies considered two scenarios most promising, a globalized strategy of *TechnoGardens* that will be illustrated for the potential of renewables in desertified drylands (PSA Almeria) and a specific *Adaptation Mosaic* that will be needed for poverty, market and climate change driven processes of desertification (8.).

The paper ends with two proposals for Almeria III (2012-2020): a) to create a research network, cluster of excellence in research or research centre on both in Almeria in Andalucía (9) and for proactive policies of Spain within the EU, in cooperation with UNCCD as a contribution to UNESCO’s Decade on Education for Sustainable Development (2005-2014).

² The Valencia talk is at: < <http://www.nato.int/science/news/2003/docu/031211c-desertification.pdf>>.

2. Definition and Drivers of Desertification

2.1. Desertification: An Element of Global Environmental Change

Since the 1970s *global environmental change* has focused on “human-induced perturbations in the environment” that encompass “a full range of globally significant issues relating to both natural and human-induced changes in the Earth’s environment, as well as their socio-economic drivers”. According to Munn (2002: xi) “changes greater than humankind has experienced in its history are in progress and are likely to accelerate”. Dealing with future environmental trajectories requires to “map a broad range of future environmental trajectories” that may confirm “that the changes of the 21st century could be far greater than experienced in the last several millennia” (Munn 2000: xii). Scientists, but also decision makers and administrators are being challenged to think the unthinkable, to minimise “surprise”.

Since the 1990s, besides the *International Geosphere-Biosphere Programme* (IGBP), the *International Human Dimensions Programme* (IHDP), the *World Climate Research Programme* (WCRP), and *DIVERSITAS* have rallied a global environmental change research community around coordinated scientific projects, and sensitised both policy-makers and the public alike.³ All four science networks deal with ‘soil issues’ and aspects of ‘desertification’.

The human dimension of global environmental change deals with the adaptation of societies to these changes. Wilson (1998) noted a growing *consilience* (the interlocking of causal explanations across disciplines) in which the “interfaces between disciplines become as important as the disciplines themselves”. Consilience is crucial for ‘desertification and migration’.

Global (environmental) change deals with changes in nature and society that have affected humankind as a whole and will increasingly affect human beings who are both the cause of this change and often also its victims. However, those who have contributed to it (with their greenhouse gas emissions) and those who are most vulnerable to it (Sahel) are not identical.

Steffen et al. (2004: 1) have argued that a global perspective on the interactions between environmental change and human societies has evolved. This led to an awareness of two aspects of Earth System functioning: “that the Earth is a single system within which the biosphere is an active, essential component; that human activities are now so pervasive and profound in their consequences that they affect the Earth at a global scale in complex, interactive and apparently accelerating ways”. They have further argued “that humans now have the capacity to alter the Earth System in ways that threaten the very processes and components, both biotic and abiotic, upon which the human species depends”. The Nobel laureate Crutzen (2002; Crutzen/Stoermer 2000) is right, we have entered a new era in earth history, the Anthropocene!

2.2. Scientific Approaches and Environmental Standpoints

In the social sciences, the analysis of global environmental change and of the human-nature relationship is polarised between epistemological idealism and realism (Glaeser 2002: 11-24), or between *social constructivism* and *neo-realism*. The *neo-idealist orientation* has highlighted two aspects: a) the uncertainty of scientific knowledge and claims; and b) the attempt to explain the scientific and public recognition of environmental change influenced by political and historical forces (Rosa/Dietz 1998). At least three standpoints exist on GEC issues:

- a *pessimist* or *Neo-Malthusian* view stimulated by Malthus’ Essay on Population (1798) that stressed the limited carrying-capacity of the Earth to feed the growing population;

³ These four scientific programmes are all part of the Earth Systems Science partnership (ESSP) that may be accessed at: <<http://www.essp.org/>>. IGBP at: <<http://www.igbp.net/>>; IHDP at: <<http://www.ihdp.uni-bonn.de/>>; DIVERSITAS at: <<http://www.diversitas-international.org/>>, WCRP, at: <<http://wcrp.wmo.int/>>.

- an *optimist* or *Cornucopian view* that believed an increase in knowledge, human progress and breakthroughs in science and technology could cope with these challenges; and
- a third perspective of an *equity-oriented pragmatist* who calls for multilateral cooperation.

Neo-Malthusian perspectives have referred to population and migration pressures and resource constraints, while Cornucopian views have stressed the potential of human ingenuity for solving increasing demand with technological breakthroughs that lead to new technologies and products. The third perspective, to which this author adheres to, has stressed the potential of multilateral cooperation in countering the Neo-Malthusian worst case projections with Cornucopian technical solutions by opting for a common middle ground that is achievable.

Adhering to the third perspective, this author has visualised the complex interaction between processes in the ecosphere and anthroposphere in my ‘survival hexagon’ (Figure 5) of three resource challenges: *air* (climate change), *land* (soil, ecosystem degradation) and *water* (scarcity, degradation, floods), and three social challenges: *human population* (growth, changes of its value systems), *urban systems* (services, industries, pollution, health), and *rural systems* (securing food and fibre). In this context ‘desertification’ and ‘migration’ have been conceptualized as new *soft security issues*, as both ‘objective dangers’ and ‘subjective concerns’.

2.3. Definitions of Desertification

Monique Mainguet (2003: 645) distinguished four meanings of desertification: a) in the scientific world, b) in the UN framework, c) in the media and d) in politics. In response to the drought in the Sahel, UNEP defined desertification in 1977:

Desertification is the diminution or destruction of the biological potential of land, and can lead ultimately to desert-like conditions. It is an aspect of the widespread deterioration of ecosystems, and has diminished or destroyed the biological potential, i.e. plant and animal production, for multiple use purposes at a time when increased productivity is needed to support growing populations in quest of development.¹

In 1990, a UNEP *ad hoc* group used this definition: “Desertification is land degradation in arid, half-arid and dry sub-humid areas *resulting from opposite human impact*”. The Rio conference in 1992 adopted this definition: “Desertification is land degradation in arid, half-arid and dry sub-humid areas, resulting from various factors, *including climatic variations and human activities*.” According to Mainguet (2003: 646-647):

Both definitions ... omit two key-notions: the *heterogeneousness of desertification*, both in its causes, mechanisms and consequences. The second definition dilutes human responsibility and, as the first, neglects the different degrees of severity of degradation, in particular its ultimate degree, the *irreversibility*, as the foundation of desertification. Irreversibility should be defined in the framework of one generation: when the generation that destroys the soil is unable to rehabilitate it for economic and/or technical reasons and/or due to lacking political will (Mainguet 2003: 646).

Mainguet (2003: 647) argues if *desertification* is used as “a synonymous with definitive degradation of lands”, referring to *irreversibility*..., then, according to Dregne (1983), only 0.2% of our planet would be affected. Thus, “according to a scientific consensus, the term *desertification of lands* is reserved for a degradation of localised soil exclusively in drylands”.

The text of the *UN Convention to Combat Desertification* (UNCCD) of 17 June 1994 used the Rio definition of UNCED. According to Art. 1 (b) “*combating desertification*” aims at:

“(i) prevention and/or reduction of land degradation; (ii) rehabilitation of partly degraded land; and (iii) reclamation of desertified land”. *Drought* is used for “the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.” The task of

¹ UNEP, Status of Desertification and Implementation of the United Nations’ Plan of Action to Combat Desertification, UNCED Part I, 1996.

“mitigation the effects of drought” (Art. 1, d) implies improved drought prediction “to reduce the vulnerability of society and natural systems to drought”.

The objective of the UNCCD (Art. 2) is twofold to “combat desertification” and “to mitigate the effects of drought”, especially in Africa with “long-term integrated strategies” aiming at “improved productivity of land, and the rehabilitation, conservation and sustainable management of land and water resources, leading to improved living conditions, in particular at the community level”.

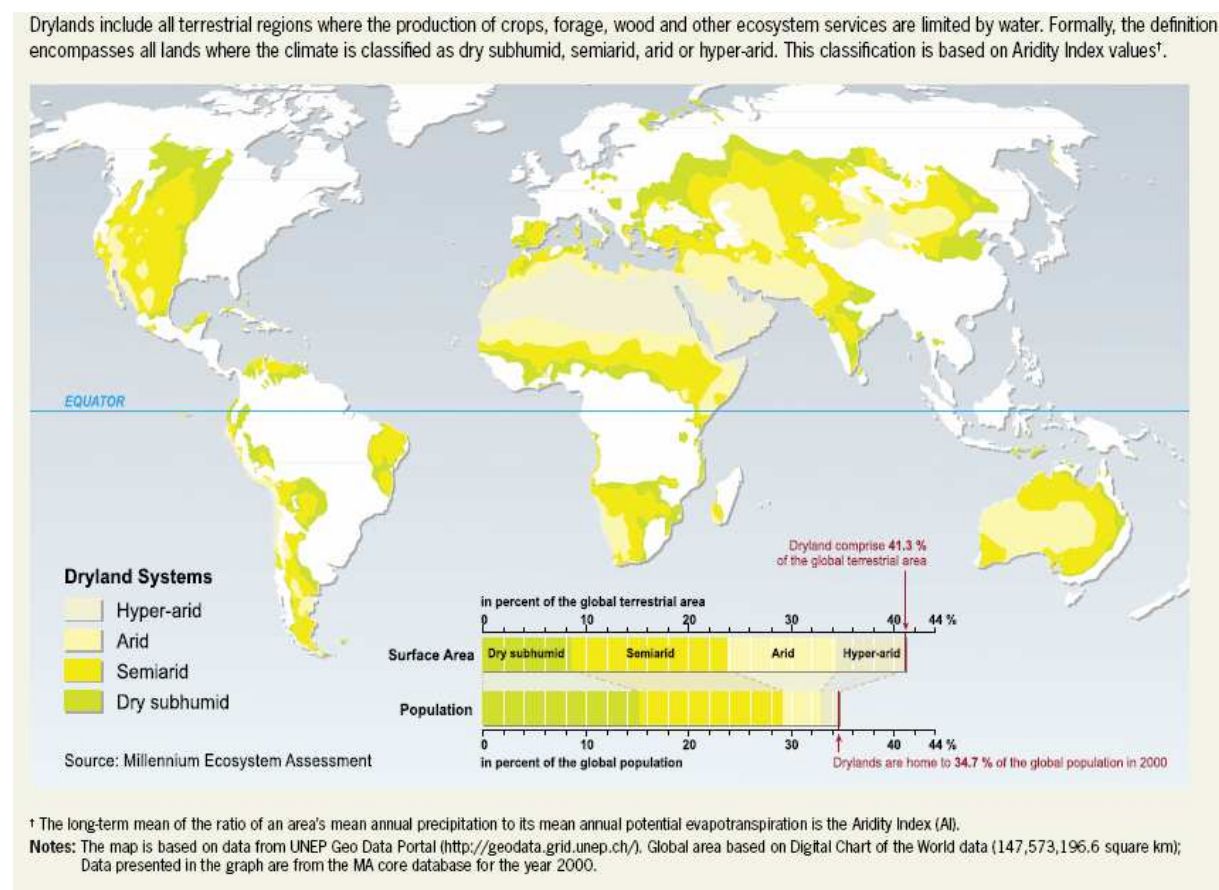
2.4. Millennium Ecosystem Assessment Defines Desertification

The *Millennium Ecosystem Assessment* defined land degradation as: “the reduction or loss of the biological or economic productivity of drylands.” Accordingly,

- drylands occupy 41% of the Earth’s land area and home more than 2 billion people;
- 10-20% of drylands are degraded, 1-6% of dryland people live in desertified land;
- Persistent, substantial reduction in the provision of ecosystem services as a result of water scarcity, intensive use of services, and climate change is a much greater threat in drylands than in non-dryland systems;
- Desertification is a result of a long-term failure to balance demand for and supply of ecosystem services in drylands. This increase is attributed to a combination of human factors (population, socio-economic and political pressures, globalization, food distortions, land-use patterns) and climatic factors (drought, reduction in freshwater, Adeel/Safriel 2005: 1).

The figure indicates the drylands that are especially vulnerable to desertification processes.

Figure 1: Drylands Vulnerable to Desertification. Source: Millennium Ecosystem Assessment, Adeel/Safriel (2005: 23).



2.5. Causes and Drivers of Desertification

The definition adopted at the Rio conference (1992) referred to “climatic variations and human activities” as the two sets of causes. According to Mendizabal and Puigdefabregas (2003: 687) desertification: “is triggered by changes in climatic and socio-economic conditions of the affected dryland systems that launch an irreversible positive feedback loop of land over-exploitation and a subsequent lack of sustainability in the system population and resources. The final outcomes are land degradation and disruption of local economies.” In their view:

The Mediterranean basin is particularly vulnerable to large scale climatic changes and their impacts on desertification may be significant, in spite of its “small grain” climatic heterogeneity, especially when combined with socio-economic disturbances. The implications of sea level rise on increasing the salinisation risk of coastal aquifers, most of them are already severely threatened has also to be considered in this context (Mendizabal/Puigdefabregas (2003: 688-689).

With regard to the 20th century they argued for Southern Europe and the Maghreb:

During the 20th century pure climate factors were rarely responsible for desertification in the Mediterranean, because droughts are relatively short. If natural and agricultural ecosystems are affected but not degraded, they will recover easily. Socio-economic disturbances, particularly when they occur combined with climatic fluctuations, should be considered as the main drivers for desertification in the area. They affect water balances and land degradation through associated changes in land use patterns.

But they saw different socioeconomic drivers for Southern Europe and the Maghreb:

- In Southern European countries, *markets and regional agricultural policies* are the key desertification drivers. Major land use changes associated to desertification risk are (i) new irrigation developments, (ii) expansion of traditional tree crops over marginal lands, and (iii) sheep overstocking in localised but relevant rangeland areas. Main effects are increasing soil erosion rates, soil and aquifer salinisation, as well as degradation of fluvial and wetland ecosystems. Because of the overall increase of the non-agricultural area and its vegetation density, a reduction of total water resources and an increase of wildfires start to be recorded.
- In the Maghreb countries, *demographic growth, together with national agricultural policies*, concerned with sedentarisation and food security, are major desertification drivers. Associated land use changes are (i) the encroachment of marginal agriculture upon rangelands and (ii) sheep overstocking of the rangelands. Mediterranean steppes are the most affected ecosystems, because they are used as buffers for the environmental impacts of agricultural policies, and lack from specific conservation strategies. Recorded effects are soil and vegetation degradation, as well as loss of biological diversity and of soil carbon sinks.

Thus, in the North desertification is largely ‘market-driven’ and in the South ‘poverty-driven’. For the MEA ‘desertification synthesis’ report (Adeel/Safriel 2005: 9):

Desertification is caused by a combination of factors that change over time and vary by location. These include indirect factors such as population pressure, socioeconomic and policy factors, and international trade as well as direct factors such as land use patterns and practices and climate related processes.

This requires detailed region-specific assessments of the relevant indirect and direct drivers as a precondition for adaptation and mitigation strategies for combating desertification.

2.6. Knowledge Gaps and Scenarios

The task of UNCCD is to deal with processes of land degradation and tasks of rehabilitation of degraded land and reclamation of desertified land as well as mitigating the effects of drought. The *Millennium Ecosystem Assessment* (MEA) noted major research and knowledge

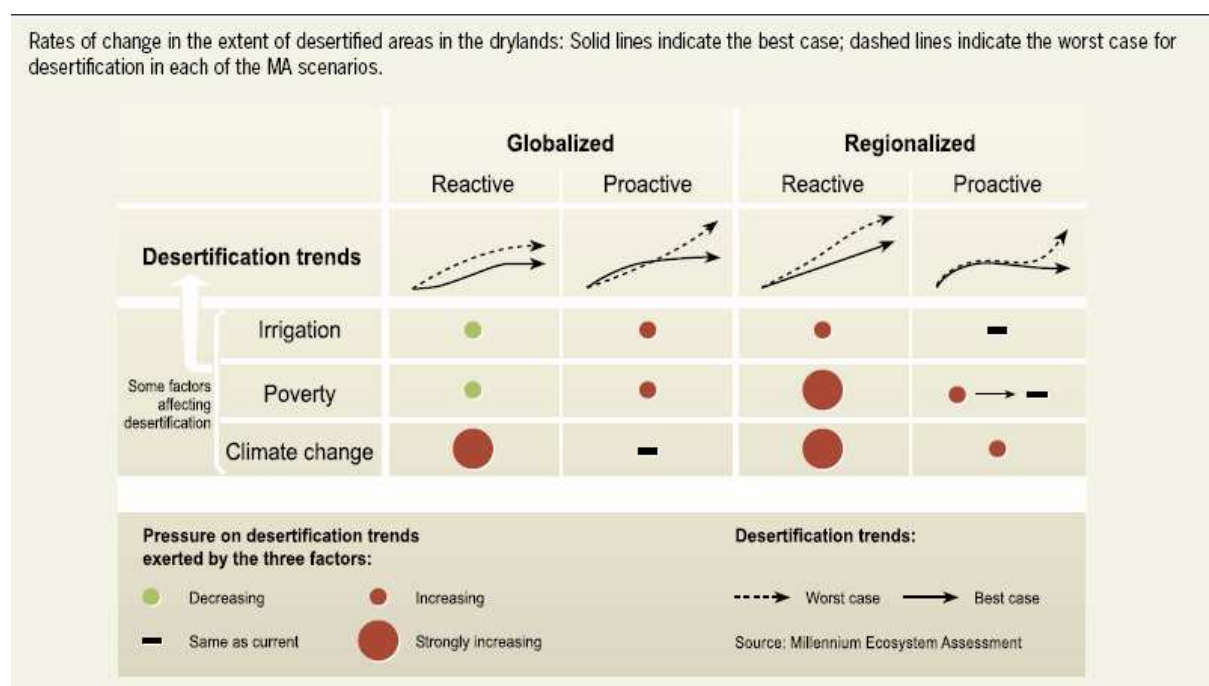
gaps on the geographical extent of desertification. 90% of the dryland populations live in developing countries that “are far behind ... in human well-being and development indicators”. The MEA used four scenarios: two focusing on a globalized and a regionalized world relying on reactive or proactive ecosystem management for technology development and adaptation.

Table 1: Scenarios for Combating Desertification. **Source:** Millennium Ecosystem Assessment, Desertification Synthesis by Adeel and Safriel (2005: 11).

Ecosystem management	Globalized world	Regionalized World
Reactive	Global orchestration	Order from Strength
Proactive	<i>TechnoGardens</i>	<i>Adapting Mosaic</i>

These four scenarios (figures 2, 3) show clear preferences for proactive strategies for irrigation, poverty and climate change (Adeel/Safriel 2005: 12).

Figure 2: Key Desertification-related Findings of the MA Scenarios. **Source:** Millennium Ecosystem Assessment, Desertification Synthesis by Adeel and Safriel (2005: 16).



The *MEA Desertification Synthesis Study* (2005) has referred to close linkages among desertification, global climate change and biodiversity loss where desertification contributes to climate change and may become irreversible as a result of climate change. The study noted that

- Understanding the impacts of desertification on human well-being requires that we improve our knowledge of the interactions between socioeconomic factors and ecosystem conditions. ...
- There are considerable scientific challenges in detecting thresholds beyond which drylands systems would reach a critical or effectively irreversible change. ...
- The impact of poverty reduction strategies on ecosystem services and desertification has not been fully explored by governments and the international community. ...
- The contribution of dryland urban areas to desertification may be significant but is not known.

The MEA – as the IPCC in its first three assessment reports – did not analyze the impact these complex processes have on political and societal outcomes whether it triggered and intensified processes of migration, of domestic economic and political crises and conflicts.

3. Definition and Drivers of Migration

3.1. Definition of Migration

Migration is a process that covers different features of people's movements from a) rural to urban livelihoods (*urbanization*), b) temporary '*internal displacements*' due to a natural hazard, conflict or a complex emergency or c) permanent internal, regional or international South-North migration. Such migration may be *forced* (often due to push factors) or *voluntary* (often due to pull factors). Environmental factors due to GEC (water scarcity, soil degradation, climate change) may force people to leave their homes and traditional livelihoods to survive or to have better prospects for life and economic and human well being.

The **International Association for the Study of Forced Migration** (IASFM) listed under forced migration the following types: a) conflict-induced displacement, b) development-induced displacement, c) Disaster-Induced Displacement and distinguished the forced migrants as: i) refugees, ii) asylum seekers, iii) internally displaced persons, iv) development displaces; v) *environmental and disaster displacees*, vi) smuggled people, and vii) trafficked people. The fifth group is "sometimes referred to as 'environmental refugees' or 'disaster refugees', in fact most of those displaced by environmental factors or disasters do not leave the borders of their homeland. This category includes people displaced as a result of natural disasters (floods, volcanoes, landslides, earthquakes), environmental change (deforestation, desertification, land degradation, global warming) and human-made disasters (industrial accidents, radioactivity)."⁵

3.2. 'Environmentally-induced migration': Migrants or Refugees

This 'environmentally-induced migration' has resulted in 'distress migrants', some have called 'environmental refugees' without any international legal entitlement to a refugee status. El-Hinnawi (1985) defined '*environmental refugees*' as: "those people who have been forced to leave their traditional habitat, temporarily or permanently, because of a marked environmental disruption (natural and/or triggered by people) that jeopardised their existence and/or seriously affected the quality of their life."

The UN Terminology (2006) defined an environmental refugee as a "person displaced owing to environmental causes, notably land loss and degradation, and natural disaster."⁶ Norman Myers (1995, 2002: 214-218) has claimed that in 1995 there were 25 million environmental refugees compared with 23 million traditional refugees but he did not give detailed statistical evidence for this claim (Black 2001). Castles (2001) in his review of the debate on "Environmental Change and Forced Migration" concluded that "we clearly need a much broader approach, which recognises the complex causes and the global dimensions of the crises that force people to flee their homes."⁷ Swain (1996) rejected this term and preferred to use the concept of "*environmental migrants*":

[for persons who] are forced to move away from their homes as a result of the loss of their livelihood and/or living space because of environmental changes (natural as well as anthropogenic) and who are forced to migrate (temporarily or permanently) to the nearest possible place (within or outside the state boundary) in search of sustenance.

⁵ See for details at: < <http://www.forcedmigration.org/whatisfm.htm> >.

⁶ See: UN Population Division: <<http://www.un.org/esa/population/unpop.htm>>; See also the glossary on Migration by IOM : <<https://unp.un.org/details.aspx?entry=E04401&title=Glossary+on+Migration#>>.

⁷ See: Stephen Castles: "Environmental Change and Forced Migration" (6 December 2001): at: *Preparing for Peace*: <http://www.preparingforpeace.org/castles__environmental_change_and_forced_migration.htm>, Stephen Castles: "Confronting the Realities of Forced Migration" (1 may 2004), at: < <http://www.migrationinformation.org/Feature/display.cfm?id=222> >.

In the 1993 “State of the World Refugees” report UNHCR listed environmental degradation as one of four root causes of refugee flows besides political instability, economic tension and ethnic conflict. Fiona Flintan (2001) listed among the main causes of environmental migration: a) human-induced environmental change (including land degradation, desertification), b) environmental catastrophes and/or natural disasters, c) military and political upheavals and d) socio-economic factors. Flintan (2001: 5) noted a “lack of any real theoretical or empirical insight and/or data on the relationship between environmental degradation, migration and indeed, conflict.” But at the same time she assumed, “that there is likely to be an increase in displaced people due to factors that include an environmental element. In addition, poor countries are, in general, more vulnerable to environmental change than rich ones, not least to having less resources to mitigate any adverse effects.”⁸

In the Report on the UNHCR/IOM/RPG (1996) symposium the concept “environmental refugees” was not used, instead the term “*environmentally displaced persons*” was used and defined as:

Persons who are displaced within their country or habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not necessarily the sole one.

A recent OSCE Background paper (22 May 2005) reviewed several environmental root causes of migration, among them: ground water, salinisation, desertification and deforestation; natural disasters (IFRC 2003); climate change (IPCC 2001, Brauch 2002) but also the migration impact on the environment. In the framework of ENVSEC, OSCE, UNEP, UNDP and NATO are collaborating on projects that aim at debating the environmental and economic factors forcing people to migrate.”⁹

However, there are major problems with the term environmental “refugee” because neither in international legal conventions nor in national immigration, asylum or internal security laws accepts “environmentally-induced causes” for granting a refugee status. The definitional problems imply that environmental refugees are not reported as a special case neither in national nor in international migration statistics. Instead in UN documents the concept of “environmentally-induced” migration has been used.

3.3. Lack of Statistics on Environmentally-induced Migration

Environmental causes for migration have not been systematically covered in available migration statistics:

- The *International Migration Report 2002*, published by the Population Division of the UN¹⁰ claimed that there were about 175 million migrants that represented about 3% of the world population. The UN Report states that between 1990 and 2000 there was an increase of 21 million migrants but there was no single reference to “environmental refugees”.¹¹
- The United Nations Populations Fund (UNFPA), in its report on: *Population and Environmental Change* (2001) included not very specific general reference to environmental refugees but no statistical evidence.¹² In its 2002 report on: *People, Poverty and Possibilities*, the UNFPA gave no statistical data on “environmental refugees”, nor on “environmentally-induced migration”.

⁸ See Flintan at: < <http://www.ucc.ie/famine/GCD/Paper%20for%20Wilton%20Park.doc> >.

⁹ See study at: < http://www.osce.org/documents/eea/2005/05/14502_en.pdf >.

¹⁰ See for publications at: < <http://www.un.org/esa/population/unpop.htm> >.

¹¹ See at: < <http://www.un.org/esa/population/publications/ittmig2002/ittmigrep2002.htm> >; the 2005 revision see at: < http://www.un.org/esa/population/publications/migration/UN_Migrant_Stock_Documentation_2005.pdf >.

¹² See UNFPA at: < <http://www.unfpa.org/> >. For the State of World Population Reports of UNPA see at: < http://www.unfpa.org/publications/index.cfm?filterPub_Type=5 >.

- The OECD, in its annual reports on *Trends in International Migration* (e.g. SOPEMI 2001b) did not discuss the issue and did not supply statistical data.¹³
- The U.S. Committee for Refugees in: *World Refugee Survey* did not list such a category.¹⁴

The UN Population Fund's Report (UNFPA 2001: 36) on: *The State of World Environment 2001: Footprints and Milestones. Population and Environmental Change* defined: 'environmental refugees' as: "Population displacement due to environmental degradation (due to natural disasters, war or over-exploitation)". UNFPA did only give a general estimate of the World Bank "that in 1998 there were 25 million people displaced by environmental degradation, outnumbering war-related refugees for the first time in history."

Based on data by the UN Population Divisions in table 2 the trends of the global population, of the estimated international migrants and refugees, of the growth of migrants, of the international migrants as a percentage of population and of the refugees as a percentage of migrants have been compiled. While the number of the world population and of international migrants has steadily increased since 1960, the estimated number of refugees jumped between 1985 and 1990 and has since declined again. No major statistical source (UN, OECD, and IOM) has included a category of "environmental refugees", "environmental migrants" and "environmentally-induced migration" in their database.

Thus, no reliable global statistics exist on environmentally triggered migration and even less on people who opt or are forced to leave their livelihood due to land degradation, desertification, drought or famine. Nevertheless, environmental change (due to natural and manmade causes) is a recognised cause of migration while migration has also become a cause of environmental change.

The report on the UNHCR/IOM/RPG (1996) symposium distinguished among several categories of environmentally-induced population movements:

- Acute onset movements, with the possibility of return;
- Acute onset movements, without the possibility of return;
- Slow onset movement, with the possibility of return;
- Slow onset movement with predictability (for example, displacement caused by large-scale development projects) with no possibility of return because of human activities;
- Slow onset movement, without the possibility of return because of the natural conditions of the area.

To summarise, there seems to be an emerging consensus that soil degradation, erosion, desertification and drought contribute to distress migration, disasters cause, and trigger or contribute to migration, while migration may intensify disasters due to a high social vulnerability. However, no detailed global or regional estimates or data exist to quantify.

3.4. Global Trends on Migration and Refugees

While the percentage of the international migrants of the world population has grown from 2.1% in 1975 to 3.0 % in 2005, the percentage of refugees of international migrants grew from 2.9% in 1960 to 11.90 in 1985 and 1990 and has since then fallen to 7.1% in 2005.

A report of the Global Commission on International Migration (GCIM) on: *Migration in an interconnected world: New directions for action* as well as a report by the UN General As-

¹³ See at: < http://www.oecd.org/departement/0,2688,en_2649_33931_1_1_1_1_1,00.html >. Since 2006 it has been published with the title: *International Migration Outlook*.

¹⁴ See now U.S. Committee for Refugees and Immigrants, at: < <http://www.refugees.org/> >; for publications and archives at: < <http://www.refugees.org/worldmap.aspx> >.

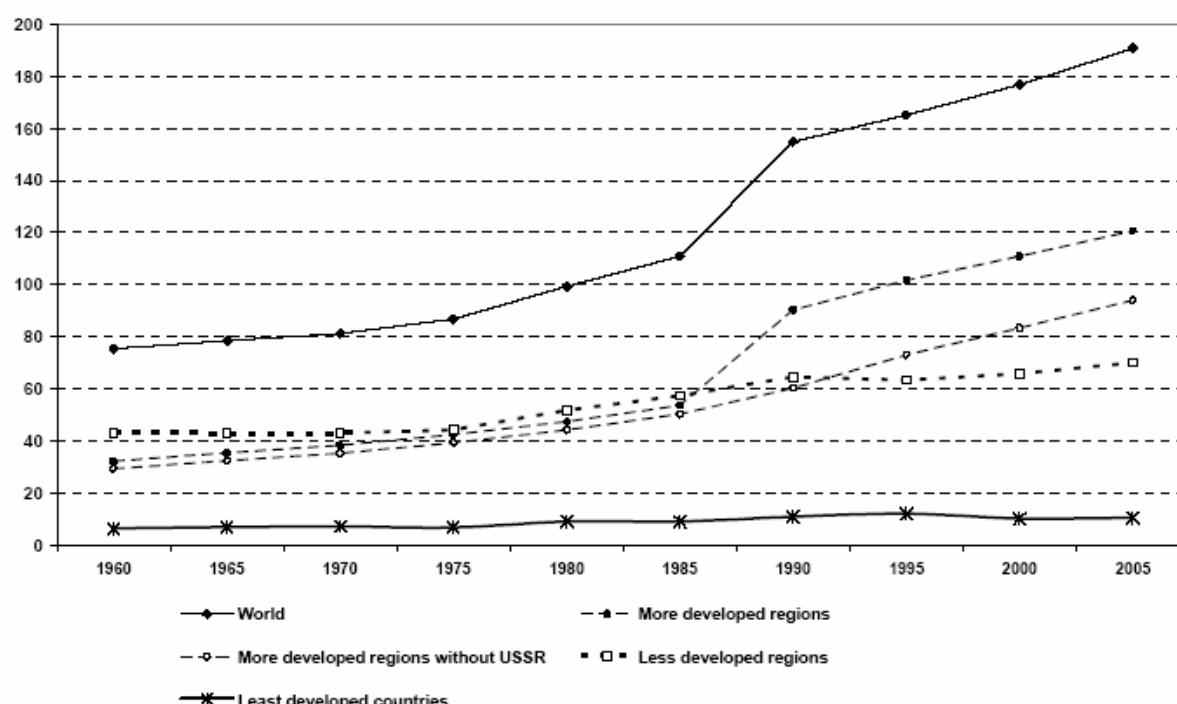
sembly on migration and development of 18 May 2006 for the high level meeting on this theme in mid September 2006 did not mention environmental factors as a driver for migration. The GCIM commissioned some 50 research papers that focused on 8 thematic projects and regional studies but none dealt with environmental causes of migration. The third project on: “Irregular migration, state security and human security” examined:

the use and adequacy of terms such as ‘irregular migrants/migration’, ‘illegal migrants/ migration’, ‘undocumented migrants/migration’ and ‘unauthorised migrants/migration’, and examines the potential for consistent and/or alternative terminology to be used in relation to the different phenomena commonly described in this manner.

Table 2: World population, migrants and refugees (1960-2005). **Source:** UN, Population Division, at: <<http://esa.un.org/migration/>>, visited on 15 October 2006.

Year	Population at mid-year (thousands)	Estimated number of international migrants at mid-year (both sexes)	Estimated number of refugees at mid-year	Growth rate of the migrant stock (percentage)	International migrants as a percentage of the population	Refugees as a percentage of international migrants
1960	3 023 670	75 463 352	2 163 992	0.8	2.5	2.9
1965	3 338 041	78 443 933	3 869 580	0.7	2.4	4.9
1970	3 696 128	81 335 779	3 886 983	1.3	2.2	4.8
1975	4 073 745	86 789 304	4 217 992	2.7	2.1	4.9
1980	4 442 309	99 275 898	9 065 472	2.2	2.2	9.1
1985	4 843 930	111 013 230	13 197 759	6.7	2.3	11.9
1990	5 279 519	154 945 333	18 497 223	1.3	2.9	11.9
1995	5 692 353	165 080 235	18 492 547	1.4	2.9	11.2
2000	6 085 572	176 735 772	15 656 912	1.5	2.9	8.9
2005	6 464 750	190 633 564	13 471 181	0.8	3.0	7.1

Figure 3: Trends in the Number of International Migrants for the World and Major Development Groups (1960-2005). **Source:** UN, Population Division, at: <http://www.un.org/esa/population/publications/migration/UN_Migrant_Stock_Documentation_2005.pdf>.



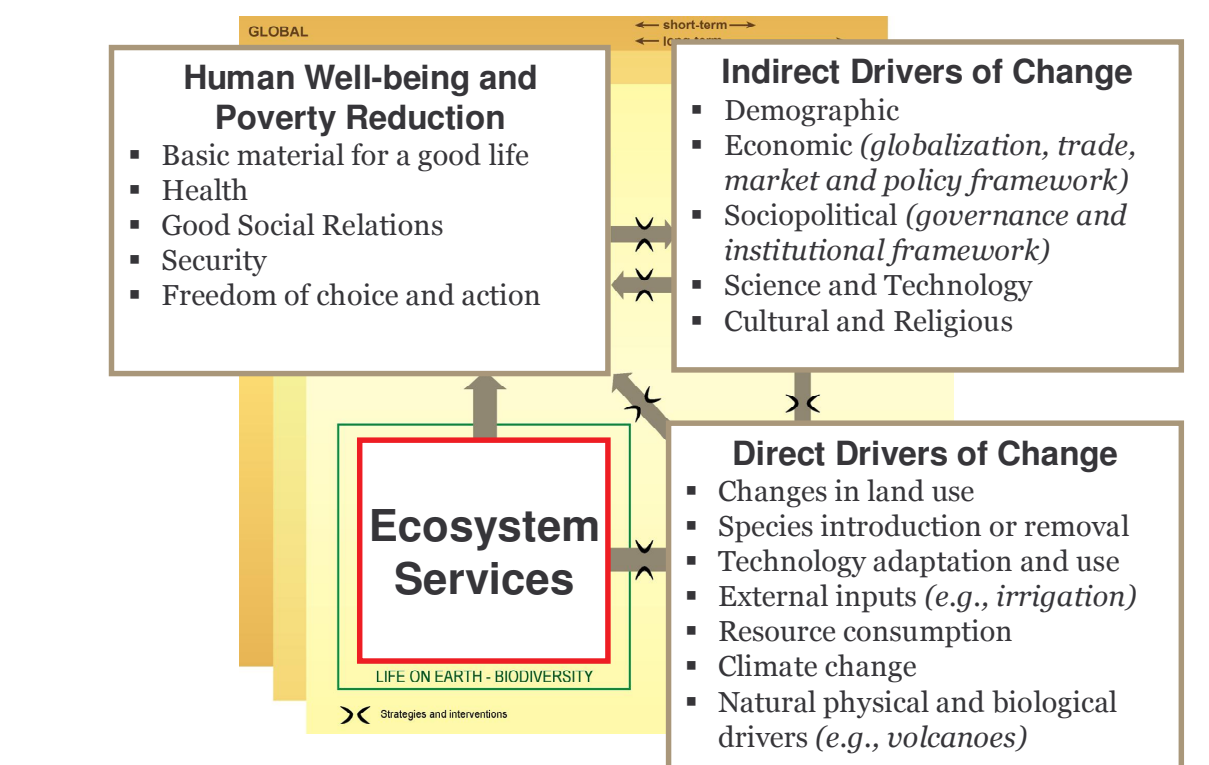
While several studies have been published on environmental refugees (Hinnawi 1985; Bächler 1994; Myers 1995) no systematic detailed statistical studies exist that permit a quantification of the environmentally triggered migration. There are, however, case studies on specific events (including desertification) that have forced people to leave their livelihood. In a survey on “interactions between desertification and population movements” by Knerr (n.y.: 5) noted on the MENA region “that almost no research has been done about this issue.”

4. Models on Linkages of ‘Desertification’ and ‘Migration’

Several models were developed for the linkage between Global Environmental Change (GEC) and societal outcomes that are relevant for *desertification* and *migration* linkages. The *Pressure-State-Response* (PSR) model of *OECD* (1993, 1994, 1998, 1999, 2000, 2001) assumes that human activities put pressure on nature that leads to environmental changes (climate change, water and *soil degradation*, biodiversity loss) to which the state and society respond with ecological and economic measures and programmes. The *OECD* model distinguished between ‘pressure’, ‘state of the environment’ and ‘response’ indicators.

Among ‘*pressure*’ (P) key factors are listed (population growth, consumption, poverty), while ‘*state*’ (S) refers to the environmental conditions that emerge from this pressure (air pollution, deforestation, degradation) that influence human health and well-being, and ‘*response*’ (R) points to the manifold activities of society to avoid, prevent and reduce negative impacts on the environment and to protect natural resources from these effects. Among the *pressures* are human activities in the energy, transport, industry and agricultural sector on natural resources (air, water, soil, organisms) to which the state, society, business and international actors respond. Between these three elements of the PSR model there are many complex interactions (resource transfers, information, decisions).¹⁵

Figure 4: MEA Framework. Source: MEA website, at: <<http://www.millenniumassessment.org/proxy/document.360.aspx>>.



¹⁵ See: < http://esl.jrc.it/envind/theory/handb_03.htm >: “The PSR model was developed in the 1970s by the Canadian statistician Anthony Friend, and subsequently adopted by the OECD’s State of the Environment (SOE) group; for an illustration see at: <<http://www.virtualcentre.org/en/dec/toolbox/Refer/EnvIndi.htm>>

The UN Commission for Sustainable Development (UN-CSD) used with its DSR (*Driving Force-State-Response*) model a slightly modified framework.¹⁶

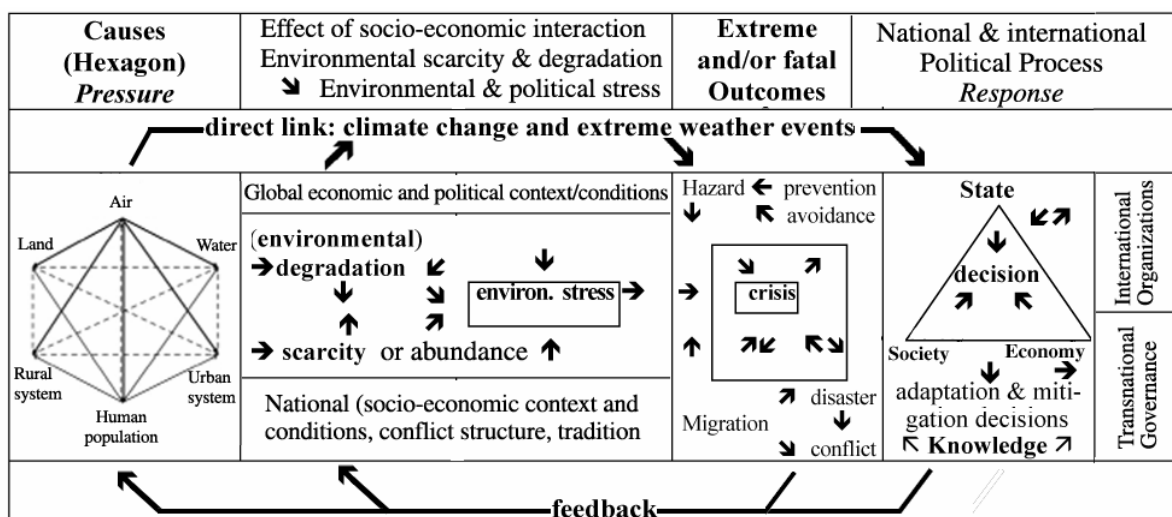
The European Environment Agency (EEA 1998) has developed a framework that distinguishes “*Driving Force - Pressure - State – Impact - Response* (DPSIR)¹⁷ that offers a mechanism for the analysis of environmental problems and for the development of environmental indicators.¹⁸

A different model was used as a framework for the *Millennium Ecosystem Assessment* (MA 2002, MEA 2005) that distinguished between direct and indirect drivers of change that directly affect human well-being and ecosystem services. In this framework besides the material minimum for a good life, health and good social relations, security is considered as one of the key elements of human well-being that influence the freedom of choice. Security has been defined as: a) the ability to live in an environmentally clean and safe shelter, and b) the ability to reduce vulnerability to ecological shocks and stress (MEA 2005; Leemans 2007). In the words of the *Human Security Commission* (CHS 2003) this refers to two basic principles: ‘protection’ and ‘empowerment’.

These four models (of OECD, UN-CSD, EEA and MEA) have served a specific purpose to develop environmental indicators and to guide the ecosystem assessment. But they did not focus – from a security perspective – on the linkages between processes of global environmental change (GEC) and natural hazards and their socio-political consequences.

This is the goal of the PEISOR model (Brauch 2005, 2007) where *P* (*pressure*) refers to six drivers of global environmental change (*survival hexagon*); *E* to the *effects* of the linear, non-linear or chaotic interactions within the ‘hexagon’ on environmental scarcity, degradation and stress; *I* to extreme or fatal *impacts* of human-induced and climate-related natural hazards (storms, flash floods, flooding, land slides, drought); *SO* to *societal outcomes*: internal displacement, *migration*, urbanization, crises, conflicts, state failure and *R* to *response* by the society, the business community, the state where both traditional and modern technological knowledge can make a difference.

Figure 5: PEISOR-Model. **Source:** Brauch (2005: 16; 2007).



¹⁶ See: UN Commission for Sustainable Development: “Indicators of Sustainable Development”, at: <<http://www.un.org/esa/sustdev/isd.htm>>.

¹⁷ See: Jochen Jesinghaus: “European System of Environmental Pressure Indices”, at: <http://esl.jrc.it/envind/theory/handb_03.htm>.

¹⁸ See: European Commission: “Towards Environmental pressure Indicators for the EU”, at: <<http://www.e-ma-i-l.nu/tepi/firstpub.htm>>.

Figure 6: PEISOR-Model.: Application for Desertification and Migration Linkages

<i>Pressure</i> Desertification	<i>Effect</i> Environmental Stress	<i>Impact</i> Migration ↓	<i>Societal Outcome</i> Integration conflict vs. Integration	<i>Policy</i> Response
Human activity (anthropogenic) (demand side)	Population growth Increase in demand for land, water and food ↗ ↓ Scarcity and degradation of soil + deforestation ↘ ↓ Overuse and overgrazing ↑ drought	internal displacement (temporary) ↓ Urbanization (permanent) ↓ Emigration ↓ Immigration (status: refugee, ↓ Integration	➡ Local Conflicts over access to and control of water and land ➡ Internal conflicts protests, strikes 'hunger riots' ➡ status of migrant (legal/illegal) ➡ humanitarian refugee status (?) ➡ integration vs. separation (in ghettos)	Reactive ↓ sending illegal migrants back - Tightening border controls (navy/police) - Tougher immigration laws - Development - Combating desertification - Sustainable agriculture - Reducing GHG emissions (post Kyoto regime)
Population Urban – rural systems North – South Economy – poverty ➡ Driven ↓ Desertification ↑ Water - Soil - climate ➡ degrade,-erosion - change				
Natural processes (supply side)	Precipitation ↑ Climate change	Water related natural hazards floods and fire	Research on links: GEC and Soc. outcomes	Jobs at home ↑ Proactive
↖ ←←←←←←←↖ ←←←←←←← Feedback ←←←←←←← ↗ ←←←←←←←↗				

While hazards cannot be prevented, their impact in terms of deaths, affected people, economic and insured damages can be reduced by a combination of policies and measures that link protection with empowerment of the people to become more resilient. The PEISOR model points to impacts of desertification on migration.¹⁹

5. Politisation and Securitisation: From Almeria to Valencia

Two stages of putting environmental issues in general and desertification on the international scientific and political agenda can be distinguished as part of a strategy of 'politisation' and 'securitisation'. The first strategy was launched with the Stockholm Conference in 1972 that resulted in the establishment of UNEP and at the Rio Conference in 1992 the adoption of a negotiation mandated for UNCCD that has resulted in a political regime with the setting up of the UNCCD secretariat in Bonn in 1999. Spain has been instrumental in politicising the 'desertification and migration' linkage in 1994 at Almeria (I), and the security aspects of desertification at Valencia in 2003 what has led to a 'securitisation' of this environmental problem.

¹⁹ See my speeches at: <http://www.afes-press.de/html/download_hgb.html>.

5.1 Hypothesis 1: Since the Stockholm Conference (1972) there was a ‘Politisation’ of ‘Environmental Issues’

Since the Stockholm Conference (1972) international environmental issues have been added to the international political agenda and at the Rio Conference (1992) with the negotiation mandate for UNCCD desertification has been “politicised”. After the Sahel drought of the late 1970s, “desertification” was an issue of soil, water and humanitarian specialists. During this early phase, El-Hinnawi (1981) coined the term “environmental refugees” but no major policy debate and research on the linkages has taken place.

5.2. Hypothesis 2: Rio de Janeiro, UNCCD and Almeria I (1994) Created Public Awareness and a ‘Politisation’ of the Linkages Between ‘Desertification’ and ‘Migration’

At the insistence of many developing, and primarily African countries, the Rio Conference (1992) adopted a negotiation mandate for UNFCCC that was put up for signature (1994) and entered into force in December 1996. Ten years later, the *International Year to Combat Desertification* (IYCD) has contributed to broaden international public awareness also in those countries that are not directly affected by desertification but indirectly by migration triggered by manifold environmental security threats, challenges, vulnerabilities and risks.

5.3. Hypothesis 3: Valencia (2003) Conceptualised Desertification in the Mediterranean as New Security Issue

Since 1989 environmental security issues increasingly had become “securitised” but the linkage between desertification and their societal outcomes has not been systematically studied. For the Copenhagen School of security studies, Ole Wæver defined *securitization* as:

the discursive and political process through which an intersubjective understanding is constructed within a political community to treat something as an *existential threat to a valued referent object*, and to enable a call for urgent and exceptional measures to deal with the threat. Other central concepts in the theory are ‘referent object’ (that which is deemed threatened and holds a general claim on ‘having to survive’, e.g. the state, the environment or liberal values), ‘securitizing actor’ (the one who makes the claim – speech act – of pointing to an existential threat to this referent object and thereby legitimizing extraordinary measures, often but not necessarily to be carried out by the actor itself), and ‘audience’ (those who have to be convinced in order for the speech act to be successful in the sense of opening the door to extraordinary measures, otherwise not available).

In two CIA studies of December 2000 (*Global Trends 2015*) and December 2004 (*Mapping the Global Future*) ‘desertification’ was not interpreted as a threat to U.S. national security while global ageing was seen as a security challenge for Europe, Russia and Japan where migration “has the potential to help the problem of a declining work force” and remittances have already overtaken foreign aid and are more valuable than exports. (CIA 2004: 58). A key question for the securitisation of ‘desertification’ and ‘migration’ is that of the referent object, be it the world community, nation state, the society or human beings or human kind. At the Valencia Conference in 2003, ‘desertification’ was for the first time discussed by a major international scientific and political meeting as a security threat, challenge, vulnerability and risk (Brauch 2005). A key question for the securitisation of ‘desertification’ and ‘migration’ has been that of the referent object, be it the world community, nation state, the society or human beings or humankind. This author (Brauch 2003, 2006) securitised ‘desertification’ primarily as an ‘environmental soft security’ challenge for human beings (human security) that affects their water, food, health and livelihood security. However, for the countries experiencing ‘desertification’ (especially in the drylands of Africa and Asia) in periods of drought and famine it has also become a serious ‘economic’ and ‘national’ security threat.

5.4. The Almeria Statement on Desertification and Migration

The Almeria Statement on Desertification and Migration of February 1994 interpreted desertification as a 'global' phenomenon and migration as a 'natural' phenomenon in history. It called for a "holistic approach to local development, empowering the local population and protecting the environment within the context of a poverty-reduction scenario, should be combined with more effective migration policies in such areas."

With regard to its *Socio-Political Dimensions* the statement noted that:

- Evidence is emerging for a correlation between *poverty, desertification and conflicts* of various kinds in arid and semi-arid areas.
- Resulting social and political disturbance ... is likely to become a major factor in geopolitical instability.
- Migration into cities or marginal lands accelerates impoverishment of land resources what may lead to further migration, stimulating ethnic conflicts or social unrest elsewhere.
- Environmental problems and related conflicts exert ever-increasing pressures on political stability at regional levels.

Among its *Policy Priorities* it noted:

- Effective integrated assistance strategies should link relief programmes with local development schemes;
- Sustainable land-use planning in drylands prone to desertification should focus on vegetation, soil and water conservation strategies;
- Prevention of involuntary desertification-induced migration should rely on promotion of sustainable agriculture in arid lands;
- Regional planning should harmonise agricultural production;
- Legislative, institutional and regulatory measures should be pursued to reform land tenure, conservation codes, harvesting, land use and water management practices;
- There is a need to review the legal status and regulatory regime governing the ... growing number of environmental migrants.

Among its *Action Priorities* the *Almeria Statement on Desertification and Migration* stressed:

- Relationship between environmental degradation and migration is important, complex, little understood;
- Further research and investigation to be pursued on desertification as a cause and consequence of displacement;
- Comparative studies between affected regions with different cultural and economic constraints ... to foster environmental education/training;
- Research on desertification-induced population movements should disintegrate factors motivating migration;
- Survey on dryland ecosystems should investigate correlation between desertification, poverty and migration and become part of an early-warning system for humanitarian crises;
- Research to be translated into policy-oriented training/dissemination.

5.5. No Systematic Research on: Desertification and Migration

Since the Almeria symposium 1994, little systematic research on the linkages between desertification, drought and famine on the one hand and forced migration and conflicts has occurred. Of two empirical projects directed by Homer-Dixon (1999) and Günther Bächler (Switzerland 1996, 1996a, 1996b) only the latter analyzed the role of soil degradation as a cause of conflict and in case studies on Niger, Algeria, Bangladesh, Sudan, Nigeria, Central Asia and Rwanda and on migration in case studies on China and Africa. Very few empirical studies are so far available primarily in the U.S. focusing on Desertification and Migration for Mexico and the US (Schwartz/Notini, 1994) and a Ph.D. thesis by Suzana Beatrix Adamo (2003) on Argentina and at the University of Texas in Austin.²⁰

At the Valencia conference (2003) only two contributions referred to a linkage between desertification and migration (Brauch 2006:11-86; Kapur et al. 2006: 291-304). The global interactive dialogue during the CRIC 3 in Bonn in May 2005 put these issues at the policy agenda of the UNCCD.²¹ In his conclusions as the moderator of this session this author:

pointed to a lack of scientific knowledge on the linkages between natural factors (desertification, drought, famine) and societal, socio-economic and political consequences (forced migration, crises, low level violence, mass protests, hunger riots below war level). Statistical data are lacking on environmentally-induced, desertification, drought and hunger-triggered migration as are systematic statistics on the socio-political impacts of these events. [He] called for multidisciplinary approaches of natural and social scientists for the development of policy-oriented integrated strategies for early warning of hazards triggering forced migration.

Both at the conference in Valencia (2003) and at the CRIC meeting on desertification in Bonn (2005), this author called for a wider conceptualization of security that includes environmental, human, water and food security concerns. Furthermore, he has suggested in many publications to analyze the individual causes contributing to GEC, that result in environmental scarcity, degradation and stress and manifold hazards and societal outcomes not separately but to focus on their interconnectedness. However, this requires both multidisciplinary and international research teams using both quantitative methods (scenario-building, modeling) as well as comparative qualitative case studies. This has remained a continuous challenge for both natural and social science research.²²

6. Migration Patterns in the North-western Mediterranean

Since 1950 to 2000 a fundamental shift has occurred in the migration patterns of the Western Mediterranean countries that include besides Spain, Portugal, France and Italy also five small states (Andorra, Holy Sea, Malta, Monaco, San Marino) and Gibraltar (Zlotnik 2003, table 33.7; here table 3). From 1950 to 1970 there was a net emigration from Spain, Portugal and Italy but since 1970 there was a net inflow of migrants of a million during the 1970 and two

²⁰ See: Susana Adamo <susana@prc.utexas.edu>: "Vulnerable People in Fragile Lands: Migration and Desertification in Arid Regions of Argentina" (dissertation 2003). This research focuses on the implications of land desertification for human populations, as this process has unfolded in the dryland regions of Argentina since 1970. The aim of the project is to explore migration processes as the demographic response to the interaction between socioeconomic and environmental dynamics, represented by vulnerability to desertification. David Salisbury <dsalisbury@mail.utexas.edu>: "Migration, Land-Use and Land-Cover in the Amazon's Corridor of Integration". In an attempt to understand how driving forces impact land-use and land-cover change, this research examines the potential impact of corridors of integration on the interconnected themes of migration, land-use, development, conservation and culture.

²¹ See the moderators summary at: <http://www.afes-press.de/pdf/Brauch_GID_AFES.pdf> and the UNCCD version at: <http://www.afes-press.de/pdf/Brauch_GID_UNCCD.pdf>.

²² George and Bennett (2005) have offered with the method of structured focused comparison an approach that may be useful for qualitative research in the social sciences for different disciplines.

millions during the 1990s. However, the emigration from the Southern Mediterranean (North Africa) has steadily increased between 1950 and 1980, temporary declined during the 1980s and during the 1990s returned to the level of the 1980s.

Table 3: Net number of migrants and net migration rates for the Mediterranean Basin, 1950-2000. **Source:** Zlotnik (2003: 599).

<i>Region</i>	<i>1950-1960</i>	<i>1960-1970</i>	<i>1970-1980</i>	<i>1980-1990</i>	<i>1990-2000</i>
<i>Net number of migrants per year (thousands)</i>					
Mediterranean	-2,765	-4,097	-2,127	-839	369
North-western Mediterranean	-1,521	-761	1,079	337	2,124
North-eastern Mediterranean	-823	-1,162	-71	-162	-888
Eastern Mediterranean	576	-406	-1,295	-506	921
Southern Mediterranean	-997	-1,769	-1,840	-508	-1,788
<i>Net migration rate</i>					
Mediterranean	-1.1	-1.4	-0.6	-0.2	0.1
North-western Mediterranean	-1.2	-0.5	0.7	0.2	1.3
North-eastern Mediterranean	-2.4	-3.1	-0.2	-0.4	-2.0
Eastern Mediterranean	1.7	-0.9	-2.3	-0.7	1.0
Southern Mediterranean	-2.0	-2.8	-2.3	-0.5	-1.4

Source: United Nations (2001). *World Population Prospects: The 2000 Revision*. Disk 2: Extensive Set. (United Nations Publication, Sales No. E.01.XIII.13)

The rapidly increasing irregular migration from both the Maghreb and Subsaharan Africa has already posed manifold national, political, societal but also human security threats and challenges both for the recipient countries and for the migrants as well. For the emigration countries emigration may reduce the potential for domestic protests among the hopeless and increase the prospects of remittances for those family members staying back home. However, for some recipient countries that are confronted with an emerging humanitarian catastrophe, the irregular South-North migration has become a major challenge for their national and internal security.

Table 4: Increase in Number of Migrants in Spain (1975-2005). **Source:** Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, Trends in Total Migrant Stock: The 2005 Revision <<http://esa.un.org/migration>>, 16 October 2006; 5:39:49 PM.

	1975	1980	1985	1990	1995	2000	2005
Estimated number of international migrants at mid-year	299 953	240 906	405 869	765 585	1 009 021	1 628 246	4 790 074
Estimated number of refugees at mid-year	17 000	23 750	9 600	8 490	5 607	6 851	5 507
Population at mid-year (thousands)	35 596	37 542	38 474	39 303	39 921	40 717	43 064
International migrants as a percentage of the population	0.8	0.6	1.1	1.9	2.5	4.0	11.1
Refugees as a percentage of international migrants	5.7	9.9	2.4	1.1	0.6	0.4	0.1
	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005
Growth rate of the migrant stock (percentage)	-4.4	-4.4	10.4	12.7	5.5	9.6	21.6

In Spain and Italy a significant increase in immigration has occurred during the past decade. In Spain the number of immigrants has increased from 299 953 (1975) to 4 790 074 (2005) or sixteen fold in 30 years (table 4). During the past decade, the migrant population has increased from 1 million to 4.8 million people or from 2.5% to 11.1% of the total population. At the same time the number of refugees remained stable at about 5500 people. Between 2000 and 2005 Spain had an average annual net migration inflow of 405.000 migrants. As a result the Spanish population rose from 39 921 (in 1995) to 40 717 (in 2000) and 43 064 (in 2005)

This increase in statistically recorded immigrants in Spain and Italy may already have been reflected in the changes in the UN population projections for both countries between the 2000 and the 2004 revisions (table 5). While the medium variant of the UN population projection (revision of 2000) projected a significant population decline for Spain (-9.6 million) and Italy (-14.6 million) between 2000 and 2050, the medium variant of the 2004 revision assumes now projects for Spain an increase 1.8 million and for Italy a decline of 6.8 million. Thus, the Spanish labour force may benefit by 2050 from immigration and thus the economic impact of ageing may be less severe.

Table 5: Population Changes (1950-2050) in Million Persons. Source: UN 2001, 2005

Real population development							Projection Med. var.		Changes			
	1850	1900	1950	1980	2000 (2000 Rev.)	2000 (2004 Rev.)	2050 (2000 Rev.)	2050 (2004 Rev.)	1950- 2050 (2000 Rev.)	1950- 2050 (2004 Rev.)	2000- 2050 (2000 Rev.)	2000- 2050 (2004 Rev.)
France	36.0	41.0	41.829	53.880	59.238	59.278	61.832	63.116	20.003	17.449	2.594	3.837
Greece	3.5	4.5	7.566	9.643	10.610	10.975	8.983	10.742	1.417	3.176	-1.627	-0.233
Italy	25.0	34.0	47.104	56.434	57.530	57.715	42.962	50.912	-4.142	3.808	-14.568	-6.803
Portugal	3.5	5.5	8.405	9.766	10.016	10.225	9.006	10.723	0.601	2.318	-1.010	0.498
Spain	15.0	18.5	28.009	37.542	39.910	40.717	31.282	42.541	3.273	14.532	-8.628	1.824
Total (5)	83.0	103.5	132.913	167.265	177.304	178.910	154.065	178.034	21.152	41.283	-23.239	-0.879

Thus, immigration has become a major political but also security challenge for the Spanish government and society. While this immigration cannot be interpreted as a direct outcome of environmental or desertification factors, nevertheless, the inflow has increased from those countries in North and Sub-Saharan Africa that are victims to desertification. We need research and scientific knowledge why people risk their lives to reach the Canary Islands from Sub-Saharan Africa. But it may be empirically very difficult to quantify the number of migrants that have left their homes and countries besides other reasons also due to environmental causes among them soil erosion, desertification, severe drought and famine.

7. Climate Change Impacts in the Mediterranean to 2100

According to Medizabal and Puigdefregas (2003) during the 20th century pure climate factors were rarely responsible for desertification in the Mediterranean. According to many regional climate models (Palutikof/Holt 2004: 61-72; Castro/Gallardo/Calabria 2004: 75-90) the impact of climate change will be much more severe in Southern Europe both with regard to temperature increase and precipitation decline.

In a lecture to the European Agricultural Ministers, Martin Parry, a co-chair of the WG II of the IPCC on climate change impacts, in September 2005 gave a gloomy picture for the Mediterranean climate and agriculture that the temperatures will rise much more in the Mediterranean while the precipitation would decline,

The frequency of hot summers and heat waves (as in 2003) would grow dramatically. They will double until 2020 and will be 10 times as frequent by 2080. Several available climate

projections (temperature increase, precipitation decline) may be dramatic for Spain by 2020, 2050 and 2080 (Figure 7, 8, 9), especially for the autonomous regions on the Mediterranean coast.

Figure 7: Projected temperatures and precipitation in Europe in 2020, 2050 and 2100. **Source** Parry 2005.

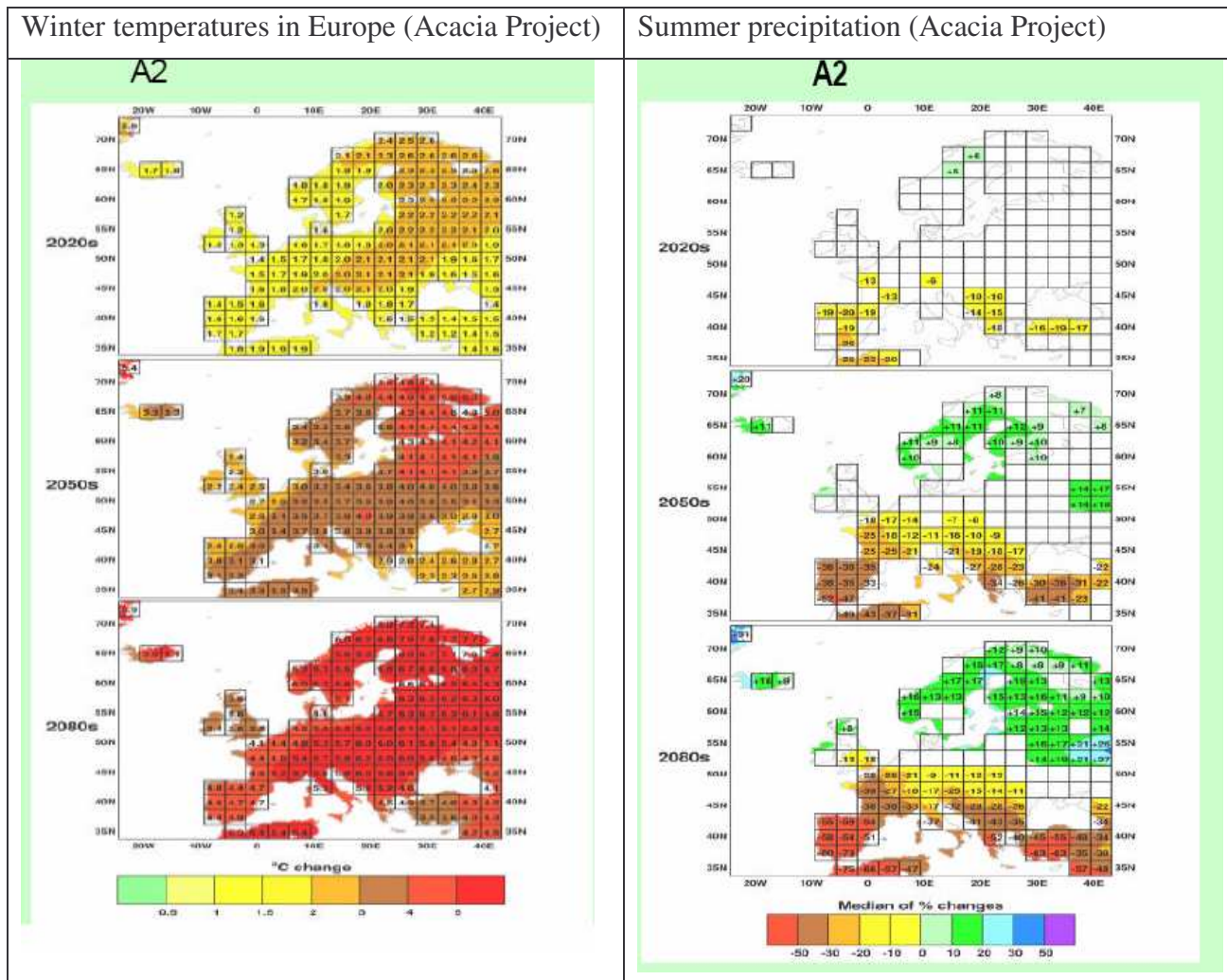
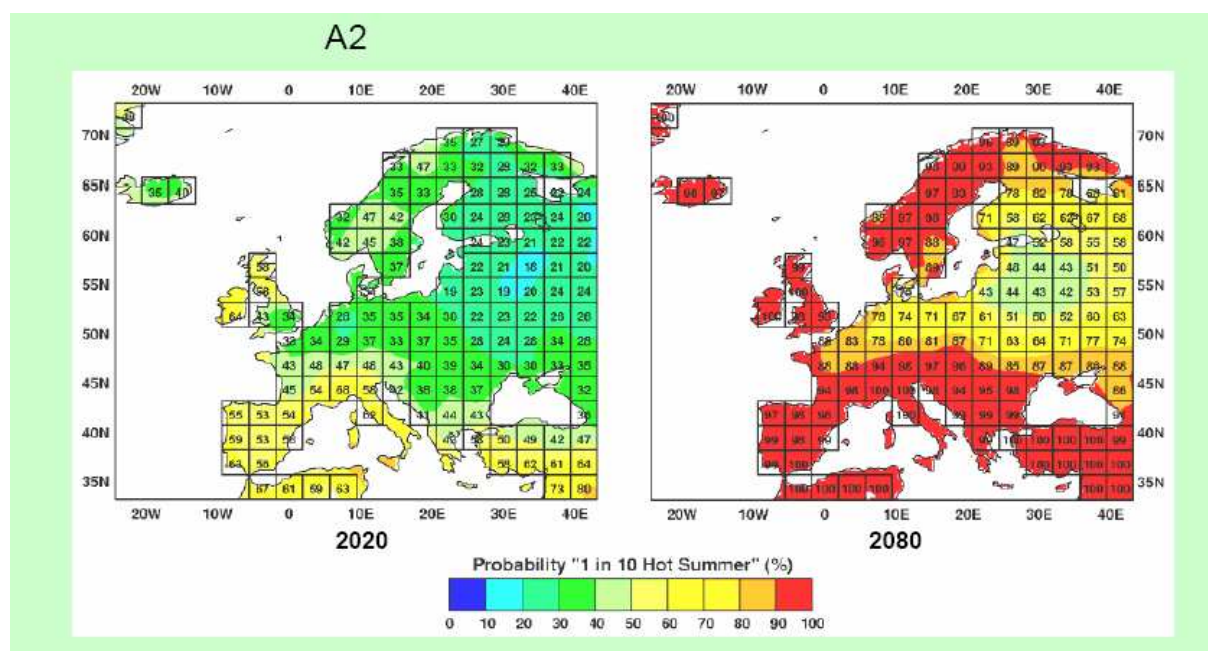


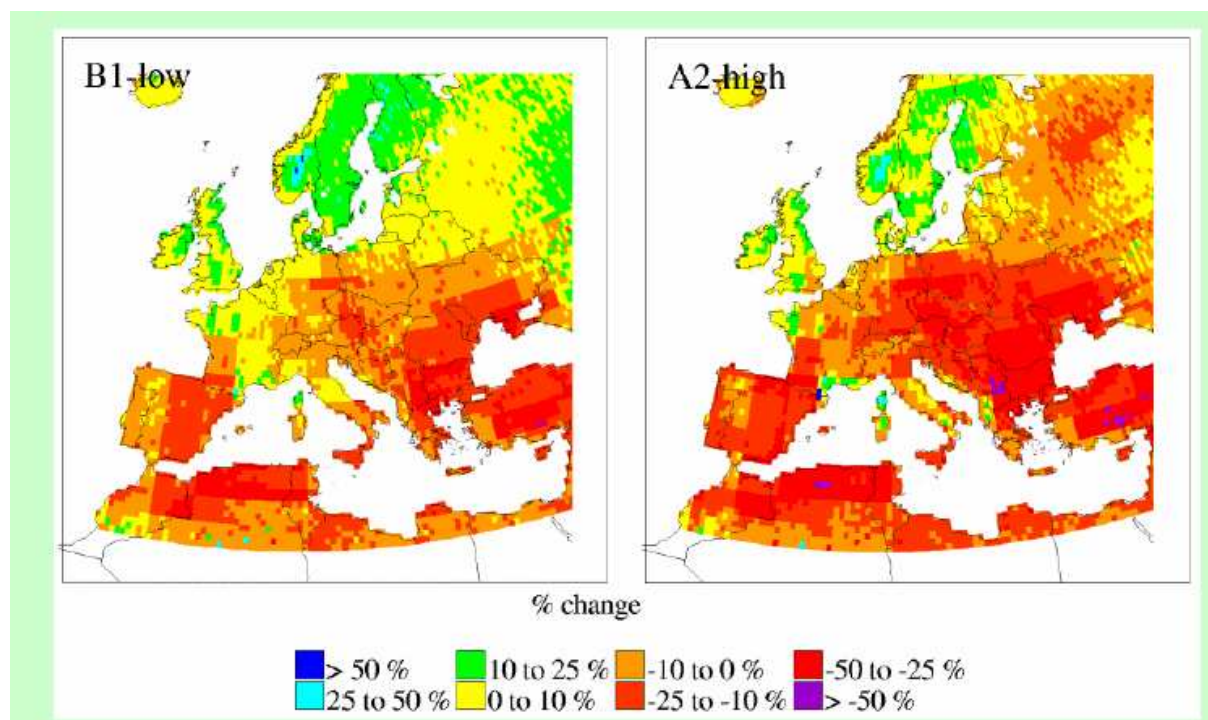
Figure 8: Changing Frequency of Hot Summers (2020 to 2080). **Source:** Parry, 2005.



Martin Parry's message to the European Agricultural Ministers in September 2005 were:

- warmer in the North, drier in the South;
- increased frequency of extremely hot days and seasons;
- more benefits to the North and disbenefits for the South;
- more water shortage and heat stress in the South;
- may aggravate desertification in the South;
- South to North shift of climate recourses in Europe;

Figure 9: Water Availability in the 2050s (Change in annual runoff). **Source:** Parry (2005).



Parry called for a mainstreaming of climate policies into European development policies. This will require major agricultural and economic readjustments in Spain:

- Decline in production of citrus fruits and in export of virtual water to Central Europe;

- Enhanced potential for sustainable renewable (solar, wind, biomass) energy sources that can be used for electricity generation, export but also for local solar desalination.

Parry's message will be reflected in the fourth Assessment report of the IPCC (2007) and in a report for the German Scientific Advisory Council on Climate Change (WBGU 2007) on global Change and Security for which I wrote a lengthy internal expert study (Brauch 2007) on the climate change implications.

In full agreement with Parry's diagnosis on the decline of precipitation (figure 7,9), figure 10 projects that the potential danger of drought in the Mediterranean will increase significantly due to the projected decline in precipitation.

Whether this will lead to increases in crop yields is disputed with regard to Spain. According to Parry the models disagree on this aspect. According to the WBGU figures there may be a slight increase in crop yields in Spain between 0-2.5% while Dow and Downing (2006: 58-59) projected a small decrease in cereal production between 1%-10% for the time span between 2050 and 2080. According to the WBGU the yield will decline for most countries in North Africa by the 2080s while Dow and Downing (2006: 58-59) projected crop yield increases for the five North African countries of 1-20%. The degradation of soil and desertification has been more difficult to predict and no similar high quality modelling data are known to this author.

Figure 10: Potential Danger of Drought in the Mediterranean. **Source:** Brauch 2006b based on WBGU 2006 (unpublished).

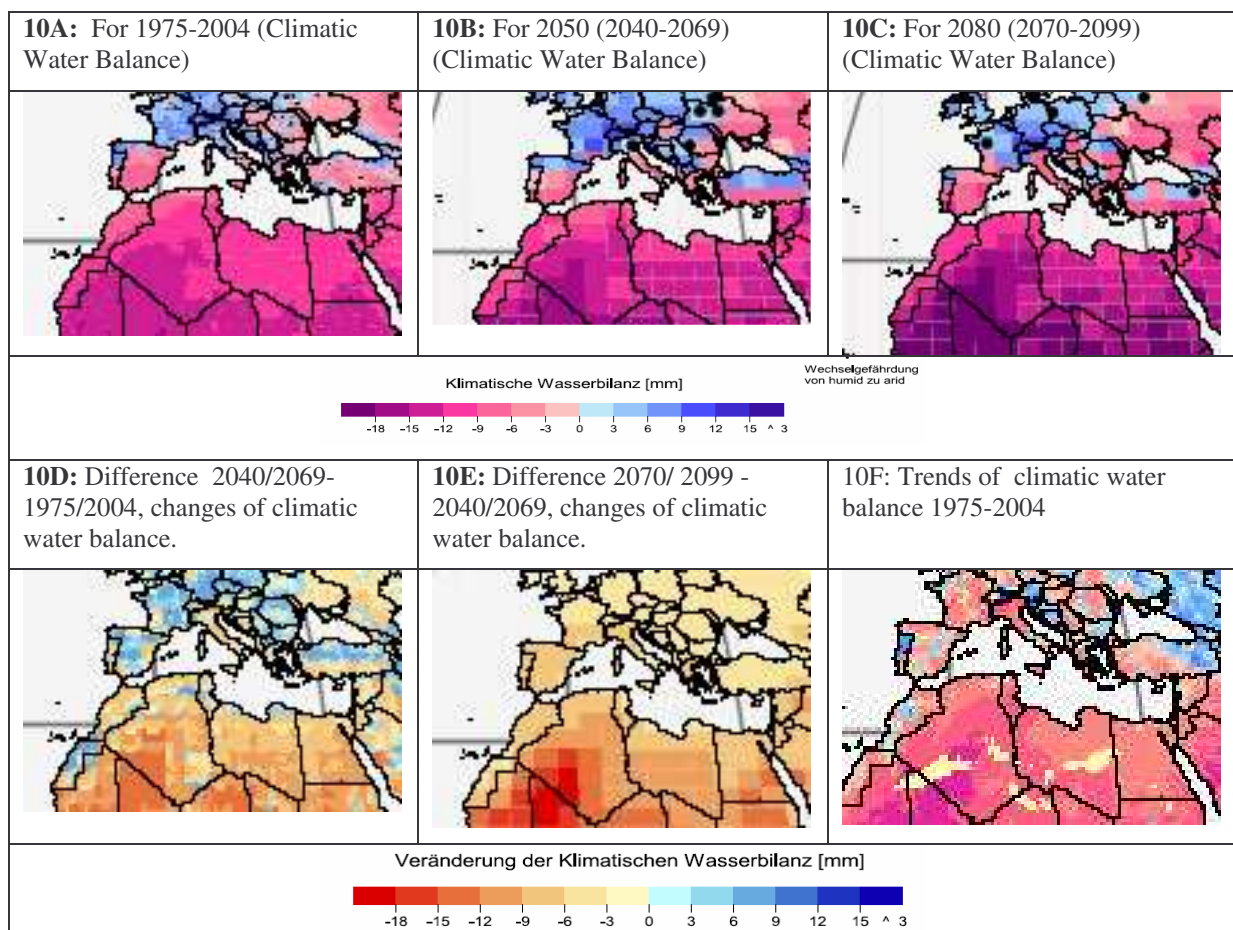
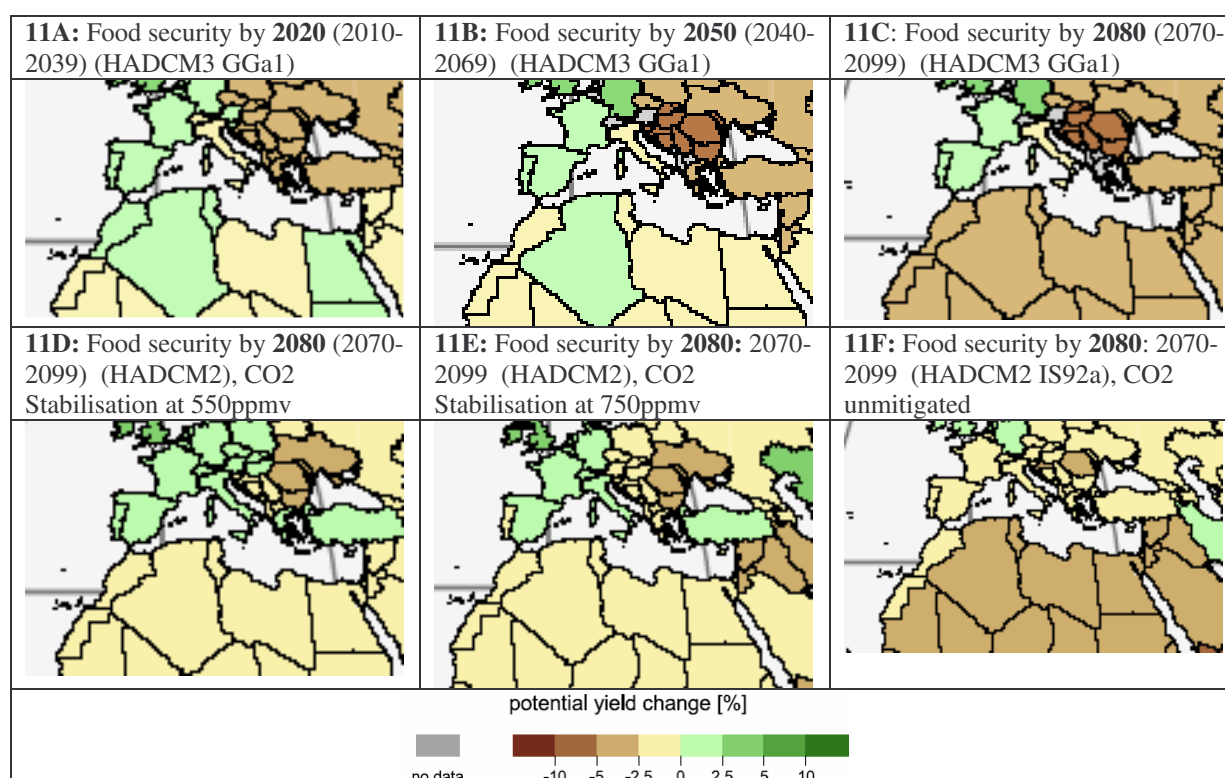


Figure 11: Climate Change in the Mediterranean. Changes of agricultural yield until 2020, 2050 und 2080. **Source:** Brauch 2006n, based on WBGU 2006 (unpublished).



8. Millenium Ecosystem Assessment: From Reactive to Proactive Scenarios: TechnoGarden & Adapting Mosaic

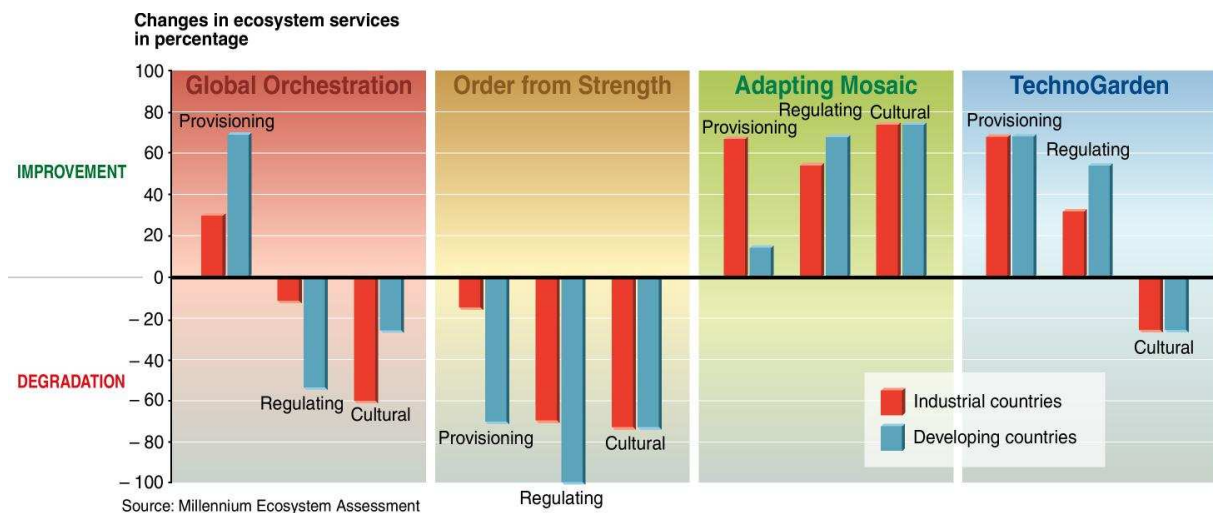
We have seen above (figure 2) that both the reactive globalized and regionalized scenarios will strongly increase the impact of climate change and that the regionalized scenario of order from Strength will also strongly increase poverty both of which may be perceived as additional drivers for distress migration from Africa to South western Europe.

According to the Millennium Ecosystem Assessment “the challenge of reversing the degradation of ecosystems while meeting increasing demands for their services can be partially met under some scenarios that the MA considered but these involve significant changes in policies, institutions and practices, that are not currently under way Many options exist to con or enhance specific ecosystem services in ways that reduce negative trade-offs or that provide positive synergies with other ecosystem services.”²³

The projection of the MEA Scenario up to 2050 show that for three of the four scenarios significant changes in policy can partially mitigate the negative consequences of growing pressures on ecosystems, although the changes required are large and not currently under way. The *regionalized proactive scenario* (Adapting Mosaic) appears to be the most promising while the *globalized scenario* (TechnoGarden) can help provide important tools (figure 12).

Figure 12: Assumed Impact of MEA Scenarios. **Source:** Millennium Ecosystem Assessment; see slight 34, at: < <http://www.millenniumassessment.org/proxy/document.360.aspx>>.

²³ The following is based on: the *Millennium Ecosystem Assessment Findings* slight show that may be downloaded at: < <http://www.millenniumassessment.org/en/Presentations.aspx>>



The regionalized *Adapting Mosaic Scenario* requires: a) widespread use of active adaptive management; and b) investment in education (countries spend 13% of GDP on education, compared to 3.5% today). In contrast the *globalized TechnoGarden Scenario* requires significant investment in development of technologies to increase efficiency of use of ecosystem services (e.g. in sustainable energy strategies based on renewable energy systems, like the solar thermal systems that have been developed in Almería at the *Plataforma Solar Almería (PSA)*, and b) widespread use of ‘payments for ecosystem services’ and development of market mechanisms.

In 1997 this author developed a similar proposal in a report in which he suggested a grid-connected hybrid *Renewable Energy System for Andalucía* starting with

- detailed feasibility studies for the *construction and financing of one or several hybrid renewable energy plants* that link most recent wind power, solar thermal and PV, biomass and waste and hydropower stations with a natural gas backup system for grid-connected electricity generation;
- stimulating the *local demand* by focused and partly EU sponsored financing for commercialisation of wind power, solar thermal and PV panels;
- furthering the *establishment of local production facilities*, e.g. by both Spanish and foreign producers of solar and PV panels and wind mills etc.;
- for training local and foreign technicians in building, servicing and maintaining of renewable energy installations;
- setting up a *postgraduate training and scientific research* unit for renewable energy for both students and practitioners from energy industry from North Africa, Latin America and elsewhere;
- organising an *industrial fair for renewable energy technologies* combined with visits to the commercially operating renewable energy plants with a special focus on future markets in developing countries.

This proposal of a proactive TechnoGarden implied that several existing EU funding programmes should be linked with different national funding programmes (e.g. of CIEMAT and of the German Federal Ministry for Education and Research in Almería) with existing efforts of the Junta de Andalucía and with private capital of interested companies. Furthermore, this author suggested in 1997 that this multifunctional programme should:

- support the efforts at optimising already existing state of the art technologies by linking different renewable energy components with a natural gas back-up system
- support the scientific exchange with present and future energy experts in manufacturing and electrical engineering from Europe, North Africa, Latin America and from other regions in the developing world;

- organise practice oriented summer schools for energy officials from Europe, North Africa, Latin America and from other regions in the developing world thus facilitating the technology transfer;
- create new technical expertise with respect to renewables in those regions of the world with a growing energy demand and excellent natural conditions for renewables;
- contribute to job creation in the EU region with the highest unemployment;
- foster the emergence of a new modern industries with a growing export potential.

One of the goals of this renewable energy vision was to address the migration pressure from both Maghreb and sub Saharan African countries but also to cope with the economic impact of climate change for Spain. This vision may still be relevant based on the projections of the IPCC assessment reports of 2001 and of 2007 and it may also become more urgent.

The MEA's suggested global Technogarden strategy requires proactive realist strategies for a regional Adaptation Mosaic that will also have impacts for 'desertification' and 'migration'.

In the concluding section the two most promising scenarios of:

- a regional *Adapting Mosaic* for Spain, North Africa and the Sahel region and a
- global *Techno Garden* based on the development of sustainable renewable energy systems.

will be translated into concrete proposals for implementing the goals developed in Almeria I (1994) and hopefully leading to policy suggestions as a result of this *second International Symposium on Desertification and Immigration for Almeria*. Thus, my proposals are simple:

Proposal 1: Development of theory-guided, empirically-based and policy-relevant multidisciplinary and international research activities addressing the linkage between: desertification and migration to create new knowledge for anticipatory learning and teaching;

Proposal 2: Development of forward looking proactive adaptation and mitigation strategies to cope with the challenges posed by global environmental change (climate change, desertification and water scarcity) and their impacts on 'forced migration'.

9. Proposal for Interdisciplinary Research

9.1 Hypothesis 4: Launching an International Research Network on Desertification and Migration for Anticipatory Learning

Policy declarations like the *Almeria Declaration* of 1994 are important for political and scientific agenda-setting but they are not sufficient. Declarations do not create research.

Within the EU, Spain has been and will be affected most severely by desertification and climate change. Between 2000 and 2005, in Spain the net migration influx of an average of 400.000 persons per year represents about 40% of the European total of ca. 1 million persons or 2/3 of the total migration influx in Southern Europe.

This has posed manifold national, political, economic, societal but also 'human security' challenges, vulnerabilities and risks for Spain and for the migrants reaching Europe via Spain. This present challenge requires both *reactive* but especially also *proactive* longer-term responses to address the root causes of both processes of desertification and migration

My first proposal for the conclusions of Almeria II is:

The autonomous region of Andalusia and the University of Almeria could become a focal point for international and multidisciplinary research in Spain and within the European Union to systematically address the linkages between environmental factors, including 'desertification', on the one hand and 'migration' on the other.

This may require the setting up of an independent endowment or a foundation supported by public sources as well as by private foundations. Such a foundation could be tasked to establish an *international research and training institution* with international staff from both EU, OECD but also from countries that are most affected by desertification and environmentally driven and desertification-induced migration.

Important models could be the international peace research institutes in Oslo and Stockholm, the Hadley Centre in the UK, the PIK in Potsdam and CICERO in Oslo, as well as the Swiss Mega Project on *Mitigating Syndromes of Global Change* that has led to many North-South Science partnership.

Such an independent foundation and international and multidisciplinary research institute with Spanish, French and English as co-equal operating languages could become an important partner of the UNCCD secretariat. Thus, a close partnership between such a research and training institution in Almeria and the UNCCD Secretariat in Bonn would be essential.

Such an academic and policy-oriented research and training institution could make significant conceptual, empirical and theoretical contributions for practical training seminars that could improve our knowledge on the empirically observed linkages, and thus to an anticipatory learning in those countries that are affected by both ‘desertification’ and ‘migration’ – as the autonomous regions of Valencia, Murcia, Andalucia and other parts of Spain are.

As Spain is the country most affected by desertification within the EU, additional research assistance could be expected from the 7th *Framework Research Programme* (2007-2013). Such an Institute could also provide a major input to the *UNESCO Decade on Education for Sustainable Development* (2005-2014).

The international year to combat desertification (IYCD) has already increased the visibility of ‘desertification’, it has ‘politicised’ this major environmental problem and its present and future societal outcomes, including to different forms of temporary and permanent, voluntary and forced migration in the drylands of the world and in the OECD countries to where many of the migrants try to come in search for a less desperate future and new livelihoods.

10. Proposal for Proactive Policy Initiatives addressing both Desertification and Migration

10.1. Hypothesis 5: Almeria II (2006) Should Call for Proactive Policies Posed by Desertification and Migration

Almeria II should send a clear policy message for launching proactive international strategies and policies at the global, regional, national and local level. The MEA has argued that a regionalized strategy aiming at an *Adaptation Mosaic*, and a globalized strategy creating *TechnoGarden* may become the most promising features of a proactive environmental policy.

- *At the global level* of the UN but also of the OECD countries could initiate, launch or support proposals for “*TechnoGardens*” in the energy, transportation, housing and other sectors that will become feasible in the 21st century.
 - The OECD and EU countries have already taken the lead in the development of energy efficiency improvements and of sustainable renewable energy sources that have decoupled economic growth from greenhouse gas emissions. This technology initiative could address one root cause that has been instrumental for anthropogenic climate change. Initially it is only the developed countries that can afford this technology development but they must develop, transfer and share these promising technologies with those countries that are the primary victims of GEC.

- The hyperarid deserts, the arid, semiarid and subhumid drylands have a huge so far unused technical potential for sustainable energy development (especially for solar thermal and future photovoltaic concentrator technologies). Developing affordable solar village and solar home systems can help to curb urbanization pressures and bring electricity and jobs to the regions that presently lack both.
- While the costs for technology development and for the build-up of emerging economies of scale will be paid by the North, many longer-term benefits will also occur in the desertified drylands of the South.
- At the *regional level* of the affected countries in the Maghreb and Masreq, the Sahel, the deserts of the Kalahari, in South West and Central Asia, in Central and South America and in the degraded parts in the Caribbean the development of a region-specific and culturally acceptable *Adaptation Mosaic* is needed. In this regard an international Research Centre in Almeria could become a global leaders for designing policy relevant pro-active strategies for coping with both desertification and migration.
- At the *national level in Spain, and particularly for Andalucía* the establishment of a *TechnoGarden* for renewable energy system development and training as well as for production of solar facilities could attract investment from Spain and abroad to create industries that do not imply exporting 'virtual water' from an area that is short of water. This could also weaken the market driven desertification process and create other more promising employment options. With the revision of its energy laws Spain is presently improving the legal framework for the commercialisation of these new sustainable renewable energy sector. This could be complemented at the EU level by:
 - a. a *political framework for co-operation on renewable energy sources between the EU and North African countries in the framework of the Barcelona process* for a sustainable development strategy for the environmentally sensitive North African region.
 - b. In the North, for such a renewable energy strategy Andalucía, Murcia and Valencia are among the most attractive sites in Spain and in the European Union with the highest technical and economic solar potential.
 - c. Once a market for solar energy and wind power has been created in the South it may become advantageous for Northern companies to produce major components there and to set up local maintenance units. The creation of new jobs in the South may become an inducement not to emigrate but to use new job opportunities at home in a familiar cultural, societal and religious setting. These new jobs will be instrumental for a new environmentally conscious agricultural policy. Cheap renewable energy will offer a major new energy source for the desalination of water for human beings, for agriculture and for hydrolysis, especially in Morocco and Tunisia.
 - d. An effective policy to counter pollution and to transform the growing agricultural and urban waste into energy will enhance the attractiveness of the people in the South to stay and for tourists from the North to come to the Southern shores for their holidays.

With the development and implementation of such a co-operative multi-focused renewable energy strategy for the five North African countries – the MEA's suggested proactive TechnoGarden scenario may gradually be implemented. Such a political energy strategy should distinguish among three time frameworks: a) *short term* (up to 2012), b) *medium term* (from 2012 to 2025), and c) *long term* (from 2025 to 2050).

- In the *short term* given the lacking (Morocco) and limited hydrocarbon energy sources (Tunisia), both countries offer good prospects for both off-grid and grid-connected hybrid renewable electricity generation based on wind, biomass and city waste and solar thermal installations with a natural gas backup. Both countries have already started to introduce renewables on a limited scale (e.g. photovoltaic solar home systems) primarily for rural electrification in off-grid villages.

- In the *medium term* Egypt will be required to substitute its decreasing oil and gas reserves with economically competitive renewable energy systems, especially solar thermal and concentrator PV plants in the deserts to reduce gas for electricity generation and to conserve oil for transportation.
- In the *long term* the construction of large scale solar PV and solar thermal plants in the Sahara desert by joint international consortia may become feasible that could supply a significant portion of the needed renewable energy sources in those European countries that do not rely on a longer-term nuclear energy option (Winter 1988; Nitsch 1996; (Brauch 1997).

10.2. Conclusions

Twelve years after Almeria I (1994) we have *not yet* gained systematic empirical knowledge based on new theory-guided empirical research focusing both on the manifold causes of desertification and on its impact on forced migration. Thus, the International Year to Combat Desertification should help create cooperative structures for funding and conducting interdisciplinary research bringing together natural and social scientists and fostering research partnerships between scholars in North and South. Let me give you a few examples:

- No similar international and multidisciplinary Research Centre exists that addresses systematically the linkages between desertification and migration. Andalucía could become a focal point for global research funded by the Spanish government and by the European Union within its 7th Framework Research Program.

With the construction of the first solar thermal energy site in Europe in Andalucía one part of the renewable energy strategy suggested by Brauch (1997) is gradually being implemented.

The joint research between CIEMAT and DLR at the *Plataforma Solar in Almeria* (PSA) has become a leading side for developing solar thermal technology in Europe. Linking a multi-disciplinary Centre for Research on Desertification and Migration with a Research and Training Centre for Solar Energy can help to use the unique technical potential for creating in the medium and long-term renewable energy systems in those regions where the young people lack jobs and a human perspective for a decent live that forces them too often to risk their lives in trying to enter the European fortress.

A trilateral Spanish-Mexican-German initiative for a *Research and Training Centre on Renewables* that shares the technology development could help to develop and realise strategies for sustainable development in the energy sector.

The *UNESCO Decade on Sustainable Development* (2005-2014) offers a framework to address some of the challenges that motivates environmentally-induced distress migrants.

The European Union has often lacked a longer-term Vision and Strategy to apply its means proactively to address the challenges the world, the EU and Spain will face during the 21st century when the impacts of climate change will hit the Mediterranean. Martin Parry, the Chairman of WG II of the IPCC, referred to major challenges for all Mediterranean countries:

- The summers will be hotter and drier in the Mediterranean-
- There will be a 100% probability of hot summers in Spain, France, Italy and Greece
- The food security impacts for the Mediterranean may be severe.

It may thus be wise to rethink the market driven forces that have contributed to desertification in the Northern Mediterranean, by shifting investments from producing water intensive citrus crops and thus exporting 'virtual water' to the North. Instead Spain – and especially Murcia, Andalucía and Valencia may become the European pioneers in developing solar thermal and photovoltaic renewables along with wind energy and biomass from city and agricultural waste. To develop these future technologies jointly with experts from the countries where people flee from desertification may be a small element of a longer-term and complex proactive hu-

man and environmental security strategy for the Mediterranean. Parts of this author's energy proposals of 1997 have been realized by the business community after the Spanish government made such investments attractive by creating predictable and long-term returns.

Research can contribute to anticipatory learning that lead to partnership building measures in the framework of the Barcelona process. We need science partnerships, development partnerships and sharing of the technologies and knowledge that can provide the answers for the countries that are hit most by desertification and whose affected people, and especially the urban young in despair and distress are daily risking their lives in small barges.

Nicholson's "March" that was portrayed in a movie in the 1988 is fully underway and may become a major humanitarian tragedy where Europe can certainly protect itself by becoming a fortress if it should follow the example of a new wall across a continent to prevent migrants from crossing the border. Europe needs a human security and development strategy that was suggested in 2004 by researchers for Javier Solana to whom the former Spanish Defence Minister Narcis Serra contributed (Kaldor 1994). Achieving 'human security' is not a dream of pacifists; rather it may be a more realistic proactive strategy for coping with global change.

Foreword looking strategies are needed to combat desertification and to create jobs, livelihoods and human prospects for the young in those countries where the 'push' and 'pull' factors of migration are working. The resources we invest today in proactive strategies for dealing with the root causes of desertification and migration may reduce the immense costs or reactive military strategy for a fortress Europe by building naval walls on its maritime borders.

It is not only an issue to transfer funds to cope with the present challenge but to develop realistic ideas and joint EU strategies for addressing the root causes of the dual natural desertification and societal migration processes. This must be done by the forward looking political leaders of Mediterranean countries. A forward-looking climate change policy will be one of the goals of the German EU- and G-8 presidency during 2007.

There are many opportunities for bold initiatives. This is a task for European governments and for the close cooperation of governments with the research community and civil society.

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