EuropeAid

ENVIRONMENT & CLIMATE CHANGE

EC Cooperation:

Responding to climate change

Sector Script for Health

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This document was developed by EuropeAid in cooperation with DG RELEX, DG DEV and DG ENV with the support of the "environmental integration advisory services" project. It was designed to provide practical guidance on the links between climate change and a specific sector, together with possible responses to climate-related challenges. The purpose of this "script" is to support political dialogue on climate change implications between the European Commission, partner governments and other national partners involved in EC development and external cooperation activities, as well as to facilitate strengthened climate change integration in ongoing and future cooperation programmes and projects, with a focus on developmental benefits for the partner countries.

This sector script is one of a series prepared in a standard format. Scripts are available for the following topics:

- Introduction and Key Concepts
- Agriculture & Rural Development (incl. forestry, fisheries and food security)
- Ecosystems & Biodiversity Management
- Education
- Energy Supply
- Health
- Infrastructure (incl. transport)
- Solid Waste Management
- Trade & Investment (incl. technological development, employment and private sector development)
- Water Supply & Sanitation

Note that the script is not country or region-specific, and has been prepared to cover a wide range of possible effects and responses. Users are invited to appreciate which elements, among those proposed, are relevant to their specific needs and circumstances.

Note: Health has connections with many other sectors. The text makes references to other related and complementary scripts.

Users of this script are advised to read it in conjunction with the Introduction and Key Concepts information note, which introduces the series and puts things in context.

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These documents can also be downloaded on the EuropeAid/E6 Intranet Pages.

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EXECUTIVE SUMMARY

Climate change impacts on the health sector

Exposure of the health sector to the effects of climate change is considerable and takes multiple forms. Impacts will materialise in the form of:

- effects on human health;
- effects on health infrastructure, equipment and supply systems;
- effects on health systems in general, including human resources.

Climate change may bring about some specific health risks, but most of its effects will probably materialise in the form of exacerbation of existing problems, as a result of interaction with other global, regional and local trends and a weakening of the life-support systems that underpin public health. One of the first ways in which climate change is likely to negatively impact human health is through lower productivity in food production sectors, with negative impacts on food security; the prevalence of malnutrition may increase, contributing to a reduction in people's immune defences and making them more susceptible to disease and less resilient to environmental stresses. Other significant potential impacts are associated with likely changes in the seasonality and range of disease vectors, the increased frequency and severity of extreme weather events, the reduced availability of freshwater, the degradation of water quality and impacts on food safety.

The increased frequency and/or severity of extreme weather events may also result in direct damage to health infrastructure and equipment – and damage to essential public infrastructure (transport, energy, water adduction, sanitation, telecoms) may adversely impact on the operation of health facilities, or make reaching some of these facilities more difficult for patients, medical staff and suppliers. Changes in temperatures, notably the increased occurrence and/or duration of periods of extreme heat or cold, may have adverse consequences on patients and health personnel and on the capacity to safely store drugs.

In some regions, and particularly in low-income countries with very vulnerable populations, climate change combined with other vulnerability factors may end up placing a substantial additional burden on health systems. Increased morbidity may aggravate the inadequacy of the supply of health services with regard to actual needs. Conflict-related and climate-induced migrations may also, over relatively short periods of times, generate a geographical mismatch between the supply of health services and demand for them. Finally, possible increases in morbidity and mortality among health workers while they simultaneously have to deal with a surge in demand for treatment from the population may considerably increase the burden on human resources for health, which in many countries are already badly over-stretched.

Also note that adaptation and mitigation measures adopted in other sectors may have unexpected short-term and long-term effects on health, both positive and negative, which should be put in the balance before they are adopted. On the positive side, mitigation measures aimed at increasing energy efficiency, substituting fossil fuels with cleaner sources of energy and encouraging public transport can be expected to generate significant improvements in air quality. By reducing the burden of disease and the costs incurred by healthcare systems, such "health co-benefits" may actually pay for a substantial fraction of mitigation costs, and should be included in cost-benefit calculations.

Adapting to climate change

Many of the measures that can help the health sector face the challenge of climate

change are in fact beyond the direct control of health authorities. Generally speaking, factors such as food security, water quality, environmental quality, peace and security, education, social cohesion and organisation, the availability of infrastructure and the level of economic development, which directly influence the health of populations and access to medical technology, are key to enhancing people's capacity to withstand the effects of climate change, in terms of health and otherwise. There are however a number of adaptation measures that can be promoted and/or directly implemented by public health authorities. Most of them are in fact not really "climate-specific", but involve the adoption or scaling-up of sound public health management practices and the maintenance of public health infrastructure, for the purpose of enhancing overall health system resilience to climate-induced (and other) shocks. The script identifies a range of possible adaptation measures targeted at climate change impacts on human health, on health infrastructure, equipment and supply systems, and on health systems in general.

Any steps taken in the health sector to effectively improve capacity to adapt to climate change will, in turn, contribute to reducing vulnerability and enhancing society's overall resilience. If decent standards of healthcare can be maintained, and if health systems can be made sufficiently responsive to climate-induced threats, populations will be in a better position to respond to the full range of challenges posed by climate – both in terms of adaptation and mitigation. Adaptation within the health sector, with its strong implications in terms of preservation of "human capital", should have positive effects beyond the health sector itself.

Contributing to climate change mitigation

The health sector is definitely not a big contributor to greenhouse gas (GHG) emissions; accordingly, the sector's potential for contributing to climate change mitigation is rather limited. Some mitigation options nevertheless exist, and may be congruent with adaptation options while allowing a reduction in recurrent costs or an improvement in the quality of health services.

Reducing GHG emissions in the health sector may be achieved by:

- improving the energy efficiency of health facilities;
- replacing old, inefficient refrigeration equipment with more efficient equipment based on "climate-friendlier" refrigeration fluids;
- gradually opting for local power supply based on renewable energies to cover part of the energy needs of health facilities (which also ensures a minimum level of power availability during power cuts);
- gradually replacing vehicles used by health services with fuel-efficient models.

There are at least two more indirect ways in which the health sector can contribute to the mitigation of GHG emissions. First, it can do so by providing accessible and acceptable family planning services. There is indeed considerable unmet demand for such services in the developing world; in addition to having positive effects in terms of adaptation, improving their supply and accessibility may contribute to reducing the population growth rate and therefore the trend to ever-increasing emissions. Second, health professionals can advocate and support the adoption of mitigation measures in other sectors that generate significant co-benefits in terms of public health, such as the replacement of coal and fuel burning with cleaner sources of energy for electricity production, the adoption and enforcement of fuel efficiency and emission standards for vehicles, or the more widespread use of highly efficient cooking stoves for domestic purposes.

u How Climate Change might affect the health sector

Climate change may affect the health sector through a range of biophysical and socio-economic impacts. The table below shows the main links between such impacts and the sector.

Exposure of the health sector to the effects of climate change is considerable and takes multiple forms. The IPCC Working Group II report states that "climate change currently contributes to the global burden of disease and premature deaths" (IPCC 2007:393). Climate change may bring about some specific health risks, but most of its effects will probably materialise in the form of exacerbation of existing problems, as a result of interaction with other global, regional and local trends (e.g. water, soil and air pollution, water scarcity, malnutrition and food insecurity, urbanisation, housing quality, changes in land use, existing health hazards, disaster risks, migrations and conflicts) – and a weakening of the life-support systems that underpin public health. In some regions, and particularly in low-income countries with very vulnerable populations, climate change combined with other vulnerability factors may end up placing a substantial additional burden on health systems.

	Health
Biophysical effects	
Changes in temperature and rainfall patterns	•
Shifts in seasons	•
Increase in extreme weather events / natural disasters	•
Desertification, soil erosion	•
Reduction in the availability of freshwater	•
Reduction in the quality of water	•
Loss of habitats, changes in ecosystems and related services	•
Increase in disease and pest outbreaks	•
Changes in atmospheric pollution patterns	•
Socio-economic impacts	
Damage to infrastructure	•
Reduced availability of energy (hydropower)	•
Economic and social disruption, loss of livelihoods	•
Increased malnutrition	•
Increased mortality and morbidity	•
Increased probability and intensity of conflicts	•
Population displacement and human migrations	•

There are however large uncertainties when it comes to predicting the health impacts of climate change. Indeed, the health vulnerability of populations critically depends

on factors such as wealth, pre-existing health and nutritional status, healthcare availability, access to water and sanitation, housing conditions, education level, etc. Where feasible, health-risk scenarios including these aspects should be developed and updated to reflect progress in the understanding of linkages between climate, socio-economic conditions, disease origin and transmission patterns, and human health. However, detailed disaggregation of specific climate change effects is very demanding and may often not be required. A broad understanding enabling reinforcement of elements of existing sector strategies may be sufficient in the majority of cases. 1.1. Effects on human health

One of the first ways in which climate change is likely to negatively impact human health is through lower productivity in food production sectors (agriculture, livestock breeding, fisheries and aquaculture). This lower productivity is an expected consequence of climate change in many regions of the world (see script on Agriculture and Rural Development). It is likely to have negative impacts on food security, especially where several "shocks" on food production systems are combined. As a result, the prevalence of malnutrition may increase – contributing to a reduction in people's immune defences and making them more susceptible to disease and less resilient to environmental stresses. More generally, the loss of livelihoods (in the primary sector as well as in other economic sectors) may aggravate malnutrition and vulnerability to the multiple impacts of climate change.

Changing and more erratic weather patterns, and notably higher temperatures, may also have direct negative impacts on the health of populations, in particular the most fragile groups. For instance, increased heatwave-related mortality and increased incidence of dehydration may be expected among older people, young children, the chronically ill and socially isolated people; workers (and others) may be exposed to a higher risk of heatstroke. The more frequent occurrence of heavy precipitation events may result in increased risk of infectious, respiratory, skin and eye diseases. In the Northern hemisphere's high and mid-latitudes, shifts in seasons may lead to an earlier onset of the spring pollen season and increased production of plant allergens. On the other hand, milder temperatures in traditionally cold areas may have some positive effects (e.g. decrease in winter infections and other cold-related ailments, reduced mortality from cold exposure).

The incidence of malaria, dengue fever, chikungunya and other vector-borne infectious diseases (e.g. Lyme's disease, tick-borne encephalitis, leishmaniasis) is likely to increase in some regions as the seasonality and the range of disease vectors (altitude, latitude, type of ecosystem) change with temperature and rainfall patterns, modified water flows, etc. (e.g. the altitude at which malaria is no longer considered a risk keeps getting higher as average temperatures increase in mountainous regions). A shift in the geographical distribution of non-insect disease vectors or reservoirs (e.g. rodents, aquatic snails, bats, migratory birds) may also lead to changes in exposure to the pathogens they carry (e.g. higher transmission rates of West Nile virus have been observed along bird migratory paths, which are gradually changing with climatic patterns). Shifts in seasons may cause a mistiming between bird breeding and the breeding of disease-carrying insects, resulting in unusual insect proliferation. In any given area, transmission seasons may become longer and catch some people off guard. Of course, alterations in the geographical distribution of infectious diseases and their vectors may also mean some areas previously affected become less exposed – but overall, it is expected that negative impacts will outweigh positive ones. This is, in any case, an evolving field of knowledge in which new research results may continuously come in.

The increased frequency and/or severity of extreme weather events (including floods, storms, storm surges, landslides, droughts…) and wildfires may leave growing numbers of people killed, injured, disabled, homeless and/or more or less temporarily without access to food and safe water. Through the contamination of water supplies with faecal matter, heavy metals and dangerous chemicals, floods and storms are likely to promote the development of water- and food-borne infectious diseases (e.g. dysentery, cholera, typhoid fever) as well as cases of toxic contamination. Droughts weaken populations by exacerbating malnutrition and reducing access to safe water; they interact in various, sometimes complex ways with the spread of infectious and parasitic diseases; by increasing the frequency and severity of dust storms, they can aggravate the incidence of respiratory and cardiovascular ailments. Generally speaking, weather-related disasters also raise the number of people suffering from post-traumatic stress disorders (e.g. anxiety, depression) – and their recurrence weakens a population's adaptive capacity.

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Independently from extreme events, the reduced availability of freshwater and/or the degradation of water quality (which can result, following different pathways, from both excessive and insufficient rainfall as well as increases in water temperature) may expose more people to water- and food-borne infectious diseases (e.g. parasitic and diarrhoeal diseases resulting from the proliferation of bacteria, parasites and the vectors of parasitic diseases in drinking and bathing water) as well as other pathologies linked to poor water quality (e.g. pathologies due to increased exposure to nitrates or heavy metals as their concentration in water increases).

More generally, climate change could affect health via negative impacts on food safety. In addition to risks originating from the use of unsafe water for market gardening and food preparation, food safety could be affected by increased transmission and changes in the range of food-borne disease agents; increased risks of contamination of the food chain by diseases of animal origin, by fungi and mycotoxins, by environmental contaminants and chemical residues (e.g. as a result of extreme weather events, increased methylation and subsequent uptake of mercury by fish, increased use of phytosanitary products); increased incidence of harmful algal blooms (which may lead to the contamination of seafood by dangerous toxins); and increased risks of food contamination associated with emergency situations. Cases of food poisoning of microbial origin are likely to increase with average temperatures, especially where access to refrigeration is limited.

Increased atmospheric pollution (due to the alteration of air pollutant distribution patterns) may lead to a surge in respiratory and cardio-respiratory diseases (e.g. higher ground-level ozone concentrations in urban areas have been shown to increase hospital admissions for pneumonia, chronic obstructive pulmonary disease, asthma, allergic rhinitis, etc.), which are likely to affect in particular fragile groups such as children, the elderly, the chronically ill and people suffering from immune system disorders.

Global warming could also alter the pattern of exposure of people to ultraviolet radiation (e.g. at high latitudes, precisely where the thinning of the ozone layer is most problematic, increased temperatures may lead people to increase the frequency and/or duration of their exposure; at low latitudes on the contrary, people may reduce their exposure; at all latitudes, the level of exposure varies with the cloud cover). Some hazards (e.g. increased risk of melanoma, sunburn and cataract) are associated with increased exposure, especially in conditions of depletion of the stratospheric ozone layer (which filters UV rays[1]) – but exposure to solar radiation also entails significant benefits by enabling the synthesis of vitamin D, which is essential for mineral fixation in bones. Depending on circumstances and locations, risks as well as potential benefits are thus associated with changes in the level of exposure to solar radiation.

If conflicts increase, possible consequences are an increase in the number of injured people, as well as the temporary or more lasting displacement of populations, with all the sanitary risks this entails. Climate-induced migrations may also have adverse consequences in terms of human health, for instance if many migrants from rural areas resettle in overcrowded urban slums with limited sanitation and other basic facilities. The poor settlement conditions associated with population displacements are known to promote the development of communicable diseases.

Changes in the distribution patterns or rarefaction of traditional medicinal plants due to climate change may have important consequences for the health of rural populations, especially in areas with no or low access to health centres, hospitals and synthetic drugs.

Generally speaking, populations with lower adaptive capacity (because they are poor, malnourished, in poor health, uneducated, deprived of access to essential infrastructure and services) are the ones likely to suffer most from the adverse effects of climate change on health, and be least able to cope.

Finally, note that <u>adaptation and mitigation measures adopted in other sectors may have unexpected short-term and long-term effects on health</u>, which should be put in the balance before they are adopted. For instance:

- the development of micro-dams for irrigated agriculture, in response to a decrease in rainfall and for the purpose of improving food security, may lead to many-fold increases in local malaria mortality and morbidity if not accompanied by mosquito-control measures;

[1] Note that although there are some interactions between the two phenomena, global warming is to a large extent independent from ozone layer depletion.

- the development of large dams for hydroelectricity production has been associated with an increase in the prevalence of schistosomiasis and other diseases in some regions;
- the re-use of untreated sewage and wastewater for irrigating crops and gardens, in response to increasing water scarcity, may lead to contamination of workers and food by pathogenic organisms and chemicals;

and on the positive side:

- measures aimed at encouraging energy efficiency and substituting fossil fuels (in particular coal and oil) and domestic biomass fuels with cleaner sources of energy are likely to prevent premature deaths and significantly reduce the burden of disease through a reduction in outdoor and indoor air pollution;
- a shift from private to public means of transport, combined with stricter speed limits, could reduce road casualties as well as ambient levels of noise and air pollution, with positive impacts on health;

Some reckon the "health co-benefits" of some mitigation measures, by reducing the burden of disease and the costs incurred by healthcare systems, may actually pay for a substantial fraction of mitigation costs, and should be included in cost-benefit calculations. Although the overall net effects of climate change on human health are expected to be negative, especially in poorer countries, appropriate responses to this challenge may thus entail some health benefits – benefits that can be reaped at the local level.[2]

1.2. Effects on healthcare infrastructure, equipment & supply systems

The increased frequency and/or severity of extreme weather events may result in direct damage to health infrastructure and equipment (including manufacturing and storage facilities for drugs, vaccines and medical supplies). Furthermore, damage to essential public infrastructure (transport, energy, water adduction, sanitation, telecoms) may adversely impact on the operation of health facilities (e.g. power cuts, unavailability of clean water, disruptions in the distribution of drugs and medical supplies), or make reaching some of these facilities more difficult for patients, medical staff and suppliers.

Changes in temperatures, notably the increased occurrence and/or duration of periods of extreme heat or cold, may have adverse consequences on patients and health personnel (via too high or too low ambient temperatures in health facility buildings) and on the capacity to safely store drugs – and thus require adjustments in the equipment of health facilities.

1.3. Effects on health systems in general, incl. human resources

Increased morbidity in some regions, in particular remote ones (which tend to have less coverage in terms of medical facilities, drugs and services availability), may aggravate the inadequacy of the supply of health services with regard to actual needs. The emergence of new pathogens that are resistant to known treatments may temporarily overwhelm health service provision. Conflict-related and climate-induced migrations may also, over relatively short periods of times, generate a geographical mismatch between the supply of health services and demand for them.

Finally, it should be noted that the adverse effects of climate change on human health, where they materialise, will affect medical staff as well as the general population. Increases in morbidity and mortality among health workers, while they simultaneously have to deal with a surge in demand for treatment from the population, may considerably increase the burden on human resources for health, which in many countries are already badly over-stretched. In an extreme situation, this could lead to the collapse of health systems in some regions or even entire countries.

[2] It is usually considered that climate change mitigation measures produce benefits only at the global level – which is a disincentive to adopting them.

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V ADAPTING CLIMATE CHANGE IN THE HEALTH SECTOR

Many of the measures that can help the health sector face the challenge of climate change are in fact beyond the direct control of health authorities. Generally speaking, factors such as food security, water quality, environmental quality, peace and security, education, social cohesion and organisation, the availability of infrastructure and the level of economic development, which directly influence the health of populations and access to medical technology, are key to enhancing people's capacity to withstand the effects of climate change, in terms of health and otherwise. Urban planning, architectural requirements, energy and transport policies – and how they are adapted in response to climate change – have major implications for the burden that will fall on the health sector. There are however a number of adaptation measures that can be promoted and/or directly implemented by public health authorities. Most of them are in fact not really "climate-specific", but involve the adoption or scaling-up of sound public health management practices and the maintenance of public health infrastructure, for the purpose of enhancing overall health system resilience to climate-induced (and other) shocks.

Any steps taken in the health sector to effectively improve capacity to adapt to climate change will, in turn, contribute to reducing vulnerability and enhancing society's overall resilience. If decent standards of healthcare can be maintained, and if health systems can be made sufficiently responsive to climate-induced threats, populations will be in a better position to respond to the full range of challenges posed by climate – both in terms of adaptation and mitigation. For instance, populations with access to adequate health services are more likely to maintain a good level of productivity; and children with access to proper care, including if needed measures aimed at fighting the effects of malnutrition, are more likely to retain the cognitive abilities required to learn and get educated. Adaptation within the health sector, with its strong implications in terms of preservation of "human capital", should thus have positive effects beyond the health sector itself.

Finally, note that:

- some adaptation measures of the health sector (e.g. increased use of refrigeration equipment, air conditioning and heating) may lead to an increase in greenhouse gas (GHG) emissions; this may be insignificant at the global or even the national level, nevertheless preference should wherever possible be given to energy-efficient equipment – and adequate insulation of buildings should precede investment (if still necessary) in air conditioning and heating systems;
- the suitability and effectiveness of specific adaptation measures will usually vary across regions and demographic groups.

2.1. ADAPTATION AIMED AT EFFECTS ON HUMAN HEALTH

Possible adaptation measures include:

- generally improving access of the most vulnerable populations to health services;
- adopting and/or strengthening programmes aimed at fighting the effects of malnutrition (e.g. distribution of food supplements rich in vitamin A, other essential micro-nutrients and/or proteins);
- developing or enhancing systems for monitoring drinking water, food and air quality – and enforcing some quality standards;
- promoting and/or directly financing measures aimed at improving access to safe drinking water and sanitation (e.g. harvesting of rainwater in carefully protected reservoirs, desalination based on renewable energy, development of basic or improved sanitation facilities in cities and villages), and protecting water supplies from contamination (e.g. improved protection of drinking water reservoirs against infiltrations, improved management of storm water runoff, regular cleaning of

blocked drains to reduce water stagnation and overflows);

- strengthening food safety regulation and monitoring, notably in terms of microbiological quality, avoidance of contact with pest species (e.g. flies, cockroaches, rodents), conservation duration and conservation temperatures;
- strengthening collaboration between veterinary and public health services;
- promoting and/or directly financing and supervising campaigns aimed at controlling disease vectors (with due regard for the environmental and indirect sanitary effects of such actions), or improving protection against them (e.g. "mosquito-proofing" houses);
- developing, testing and building capacity for emergency preparedness plans at various levels, in collaboration with other relevant authorities, to improve the handling of potential catastrophic weather events and/or conflict situations;
- adopting and/or strengthening programmes aimed at reducing tobacco consumption, to at least partly offset the effects of increased air pollution;
- strengthening epidemiological surveillance systems, to track disease outbreaks and new disease patterns, and more generally changes in morbidity and mortality patterns; in relation to climate change, priority should be given to diseases for which there is evidence of climate sensitivity, and that do or may place a significant burden on public health systems;
- developing climate-sensitive early warning systems, to predict earlier and more accurately heatwaves, other extreme weather events and outbreaks of diseases such as malaria – and on that basis improve the level of preparedness of health systems;
- developing heatwave-related health action plans, including the provision of timely advice to the population ;
- more generally, enhancing capacities to quickly act on information obtained from epidemiological surveillance systems, early warning systems as well as from the primary healthcare system (through periodical reporting); intervention plans may for instance rest on a combination of: (i) awareness-raising and information campaigns about climate change, its expected effects and adequate adaptation measures, targeted at the general population and health workers; (ii) training of local medical staff to improve diagnosis and treatment of new or rising pathologies; (iii) improvements in the responsiveness of drug procurement and distribution systems, to ensure essential drugs can quickly reach the places where they are most needed at any given time; (iv) adoption of specific prevention and disease-control measures;
- financing research, pilot projects and demonstration activities in relation to the adaptation measures proposed above, as well as awareness raising, public education, capacity building, the dissemination of research results and the scaling-up of successful initiatives.

In a more indirect way, the health sector can contribute to enhancing the overall resilience of human populations by improving the supply and accessibility of family planning services, for which there is considerable unmet demand in the developing world. Any reduction in the demographic growth rate will indeed reduce the strength of human pressures on natural systems and resources, with positive effects on the resilience of ecosystems and therefore on the coping capacity of the populations that depend on them. (This also has implications on mitigation, see end of Section 3.)

Furthermore, doctors and other health professionals are in a good position to alert local and national authorities with regard to the health risks induced by climate-induced environmental degradation and other socio-economic impacts – and to advocate the adoption of adaptation measures in other sectors. They should be invited to participate in the development of context-specific adaptive responses.

2.2. Adaptation aimed at effects on health infrastructure, equipment & supply systems

Possible adaptation measures include:

- improving the protection of health infrastructure against extreme weather events, including in the choice of locations;
- ensuring that the public infrastructure on which the proper functioning of the sector depends (e.g. transport, energy) is gradually made as "climate-resilient" as possible, to protect or improve the accessibility and operationality of health centres and hospitals;
- adapting the storage and distribution systems for drugs, vaccines, medical supplies and equipment to reduce vulnerability;
- improving the insulation of the buildings that host medical facilities and, to cover

residual needs, equipping them as necessary with (energy-efficient) air conditioning and/or heating systems;

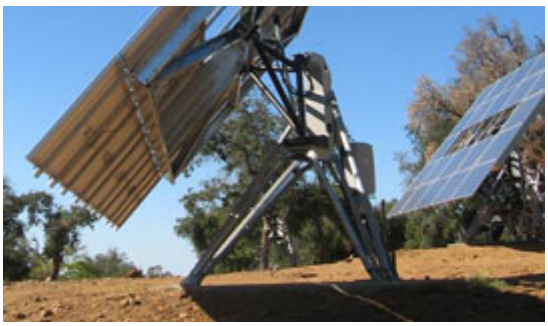
- upgrading or modernising refrigeration facilities to ensure the proper conservation of drugs and vaccines;
- upgrading medical facilities to reduce water and energy consumption to what is strictly essential, safely store clean water to ensure availability at times of supply interruption, and diversify energy supply sources, with a preference for renewable energies (e.g. installation of solar panels to be able to maintain a minimum amount of refrigeration and lighting during power cuts);
- financing research, pilot projects and demonstration activities in relation to the adaptation measures proposed above, as well as awareness raising, capacity building, the dissemination of research results and the scaling-up of successful initiatives.

2.3. Adaptation aimed at effects on health systems in general, incl. human resources

Possible adaptation measures include:

- integrating climate change considerations in the development of health sector policies and strategies;
- conducting health impact assessments of climate change for the purpose of devising risk management strategies; this will notably require improving the ways in which the outputs of global climate models are incorporated into human health studies and models;
- strengthening human resource management, and investing in the motivation and retention of medical staff, to improve the “base level” of health facility staffing, the delivery of primary healthcare services and the ability of the system to respond to surges in demand for health services;
- training health professionals (including community-based health workers) to improve their understanding of the threats posed by climate change and of possible adaptation options;
- promoting the uptake of effective clinical and public-health interventions in relation to new or emerging pathologies;
- strengthening the health systems’ capacity to deliver emergency medical services and participate in emergency preparedness plans; this may notably require improved collaboration and cooperation with governmental and non-governmental national partners, neighbouring countries and international organisations;
- building flexibility and responsiveness in health systems, to enable them to adapt to new patterns of demand for services and to re-allocate staff and other resources according to changing needs; this may require some adaptation of health institutions, a re-allocation of competences across institutions and organisational levels (national, regional, local), and/or the adaptation and strengthening of sector-wide consultation and decision mechanisms;
- building outreach capacities, to improve the ability to deliver effective public health messages at the community level;
- financing research, pilot projects and demonstration activities in relation to the adaptation measures proposed above, as well as awareness raising, capacity building, the dissemination of research results and the scaling-up of successful initiatives.

W OPPORTUNITIES FOR REDUCING GHG IN THE HEALTH SECTOR



The health sector is definitely not a big contributor to GHG emissions; accordingly, the sector's potential for contributing to climate change mitigation is rather limited. Some mitigation options nevertheless exist, and may be congruent with adaptation options while allowing a reduction in recurrent costs or an improvement in the quality of health services.

Reducing GHG emissions in the health sector may be achieved by:

- improving the energy efficiency of health facilities: for instance, the insulation of buildings (or the use of passive and active solar design for heating and cooling new buildings) may help reduce energy consumption while improving the working conditions of medical staff and the comfort of patients; the use of low-consumption light bulbs may reduce the amount of electricity bills, allow maintaining a minimum level of lighting during power cuts (by reducing demand on a facility's local generators) – or enable a significant upgrade of lighting systems for an unchanged overall level of consumption;
- replacing old, inefficient refrigeration equipment with more efficient equipment based on "climate-friendlier" refrigeration fluids; this may bring about both improved cooling capacities and reduced power consumption; [3]
- gradually opting for local power supply based on renewable energies to cover part of the energy needs of health facilities (which also ensures a minimum level of power availability during power cuts);
- gradually replacing vehicles used by health services with fuel-efficient models.

There are at least two more indirect ways in which the health sector can contribute to the mitigation of GHG emissions. First, it can do so by providing accessible and acceptable family planning services. There is indeed considerable unmet demand for such services in the developing world; in addition to having positive effects in terms of adaptation (see Section 2.1), improving their supply and accessibility may contribute to reducing the population growth rate and therefore the trend to ever-increasing emissions. Second, health professionals can advocate and support the adoption of mitigation measures in other sectors that generate significant co-benefits in terms of public health, such as the replacement of coal and fuel burning with cleaner sources of energy for electricity production, the adoption and enforcement of fuel efficiency and emission standards for vehicles, or the more widespread use of highly efficient cooking stoves for domestic purposes. They should remind policy makers that "some of the greatest benefits to public health have been achieved through environmental interventions" (Haines et al. 2007:81).

[3] Note that the fluorinated gases of discarded refrigerating equipment should be recovered and recycled or destroyed (to the extent local capacities and infrastructure to do this are available), since they are extremely powerful GHGs.

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X ILLUSTRATIVE EXAMPLES

Illustrative example 1: Climate change health impact assessment and integration in national response strategies

The UN Framework Convention on Climate Change (UNFCCC) requires signatory countries to carry out national assessments of the potential impacts of climate change – including impacts on human health. Global health impact assessments were carried out in the context of the 3rd and the 4th IPCC reports. However, national impact assessments remain useful, given the differences in geographic, climatic, socio-economic and institutional situations across countries (and, within countries and especially large ones, across sub-national regions). Health impact assessments should be driven by national priorities, involve stakeholders, lead to the identification of concrete risk management and vulnerability reduction measures – and feed into overall national climate change response strategies.

The results of health impact assessments should notably be reflected in countries' National Communications to the UNFCCC, as well as their National Adaptation Programmes of Action (NAPAs) (for those countries that have one). In fact, the record of integration of human health impacts in these reports has been mixed so far, with health-related issues and proposed actions adequately addressed in some of them but not at all or insufficiently in others. India and Bhutan are examples of good practice in this regard.

In India's Initial Communication to the UNFCCC, the chapter on "vulnerability assessment and adaptation" includes an extensive section on climate change impacts on health. The most likely impacts are described, and a more in-depth study of the possible effects of climate change on malaria incidence is presented as an illustration of the possible relationship between climate parameters and disease incidence. The Communication recommends designing adaptation policies that take account of the uncertainties associated with climate change health impacts. It advocates improvements in the public health infrastructure, in environmental management practices, in the preparation of disaster management plans, and further research into some specific aspects of malaria transmission. The authors of the report also point out that "development", with all its associated features (e.g. additional financial resources, infrastructure, improved public services, improved education, …), should play a key role in controlling the spread of malaria and reducing vulnerability in future.

In Bhutan, the NAPA Task Force in charge of drafting the action plan included several sector-specific working groups including a Health Working Group, to ensure adequate consideration of human health aspects. Expert work was complemented with extensive regional and stakeholder consultations, so as to reflect the population's and local authorities' views. An initial list of 55 possible adaptation projects was narrowed down to 20 proposals based on the application of a few general criteria (such as level of risk, cost-effectiveness and complementarity with the country's main development goals). The remaining projects were ranked using four criteria, of which "human life and health saved by the intervention" came first with a weight of 33%. Nine priority projects were retained as the outcome of this process.

Given the nature of the main climate-related hazards in Bhutan (glacial lake outburst floods, landslides, flash floods and droughts), the number-one project to be implemented in the context of the NAPA is the development of a Disaster Management Strategy, with a focus on the delivery of emergency medical and first aid services as well as the setting up of a rapid food distribution system to vulnerable communities in potential disaster areas. Project activities notably include the mapping of vulnerable areas, the formulation of a National Emergency Medical Services Strategy (at national and district level), the establishment of functional trauma centres, and the strengthening of institutional arrangements at national and local levels (to optimise levels of preparation and coordination). Community-level awareness will also be developed to ensure adequate support of the population (e.g. in terms of physical support to emergency workers and blood donations).

Illustrative example 2: Climate-sensitive early warning systems for epidemic malaria

Malaria is endemic – i.e. permanently present in the population – in some regions of the world, but in many other regions, in particular the highlands and semi-arid regions of Africa and Asia, it strikes in the form of occasional, deadly epidemics. Epidemic malaria may have particularly severe consequences, both in terms of morbidity and mortality, because it affects populations that have had no or only sporadic exposure to the disease, and therefore lack protective immunity.

Epidemic malaria is closely related to weather conditions – in particular anomalies in rainfall patterns (in semi-arid regions) and temperature patterns (in highlands), which influence the development of both the mosquito vector and the parasite. In the southern hemisphere, it has been shown to be associated with El Niño events. Because of its irregular occurrence, there is value in developing early warning systems that could predict, with sufficient notice for health systems to prepare their response, the onset of an epidemic.

Early detection systems rest on a combination of vulnerability monitoring (i.e. the tracking and mapping of factors that increase transmission, such as migrations, and vulnerability to the disease, such as unusually low malaria incidence in the preceding years, high levels of HIV-AIDS prevalence, drug and insecticide resistance) and epidemiological surveillance (i.e. the identification of unusually high incidence of malaria cases at a number of "sentinel sites" that report disease incidence data much more frequently than other health facilities). They are useful but provide a signal only when the epidemic is about to start, and thus leave very little time for responding (max. two weeks for an effective response). Early warning systems combine the tools of early detection with climate and environmental monitoring, with a focus on the identification of unusual temperatures or unusual rainfall patterns (used as a predictor of the transmission potential). Such systems typically predict the onset of a malaria epidemic about one month in advance.

Researchers have now also developed long-range epidemic forecasting systems that, in addition to the traditional tools of early warning systems, integrate seasonal climate forecasts based on the observation of sea surface temperatures and the modelling of the interactions between the atmosphere and the oceans. In Eritrea, Botswana and Zimbabwe, for instance, these systems have been used to produce probabilistic forecasts of epidemic risks with a four-month lead time. They are slightly less reliable than systems based on the actual observation of temperatures and rainfall, but the additional lead time they provide should be useful for governments and non-governmental organisations to plan for an outbreak, ensure the national and local availability of essential supplies (e.g. drugs, insecticide-treated bednets and vector-control substances), choose the most adequate response (e.g. strengthened application of routine prevention measures, increased attention paid to case identification, mass or selective drug administration) and cost-effectively target their response at the areas most at risk (something especially important where resources are scarce).

Although these early warning systems were not developed specifically as a response to climate change, they show how technology can be used to help health systems cope with increasing climate variability and unpredictability. In future, collaboration between national meteorological services and public health authorities should allow the development of more warning systems aimed at improving health systems' responsiveness to a variety of climate-sensitive emergencies. The first priority, however, remains to strengthen the response capacity of healthcare delivery systems – without which early warning systems are unlikely to produce any substantial benefits.

Illustrative example 3: Developing community responses to the health impact of climate change

In the arctic region, the effects of climate change are already very noticeable. Inuit and other northern indigenous communities have a close relationship with their natural environment, and are affected in many ways in their traditional way of life and in their health. Their strong connections with their environment are a source of vulnerability (given their significant level of dependence on natural resources for subsistence) – but also a potential opportunity (thanks to their enhanced capacity to observe, detect and anticipate environmental changes). To some extent, these communities are already spontaneously adopting measures to reduce their vulnerability. However, more needs to be done to help them address the very specific challenges they face, especially if one takes into account that their adaptive capacity is constrained by various factors, including precarious livelihoods, social marginalisation, lack of economic power and reduced access to quality health care services.

Possible responses include the identification, selection and monitoring (at national, regional or local level, whichever is most appropriate) of a range of indicators that link climate, environment and health. These indicators can be used in conjunction with health impact scenarios to develop more structured adaptation strategies, involving national and regional public health authorities as well as local communities. Examples of potentially useful indicators include, for instance, the number of days with extremely low and high temperatures, ground-level exposure to UV-B radiation, the incidence of waterborne disease, or the consumption of traditional food items in typical diets. For this approach to be effective, communities must be directly involved in the identification and selection of locally relevant and meaningful indicators, and in the design and implementation of data collection and monitoring systems. Simultaneously, efforts should be made to better understand, preserve and utilize indigenous knowledge with regard to climate observation and adaptation.

To help assess and address the specific health challenges faced by Inuit people in northern Canada, public health researchers and social scientists used a multi-stakeholder, participatory framework that combined community-based interviews and dialogue with more classical scientific knowledge. A series of two-day workshops were held in various communities to document:

- people's observations of environmental changes (e.g. changes in ice thickness and stability and in the freeze-up period);
- their perceived direct effects on health and safety (e.g. increases in the number of hunting accidents and drowning);
- their indirect health effects (e.g. malnutrition caused by the reduced supply of hunting and fishing products, as travel on ice is reduced by the increased risk of accidents and unexpected storms; increase in cardiovascular diseases as people move to western-style diets and reduce their consumption of wild foods rich in omega-3 fatty acids);
- potential adaptation strategies at the local level (e.g. purchase of equipment to make travel on ice and away from the community safer under the new conditions; organisation of markets for traditional foods so that those who can no longer go hunting and fishing still have access to them).

This community-focused approach allowed not only to improve the assessment of health vulnerabilities in Inuit communities, but also to raise their awareness and understanding of climate-related health challenges, and to identify concrete grassroots-level projects and initiatives that can contribute to improved coping strategies. Mutatis mutandis, it could be replicated elsewhere to help indigenous and socially isolated communities deal with the health (and other) problems caused by a changing climate.

y ILLUSTRATION LINKAGES

Below is an illustration (in a format that was voluntarily kept simple[4]) of the linkages between biophysical effects of climate change, potential socio-economic consequences and possible adaptive responses. It is provided to help visualize some important cause-effect relationships and how adaptive responses relate to the identified manifestations and impacts of climate change.

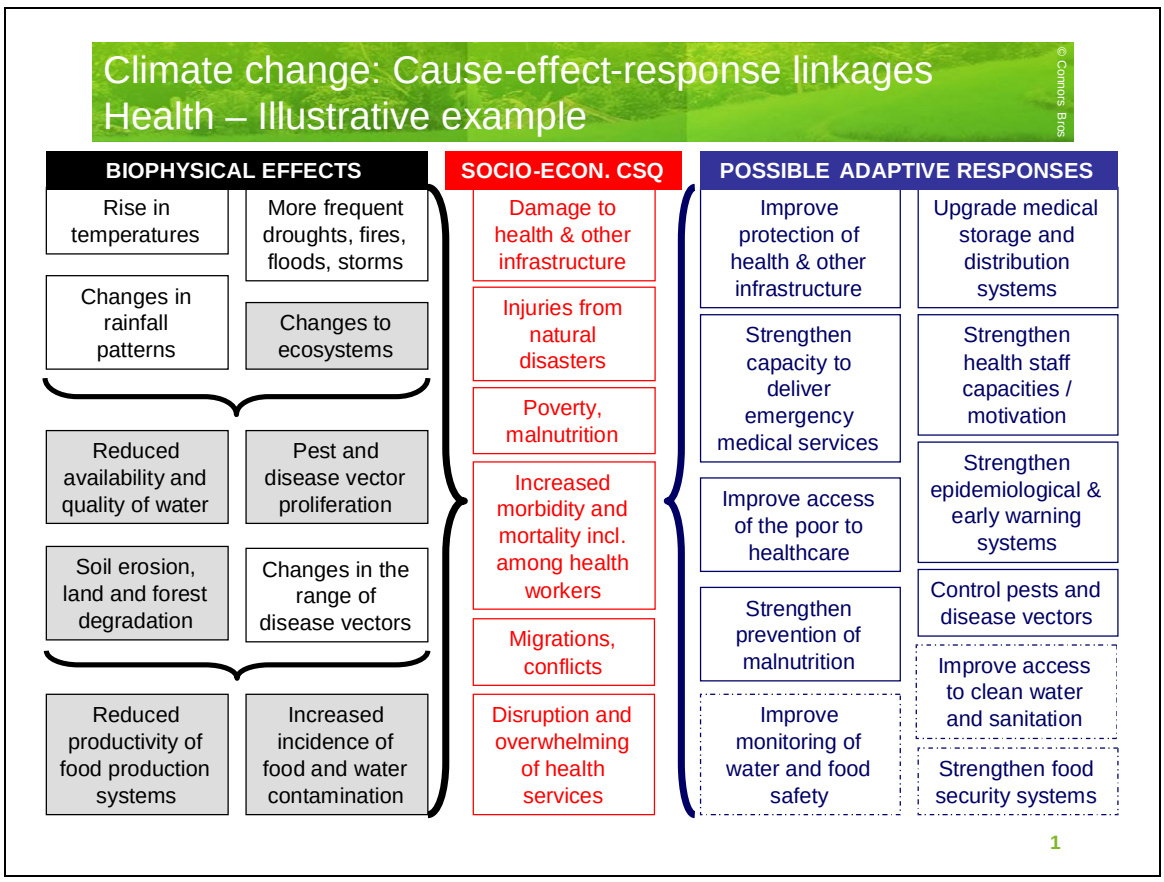
Legend:

Changes to ecosystems

Grey boxes show biophysical impacts that are not exclusively or even primarily caused by climate change – but are also significantly influenced by other pressures resulting from human activities.

Develop migration & conflict management capacities

Boxes framed with a dotted line show possible responses that are in principle not under the direct control of the concerned sector authorities – but depend on the development of a cross-sectoral coordinated response.



[4] These illustrations are not meant to be comprehensive, or to be universally applicable; the simple format retained does not allow showing the multiple systemic interactions (including feedback loops) between various elements.

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{ FURTHER INFORMATION AND SUPPORT

For further support in relation to the use of sector scripts, including the identification of sources of information on climate change projections in specific regions, you may contact the team in charge of providing advisory services for environmental integration in EC development/external co-operation:

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