15. Medical / Health Care Sub-sector

Guideline:

(1) Medical / Health Care (Adaptation Project)
(2) Medical / Health Care (BAU Development with Adaptation Options)

Basic Concept

A. General Concept	Temperature rise due to climate change is likely to shift or expand habitat areas of disease-carrying vectors. Climate-induced changes in locations and seasons may potentially trigger an epidemic of mosquito-borne diseases such as malaria and dengue fever. Water temperature fluctuations will likely increase water-borne diseases such as diarrhea and cholera, while flood, drought, and crop failure associated with change in rainfall intensities and patterns will potentially increase risks of water- and food-borne diseases. Particularly in the areas with poor healthcare services and facilities as well as poor hygienic conditions, risks of exposure to these infectious diseases are considerably high, which may be exacerbated by climate change impacts. Adaptation measures for this sub-sector includes strengthening of preventive and responsive actions against outbreaks of infectious diseases, as mitigating mechanism of significant risks arising from climate change.
B. Vulnerability	1) Major Climate Change Impacts on the Medical / Health Care Sub-sector According to WHO (2003)[1], there are epidemiologically significant associations between temperature rise and mortality rates. WHO suggests the following as key points of view regarding health and climate change. a) Air Pollution Air pollutant emissions such as carbon monoxide, ozone, nitrogen oxides, and sulfuroxides) vary by anthropogenic emissions such as those caused by increased consumption of energy and economic activities. Control of air pollutant emissions, which is expected to increase in urban centers in developing countries, will necessitate imposition of rigorous environmental air quality standards. b) Disasters Increased intensity and frequency of extreme events such as floods and heavy storms, may potentially lead to increase in incidences of injury and malnutrition, increased morbidities due to water/vector-borne diseases, intensified contamination of flood water by toxic chemicals, and more mental disorders. More frequent occurrences of drought will likely exacerbate hygienic environment due to non-availability of fresh water, and also increase the risk of diarrhea, trachoma and scabies. c) Vector-Borne Diseases Temperature rise and change in rainfall amount due to climate change will alter or expand distribution disease-carrying vectors, and will potentially increase the risk of malaria, filariasis, dengue fever, West Nile fever, tick-borne diseases and schistosomiasis. d) Water-borne and Food-borne Diarrheal Diseases Temperature rise and change in rainfall and humidity will likely promote proliferation of pathogens, while heavy rains and floods will increase chances of transmission through water, food, insects, and eventually to humans, potentially causing diarrhea, shigella, and salmonellosis. There are some studies that came up with estimates of potential impacts of climate

[1] WHO.(2003). Methods of Assessing Human Health Vulnerability and Public Health Adaptation to Climate Change.

	change on the incidence of water-borne and food-borne diseases. In developing countries, reduction in the occurrence of these diseases is expected with the economic development and improved sanitation, apart from the climate change (WHO 2003). e) Stratospheric Ozone Depletion Stratospheric ozone has been substantially depleted from the polar regions to middle latitudes, increasing concerns for impact of incoming UV radiation. Particularly, it is known that there is significant association with UV radiation which causes nonmelanocytic skin cancer. 2) Other Factors that Influence the Medical / Health Care Sub-sector Associated with Climate Change Impacts ・Changes in lifestyle and industrial structure associated with population and economic growth will impact the socially vulnerable group of the population such as elderly, infants, poor and physically weak people. 3) Adaptive Capacity to Climate Change ・Adaptive capacity is likely higher in areas with high infrastructure development levels of sanitation-related facilities (sewerage and drainage system, waste disposal system). ・Adaptive capacity is likely higher in areas with high infrastructure development levels of hospitals, clinics, healthcare centers that can respond to infectious diseases. ・Adaptive capacity is likely higher in the areas where residents' awareness of sanitation is relatively high. 4) Spatial Distribution of Vulnerability a) Climate Change ・According to WHO (2003), meteorological conditions should be considered as follows. If daily data are used, temperatures are homogeneous within about a 300-km radius if no local landscape features such as mountains, watercourses and coastal regions affect climate. For monthly data, temperatures are considered similar up to 1,200 km in radius. Precipitation is more localized in area and time, but should not be used beyond a 50-km radius for daily recorded values or 400-km radius for monthly recorded values. b) Sensitivity in Medical / Health Care Sub-sector ・There is an uneven spatial distribution of sensitivity according to distribution of the existing healthcare-related facilities as well as the geographical distribution of population in the target areas. c) Adaptive Capacity ・Adaptive capacities may differ depending on the demographic conditions (age and income level structures) of the target areas.
C. Adaptation Measures	■ Development of Hospital / Medical Facilities and Capacity Strengthening of Medical Personnel ・Development of new hospital / clinic / healthcare facilities ・Improvement / expansion of healthcare equipment for existing facilities ・Training healthcare related personnel and strengthening their capacity for prevention and treatment of infectious diseases

	■ Countermeasures for Beneficiaries ・Raising awareness of the beneficiaries on sanitation management and preventive measures against infectious diseases ■ Other Measures to Improve Hygienic Conditions (Refer to Water Supply, Sewerage, and Urban Drainage Sub-sectors for more details) ・Development / Improvement / Expansion of Water Supply System ・Development / Improvement / Expansion of Sewerage System ・Development / Improvement / Expansion of Urban Drainage System
D. Maladaptation	■ Maladaptation in Adaptation Measures ・It will be necessary to pay attention not to neglect treatment frameworks for other diseases or injuries while further strengthening those for infectious diseases. ■ Maladaptation Common to “Business as Usual” Project ・There is nothing particular under this condition.

Guideline: Medical / Health Care (Adaptation Project)

A. General	■ Necessity of Adaptation Temperature rise due to climate change is likely to shift or expand habitat areas of disease-carrying vectors for infectious diseases. Climate-induced changes in locations and seasons will likely trigger an epidemic of infectious diseases such as malaria and dengue fever. Flood, drought, and crop failure associated with change in rainfall intensities and patterns will increase risks of water- and food-borne diseases. Particularly in the areas with poor healthcare services and facilities as well as poor hygienic conditions, risks of exposure to these infectious diseases are considerably high, which will be exacerbated by climate change impacts. ■ Adaptation Measures The adaptation measures will strengthen preventive and responsive actions against infectious diseases and improve health conditions of people in the target areas by developing clinics or general hospitals, upgrading equipment, and strengthening capacity of healthcare personnel. ■ Outcome of Adaptation Measures The framework for treatment will be strengthened for patients whose numbers are increasing due to climate change impacts, and corresponding preventive measures will be undertaken.
B. Vulnerability Assessment	Step 1 1) Assess Past and Present Climate Trends and Risks a) Study Past and Present Climate Conditions Based on existing reference materials [National Communication (NC) and National Adaptation Program of Action (NAPA)], study and assess the past to present climate trends (rainfall intensity / pattern, daily / seasonal temperature changes, frequency / intensity / cycle of floods and droughts). b) Study Future Climate Conditions In addition to the above review of references, review the national policies related to climate change, and discuss and confirm with counterpart organization regarding applied climate change scenarios and analysis models, and target year for adaptation measures. Qualitatively assess precipitation parameters such as intensity, frequency, and volume, for the target year based on the analysis results on climate change. 2) Assess Future Exposure to Climate Hazards and Perturbations a) Study Future Weather Conditions For this sub-sector, readily and qualitatively assess future weather conditions through review of references as mentioned in the above item 1). b) Study Other Factors related to Socio-economic Changes Study change factors for healthcare regulations and development plans, while examining insurance and subsidy policies associated with infectious diseases. 3) Assess Future Sensitivity to Climate Change a) Study Past Damage Since affected areas and vectors' habitat will likely shift to extended areas, the trend of the different diseases based on morbidity and mortality rates should be investigated for the past 5-10 years. This should include statistics from the target countries, neighboring countries, and other site-specific areas. The following diseases are epidemiologically

associated with the impacts of climate change in tropical and sub-tropical regions.

・Vector-borne diseases (malaria, dengue fever, B-encephalitis, filariasis, West Nile fever, tick-borne diseases and schistosomiasis)
・Water- and food-borne diseases (diarrhea, shigella, and salmonella)
・Other locally specific diseases
Furthermore, this will be important in collecting primary information on the above cases from existing public health facilities, medical/clinical institutions, and public agencies (Ministry and / or Department of Health, and healthcare centers) as well as from available secondary statistics data.

b) Study Present Condition of Facilities and Measures
Clarify the present infrastructure development level of health-related facilities such as water supply, sewerage, drainage and public toilet. And clarify the conditions of these infrastructures during rainfall through interviews with the relevant organizations and agencies, qualitatively evaluating potential influences on infectious disease incidences.

c) Assess Future Sensitivity to Climate Change
Assess the future sensitivity of the sub-sector to climate change based on the correlation between the past and present records of infectious disease cases, meteorological conditions, future climate condition, and the development level of public health infrastructures with consideration of predicted socio-economic parameters.

Step 2
4) Determine and Project Adaptive Capacity to Climate Change
a) Identification of Adaptive Capacity
Clarifying demographics of the target areas, investigate regional dispersal distribution of infectious diseases cases, and assessment of the locality's overall adaptive capacities and regional capacity gaps of the whole area. In the assessment, clarify the following:
・Population at risk structured by age groups and income levels
・Potential risk of diseases on socially-vulnerable groups, including infant, elderly, poor households, identifying the population shares and structures.
・Clarify the following in relation to adaptive capacities of patients
- Number of doctors per population
- Geographic distribution of healthcare facilities that specialize in the treatment of infectious diseases
- Current preventive activities against infectious diseases

・Other stakeholders' involvement
In order to clarify the levels of public sanitation improvement and disease prevention, different stakeholders' involvement on the following indicators are investigated:
- Medical or infectious disease-related budgets of central or regional governments
- Preventive action initiatives by NGOs regarding infectious diseases

b) Clarify Exacerbating Factors for Climate Change Impacts
As exacerbating factors, the following is considered:
・Lack of medical personnel specializing in treatment of infectious diseases, such as doctors, nurses, health workers.

Step 3
5) Assess Vulnerability
Assess vulnerability to climate change in the target area by overlapping the factors assessed in Steps 1 and 2. Vulnerability Assessment should adopt as below:

Items	Low ← Vulnerability → High
Future sensitivity to climate change	Small Large
Population shares of socially-vulnerable groups	Low High
Number of doctors per population	Large Small
Number of existing medical institutions / healthcare centers	Large Small
Conditions of preventive activities against infectious diseases	Active Inactive
National / regional budgets for medical care and infectious diseases	Sufficient Insufficient
Activities by NGOs	Active Inactive

C. Project Evaluation of Adaptation Measures

[Items for Assessment in Project Formulation]

Items	Outcome	Method	Relative Operation and Effect Indicators
Future sensitivity to climate change	Support framework for medical treatment will be improved, and infection periods and mortality rate will be reduced.	Quantitative	・Disease incidence per population and mortality rate
Population shares of socially-vulnerable groups	Monitoring of population shares of infant, elderly, and poor households	Quantitative	-
Number of doctors per population	Proportion of doctors to population will be improved.	Qualitative	-
Number of existing medical institutions / healthcare centers	Distribution density will increase	Quantitative	-
Conditions of preventive activities against infectious diseases	Preventive activities will become proactive.	Qualitative	-
National / regional budgets for medical care and infectious diseases	The budgets will be stabilized or increased.	Quantitative	-
Activities by NGOs	Preventive activities will become proactive.	Qualitative	-

[Alternative Items for Assessment in Monitoring and Review]

Type of Measures	Alternative Indicators	Method	Relative Operation and Effect Indicators
Non-structural measures	Trend of the budgets for disease prevention	Quantitative	-
Others	Number of patients	Quantitative	・Disease incidence per population and mortality rate

D. Necessary Consideration for Planning of Adaptation Measures	1) Monitoring and Review Plan periodical schedule for monitoring of climate condition and review after project implementation. The climate change impacts, which are not considered for the project but have certain risks, shall be included among the monitoring items. 2) Flexibility to Climate Change Secure flexibility to climate change impacts, which are not considered in the project scope but to address certain risks. The range of flexibility shall be determined with counterpart agencies. The items should include the following: - Consider the option of allocating treatment service of climate-sensitive diseases into other departments within hospitals or medical facilities, in case prevalence of these types of diseases exceeds the medical facilities' normal capacity - Consider not only strengthening capacities of facilities, equipment and personnel, but also promotion of preventive measures (promoting hand-wash, distribution of mosquito nets) as part of project scope. 3) Consideration to Maladaptation Check maladaptation caused by the project, and plan the corresponding countermeasures.
E. Required Data	

	Data	Remarks
B. Vulnerability Assessment		
1) Assess Past and Present Climate Trends and Risks	Past and present meteorological data	Clarify the past and present meteorological conditions and trends through review of NC, NAPA and other relevant / available documents.
2) Assess Future Exposure to Climate Hazards and Perturbations	Future climate	In addition to the review of NC, NAPA and other reference materials, qualitative estimate of future climate conditions including trends in temperature, rainfall pattern / intensity, and extreme weather, using the data if any, from the analysis models and climate change scenarios adopted in the country.
3) Assess Future Sensitivity to Climate Change	Incidence levels of infectious disease cases (morbidity and mortality rates)	Study infectious disease cases in the target country and other potentially affected areas in neighboring countries. For the specific disease types observed, collect data and information on morbidity and mortality rates of the infectious diseases for the past 5-10 years. Using national and regional statistics as basic secondary data, then, collect the primary data from public health organizations, health-related government institutions, and other regional health centers.
	Conditions of existing public health-related infrastructures	Clarify the level of infrastructure development of public health-related facilities such as water supply, sewerage, drainage and public toilet interviews with the relevant agencies, while examining potential health risks that may arise from the use of these facilities (i.e., flood of contaminated and/or rain water, incidence of stagnant water areas).

4) Determine and Project Adaptive Capacity to Climate Change	Population shares of socially-vulnerable groups	Collect demographic profiles of infant, elderly, poor households from national or regional census. Substitute with the morbidity and mortality rates and other population data obtained in "3) Assess Future Sensitivity to Climate Change".
	Number of doctors per population	Clarify number of doctors and other healthcare-related workers and obtain their proportions to the population of the target areas or the entire administration unit.
	Number of existing medical institutions / healthcare centers	Clarify the number and geographic distribution of existing medical and healthcare centers that can treat infectious diseases in the target areas or the entire administration unit.
	Conditions of preventive action initiatives against infectious diseases	Clarify current preventive action programs and performances against infectious diseases.
	Other stakeholders' involvement	Clarify and assess budget levels of national or regional government for infectious disease prevention and treatment. Clarify NGOs' involvement in preventive or treatment activities. Clarify imbalances on these aspects in the target areas.
Others		
	Information related to adaptation	Review and study the adaptation policy by reviewing past studies and other information about adaptability to climate change in and around the target area, if available.

Guideline: Medical / Health Care (BAU Development with Adaptation Options)

<table>
<tr><td>A.
General</td><td>■ Necessity of Adaptation Options
It is necessary to upgrade and expand medical / healthcare facilities and equipment in order to provide better healthcare services in the target areas. Climate change impacts are expected to increase infectious disease cases which would have been a minor issue in the target areas.
■ Adaptation Options
In the development under the business-as-usual condition, the project may focus on capacity-building for the areas of cardiac and brain surgeries, other internal medicine, trauma care, adult disease, and HIV. In addition to these, adaptation measures to climate change will require preparation for the increasing concern on water and vector-borne diseases.
■ Outcome of Adaptation Options
In case there are serious climate change impacts, sufficient medical or healthcare services will be provided.</td></tr>
<tr><td>B.
Vulnerability Assessment (Risk and Change)</td><td>Referring to existing references (National Communication and National Adaptation Program of Action), study and assess the past and present climate trends (rainfall intensity / pattern, daily / seasonal temperature changes, frequency / intensity / cycle of floods and droughts).</td></tr>
<tr><td>C.
Planning Adaptation Options</td><td>The planning of adaptation options must take into consideration the primary objectives of prevention and treatment of infectious diseases associated with climate change. Adaptation options is comprised of the following several measures:
- Development of departments or facilities specifically designated for prevention and treatment of infectious diseases.
- Strengthening capacity of personnel involved in prevention and treatment of infectious diseases.
- Conducting awareness campaigns or activities to promote preventive measures against infectious diseases.
- Combinations of the above options.</td></tr>
<tr><td>D.
Project Evaluation of Adaptation Options</td><td>[Items for Assessment in Project Formulation]
<table>
<tr><th>Items</th><th>Outcome</th><th>Method</th><th>Relative Operation and Effect Indicators</th></tr>
<tr><td>Morbidity rates for infectious diseases</td><td>Monitoring number of patients, infection periods will be reduced.</td><td>Quantitative</td><td>・Disease incidence per 100 persons by type of disease</td></tr>
<tr><td>Mortality rates for infectious diseases</td><td>Treatment environment will be improved and mortality rates will be reduced.</td><td>Quantitative</td><td>・Disease mortality rate per 1000 persons</td></tr>
<tr><td>Conditions of preventive activities against infectious diseases</td><td>Preventive activities will become proactive.</td><td>Qualitative</td><td>-</td></tr>
</table></td></tr>
</table>

[Alternative Items for Assessment in Monitoring and Review]

Type of Measures	Alternative Indicators	Method	Relative Operation and Effect Indicators
Non-structural measures	Trend of the budgets size for disease prevention	Quantitative	-
Others	Number of patients	Quantitative	・Disease incidence per population and mortality rate

E. Necessary Consideration for Planning of Adaptation Options

1) Monitoring and Review

Plan periodical schedule for monitoring of climate condition and review after project implementation. The climate change impacts, which are not considered for the project but have certain risks, shall be included among the monitoring items.

2) Flexibility to Climate Change

Secure flexibility to climate change impacts, which are not considered in the project scope but to address certain risks. The range of flexibility shall be determined with counterpart agencies. The items should include the following:

- Consider the option of allocating treatment service of climate-sensitive diseases into other departments within hospitals or medical facilities, in case prevalence of these types of diseases exceeds the medical facilities' normal capacity
- Consider not only strengthening capacities of facilities, equipment and personnel, but also promotion of preventive measures (promoting hand-wash, distribution of mosquito nets) as part of project scope.

3) Consideration to Maladaptation

Check maladaptation caused by the project, and plan the corresponding countermeasures.

F. Required Data

	Data	Remarks
B. Vulnerability Assessment		
	Past and present meteorological data	Clarify the past and present meteorological conditions and trends through review of NC, NAPA and other relevant / available documents.
	Incidence levels of infectious disease cases (morbidity and mortality rates)	Study infectious disease cases in the target country and other potentially affected areas in neighboring countries. For the specific disease types observed, collect data and information on morbidity and mortality rates of the infectious diseases for the past 5-10 years. Using national and regional statistics as basic secondary data, then, collect the primary data from public health organizations, health-related government institutions, and other regional health centers.
	Conditions of preventive action initiatives against infectious diseases	Clarify current preventive action programs and performances against infectious diseases.
Others		
	Information related to adaptation	Review and study the adaptation policy as well as the past studies and other information about adaptation to climate change in and around the target area, if available.

References and Key Different Features

1) Methods of Assessing Human Health Vulnerability and Public Health Adaptation to Climate Change[1]
WHO proposes the following steps to assess vulnerability and adaptation in the area of public health:

a) Determine the scope of assessment
b) Describe the current distribution and burden of climate-sensitive diseases
c) Identify and describe current strategies, policies and measures that reduce the burden of climate-sensitive diseases
d) Review the health implications of the potential impact of climate variability and change on other sectors
e) Estimate the future potential health impact using scenarios of future climate change, population growth and other factors and describe the uncertainty
f) Synthesize the results and draft a scientific assessment report
g) Identify additional adaptation policies and measures to reduce potential negative health effects, including procedures for evaluation after implementation

This document highlights the procedures in developing adaptation measures from the assessment of human health vulnerability affected by climate change. Assessment methods for general infectious diseases (vector, water and food-borne diseases and health impacts by flood, heat wave, air pollution and ozone depletion) will be useful in formulating yen loan adaptation projects for the healthcare sub-sector. Since the document is designed for developed countries as well as developing countries, it considers heat wave impacts and risk of skin cancer due to increasing level of incoming UV radiation.

2) Wise Adaptation to Climate Change[2]
The document contains discussion on human health impacts by climate change in Japan and points out potential risks of increase in heat stroke cases and its mortality rate. While alerting outbreak of infectious diseases in Japan, it concerns possibility of indirect import of pathogen and vectors from developing countries through trade of goods and materials as well as intercommunication of travelers. Thus, it recognizes that risk of disease outbreak in developing countries as own risk in Japan, which supports the importance of mitigation measures against infectious disease risk in developing countries.

[1] WHO. (2003). Methods of Assessing Human Health Vulnerability and Public Health Adaptation to Climate Change.

[2] Ministry of the Environment of Japan. (2008). Kikouhendou heno Kashikoi Tekiou - Chapter 6 Kenkou Bunya. (in Japanese).