Southern Neighbourhood Workshop

Climate change and infectious disease: from projections to preparedness

21–23 May 2024, Sharm El-Sheikh, Egypt

Abbreviations

Africa CDC	Africa Centres for Disease Control and Prevention
EU	European Union
EMPHNET	The Eastern Mediterranean Public Health Network
EWRS	Early Warning and Response System
GIS	Geographic Information System
JEAP	Joint Emergency Action Plan
RCCE	Risk Communication and Community Engagement
RDT	Rapid Diagnostic Test
SimEx	Simulation Exercise
(EU) SNP	(European Union) Southern Neighbourhood Policy
TB	Tuberculosis
WHO EMRO	World Health Organization Regional Office for the Eastern Mediterranean

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Introduction

Scope and purpose

This report describes a workshop entitled 'Climate change and infectious disease: from projections to preparedness' which took place on 21–23 May 2024 in Sharm El-Sheikh, Egypt. The workshop was organised by the Egyptian Ministry of Health and Population and the European Centre for Disease Prevention and Control (ECDC) as part of the EU Initiative on Health Security. The scope of the workshop was to discuss the effects of climate change on infectious diseases in European Union (EU) Southern Neighbourhood Policy (SNP) partner countries. The workshop focussed on approaches and activities that could , enhance preparedness for infectious disease and response to the impacts of climate change in the coming years. Key objectives included identifying and prioritising infectious disease risks related to climate change; exchanging country experiences and best practices and promoting preparedness, surveillance and early warning strategies which could help to mitigate the recognised risks. In addition, the workshop discussed the sustainability and 'greening' of healthcare systems.

Target audience

The workshop was delivered in English and was designed for professionals at national and sub-national levels engaged in climate change and infectious disease. To ensure multi-disciplinarity and a One-Health perspective, invitations encouraged participation from country representatives who had experience working with vector-borne diseases, food- and water-borne diseases, animal health, humanitarian crises, or related issues. Approximately 100 participants from Egypt, Lebanon, Morocco, Libya, Jordan, Tunisia and Algeria attended the workshop. In addition to the national representation, this workshop involved EU-based experts and staff from World Health Organization Regional Office for the Eastern Mediterranean (WHO EMRO, Africa Centres for Disease Control and Prevention (Africa CDC) and the Eastern Mediterranean Public Health Network (EMPHNET).

Section 1. Summary of key discussion points

This three-day workshop aimed to identify and prioritise emerging risks, facilitate the exchange of country experiences and best practices, and develop strategies for preparedness, surveillance, and early warning. The agenda is presented in Annex 1. The introductory session highlighted international initiatives addressing climate change and health in the EU SNP Region. These include the Joint Emergency Action Plan (JEAP), a collaboration between Africa CDC and WHO EMRO, which aims to create a regional platform for tackling public health emergencies related to climate change, focusing on vulnerable populations [1]. In addition, the One Health department at Africa CDC focuses on the impact of climate change, zoonotic diseases, food safety, and antimicrobial resistance and prioritises strategic responses to these interconnected health challenges.

The first plenary session presented the latest scientific evidence on the impact of the climate change on infectious diseases, showing how it intensifies extreme weather patterns, increases the incidence or consequences of communicable and non-communicable diseases [2], affects health infrastructure and workforce [3,4], and can lead to conflicts and population displacements. A three-concept tool was introduced to assess climate risks, based on hazard, exposure and vulnerability; this tool helps identify the areas most at risk and the factors contributing to their vulnerability [5,6]. In addition, a presentation highlighted how climate change is making the environment more suitable for arthropods and therefore, for the transmission of vector-borne diseases. This underscores the need for targeted mitigation or adaptation strategies to address these increased risks [7,8].

Following the presentations, in the second plenary session countries (Egypt, Algeria, Lebanon, Tunisia, Italy, Morocco and Greece) shared their recent national experiences related to climate change and infectious disease. Egypt highlighted green architecture and sustainable healthcare systems. Algeria showcased the use of Geographic Information System (GIS) and e-data for vector-spread assessment, ecological modelling, and water quality monitoring [9]. Lebanon discussed the formation of steering committees to lead initiatives in climate change. Tunisia presented operational and multisectoral capacities for early outbreak detection, investigation, and control to protect vulnerable populations. Italy emphasised the establishment of a multisectoral Early Warning and Response network [10]. Morocco is assessing sustainability and climate resilience of health facilities to build a more adapted health sector, progressively reduce the related greenhouse gas emissions and achieve carbon neutrality by 2050. Greece is developing strategies to address vector-borne diseases, by establishing multi-sectoral national committees and action plans for the management of specific diseases [11], such as malaria[12], west nile virus infection[13], and aedes-borne diseases[14] and for mosquito management [15].

The third plenary session concentrated on vulnerability and adaptation assessments. The session included an explanation of WHO's guidance on conducting climate change and health vulnerability assessments at national and subnational levels. This guidance supports the development of health systems that are both resilient to climate impact and low in carbon emissions [16,17].

The fourth plenary session centred on climate-sensitive disease epidemiology and surveillance. Key points included the importance of climate information for understanding changes in disease transmission, identifying (new) at-risk populations, and evaluating the impact of intervention [18]. The session emphasised the need for better coordination, more funding, and advanced research in climate and disease modelling. It also highlighted the role of remote sensing and GIS in monitoring climate parameters and predicting disease outbreaks using satellite data [19-21].

The fifth plenary session addressed lowering the carbon impact of the health sector. It analysed the sector's significant greenhouse gas emissions and presented strategies for reduction [18,19]. The Green Transformation Project at Sharm El-Sheikh International Hospital was showcased as an example of the development of a resilient healthcare system (see Section 3).

The parallel group activities started out with a consensual ranking of the diseases affected by climate change in the SNP Region, followed by the identification of vulnerabilities and adaptation and preparedness strategies that can be implemented. Participants were split into three groups, with Egyptian, EU-based, WHO EMRO and ECDC experts to each as facilitators (see Section 2).

Section 2. Findings from group work

During the workshop, parallel group work was structured according to a streamlined approach for conducting climate change vulnerability and adaptation assessments. Three parallel working groups focused on the following steps: 1) identifying and prioritising infectious diseases linked to climate change 2) identifying population and health system vulnerabilities to infectious disease, and 3) identifying preparedness and climate change adaptation strategies that could mitigate the impact of the prioritised diseases.

To ensure diversity and complementarity during the plenary discussion, after the first step, the working groups were attributed different (types of) infectious disease.

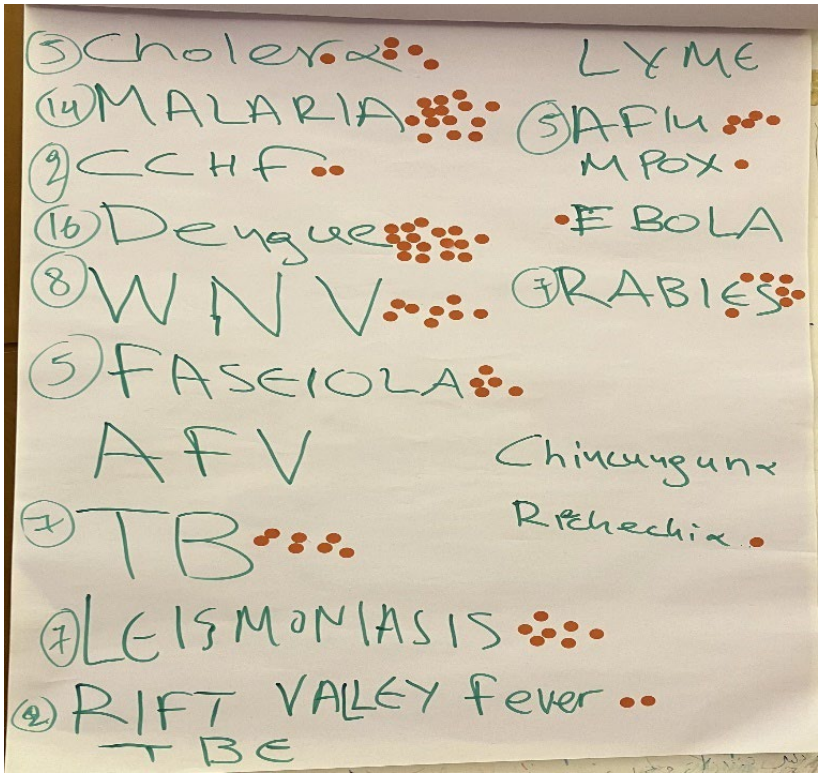
Step 1. Identifying climate-sensitive diseases

On the first day, each group of participants identified and prioritised key climate-sensitive infectious diseases in the Region based on their experience and expertise. The following questions guided their discussion:

- What is the current situation regarding climate-sensitive infectious diseases?
- What are the historical and seasonal trends?
- How have epidemiological indicators been affected by climate change?
- What are the most worrying impacts of climate change on infectious diseases in your country?
- What are the relationships between health outcomes and climate/extreme weather patterns?
- What are the drivers of climate-sensitive infectious disease outcomes?
- How does climate change affect diseases such as water-borne, vector-borne, and food-borne diseases?

Once a relatively exhaustive list had been established, each participant voted, according to his/her perception, for the (up to five) most significant infectious diseases influenced by climate change (Figure 1). It was then possible, through discussions at group level, to establish a consensual ranking of the diseases estimated to be the most affected by climate change.

Figure 1. Example of prioritised climate-sensitive infectious diseases from one of the working groups (the number of red dots represent the number of votes that a given infectious disease received from the group's participants)

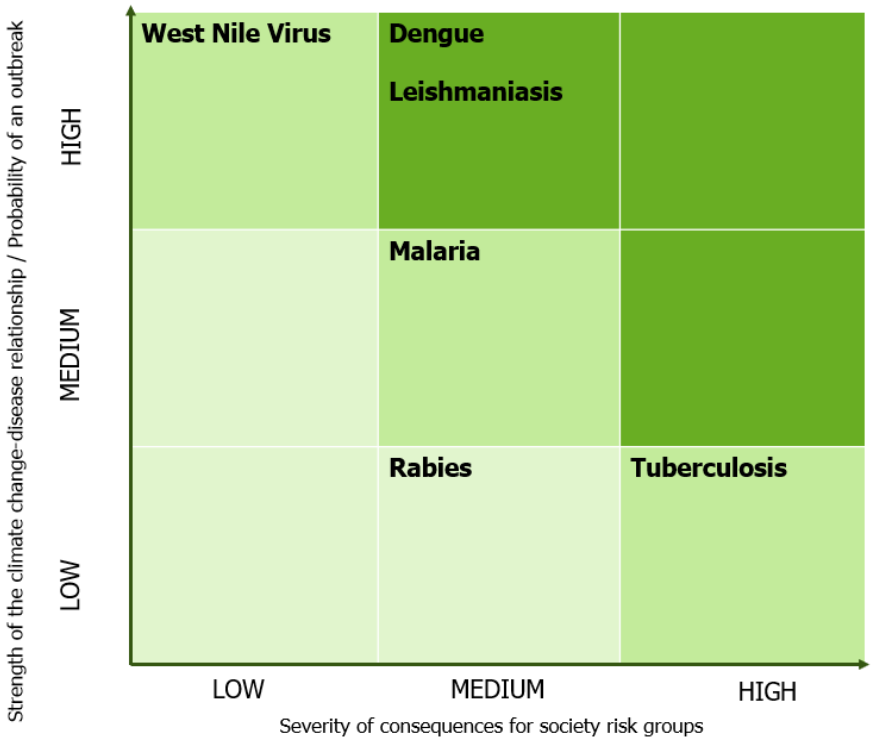


Following prioritisation, participants worked to plot selected pathologies in a matrix which accounted for the strength of the climate-disease relationship (e.g. probability of an outbreak, etc.) on one axis, and the public health impact of disease on the other axis (severity of consequences for society and risk groups) (see Figure 2). The matrix provides a gradient of colours expressing the intensity of the risk (and potentially, of a related public health issue), thereby indicating the priority to be given to each of the diseases analysed (see Annex 2).

For Group A, the most significant climate-sensitive infectious diseases identified were leishmaniasis; malaria; hepatitis A; diarrhoeal diseases (including cholera); and dengue. Cholera was identified as the most critical disease in terms of climate change[1]. While dengue was recognised as having a high probability of outbreak, the participants were not confident in defining its potential consequences on populations, because the relevant knowledge was lacking in the group. The strength of the relationship to the climate was estimated as high but it was not possible to position dengue on the abscissa. Therefore, it was located slightly to the side of the matrix.

For Group B, the key diseases were dengue, malaria, West Nile virus, tuberculosis (TB), leishmaniasis, and rabies. TB was determined to be the most significant disease. For Group C, the most important diseases identified were dengue, malaria, West Nile virus, Rift Valley fever, and leishmaniasis. Dengue was considered the most significant disease.

Figure 2. Example of the weighted prioritisation process



Step 2. Identifying vulnerable populations and health system vulnerabilities

In the second phase of the parallel activity, each group focused on a different type of disease, so that one vector-borne disease (dengue), one food- or water-borne disease (cholera), and one disease indirectly affected by climate change (tuberculosis) were studied and complemented one another. For each attributed pathology, groups exchanged views to identify vulnerable populations, health system vulnerabilities, and underlying factors exacerbating susceptibility to these diseases. A summary of these discussions is presented in Table 1.

[1] *Initially, cholera was considered together with other diarrhoeal diseases. However, when applying the weighted prioritisation process for cholera specifically and for the other diseases, the results were different. As a consequence, the group decided to tackle them separately.*

Table 1. Climate-sensitive diseases, vulnerabilities and proposed strategies as discussed in groups

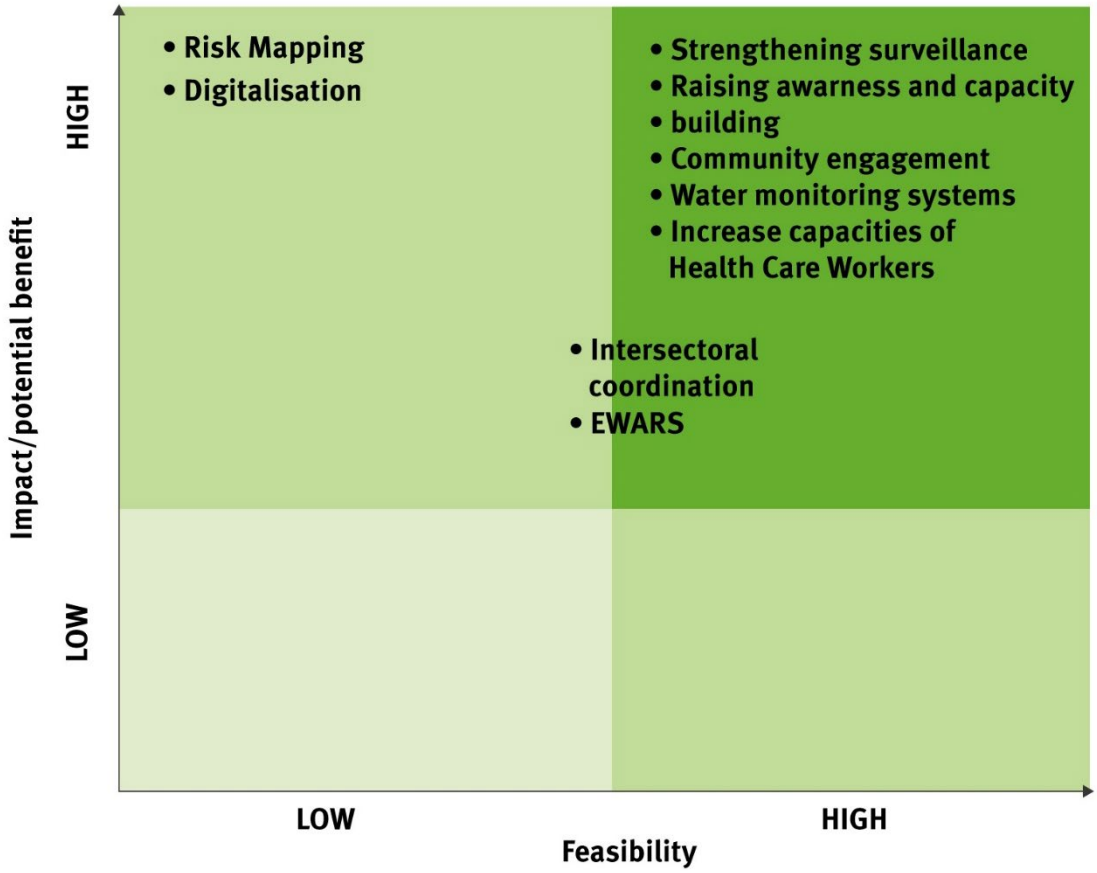
	Group A	Group B	Group C
Diseases	Cholera	TB	Dengue
Vulnerable populations	• The elderly • Children • Pregnant women • Migrants • Malnourished individuals • Immunocompromised individuals.	• Pregnant women • The elderly • Immunocompromised groups • Disabled individuals • Children • Malnourished individuals • Healthcare workers • Farmers • Prisoners • Smokers • Internally displaced people • Low socioeconomic status • Diabetes mellitus patients	• Residents without access to piped water • Pregnant women • Individuals with underlying conditions • Children • People with low-risk perception • People working or spending time outdoors
Health System Vulnerabilities	• Lack of specialists and experts • Inadequate diagnostic tests • Weak surveillance capacity • Poor coordination systems • Insufficient vaccines • Limited accessibility and interoperable digitalized systems	a) Detection • Disrupted diagnostics (e.g. X-ray availability) • Lack of laboratory capacity for resistant TB. • Insufficient medical supplies. • Decreased patient compliance. • Disruption of human resources availability and access to care facilities. b) Treatment and management disruption • In follow-up of cases • Early access • Patient's compliance • In medical supplies, drugs and procurement • Increased risk of developing MDR-TB/XDR-TB • Affected patient registries • Decreased immunity in malnourished • Ability to address stigma. c) Public health disruption in surveillance/response • Rapid Response Teams (RRT) capacity to respond • Breakdown of capabilities of surveillance system and public health response (e.g. contact tracing).	• Case detection: rapid diagnostic test (RDT) performance, availability, laboratory capacity. • Surveillance: Early Warning and Response System (EWRS), cross-border, technical skills. • Inadequate training for healthcare workers.
Proposed strategies	• Strengthening surveillance • Raising awareness and capacity building • Community engagement • Water monitoring systems • Increase capacities of healthcare workers • Intersectoral coordination • EWRS • Risk mapping • Digitalisation.	• Routine surveillance • Public health emergency plans: preparedness, response, surveillance, prevention. • Capacity building activities: a) Preparedness/response: e.g. simulation exercises. b) Prevention e.g. risk communication, screening, health literacy/education • Building climate-resilient health systems • Contact tracing • Surveillance • Treatment • TB control measures • Detection/diagnostics.	• Water storage Risk Communication and Community Engagement (RCCE) • Training of healthcare workers (facility, community) • Evaluation of public health interventions • Vector control • Assessment of risk factors for severe outcomes • Lab capacity • Data sharing • RCCE seeking care (acceptability) • Expansion of the water pipe network • Rapid diagnostic test (RDT) development.

Step 3. Adaptation and preparedness strategies

On the third day, participants explored adaptation and preparedness strategies, mitigation options and interventions for the specific disease and related vulnerabilities that the groups had focused on the previous day (see Table 1 above). Once the strategies had been listed, they were assessed for feasibility (low or high) and for potential impact (low or high). These analyses, leading to a strategic prioritisation, were undertaken using a tool (see matrix in Annex 3).

The prioritisation of strategies for Group A in addressing cholera is shown in Figure3. See Figure 4 for the strategies identified by Group B for targeting TB. Figure 5 illustrates Group C's prioritisation of strategies for combatting dengue.

Figure 3. Strategic Action matrix Group A (cholera)



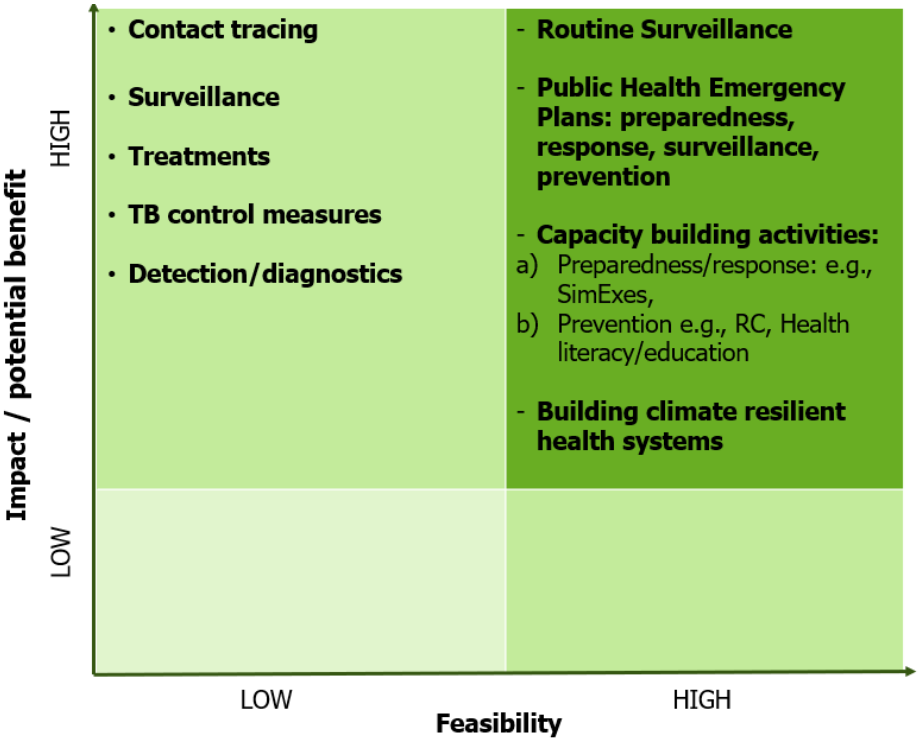
Group A mentioned nine principal strategies for responding to vulnerabilities identified among specific population groups or associated with the health systems. Improving the systems of epidemiological surveillance and raising the awareness and knowledge of health professionals in charge of identifying diseases, and establishing diagnostics were among the first elements proposed [24]. This led to the need to develop the competences of healthcare workers, through teaching and capacity-building. As a complement to this, it appeared that awareness on cholera and its risk factors also needed to be raised among the communities and their leaders, especially among the most exposed, who had less access to the healthcare system. This could be achieved through increased attention, preparation and engagement. Water systems and equipment were obviously crucial for the proper monitoring of water quality. Efforts to optimise these water and sanitation systems were estimated to be affordable and achievable and to have a high impact on the control of cholera spread. Lack of time for this activity meant that the group were unable to analyse the impact and feasibility of this strategy in rural, remote or at-risk areas, where a number of vulnerabilities would probably accumulate.

Depending on their country of origin, participants had different perceptions of the feasibility of intersectoral coordination to prevent, detect at an early stage and respond to cholera outbreaks. Similarly, based on previous personal experiences, there were different opinions on the workability of an EWRS.

Two more approaches linked to informatics and technologies were discussed: the risk mapping capacity and the digitalisation of the health information systems. Both were considered to have a low feasibility but discussions were needed to get a consensual understanding of the scope (or scale) of a digitalisation strategy and its potential benefit.

Therefore, and interestingly, none of the strategies proposed were estimated to have a low impact, but some were seen as more complicated than others to implement. Group A broadened the discussion to whether a country's regulatory framework should enable (or be adapted) in order for such a plan to be implemented. The group also commented on the fact that actions which are easier to implement and have a high impact should be prioritised, including in terms of time, in order to give visibility and credit to the overall action plan. This in turn would facilitate the mobilisation of budgets and the efforts needed to tackle other more complicated steps and objectives.

Figure 4. Strategic Action matrix Group B (tuberculosis)



It is anticipated that climate change will have a major influence on population displacement [25] especially in areas that are highly vulnerable, and this in turn will affect the occurrence of TB [26]. In step two, county experts exchanged views on the vulnerabilities associated with TB and how these are indirectly affected by extreme weather events, leading to migration and population displacement. In this step, participants had to identify public health strategies to enhance preparedness and increase resilience. During the session, the team highlighted the different levels of intervention and strategies to address TB vulnerabilities, based on the level of feasibility and overall impact on the population and health system (Figure 4) when climatic disruptions occur.

Making judgements on the measures that should be implemented with higher impact, but lower feasibility, the following were indicated:

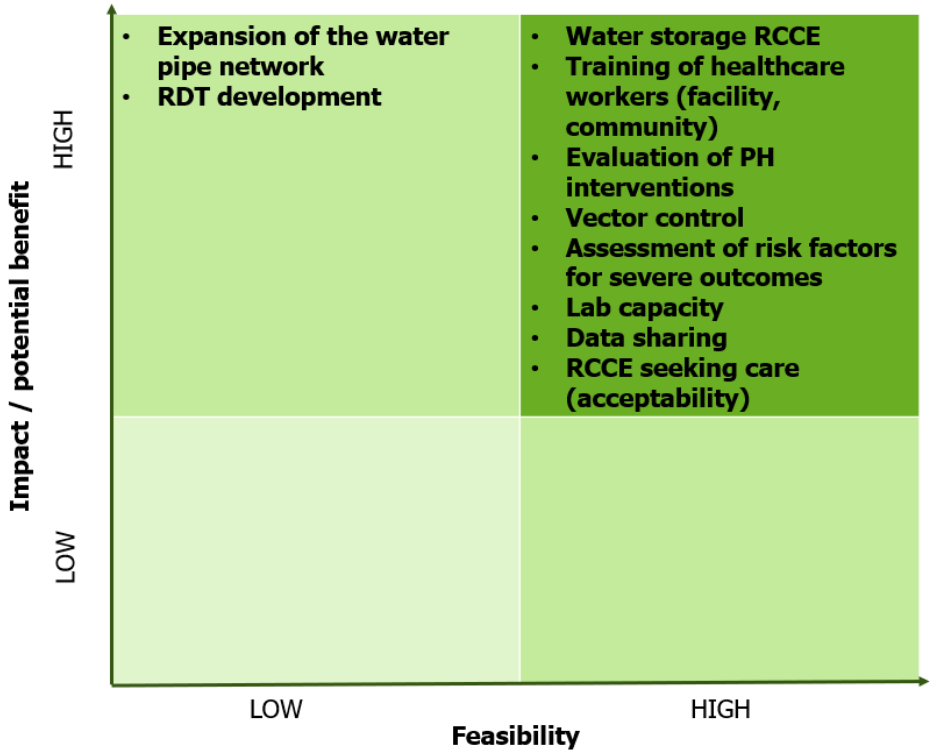
- **Contact tracing:** as a response measure, people who had had recent contact with an active TB case could be screened to stop transmission;
- **Surveillance system:** monitoring and data management could be strengthened, especially for drug-resistant TB cases;
- **TB diagnostics**: laboratory capacity (financial and human resources) could be scaled up to facilitate diagnosis;
- **Detection:** access to accurate/rapid detection techniques could be improved and increased;
- **Treatment:** access to therapy for new cases and facilitating the identification of TB carriers who are lost to follow-up and represent a transmission risk.

Prioritisation measures that were considered to have both high impact and high feasibility were:

- **Routine surveillance:** strengthen routine TB surveillance data systems to enhance monitoring and reporting;
- **Public health plans:** developing national strategic planning for tuberculosis and testing before implementation;
- **Capacity building:** education and training of public health and healthcare professionals; risk communication to raise awareness; simulation exercises to test preparedness and response plans;
- **Building resilience of health systems** during hazardous weather events can improve the facility's capacity to respond and minimise the risks to infrastructure, patients and staff.

It was also pointed out that when extreme weather events force people to move from one country to another, the management of TB cases is strongly affected by the level of public health capacity in neighbouring/host countries, especially at points of entry, but also by their migration policy, and the existence of country cooperation agreements.

Figure 5. Strategic action matrix Group C (dengue)



Group C discussed possible interventions for dengue (Figure 5). There were some disagreements on classifying the proposed interventions, based on the level of feasibility and impact, due to the different country contexts. Nevertheless, the participants agreed on the following low feasibility, but high-impact interventions:

- Expansion of the water pipe network: populations with limited access to a water pipe network usually store the water in containers which become breeding sites for *Aedes* mosquitoes. Access to a well-connected water system can reduce the use of water containers.
- Rapid Diagnostic Test (RDT): there is a need to develop RDTs for dengue with higher specificity and sensitivity.

The participants considered the measures below as high feasibility and high impact:

- Risk communication and community engagement: inform groups who store water in containers on how to do so properly and how to clean them, by engaging the community.
- Training of healthcare workers: train facility and community healthcare workers in the detection of dengue symptoms and early diagnosis.
- Evaluate public health interventions: evaluate current preparedness and response plans for dengue or other public health interventions, to inform future plans and measures.
- Vector control: apply vector control measures for *Aedes* mosquitoes.
- Assessment of risk factors: assess risk factors for severe outcomes – e.g. malnutrition that could indicate populations at risk of disease or severe disease.
- Lab capacity: improve lab capacity for detection and characterisation of dengue virus.
- Data sharing: improve and/or establish communication between countries and share information on dengue cases.
- Seeking care RCCE: inform and educate the populations at risk of the importance of seeking timely medical care. The community should be engaged in this risk communication.

Section 3. Greening the healthcare system

On the second day of the workshop, Egypt's Healthcare Authority arranged a field visit to Sharm El-Sheikh International Hospital (Figure 6) to showcase its efforts in optimising resource utilisation to achieve economic, environmental and social objectives in healthcare settings. The hospital, which mainly targets medical tourism in Egypt, opened its doors to all attendees of the workshop for a two-hour guided tour, giving them the chance to discover the country's first green hospital.

The management team of the facility explained the concept of a 'green hospital' and the steps that were taken for this transformation. The key functions, diagnostics and treatment capacities, and other types of procedures offered to clients were included in the explanation. The guide gave an overview of the in-patient and out-patient departments and the personnel competencies required. After the initial presentation, participants were shown around the different wards inside the main building and outside (technical premises). Visitors were given the opportunity to explore the eco-friendly facilities and were briefed on several practices that have been implemented to reduce the environmental impact and promote public health. By way of example, such practices included the replacement of all mercury blood pressure devices and thermometers, the telemedicine unit that is equipped with modern technological capabilities, the water purification plant and the management of hazardous healthcare waste.

Figure 6. Group photo during the visit to Sharm El-Sheikh International Hospital

Climate change is defined as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods' [16]. Climate change poses critical challenges to healthcare facilities, as they can generate significant greenhouse gas emissions and amounts of environmental waste which can adversely affect the environment and public health. Many facilities lack adequate infrastructure, a trained workforce, and reliable energy, water, sanitation, and waste management services. Addressing these deficiencies is crucial for building resilience and reducing the negative impact on the environment. Climate-resilient and environmentally-sustainable healthcare facilities aim to optimise resource use and minimise waste release. [27]. The Global Green and Healthy Hospitals Network defines a 'green and healthy hospital' as one that 'promotes public health by continuously reducing its environmental impact and ultimately eliminating its contribution to the burden of disease' [28]. Even though there is no standard definition of a 'green hospital', this expression seems to have been introduced to describe how a facility can improve its environmental practices and use of its resources as an approach for reducing climate-related hazards [29].

Conclusions

There is strong evidence that climate change affects the transmission patterns of infectious diseases through multiple direct and indirect pathways. During this workshop, experts identified specific diseases likely to be more affected by climate change in their territories, particularly dengue, malaria and leishmaniasis. These diseases were consistently highlighted by each of the three parallel working groups. Other diseases of concern mentioned by participants included West Nile virus, Rift Valley fever, TB, cholera, other diarrhoeal diseases, hepatitis A and rabies. In some instances, (e.g. for TB), the perceived importance was due to the indirect pathways through which climate change could lead to increased population vulnerabilities and susceptibilities.

With regard to vulnerabilities, the most frequently mentioned factors were associated with the most susceptible populations, including elderly people, children, pregnant women, migrants and immunocompromised individuals. Factors exacerbating vulnerability included issues associated with case detection, such as limited laboratory capacity, weak surveillance systems and inadequately trained healthcare professionals.

For adaptation and preparedness strategies, the identified mitigation options and interventions focused on improving the competencies of public health and healthcare workers; engaging communities and strengthening surveillance systems. Implementing these strategies requires a multidisciplinary approach and a One-Health perspective to ensure all sectors are involved in designing and applying adaptation and preparedness plans. This approach promotes resilient and long-term strategies to address the increasing prevalence of infectious diseases driven by climate change.

The workshop, organised jointly by the Egyptian Ministry of Health and Population and ECDC, aimed to raise awareness on the impact that climate change has already had and will continue to have on infectious diseases, as well as at providing participants with knowledge, methodologies and tools to deal with this, especially those developed in and for the EU SNP Region. ECDC wishes to thank all organisers, facilitators and attendees for making this event so successful.

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Annex 1. Meeting agenda

Day 1 – 21 May 2024

08:30-09:00	**Registration**: please sign the attendance list
09:00-09:40	**Welcome, scope and objectives of the workshop** - Jonathan SUK, ECDC - Prof. Mohamed HASSANY, Ministry of Health and Population (MoHP) - Prof. Ahmed EL-SOBKY, Chairman, Egyptian Healthcare Authority (EHA) (*Recorded)* -
09:40-10:00	**Introductory session: International initiatives to address climate change and health** (Chair: Nermeen ASHOUR, EHA) - Dr Mazen MALKAWI, WHO-EMRO. JEAP for climate change - Dr Yewande ALIMI, Africa CDC. Africa CDC's Continental Priorities for Climate Change and Health
10:00-11:00	**Plenary session 1**: **Impacts of climate change** (Chair: Jonathan SUK, ECDC) **Linkages between climate change and the transmission of infectious diseases** - Prof. Amal SAAD-HUSSEIN, Egyptian Ministry of Higher Education & Scientific Research (MHESR). Major impacts of climate change on infectious diseases pathways. - Prof. Jan SEMENZA, Lancet Regional Health, Europe. Climate change and vector-, water-, and food-borne diseases: impacts and adaptation. - Dr Richard ALLEN, The Mentor Initiative. Impacts of changing climates, contexts, people and insects on the global epidemiology of vector borne diseases – is mitigation possible? **Questions and answers with audience**
11:00-11:30	**Coffee break**
11:30-13:00	**Plenary session 2: Country perspectives and case studies related to climate change and infectious disease** (Chairs: Sherein ZAHRAN, Ministry of Water Resources and Irrigation (MWRI); Mazen MALKAWI, WHO-EMRO) - Egypt: Dr Ahmed HAMMAD, EHA. Prioritising the Environment: Integrating EHA Strategies to Address Infectious Disease Risks. - Algeria: Mr. Rafik GARNI, Institut Pasteur of Algeria. Climate change and vector-borne diseases in Algeria: from experience to preparedness. - Lebanon: Eng. Joyce HADDAD, Ministry of Health. Climate change and infectious diseases: Lebanese experience. - Tunisia: Dr Sonia DHAOUADI, National Observatory New & Emerging Diseases. Climate change and infectious diseases in Tunisia: focus on vector-borne and water-borne diseases. - Morocco: Eng. Amal DAHRI, Environmental Health Officer. Morocco's challenges and initiatives regarding infectious diseases and climate change. - Italy: Dr Flavia RICCARDO, National Institute of Health. Changing epidemiology of arboviruses in a changing climate, examples from Italy. - Greece: Dr Danai PERVANIDOU, Hellenic National Public Health Organization. Vector-borne diseases in Greece: risks, challenges and strategies. **Questions and answers with audience**
13:00-14:30	**Lunch break and group photograph**
14:30-15:30	**Parallel group activity 1** Projections and prioritisation of infectious diseases due to climate change (vector-, food-, water-, or air-borne infectious diseases, zoonotic diseases, emerging and re-emerging infectious diseases, etc.).
15:30-16:00	**Coffee break**
16:00-16:45	**Plenary session 3: Vulnerability and adaptation assessments** (Chairs: Prof. Atef MOHAMMED, MHESR; Anne INGENBLEEK, ECDC) - Dr Saleh RABABA, WHO-EMRO **Questions and answers with audience**
16:45-17:00	**Day 1 concluding remarks** (Jonathan SUK, ECDC)

Day 2 –22 May 2024

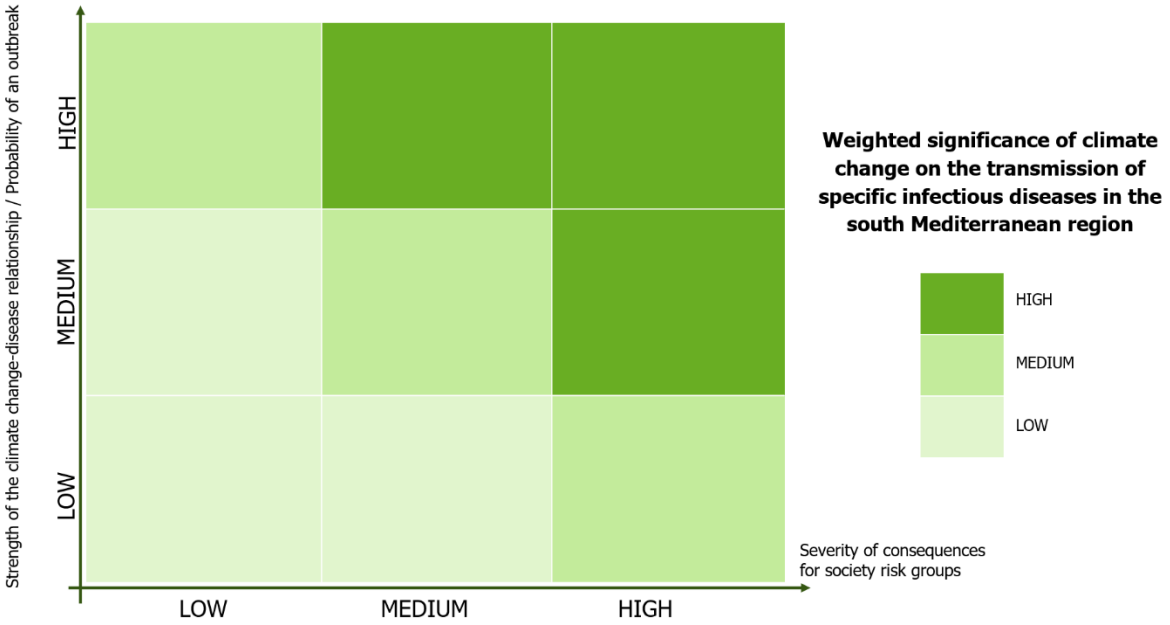
08:30-09:00	**Registration**: please sign the attendance list
09:00-09:30	**Introduction to Day 2** (Chair: Konstantinos KOUTENTAKIS, ECDC) **Recap of Day 1** - Maria MORENO, ECDC
09:30-11:00	**Plenary session 4: Towards climate-sensitive disease epidemiology and surveillance** (Chair: Julien BEAUTÉ, ECDC) - Dr Saleh RABABA, WHO-EMRO - Prof. Sherein ZAHRAN, MWRI. Climate projections for accurate protection. - Dr Naglaa ZANATY, MHESR. Applications of remote sensing and GIS in climate change and infectious diseases. **Question and answers with audience**
11:00-11:30	**Coffee break**
11:30-12:30	**Parallel group activity 2** Drawing upon the prioritisation from Day 1, groups will discuss the population and health system vulnerabilities to specific prioritised pathogens.
12:30-13:30	**Lunch break**
13:30-14:30	**Plenary session 5: Lowering the carbon impact from the health sector** (Chair Prof. Amal SAAD-HUSSEIN, MHESR) - Prof. Atef MOHAMMED, MHESR. Carbon impact from the health sector and steps for reduction. - Dr Nermeen ASHOUR (EHA). Greening healthcare: Embracing sustainability for a better tomorrow: Egypt Healthcare Authority case study.
15:00-15:15	**Coffee break**
15:15	Visit of Sharm-El-Sheikh International Hospital
19:00	**Dinner for all guests**

Day 3 –23 May 2024

08:30-09:00	**Registration**: please sign the attendance list
09:00-09:30	**Introduction to Day 3** (Despina PAMPAKA, ECDC) **Recap of Day 2** - Maria MORENO, ECDC
09:30-11:00	**Parallel group activity 3** Groups will identify preparedness and adaptation strategies that could address the identified vulnerabilities and mitigate prioritised risks.
11:00-11:30	**Coffee break**
11:30-12:30	**Plenary session 6**: **Group presentations** (Chair: Mohamed SEOUDI, MoHP)
12:30-13:00	**Concluding remarks** (Chairs: A'laa' ABDELFATTAH, MoHP; Jonathan SUK, ECDC)
13:00-14:00	**Farewell and lunch**

Annex 2. Diagram for plotting the weighted significance of climate change for different infectious diseases

During parallel group work, groups discussed climate-related disease risks according to this matrix which plots the strength of the association between a disease and climate on the y axis, and the public health impact of the disease on the x axis. This diagram was sourced from ECDC's technical document on climate change and communicable diseases in EU Member States, 2010 [30].



Annex 3. Strategic action matrix

During group work, potential measures to mitigate or prepare for infectious disease risks affected by climate change were plotted according to a strategic action matrix, which aims to identify action according to its potential benefits and feasibility. This matrix was derived from ECDC's technical document on conducting after-action reviews of the public health response to COVID-19, 2023 [31].