Policy and practice

PROTECTING HEALTH FROM CLIMATE CHANGE: A SEVEN-COUNTRY APPROACH

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ABSTRACT

During 2008–2012, the WHO Regional Office for Europe coordinated the largest pilot project to date to strengthen health systems to cope with climate change. Of the wide range of activities in this seven-country initiative, this article reports on two: (i) the results of the national or subnational health vulnerability, impact and adaptation assessments of climate change and (ii) development of national or subnational health adaptation plans. For the assessments, a variety of qualitative and quantitative methods were used including: literature reviews; focus group interviews; time-series and regression analyses; risk-mapping exercises; damage and adaptation cost estimations; and scenario-based assessments. The process of developing each adaptation plan was done through the activities of a national multisectoral government committee, stakeholder engagement and dialogue, capacity development, policy impact assessment and monitoring. Correlations between weather factors and human health were detected in all countries. The evidence for near-term adverse health effects was strongest for extreme weather events and changes in infectious-disease patterns. Based on these findings, and guided by the European regional framework for action, a range of adaptation measures to strengthen health systems were analysed. The assessments showed that a number of current measures, policies and strategies needed to be revised or strengthened to respond to current and projected levels of risks from climate change. The analyses also identified measures that needed to be newly developed, such as weather early warning and integrated information systems, or where cooperation with other sectors needed strengthening. The methods, tools and experiences developed during this seven-country initiative can be shared across countries in Europe and beyond.

Keywords: ADAPTATION, CLIMATE CHANGE, HEALTH, PUBLIC HEALTH, ASSESSMENT

BACKGROUND

Climate change has complex and wide-ranging impacts on human health, both directly through increased frequency and intensity of extreme weather events and indirectly via changes in major environmental, social and economic determinants of health (1). Recent estimates suggest that climate change will cause approximately 250 000 additional deaths per year globally between 2030 and 2050 (2). The most recent report of the Intergovernmental Panel on Climate Change highlighted the evidence for greater risk of injury, disease, and death owing to more intense heatwaves and fires; increased risks of diseases transmitted by food, water and vector-borne diseases; and consequences for health of lost work capacity and reduced labour productivity in vulnerable populations (3). Climate change is likely to widen existing health inequalities between and within populations. In the near term, many of these health impacts can be reduced by strengthened health systems that have public health measures in place and the capacity to manage and adapt to climatic risks (3, 4).

The necessity to mitigate and adapt to climate change has been recognized through resolutions of the World Health Assembly (5) and World Health Organization (WHO) regional committees (6). At the regional level, the Parma declaration on environment and health was adopted in 2010, whereby the 53 WHO European Member States pledged to integrate health issues into climate change mitigation and adaptation measures in all sectors, and to implement the European regional framework for action (7). Creation of resilient communities was identified as a priority area in the WHO Regional Office for Europe’s Health 2020 policy framework and strategy (8).
Observations of climate change and associated health effects across Europe have highlighted that implementation of adaptation strategies to protect human health should be accelerated and strengthened. This paper reports components of a pilot initiative for protecting health from climate change in seven countries from 2008 to 2012. Described below are (i) the findings of the national or subnational health vulnerability, impact and adaptation assessments of climate change and (ii) the results of the development of national, or subnational, health adaptation plans of action carried out in seven countries: Albania, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia and Uzbekistan. The work reported here was part of a larger initiative, which had the aim of protecting health from climate change through strengthening of health systems (Fig. 1) (9).

**LOCAL CONTEXT**

The seven-country initiative covered four different geographical and climatic zones: arid and semi-arid water-stressed areas (Kazakhstan and Uzbekistan); high mountainous areas (Kyrgyzstan and Tajikistan); Mediterranean countries (Albania and the former Yugoslav Republic of Macedonia); and a sub-Arctic region in the northern Russian Federation (Arkhangelsk Oblast and Nenets Autonomous Okrug). Each country had already experienced climate-related exposures, such as extreme events, water scarcity, glacier melting and permafrost thawing. This initiative, by drawing upon the experiences of countries already affected by climate change, gave a firm foundation for future action by providing examples of the priorities, challenges and emerging solutions utilized by the seven countries in the project (9).

**FIG. 1. ACTIVITIES OF THE SEVEN-COUNTRY INITIATIVE**

- **Albania**: implementation of air quality monitoring, strengthening communicable disease surveillance, development of emergency medical services, disaster preparedness
- **Kazakhstan**: strengthening of communicable disease surveillance, vulnerability risk assessment and mapping of disasters (VRAM), application of International Health Regulations (IHR)
- **Kyrgyzstan**: assessment of energy efficiency, installation of renewable energy in five hospitals, development of curricula for health professionals
- **Tajikistan**: implementation of small-scale water safety plans, development of early warning for extremes
- **Uzbekistan (Republic of Karakalpakstan)**: development of dust storm early-warning system, implementation of practical approach to lung health (PAL), assessment of nutrition, development of air quality monitoring (Tashkent and Nukus)
- **The former Yugoslav Republic of Macedonia**: implementation of Heat-Health Action Plan, strengthening communicable disease surveillance, assessment of energy efficiency in hospitals, installation of renewable energy in two hospitals
- **Russian Federation (Arkhangelsk Region and Nenets Autonomous District)**: strengthening health systems in remote areas
- **WHO/BMU seven-country initiative**

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

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APPRAOCH

The overall aim of the seven-country initiative was to protect health from climate change through strengthening health systems through building capacity in assessing vulnerability, impacts and adaptive capacity in each country. This process formed the basis for the development of national health adaptation strategies or action plans; promotion of awareness raising activities; and facilitation of sharing of knowledge and experiences. A range of parallel activities, such as health worker training and specific interventions, also took place (Fig. 1).

MANAGEMENT AND COORDINATION

This initiative involved several hundred people within the seven countries and at the intercountry coordination level. Governments of each of the seven pilot countries appointed a national multisectoral steering committee to guide political and technical implementation. Each national steering committee appointed a technical working group of scientists and professionals from national research institutions, public health organizations, universities and nongovernmental organizations, to carry out the assessment. Each steering committee also identified possible stakeholders, based on interest and influence, and developed a stakeholder engagement plan. Several dialogue workshops were organized in each country to develop the national health adaptation strategies or action plans.

The WHO Regional Office for Europe (Rome/Bonn office) coordinated the implementation of the project by sharing a common logical framework; setting up a project implementation facility; coordinating with WHO country offices; providing technical expertise; coordinating with an international scientific advisory committee; building capacity across disciplines and providing methods and tools; and developing a mechanism of sharing experiences between countries. Seven WHO national project officers were appointed to serve within the country offices and work directly with the chairs of the steering committees and working groups. These officers were a constant driving force in the project: seeking out technical expertise where needed and liaising between all the partners involved at the national level. Each national steering committee identified major climate change exposures and risks by means of a stakeholders’ dialogue workshop. Their technical working groups identified readily available data and sources for assessing health risks and impacts.

HEALTH VULNERABILITY, IMPACT AND ADAPTATION ASSESSMENTS

A step-wise health vulnerability and impact assessment was done in each country using a range of qualitative and quantitative methodologies based on guidance developed by the WHO Regional Office for Europe in 2003 (Fig. 2) (10). Assessments were tailored to national data availability and the nature of the challenges under

FIG. 2. STEPS IN THE HEALTH VULNERABILITY, IMPACT AND ADAPTATION ASSESSMENT

1. Define scope of assessment
   - geographical, policy context, project team and stakeholders

2. Undertake vulnerability assessment of human health risks of current climate variability
   - current exposure, observed health effects, vulnerable populations and regions

3. Undertake impact assessment of projected future health risks and impacts under climate change
   - climate-sensitive health outcomes as well as changes to vulnerable populations and regions

4. Undertake adaptation assessment of policies and programmes to address current and projected health risks

5. Define iterative process for monitoring and managing health risks of climate change

review (10, 11). Several additional tools were developed and tested to support national implementation. Examples include: a statistical tool for climate-related exposure effects analysis; the economic damage and adaptation cost tool (12); and a disaster mapping tool, which was used to determine vulnerability to flooding in 99 health facilities in Kazakhstan. In addition, existing tools were adapted for climate change purposes. For example, the hospital safety index (13) was applied in the former Yugoslav Republic of Macedonia in order to identify climate-vulnerable health services.

Additional data were collected through specific research, case studies, stakeholder interviews and focus group discussions. Where specific vulnerabilities had been identified, in-depth analyses were performed to improve understanding of the scope and scale of the exposures and risks (9). A risk-criteria approach was used to identify near-term outcomes of the highest burden of disease which could be mitigated through efficient interventions. Where future projections were developed, the Intergovernmental Panel on Climate Change special report on emissions scenarios were used (mainly A2). The data collected contributed to WHO information platforms through the sharing of tools, results and lessons learned.

**DEVELOPMENT OF HEALTH ADAPTATION PLANS OF ACTION**

The WHO Regional Office for Europe developed a public health framework and a step-wise approach to develop national health adaptation plans (Fig. 3) (9). Several other frameworks were also considered, in particular to align with the United Nations Framework Convention on Climate Change national adaptation plans for action guidance (14). For each step, guiding questions were debated within the national steering committee and among stakeholders. Key factors considered included: (i) the size and the nature of the problem related to each of the priorities; (ii) effective

**FIG. 3. ADAPTATION FRAMEWORK AND APPROACH**

Note: Public health adaptation framework (left); stepwise approach for developing a health adaptation strategy/action plan (right). Source: Protecting health from climate change: a seven-country initiative. Copenhagen: WHO Regional Office for Europe; 2014 (9).
interventions; (iii) the goal and objectives of the strategy for each of the priorities; (iv) involvement of institutions and roles and responsibilities; (v) indicators; and (vi) financial implications of each proposed intervention.

As guiding document for the development of the action plan, the five pillars of the European regional framework for action were used, namely:

• integrate health into all climate change related policies;
• strengthen health systems to prevent, prepare for and respond to health effects of climate change;
• raise awareness and build capacity;
• encourage greening of the health sector;
• share best practices, research, data, information, technology and tools at all levels (7).

CAPACITY DEVELOPMENT AND AWARENESS RISING

Capacity development and outreach activities within the project were targeted at a broad range of society: from training of medical professionals to awareness raising among the general public. As far as was possible, a whole-of-society approach was used. Training programmes and curricula development within the education systems were developed. The World Health Youth Environment and Health Communication Network was involved in producing and delivering education materials, including a video (15). Policy-makers, civil society and the private sector were also involved in the outreach programme, often as project stakeholders.

RELEVANT CHANGES

This project generated a range of important results. The evidence collected through the health vulnerability, impact and adaptation assessments clearly demonstrated that climate change exposures are likely to have both direct and indirect impacts on population health in all seven countries, with the highest near-term health effects resulting from extreme weather events (Table 1). The quantitative results of observed and projected health effects in the seven countries are summarized in Table 2. This evidence highlighted that these impacts are happening now and exist alongside

TABLE 1. COMPONENTS OF THE VULNERABILITY ASSESSMENT BY COUNTRY

<table>
<thead>
<tr>
<th>Country</th>
<th>Climate change exposures assessed</th>
<th>Other social and environmental determinants of health to be affected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperature change expected</td>
<td>Precipitation expected</td>
</tr>
<tr>
<td>Kazakhstan [9, 18]</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Kyrgyzstan [9, 19]</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Russian Federation (northern pilot region) [9, 20]</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Tajikistan [9, 21]</td>
<td>↑</td>
<td>↑ / ↓</td>
</tr>
<tr>
<td>The former Yugoslav Republic of Macedonia [9, 22]</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Uzbekistan [9, 23]</td>
<td>↑</td>
<td>↑ / ↓</td>
</tr>
</tbody>
</table>

↑ – increase; ↓ – decrease; ↑ / ↓ – depends on region
<table>
<thead>
<tr>
<th>Country</th>
<th>Heat-related illnesses</th>
<th>Respiratory diseases (cold, heat and air-pollution related)</th>
<th>Communicable diseases</th>
<th>Allergic diseases</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>• Possible correlation between number of emergency visits and high daily temperatures. Heat-related illnesses likely to increase, especially among those with pre-existing chronic conditions</td>
<td>• About 200 deaths per year are attributed to air pollution in Tirana, with an approximate life-expectancy loss of 1.5–2 years</td>
<td>• Expanding vector distribution and behaviour changes e.g. ticks, mosquitoes, rodents occurred in the past 20–30 years. An increased risk of vector-borne diseases is expected</td>
<td>• Pollen-related allergic diseases expected to increase</td>
<td>• Increasing extreme weather events e.g. heavy precipitation expected to cause increased rates of mental illness, injuries, communicable diseases</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>• A 1°C increase in daily maximum apparent temperature was associated with a 2–9.5% increase in mortality due to external causes in Astana during 2005–2010</td>
<td>• More research needed</td>
<td>• A 1°C temperature increase in Astana was associated with a 5.3% increase in monthly salmonella cases (2000–2009)</td>
<td>• A 1°C increase of temperature was associated with a 0.5–3.6% decrease in ambulance calls for asthma during the warm season (2006–2011)</td>
<td>• Increase of 1°C in daily maximum apparent temperature in Astana was associated with a 2% increase in suicides</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>• Thermoregulation stress and deterioration in well-being recorded when temperatures are more than 26–27°C. Requests for ambulance assistance in Bishkek city are greater in summer than in winter</td>
<td>• Overall mortality from respiratory diseases is predicted to decline by up to 5.1% in some groups by 2100, which is likely to be due to reductions in cold weather</td>
<td>• Morbidity of infectious diseases in children aged &lt;1 year expected to increase by 17.8–18.2% from 2010 to 2100. Incidence of acute intestinal infections expected to increase by 10.6–15.9% from 2005 to 2100</td>
<td>• Not assessed</td>
<td>• Deaths and injuries from natural disasters have increased, with most related to floods and mudslides</td>
</tr>
<tr>
<td></td>
<td>• Overall winter mortality is expected to decrease</td>
<td></td>
<td></td>
<td></td>
<td>• Increasing extreme weather events are expected to threaten mental health, food safety/security and nutrition status. Approximately 11.5% of children aged &lt;1 year are underweight and 5.3% of those aged 1–11 years are malnourished (2009). 8% of women aged 18–29 are underweight (2009) and chronic caloric shortage is present in 3% of the population</td>
</tr>
<tr>
<td>Country</td>
<td>Health-related illnesses</td>
<td>Allergic diseases</td>
<td>Communicable diseases</td>
<td>Respiratory diseases (heat and air-pollution related)</td>
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</tr>
<tr>
<td>Russian Federation (northern region)</td>
<td>Heatwaves in Arkhangelsk, temperature threshold 2°C above normal, increase in mortality from both cardiovascular diseases and all natural causes in people older than 65 years (1997–2008), 1°C temperature increase associated with an increase in calls for medical assistance in children and 3% increase in calls for people aged &gt;60 years (2007–2009)</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td></td>
</tr>
<tr>
<td>Tajikistan</td>
<td>Number of patients presenting with myocardial infarction 5.1% higher in summer than in winter</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td></td>
</tr>
<tr>
<td>The former Yugoslav Republic of Macedonia</td>
<td>Temperature increase of 1°C above cut-off point of 30.8°C increases mortality by 8%</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased cardiovascular mortality observed during heatwaves</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td>Not assessed</td>
<td></td>
</tr>
</tbody>
</table>

**Relation of Heatwaves with Increases in Salmonellosis Cases**

- Average monthly air temperature increase of 1°C was associated with 1.9% increase in salmonellosis cases in the following month. However, overall, salmonella cases have reduced substantially in the region (1992–2009).

**Risk of Increased Cases of Falciparum Malaria**


**Increased Risk of Pregnancy Complications**

- Increased risk of pregnancy complications associated with warmer temperatures, and increased average annual temperature associated with increased infant mortality. Low birth rate incidence is expected to increase due to increasing levels of tropospheric ozone.
and potentially exacerbate prevailing challenges to health, social, environmental and economic systems.

The findings also underscored the gaps and difficulties in assessing health risks; for example, quantitative attribution to climate change in most cases is difficult if not impossible. Where data are available, detection of health effects or correlation with weather patterns over time is possible. However, many results are based on qualitative or even anecdotal evidence, which are not reported here. The assessments cover mainly what is known today based on past exposures and do not reflect the full scale of the observed or potential health effects. For example, potential conflicts associated with resource scarcity and population movements, retardation of economic growth and poverty exacerbation, were not assessed or not assessed in detail. Furthermore, a scenario-based assessment was possible for only a few countries, thus only a limited assessment of health futures was possible.

Nevertheless, epidemiological evidence based on local and national data was sufficiently important and strong to form a decision-making resource for policy-makers. The evidence provided a robust knowledge base for the selection and implementation of policy options; support of monitoring to improve health systems; and enhancement of a preventive approach to climate change risks for population health in the near term.

This initiative has created a foundation of climate change impact research upon which national and regional academic communities in each of the seven countries may build. A number of doctoral theses have been written, thereby achieving another project objective—improving learning. In many cases, the vulnerability assessments and some of the methodologies used were the first of their type to be conducted nationally, regionally and globally. Thus, they also provided important contributions to global guidance development (16).

The resulting wide range of information on the epidemiological, demographic, health, social and environmental situations; rules and regulations in place; and levels of health system preparedness served as a solid evidence base on which to develop an adaptation policy. The assessment process identified a number of specific climate-sensitive conditions and diseases where adaptation is required in all countries.
It showed that a number of current measures, policies and strategies needed to be revised or strengthened to respond to current and projected levels of risks from climate change, e.g. strengthening the surveillance and monitoring of infectious diseases or capacity building among health professionals. The assessment also identified measures that needed to be newly developed, such as weather early warning and integrated information systems, or where cooperation with other sectors needed strengthening (Table 3).

The processes and methods developed, such as performance of vulnerability assessments and strategy development, were regularly shared between the seven countries. In five of the seven countries the national or subnational action plans were approved and endorsed by the government, creating the foundation or stimulus for further multisectoral national adaptation plans. In two countries the action plans became part of the multisectoral adaptation plan development but were not separately approved or endorsed.

**LESSONS LEARNED**

A range of lessons have been learned during the process of implementation. At the managerial level, the level of implementation depended strongly on the level of engagement, power and continuous efforts of the national steering committee. While all countries experienced specific project benefits, such as increasing the awareness among health professionals of the health impacts of climate change, the broader benefit was the increased engagement of key stakeholders and policy-makers with the agenda. Before the process was initiated, health was largely marginalized in policy developments in climate change and environment; at the same time, climate change was largely marginalized in health policy development.

In many cases, the vulnerability assessments were the first of their type to be conducted in the country or region. The seven-country initiative therefore provided case studies of practical on-the-ground action, built on robust assessments, delineating the areas where human health vulnerability to climate change were likely to occur. By defining areas of increased risk and exposure, the teams from the seven countries were able to provide a firm foundation for health officials, planners and decision-makers to develop and focus adaptation strategies, highlighting the relationships between climate change, specific environmental, cultural, social and geographical factors and human health outcomes.

While the specific priorities for each of the countries were different, based on their analysis and interpretation of their vulnerability and exposures to the effects of climate change (17–23), and the capacity and capability of their health systems to respond to these threats, the process identified a number of common areas of concern. These included:

- limited understanding of assessment processes and scientific project planning within this field of practice to support the identification and analysis of impact and vulnerability adequately to inform adaptation planning;
- paucity of existing data sources;
- limited knowledge of environment and health epidemiological and statistical methods;
- limited experience of implementing national or local impact, vulnerability and adaptation assessments across different stakeholder groups.

In addition, the adaptation strategies aim to increase society resilience; they are frameworks for managing future climate risk and offer the potential to reduce future economic, environmental and social costs, particularly in the health sector. To reach this goal, more new knowledge is required on climate impacts, particularly on regional impacts as well as on the economic costs of action or inaction.

By illustrating how climate change adaptation and mitigation measures can be applied to the health sector, this seven-country initiative served as a true pilot for further development and investment in the field. The project has not only contributed to policy changes, but has also heralded the start of a new era in terms of thinking about inter-relationships between climate change and health. The pilot activities specific to each country aimed to address current climate change vulnerability. These included strengthening preparedness and response for extreme weather events; increasing surveillance and response for climate-sensitive infectious diseases; developing water safety plans; reducing the risk for respiratory diseases; fostering innovation in energy efficiency and use.
<table>
<thead>
<tr>
<th>Country</th>
<th>Integrate health into other related policies</th>
<th>Encourage greening of health systems</th>
<th>Raise awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>Strengthen health sector engagement in emergency planning and develop health-focused cross-sector action plans; prevent exposure to extreme heat/cold and pollution</td>
<td>Develop extreme weather action plans and early warning systems; educate health professionals and the public</td>
<td>Develop extreme weather health action plans; increase energy efficiency and waste management; ensure adequate staffing and resources in priority areas; manage health care during extreme weather events</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>Strengthen health sector engagement in emergency planning and develop health-focused cross-sector action plans; prevent exposure to extreme heat/cold and pollution</td>
<td>Develop health-focused early warning systems and action plans; educate health professionals and the public</td>
<td>Develop extreme weather health action plans; increase energy efficiency and waste management; ensure adequate staffing and resources in priority areas; manage health care during extreme weather events</td>
</tr>
<tr>
<td>Russian Federation (northern region)</td>
<td>Promote interagency cooperation to develop and implement early warning systems and emergency plans; prioritize health care in emergency situations</td>
<td>Coordinate activities with the Ministry of Civil Defence, Emergency Management and Natural Disasters; ensure adequate staffing and resources in priority areas; manage health care during extreme weather events</td>
<td>Develop extreme weather health action plans; increase energy efficiency and waste management; ensure adequate staffing and resources in priority areas; manage health care during extreme weather events</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>TABLE 3. STRATEGIC PROPOSED ACTIONS BY COUNTRY, GROUPED BY THE FIVE PILLARS</th>
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</thead>
<tbody>
<tr>
<td>Country</td>
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<tr>
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<tr>
<td>Albania</td>
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<tr>
<td>Kazakhstan</td>
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<tr>
<td>Kyrgyzstan</td>
</tr>
<tr>
<td>Russian Federation (northern region)</td>
</tr>
</tbody>
</table>
Country | Integrate climate change into the national council of health, and prioritize adaptation and mitigationLabel: Tajikistan
---|---
| Improve quality of public health and health care services, e.g. sanitation, technical assessment of water and sanitation services, water and sanitation education programs | Strengthen noncommunicable-disease management (e.g. cardiovascular diseases) | Establish capacity for climate change-related health effects in the Ministry of Health and other relevant ministries | Establishment of a technical body for effective use of resources | Improve coordination among institutions to plan and implement integrated urban planning for heat island effect reduction and other public health measures | Develop systematic measures to increase energy efficiency and sustainability of health care systems | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop data and information sharing systems and promote functional sharing of data and information | Raise public awareness about climate change, noncommunicable diseases, water safety, reproductive health, communicable diseases, and healthy lifestyles, nutrition and hygiene | Use media and information technology to disseminate information on climate change, health effects, and mitigation strategies | Train specialists to work on adverse climate factors | Use mass media to disseminate information on climate change and health effects | Establish a national cross-sector cooperation mechanism for climate change adaptation and mitigation in the health sector | Develop national capacities and interagency cooperation | Develop early warning and response plans for extreme weather events and respiratory diseases caused by climate change | Improve national standards for management of noncommunicable diseases related to climate change (e.g. respiratory diseases) | Develop national capacities and interagency cooperation | Develop a database of health status depending on meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Establish a national data and information sharing platform | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies

Country | Integrate climate change into the national council of health, and prioritize adaptation and mitigationLabel: Uzbekistan
---|---
| Improve quality of public health and health care services, e.g. sanitation, technical assessment of water and sanitation services, water and sanitation education programs | Strengthen noncommunicable-disease management (e.g. cardiovascular diseases) | Establish capacity for climate change-related health effects in the Ministry of Health and other relevant ministries | Establishment of a technical body for effective use of resources | Improve coordination among institutions to plan and implement integrated urban planning for heat island effect reduction and other public health measures | Develop systematic measures to increase energy efficiency and sustainability of health care systems | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop data and information sharing systems and promote functional sharing of data and information | Raise public awareness about climate change, noncommunicable diseases, water safety, reproductive health, communicable diseases, and healthy lifestyles, nutrition and hygiene | Use media and information technology to disseminate information on climate change, health effects, and mitigation strategies | Train specialists to work on adverse climate factors | Use mass media to disseminate information on climate change and health effects | Establish a national cross-sector cooperation mechanism for climate change adaptation and mitigation in the health sector | Develop national capacities and interagency cooperation | Develop early warning and response plans for extreme weather events and respiratory diseases caused by climate change | Improve national standards for management of noncommunicable diseases related to climate change (e.g. respiratory diseases) | Develop national capacities and interagency cooperation | Develop a database of health status depending on meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Establish a national data and information sharing platform | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies

Country | Integrate climate change into the national council of health, and prioritize adaptation and mitigationLabel: The Former Yugoslav Republic of Macedonia
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| Improve quality of public health and health care services, e.g. sanitation, technical assessment of water and sanitation services, water and sanitation education programs | Strengthen noncommunicable-disease management (e.g. cardiovascular diseases) | Establish capacity for climate change-related health effects in the Ministry of Health and other relevant ministries | Establishment of a technical body for effective use of resources | Improve coordination among institutions to plan and implement integrated urban planning for heat island effect reduction and other public health measures | Develop systematic measures to increase energy efficiency and sustainability of health care systems | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop data and information sharing systems and promote functional sharing of data and information | Raise public awareness about climate change, noncommunicable diseases, water safety, reproductive health, communicable diseases, and healthy lifestyles, nutrition and hygiene | Use media and information technology to disseminate information on climate change, health effects, and mitigation strategies | Train specialists to work on adverse climate factors | Use mass media to disseminate information on climate change and health effects | Establish a national cross-sector cooperation mechanism for climate change adaptation and mitigation in the health sector | Develop national capacities and interagency cooperation | Develop early warning and response plans for extreme weather events and respiratory diseases caused by climate change | Improve national standards for management of noncommunicable diseases related to climate change (e.g. respiratory diseases) | Develop national capacities and interagency cooperation | Develop a database of health status depending on meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Establish a national data and information sharing platform | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies

Country | Integrate climate change into the national council of health, and prioritize adaptation and mitigationLabel: Myanmar
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| Improve quality of public health and health care services, e.g. sanitation, technical assessment of water and sanitation services, water and sanitation education programs | Strengthen noncommunicable-disease management (e.g. cardiovascular diseases) | Establish capacity for climate change-related health effects in the Ministry of Health and other relevant ministries | Establishment of a technical body for effective use of resources | Improve coordination among institutions to plan and implement integrated urban planning for heat island effect reduction and other public health measures | Develop systematic measures to increase energy efficiency and sustainability of health care systems | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop data and information sharing systems and promote functional sharing of data and information | Raise public awareness about climate change, noncommunicable diseases, water safety, reproductive health, communicable diseases, and healthy lifestyles, nutrition and hygiene | Use media and information technology to disseminate information on climate change, health effects, and mitigation strategies | Train specialists to work on adverse climate factors | Use mass media to disseminate information on climate change and health effects | Establish a national cross-sector cooperation mechanism for climate change adaptation and mitigation in the health sector | Develop national capacities and interagency cooperation | Develop early warning and response plans for extreme weather events and respiratory diseases caused by climate change | Improve national standards for management of noncommunicable diseases related to climate change (e.g. respiratory diseases) | Develop national capacities and interagency cooperation | Develop a database of health status depending on meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Establish a national data and information sharing platform | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies

Country | Integrate climate change into the national council of health, and prioritize adaptation and mitigationLabel: Pakistan
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| Improve quality of public health and health care services, e.g. sanitation, technical assessment of water and sanitation services, water and sanitation education programs | Strengthen noncommunicable-disease management (e.g. cardiovascular diseases) | Establish capacity for climate change-related health effects in the Ministry of Health and other relevant ministries | Establishment of a technical body for effective use of resources | Improve coordination among institutions to plan and implement integrated urban planning for heat island effect reduction and other public health measures | Develop systematic measures to increase energy efficiency and sustainability of health care systems | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop data and information sharing systems and promote functional sharing of data and information | Raise public awareness about climate change, noncommunicable diseases, water safety, reproductive health, communicable diseases, and healthy lifestyles, nutrition and hygiene | Use media and information technology to disseminate information on climate change, health effects, and mitigation strategies | Train specialists to work on adverse climate factors | Use mass media to disseminate information on climate change and health effects | Establish a national cross-sector cooperation mechanism for climate change adaptation and mitigation in the health sector | Develop national capacities and interagency cooperation | Develop early warning and response plans for extreme weather events and respiratory diseases caused by climate change | Improve national standards for management of noncommunicable diseases related to climate change (e.g. respiratory diseases) | Develop national capacities and interagency cooperation | Develop a database of health status depending on meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Establish a national data and information sharing platform | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies

Country | Integrate climate change into the national council of health, and prioritize adaptation and mitigationLabel: Bangladesh
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| Improve quality of public health and health care services, e.g. sanitation, technical assessment of water and sanitation services, water and sanitation education programs | Strengthen noncommunicable-disease management (e.g. cardiovascular diseases) | Establish capacity for climate change-related health effects in the Ministry of Health and other relevant ministries | Establishment of a technical body for effective use of resources | Improve coordination among institutions to plan and implement integrated urban planning for heat island effect reduction and other public health measures | Develop systematic measures to increase energy efficiency and sustainability of health care systems | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop data and information sharing systems and promote functional sharing of data and information | Raise public awareness about climate change, noncommunicable diseases, water safety, reproductive health, communicable diseases, and healthy lifestyles, nutrition and hygiene | Use media and information technology to disseminate information on climate change, health effects, and mitigation strategies | Train specialists to work on adverse climate factors | Use mass media to disseminate information on climate change and health effects | Establish a national cross-sector cooperation mechanism for climate change adaptation and mitigation in the health sector | Develop national capacities and interagency cooperation | Develop early warning and response plans for extreme weather events and respiratory diseases caused by climate change | Improve national standards for management of noncommunicable diseases related to climate change (e.g. respiratory diseases) | Develop national capacities and interagency cooperation | Develop a database of health status depending on meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Establish a national data and information sharing platform | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies | Develop a database of health status, including meteorological parameters and experience in adaptation and mitigation strategies
of renewable energy for health services; and air quality monitoring.

The initiative also illustrated that public health institutions at all operational levels will need consciously to modify their approaches to both science and practice in anticipation of climate change health impacts (24). It also highlighted a series of difficulties, namely:

- lack of enabling mechanisms for gaps of inter-institutional cooperation;
- poor communication of the evidence base to decision-makers to inform adaptation planning to improve health;
- the need to build capacity and increase public awareness of the health effects and adaptation actions;
- limited practical experience of developing health adaptation plans with cross-sectoral stakeholder engagement;
- limited availability of integrated information systems and capability;
- limited experience in systematic monitoring of implementation.

A number of further mechanisms needed to be put into place within countries or at the subnational level to ensure implementation of the action plans. Countries will need to monitor the implementation of their national strategies and evaluate their actions to feed back into policy development, thereby completing the adaptation cycle. The lessons learned from this project will be applicable to both small and larger countries considering how best to improve adaptive capacity and the resilience of health systems to climate change and its associated impacts.

This initiative has underscored the need for systems to recognize, monitor, anticipate, communicate, and prepare for changing climate-related health risks, drawing upon and using the full spectrum of available knowledge and resources. More work is needed to develop these systems further, to ensure that the opportunities provided by recognition of the convergence of objectives between health and other sectors’ activities is neither restricted by infrastructural inadequacies nor derailed by lack of ongoing funding.

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Conflicts of interest: None declared.

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REFERENCES


23. Evaluation report of the practical approach