INTRODUCTION

Arab Environment: Climate Change

2009 Report of the Arab Forum for Environment and Development (AFED)

Impact of Climate Change on Arab Countries

Main Findings and Conclusions

MOSTAFA K. TOLBA AND NAJIB W. SAAB

Ours is a habitable planet because of a combination of conditions congenial to life. Earth's climate is conducive to life because atmospheric greenhouse gas concentrations, most notably CO2, trap a portion of the sunlight reflected off its surface, thereby warming the planet. Since the Industrial Revolution human activities – in particular, fossil fuel usage, land use patterns, agriculture and deforestation – have increased greenhouse gas concentrations in the atmosphere, causing average temperatures to rise. That the climate is actually changing is now a globally accepted fact; even the few opponents who still deny that it is man-made agree that it is happening, but as a manifestation of a natural cycle.

By 2007, the Intergovernmental Panel on Climate Change (IPCC), the United Nations' scientific body on the issue, stated with high certainty that human causes lay behind most of the observed global temperature increases. Atmospheric CO2 concentrations have increased from approximately 280 ppm (parts per million) in the pre-industrial age to around 430 today. At the level of 550 ppm, which could be reached as early as 2035, global average temperatures may rise by more than 2°C. Under a business-as-usual (BAU) scenario, the stock of greenhouse gases could more than triple by the end of the century, giving at least a 50% risk of temperatures rising by more than 5°C during the decades to follow. The scale of such an increase could be illustrated by the fact that the climate is presently 5°C warmer than in the last ice age, which was over 10,000 years ago.

The amount of carbon held in the oceans has increased, causing gradual but steady acidification that threatens marine ecosystems. Warmer water temperatures have also caused much coral bleaching. Increasing average temperatures have steadily caused melting of ice in the polar regions as well as of glaciers around the world. Warming ocean waters may cause the sea level to rise by up to 59 cm by 2100 according to IPCC 2007 estimates, or even up to 5 metres if the melting of the Antarctic ice sheet is taken into consideration.

The IPCC predicts that 20 to 30% of species will be made extinct if the temperature increases by more than 1°C, which is already virtually unavoidable. Extreme weather events and variability will also likely to ensue.

A number of recent studies suggest that the estimates of the 2007 IPCC Fourth Assessment Report were too conservative, and that projections will have to be altered to reflect stronger impacts. For example, developing world emissions have been growing much more quickly than previously thought, and they are now projected to surpass those from the developed world by 2010; this crossing point had previously been projected for 2020 or even later. The IEA's Reference Forecasts of Chinese CO2 emissions, for instance, have been drastically revised upwards between 2000 and 2007. In September 2009 evidence was found by US scientists that the thickness of the Antarctic ice sheet has declined by 53% since the 1980 peak, creating the potential for worse than projected sea level rise.

Christopher Field, an American member of the IPCC and founding director of the Carnegie Institution's Department of Global Ecology at Stanford University, said at the annual meeting of the American Association for the Advancement of Science in February 2009 that the pace of climate change exceeds predictions, as emissions since 2000 have outpaced the estimates used in the IPCC's 2007 report. Lord Nicholas Stern likewise said in 2008 that in his 2006 Review of the economic impacts of climate change for the British government, which advocated strong and immediate climate change action, "we underestimated the risks... we underestimated the damage associated with temperature increases... and we underestimated the probabilities of temperature increases."

The climate change challenge is one that is global both in its causes and in its solutions. It is ubiquitous in that almost all human activities contribute to the problem, and will also be affected by its impacts.

Greenhouse gas emissions are a classical example of what economists call 'an externality': the costs are felt by everyone around the world, not just by the individuals or countries responsible for the emissions. The damage associated with climate change is not distributed proportionately according to emissions, as the burden is shared by those who contribute least to it. As an extra complication, the most serious damages will be not to present generations but to future ones, which do not have a strong voice at the negotiating table.

Finally, there is the temporal aspect of the problem. The costs of mitigation and adaptation to climate change will be incurred immediately while the benefits will be in the form of avoided future damages, which are difficult to quantify. In other words, politicians are finding it difficult to justify immediate costs in order to yield future benefits.

But the economic consequences of inaction are immense: it is estimated that for every 1°C rise in average global temperature, economic growth would drop by between 2-3%. The World Economic and Social Survey released by the UN in 2009 estimates the costs of mitigation and adaptation at 1% of World Gross Product (WGP), which is small compared to the costs and risks of the impacts of climate change. If action is not taken, or is delayed "by continuing in the present business-as-usual scenario, or making only marginal change, the permanent loss of projected WGP could be as high as 20%." These figures would dwarf the losses of the economic meltdown of 2008-9. The dilemma is that the impacts of climate change will be most acutely felt in developing countries, which posses the least capacity to cope and adapt, both technologically and financially. This makes technology transfer and appropriate financial packages crucial for any global agreement or effective action to deal with climate change.

It is no longer a question of whether or not climate change is happening. The question now is how climate change will manifest itself regionally and locally and what can be done about it. For governments, the key issue is balancing short-term economic growth with long-term sustainable development. A complicating factor is the scientific uncertainty surrounding climate change: the exact impacts of climate change and their locations cannot be predicted with perfect accuracy, nor can so-called "tipping points" – points beyond which climate changes are irreversible – be fully and accurately predicted.

However, this AFED Report argues that the climate change challenge should be treated like any other decision made in the face of uncertainty: a risk-management, or insurance, framework. Utilizing the insurance principle, as long as there is sufficient likelihood of significant damage, we take measured anticipatory action, the costs of which are fully justified. What is required is an honest evaluation of the level of insurance deemed necessary to protect – with an acceptable amount of certainty – against the impacts of climate change. Uncertainty is not and should not be an excuse for inaction.

As stated previously, effectively battling climate change will require concerted global action. The division of responsibilities – "common but differentiated responsibilities," according to the UNFCCC – runs into issues of equity. How should the different responsibilities be fairly distributed? Without adequately answering this question, any climate change agreement will be neither acceptable nor sustainable. At the same time, any acceptable and sustainable climate change agreement will also have to be effective. It will need to be acceptable to all, respected by all, sufficiently ambitious, and flexible enough to adjust to changing scientific and technological information.

While this report endorses the view that developed countries will need to take the lead in global climate change action, developing countries will also need to play their part. Moreover, while all countries have a legitimate right to economic development, this need not necessarily conflict with strategies to reduce emissions. With the help of developed countries, developing countries should be able to reduce their carbon intensity to set them on a path to sustainable development. This should be achieved through effective mechanisms of technological and financial transfers and investment, in a legally binding treaty.

Looking ahead to the negotiations in Copenhagen, it is clear that developing countries are hesitant to commit to any obligations that place significant restrictions on their economic growth. They point to their priority responsibilities to provide employment opportunities and better standards of living for their populations.

At the same time, developed countries, in particular the United States, will not accept a climate change agreement in which the major emitters among the developing countries are allowed to continue with "business as usual" development. There must be give and take between the two groups, developed and developing.

Since the successful meeting of the Conference of the Parties in Bali in December 2007, little progress has been made in the negotiations for a post-2012 agreement on climate change. The Bali Action Plan/Road Map calls for a long-term goal for global emissions reduction and mitigation actions by developed and developing countries. Besides mitigation, it also includes adaptation, reforestation, tech-

nology cooperation, and finance. With Copenhagen fast approaching, the negotiations have stalled and there is little or no agreement on any of these.

Disagreement is not only between developed and developing countries, it is also among developed countries. The G-8 Summits in 2008 and 2009 agreed to reduce global greenhouse gas emissions by 50% by 2050 and to limit the rise in worldwide temperatures to no more than 2 degrees Celsius. Developing countries do not want to support a global target in fear that they will be asked to accept intermediate targets leading to the 2050 one. In addition, there is disagreement among developed countries on near-term sharing of the burden of emissions reduction. The EU can commit to 20% reduction by 2020 from 1990 levels and can go to 30% if others make the same commitment. Similarly, Japan would reduce their emissions by 25% by 2020 from 1990 levels. On the other hand, US legislation, if it becomes law, would result in a 17% reduction by 2020 from 2005 levels.

Many had hoped that world leaders gathered in New York, on September 22, 2009, for a global summit on climate change might move things forward as they did in 2007 before Bali. Those hopes were dashed. In speech after speech, presidents and prime-ministers spoke of the importance and urgency of confronting climate change but stopped short of providing specifics of what they were prepared to do in Copenhagen and beyond.

While some believe that a strong deal is still possible, others have begun to talk of a "political declaration" rather than a full agreement. Such declaration would recognize actions being taken and/or planned by countries in their own best interest (for example, energy efficiency and renewable energy) and continue negotiations.

The Arab region's minimal contribution to climate change through its limited greenhouse gas emissions, at less than 5% of the global figure, is dwarfed by the region's immense vulnerabilities to climate change. Arab countries have a vested interest in pushing forcefully for a strong treaty that incorporates a diversity of strict climate change mitigation and adaptation measures and, more importantly, to ensure financial and technical assistance to those who need it for achieving its targets.

Arab governments, as an indication of their willingness to participate in the global efforts to mitigate climate change, can stress the development of clean energy technologies, particularly in light of the abundant renewable energy resources available in the Arab world, specifically solar, wind and hydro. Finally, with an eye on the Copenhagen negotiations in December 2009, Arab countries would do well to formulate a unified position on the key issues at stake.

CLIMATE CHANGE MITIGATION EFFORTS

Arab countries, though not primary contributors to atmospheric greenhouse gas emissions, will have to undertake mitigation efforts as part of global action. A review of Arab national communications reports to the UNFCCC and current projects and initiatives shows that Arab countries are in fact implementing various climate friendly policies and measures, encompassing both measures to reduce anthropogenic GHG emissions as well as those to enhance carbon sinks.

Specific examples in the Arab world are the commercialization of wind energy in Egypt; widespread use of solar heating in Palestine, Tunisia, and Morocco; the introduction of compressed natural gas (CNG) as a transport fuel in Egypt; the first concentrated solar power projects in Egypt, Tunisia, Morocco, and Algeria; the first two Arab green building councils in The UAE and Egypt; the massive forestation program in the UAE; Masdar, the first zero-carbon city in Abu Dhabi; the pioneering carbon capture and storage project in Algeria; and Jordan's introduction of duty and tax exemptions to encourage the import of hybrid cars. However, most of these initiatives are fragmented and do not appear to have been implemented as part of a comprehensive policy framework at the national level, let alone at the regional one.

In a particularly promising development, the newly established International Renewable Energy Agency (IRENA) has chosen Masdar City in Abu Dhabi as the agency's first headquarters. This is not only very important for the developing world as a whole but will hopefully also lead to significant research and investments into renewable energy in the Arab region.

Arab-Arab cooperation can also be improved, for example in the areas of energy efficiency and renewable energy, the use of compressed natural gas as a transport fuel, and investing in carbon capture and storage. Given the importance of the fossil fuel industry in the Arab region, Arab countries have a vested interest in helping develop carbon capture and storage technology to help offset emissions due to fossil fuels usage. Ultimately, if this technology can be made sufficiently viable, it will be an important part of global climate change mitigation strategies. As fossil fuels will remain an important part of the energy mix in any future scenario, carbon capture and storage is an important area into which Arab scientists have to get involved and resources need to be devoted.

PUBLIC PERCEPTION OF CLIMATE CHANGE

AFED conducted a pan-Arab survey in order to explore awareness of climate change among the Arab public, their perceptions of the need to take action, and their willingness to personally contribute to climate change mitigation and adaptation measures.

The results of the survey showed increasing awareness: 98% believed that the climate is changing, and 89% believed this was due to human activities. 51% believed that governments were not acting adequately to address the problem, while 84% believed climate change posed a serious challenge to their countries. Over 94% believed that their countries would benefit from participating in global action to deal with climate change, and 93% pledged to participate in personal action to reduce their contribution to the problem.

Asked to choose sectors where climate change will have a major impact in their countries, it was notable that not a single respondent said there would be no effect at all. The majority, at the regional level, gave priority to health, drinking water and food, followed by coastal areas. Those surveyed were also asked to choose the three most important measures to mitigate the causes and to adapt to the effects of climate change. Changing consumption patterns, mainly reducing the use of energy, was the main measure chosen, followed by education and awareness. Ratifying and implementing international treaties came third.

The respondents to the AFED survey revealed a clear desire for their governments to participate and cooperate proactively in order to reach a solution to the problem of climate change; the Arab public seems ready to accept and be part of concrete national and regional action to deal with climate change. The sceptical attitudes which prevailed among some groups on the facts and causes of climate change, either denying it entirely or limiting it to natural causes, are receding. Government inaction is no longer an option.

CLIMATE CHANGE IN THE ARAB WORLD: VULNERABILITIES AND IMPACT

COASTAL AREAS

The Arab region's coastal zones are of immense importance. The total length of the coastal zone in the Arab region is 34,000 km, of which 18,000km is inhabited. Most of the region's major cities and economic activity is in the coastal zones. Vastly fertile agricultural lands are located in low-lying, coastal areas such as the Nile Delta, and popular tourist activities depend on marine and coastal assets, like coral reefs and associated fauna.

Individual Arab countries will be affected differently under various climate change related sea level rise projections. Qatar, the UAE, Kuwait, and Tunisia are most vulnerable in terms of their land mass: 1 to 3 % of land in these countries will be affected by a 1 metre SLR. Of these, Qatar is by far the most exposed: under various different SLR projections the figure rises from approximately 3% of land (1m) to 8% (3m), and even up to more than 13% (5m).

As for SLR's effect on GDP, Egypt's economy is by far the most vulnerable: for SLR of 1 metre, more than 6% of its GDP is at risk, which rises to more than 12% for an SLR of 3 metres. Qatar, Tunisia, and the UAE are also exposed, as over 2% of their respective GDPs are at risk for an SLR of 1 metre, rising to between 3 and 5% for SLR of 3 metres.

When it comes to the agricultural sector, Egypt will be most impacted by SLR. More than 12% of Egypt's best agricultural lands in the Nile Delta are at risk from SLR of 1 metre, and this figure rises dramatically to 25% (SLR of 3m) and even almost 35% (extreme SLR of 5m).

HUMAN HEALTH

Increasingly, scientists are beginning to recognize climate change as an emerging risk factor for human health. A number of projected climate change impacts will have negative implications for human health. The health effects can be direct, such as extreme weather events like storms, floods, and heat waves, or indirect, such as changes in the ranges of disease vectors (e.g., mosquitoes), water-borne pathogens, water quality, air quality, and food availability and quality. Furthermore, the actual health impacts will be different for different Arab countries, according to local environmental conditions, socio-economic circumstances, and the range of adopted social, institutional, technological, and behavioural measures.

The limited research conducted in Arab countries has shown that climate change

plays an important role in the spread of vector-borne infectious diseases, such as malaria and schistosomiasis (Egypt, Morocco and Sudan). It also affects the seasonal concentrations of some allergens in the atmosphere, causing allergic reactions and pulmonary diseases (Lebanon, Saudi Arabia and UAE), and worsens the public health impact of heat waves especially in Arab countries with hot summer climates.

Heat waves are projected to become more intense, frequent, and prolonged due to climate change. A number of studies in the region have looked at heat-related mortality rates, and have consistently found a significant association between temperature and mortality.

The link between infectious diseases – which globally kill between 14 and 17 million people each year – and climatic conditions has been studied extensively. Malaria, for instance, which infects about 3 million people in the Arab region each year, may become more prevalent as higher temperatures reduce the disease's incubation period, spread the range of malaria-bearing mosquitoes, and increase mosquito abundance.

Indirectly, a number of climate change impacts discussed in various sections of this report may also have health ramifications. For instance, sea level rise and coastal flooding may impact food security and lead to malnutrition and hunger, and reduced precipitation and increased temperatures may aggravate water scarcity, increasing its negative impact on human health.

Health systems in the Arab world need to be adapted and prepared to respond to the consequences of climate change.

FRESH WATER

Water is scarce across the region, with available water resources below 1,000 m3 per capita per year in all Arab countries except Iraq, Lebanon, and Syria. Although the Arab region occupies 10% of the planet, it contains less than 1% of the world's freshwater resources. The predicted impacts of climate change in the Arab region, namely increased temperatures as well as reduced and more erratic precipitation, will exacerbate an already critical state of vulnerability, and place even more stress on the limited fresh water resources. Both the quantity and quality of fresh water resources are in danger. High population growth rates in the region, and the high rate of per capita consumption of fresh water, make the problem chronic and aggravate its impact, with around 80% of fresh water resources devoted to agriculture.

Climate change is expected to affect the flow of rivers, which could cause water shortages (in case of decreased rainfall) or flooding (in case of periodic increased rainfall). Water regimes in riparian countries will also affect Arab countries dependent on rivers originating elsewhere, such as Iraq, Syria, Egypt and Sudan.

Recommended adaptation measures include changing cropping patterns, adopting water saving techniques, introducing integrated water resource management, developing new varieties of crops that are more resilient to higher temperatures and soil salinity, and initiating innovative desalination technologies. Finally, Arab countries have to reconsider allocating water for different development

activities based on water use efficiency represented by production per cubic meter of water, rather than production per unit area of land, i.e., optimizing water use, especially in agriculture, which gives maximum economic return per unit volume of water.

FOOD PRODUCTION

Food security in the Arab world has long been subject to environmental and socio-economic pressures. The dominant arid conditions, limited water resources, erratic cropping patterns, intensive grazing, population growth, and low knowledge and technology levels all affect food production systems in the region.

The dominant agricultural system in Arab countries is rainfed agriculture; as such, annual agricultural productivity and food security are highly correlated to the annual variability of precipitation. Climate change may increase the variability of rainfall and thus increase incidents of drought.

Projected climate changes may have disastrous effects on agricultural production in the Arab world. As a number of studies have shown, increased temperatures cause much higher water needs in summer crops. Water scarcity in the Arab region is projected to increase rather than decrease, and therefore agriculture – and in turn the Arab region's food security – is highly vulnerable to climate change, with the risk of 50% decrease in food production if current practices continue.

What policies can help adapt the Arab world's agricultural sector to climate change? This AFED Report recommends that crop varieties, fertilizer, irrigation and other water management practices should be altered, as necessary, in light of climate change vulnerabilities. Also, information on climate variability and seasonal climate forecasting need to be improved in order to reduce production risk.

TOURISM

Tourism is important for a number of Arab economies. However, like most sectors of economic activity, it is vulnerable to the impacts of climate change.

The attractiveness of a tourism destination depends to a significant degree on the climate, although clearly a number of other factors are also important. Using an index of various climatic factors, the index of tourism comfort measures the degree of climatic comfort at a given site. With climate change, however, the climatic factors change. For example, the arid lands in the Arab region will expand, moving north in North Africa.

The index of tourism comfort will probably decline in the Arab world in the coming decades. The areas currently classified as "good", "very good" and "excellent" will be less favourable by the year 2080, with climate change to blame. Many of the projected climate changes in the Arab region will impact the attractiveness of Arab tourist destinations. Hotter summers, droughts, extreme weather events, water scarcity, and ecosystem degradation are examples.

Coral reefs are important tourist attractions for Egypt and Jordan, but are at the same time extremely vulnerable to climatic changes, brought about by increased temperatures and ocean acidity, both of which contribute to coral bleaching. Beach erosion is also a risk to the attractiveness of coastal areas. Narrow low-lying sandy beaches will be badly affected and these stretches would become unsuitable for sea-goers.

Much will depend on how well the sector can adapt. Future tourism development must take anticipated changes into account through integrated and inclusive planning, such as clearer guidelines on the allowed distance between permanent structures and the shoreline. Options for alternative and more sustainable tourism which is less sensitive to climatic variability, such as cultural tourism, should be explored. Finally, more inland and desert tourist destinations should be developed.

INFRASTRUCTURE

Climate change is expected to significantly affect infrastructure across the Arab world. Transportation infrastructure is generally vulnerable to projected increases in the intensity and frequency of hot days, storm activities, and sea level rise. Infrastructure in the coastal zones is particularly vulnerable to SLR and possible storm surges. These risks are highest in Egypt, Bahrain, and the UAE.

Reliability of water supply systems will be impacted by diminishing fresh water supplies and higher average temperatures. Wastewater networks are particularly vulnerable to excessive rainfall events and SLR. Energy generation will be hampered by higher ambient temperatures which will reduce the efficiency and capacity of gas turbines, and reduce the cooling efficiency of thermal plants. Energy distribution and transmission systems will be more prone to failure as extreme weather events become more frequent.

What should be done? Infrastructure should be enhanced to withstand climate change, design criteria and operations should be upgraded to take it into account, new technologies should be utilized and the public should be brought into the decision-making process.

BIODIVERSITY

Many plant and animal species in the Arab world already face threats to their survival, and their vulnerability will be exacerbated by the projected impacts of climate change. The number of species in the Arab world is already low by global standards, and the general harshness of the arid climate makes the region especially vulnerable to significant species loss. Using the IUCN threat categories, Yemen has by far the highest number of threatened plant species at 159, while Sudan and Somalia have 17 each.

Djibouti, Egypt, Jordan, Morocco, Saudi Arabia, Somalia, Sudan and Yemen all have more than 80 threatened animal species, with Egypt topping the list at 108 species. Climate change could alter the animal composition of entire ecosystems.

Ornithological diversity is a major asset to the Arab world and is very threatened

by climate change. Many Arab countries lie on important bird migration routes. In particular, Djibouti, Mauritania, and Bahrain are home to millions of migratory birds and large breeding colonies.

Unique species that are restricted in their habitat range, and/or are at the margin of their ecological tolerances, are most vulnerable to climate change. In the Arab region, these habitats include the mangroves in Qatar, the cedar forests in Lebanon and Syria, the islands of Djibouti, the marshes of Iraq, the high mountain ranges of Yemen and Oman, and the large rivers of the Nile (Egypt and Sudan), the Euphrates and Tigris (Iraq and Syria), and Yarmuk (Syria and Jordan).

The Arab region as an interlinked geographical entity should develop and implement regional mechanisms for coordinating activities in this field. Species range-shifts and impacts of extreme events often occur on regional scales so an effective climate change strategy must include mechanisms for coordinating conservation actions at the regional level across political boundaries and agency jurisdiction.

CONCLUDING REMARKS

In the Arab region, the vulnerabilities to the potential impacts of climate change are high, current capacities and actions are inadequate, and effective strategies for mitigating and adapting to climate change are urgently required. The fact that the region's contribution to the problem is relatively small does not mean that political and diplomatic complacency is an option. Arab countries are among the most vulnerable to the potential impacts of climate change because of their existing vulnerabilities, notably water scarcity and recurrent drought.

Alarmingly, this report has found that virtually no work is being carried out to make the Arab countries prepared for climate change challenges. Specifically, no concerted data gathering and research efforts could be traced regarding the impacts of climate change on health, infrastructure, biodiversity, tourism, water and food production. The economic impact seems to be totally ignored. Reliable records on climate patterns in the region barely exist. This highlights the need for high quality climate information and research, as regional climate predictions are critical for planning and risk management. Land-use, physical planning and building standards, which take account of climate change, have to be imposed on buildings and long-lived infrastructure. Government policies that promote low-carbon and efficient goods and services, and endorse sustainable management of natural resources and coastal protection, are overdue. The private sector needs to be brought in by offering the right incentives for implementing effective solutions.

This report argues that, in the case of Arab countries, adaptation will provide local benefits in the short term and provide – as by-products - immediate solutions to inherent Arab problems not entirely caused by climate change, such as drought, water scarcity and air pollution.

There are a number of promising initiatives in the Arab region: Abu Dhabi Future Energy Company (Masdar) is building an innovative zero-carbon clean energy hub, and the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia has been established as a centre of excellence on ener-

gy studies; both are perfect manifestations of transforming oil income into future technology. There is also AFED's Arab Green Economy Initiative, an exercise in public-private partnership. It is essential that these initiatives become part of an integrated, large and sustainable development plan.

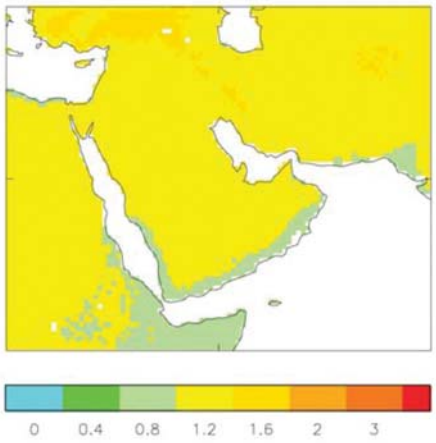
The Council of Arab Ministers Responsible for the Environment (CAMRE) issued a landmark Declaration in 2007, which adopted the scientific consensus that was reached by the IPCC, accepting that the increase of global temperatures was mainly due to human activities. The ministers stated their "determination to strive to achieve" several objectives, including: adopting national and regional action plans dealing with climate change issues in order to assess possible impacts and develop mitigation and adaptation programmes; promoting the production and use of cleaner fuels; making energy use more efficient in all sectors; diversifying energy sources in accordance with the prevailing economic and social conditions; expanding the use of cleaner production techniques and environmentally friendly technologies; and expanding the use of economic incentives to encourage more efficient products. In the context of adaptation, the declaration focused on the need for necessary infrastructure to reduce potential risks, including the efficiency of natural resource management and advanced monitoring, control and early warning systems as well as the establishment of climate research and study centres.

This comprehensive declaration of intentions constitutes the basis for action that should include specific objectives and implementation plans within a fixed timeframe. Delays are no longer an option, especially amid crucial negotiations that will define the international position towards climate change for the post Kyoto era.

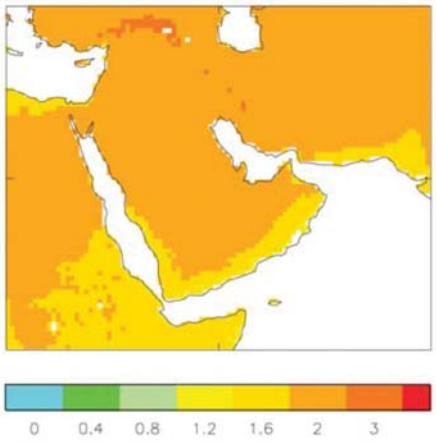
The challenges facing the Arab world from climate change are immense, but the bleak situation can still be averted if the region acts fast. Inaction is no longer an option.

REGIONAL CLIMATE MODEL PROJECTIONS OF AVERAGE TEMPERATURE CHANGES (°C) FOR THE 2020s, 2040s AND 2070s, RELATIVE TO THE 1990s

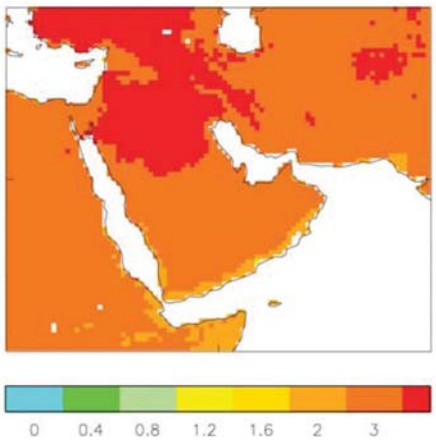
2020s RCM



2040s RCM



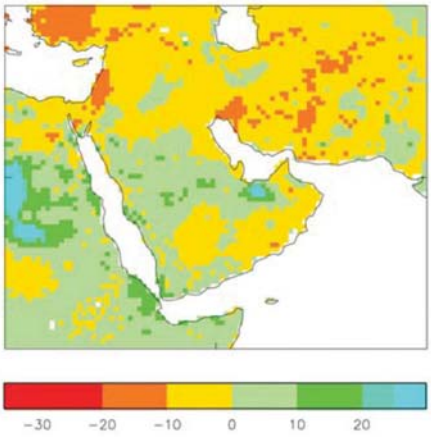
2070s RCM



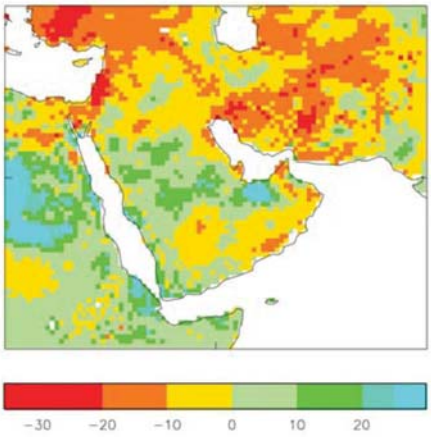
Source: Hemming D, Betts R, & Ryall D. 2007.

REGIONAL CLIMATE MODEL PROJECTIONS OF PRECIPITATION CHANGES (%) FOR 2020s, 2040s, AND 2070s, RELATIVE TO THE 1990s

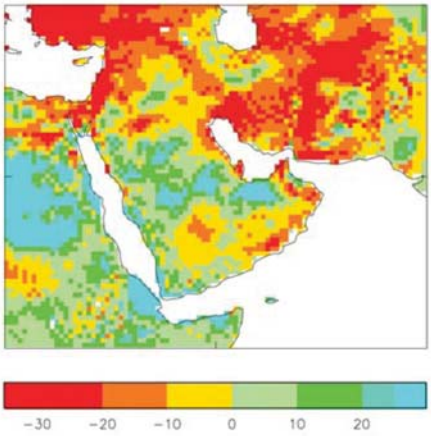
2020s RCM



2040s RCM



2070s RCM



Source: Hemming D, Betts R, & Ryall D. 2007.

STABILISATION LEVELS AND PROBABILITY RANGES FOR TEMPERATURE INCREASES