



Republic of Macedonia
Ministry of Environment
and Physical Planning

Contribution to the Third National Communication- Health Sector

Overview of available methodologies and tools for vulnerability assessment of climate change on health and examples of practices which can be applicable in the country

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This document intends to establish the level of development related to climate change adaptation in the health sector and to determine the congruence and confluence of the policies, programs, projects or activities between national priorities on climate change and general national priorities. No detailed assessment of the quality of the vulnerability analysis or the pertinence of the adaptation strategies was made. The scope of the results is limited to the documents reviewed.

The Republic of Macedonia is preparing its third National Communication. This document intends to contribute by giving an overview of current methodologies and practices about vulnerability assessment that can be applicable in Macedonia and to make recommendations for the vulnerability assessment.

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1 Overview of vulnerability assessment methodologies

Nowadays it is irrefutable that climate change is a current and future hazard to human health. Nevertheless, it is also true that given the complex mechanisms and interactions involved, measuring the actual impacts and estimating the future ones, in any system, is surrounded of uncertainties. This characteristic generates a problematic situation at the moment of making decisions about what to do, that is, adaptation. In addition, despite the international efforts to reduce green house gases emission, given the long lifetime of some of them and the characteristic inertia of the climatic system, adaptation to climate change is a necessity in the short, medium and long term. This adaptation presents a challenge to the planning and intersectoral work capacities of a country at the moment of assessing vulnerability. Adaptation was not the primary focus of attention from the beginning for cooperation organizations like the UNFCCC. Consequently vulnerability was not either. To track the origins of vulnerability frameworks it is necessary to start looking for adaptation frameworks.

1.1 Vulnerability in the context of the United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change -UNFCCC- began to establish adaptation itself as an important issue for action in 2001 at the Seventh session of the Conference of the Parties (COP 7, Marrakech, Morocco), where guidelines for the preparation of National Adaptation Programmes of Action – NAPAS- were presented (United Nations Framework Convention on Climate Change). From COP 7 political interest adaptation has increased steadily, as a complement to mitigation activities that were until then, the focus of the negotiations. The interest in adaptation materialized at COP 11 in 2005 when the UNFCCC adopted the five-year work programme of the Subsidiary Body for Scientific and Technological Advice – SBSTA- on impacts, vulnerability and adaptation to climate change. The objective of the programme was “to assist all Parties, in particular developing countries, including the least developed countries and small island developing States, to improve their understanding and assessment of impacts, vulnerability and adaptation, and to make informed decisions on practical” (United Nations Framework Convention on Climate Change). At COP 13 in 2007 in Bali the UNFCCC adopted the Bali Road Map and Action Plan. The Action Plan addresses four specific modules: mitigation, adaptation, technology transfer and distribution and financing. At COP 16 in 2010 in Cancun, UNFCCC established the Cancun Adaptation Framework with the objective of “enhancing action on adaptation, including through international cooperation and coherent consideration of matters relating to adaptation under the Convention” (United Nations Framework Convention on Climate Change, 2011) and establishing an Adaptation Committee “to promote the implementation of enhanced action on adaptation in a coherent manner under the Convention” (United Nations Framework Convention on Climate Change, 2011). However, defining a vulnerability framework and the ways to measure it was not in the center of the debate. This subject was discussed more in deep at the Intergovernmental Panel on Climate Change.

1.2 Vulnerability in the context of the Intergovernmental Panel on Climate Change

From the beginning, the IPCC includes on its reports the term vulnerability and defines it as the susceptibility to damage or harm. The definition as well includes sensibility, adaptive capacity and exposure as components of vulnerability.

1.2.1 Second Assessment Report -SAR

The SAR defines vulnerability to climate change as susceptibility to damage or harm. The definition of vulnerability also includes the extent of the damage and depends on the sensitivity of the system and its ability to adapt. The definition also incorporates exposure when it mentions that “the magnitude and

rate of climate change are important in determining the sensitivity, adaptability, and vulnerability of a system” (Working Group II to the Second Assessment Report of the IPCC, 1995).

The SAR also defines sensitivity and adaptability. Sensitivity is defined as “the degree to which a system will respond to a change in climatic conditions (e.g., the extent of change in ecosystem composition, structure, and functioning, including primary productivity, resulting from a given change in temperature or precipitation)” (Working Group II to the Second Assessment Report of the IPCC, 1995). Adaptability refers to “the degree to which adjustments are possible in practices, processes, or structures of systems to projected or actual changes of climate. Adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of changes in conditions”.

The SAR was aware of the difficulties in estimating the vulnerability of human health given the multiple interacting factors that could end up with the increase of a disease. It also included quantitative and qualitative analysis to estimate sensitivity, but not further discussion or methodologies for its measurement were included.

1.2.2 Third Assessment Report –TAR

The TAR kept using the basic concept of vulnerability of the SAR. Nevertheless the definition of vulnerability was widened to include two new areas: natural or social system. The definition kept sensitivity and adaptive capacity but it became more explicit about exposure¹.

The TAR is more specific about the difficulties in assessing vulnerability given the nonlinear, complex and irregular response of a system to climate stimuli (climate change). Consequently it also recognizes that given this situation most of the advances in understanding this response are qualitative.

Once again the Report highlights the difficulties in estimating the response of human health to climate variability and/or change given the multi-factorial relations between health determinants.

As in the SAR, not further discussion or methodologies for its measurement were included.

1.2.3 Four Assessment Report- FAR

The FAR complements the definition of vulnerability by including susceptibility to climate variability and extremes². The FAR specifies that identifying the impact of climate change on health is difficult given the short epidemiological time series and the importance of health determinants different from climate in the dynamic of diseases.

1.2.4 Conclusions

All assessment reports include a definition of vulnerability. The definition of vulnerability has been improving in its specificity but it keeps the underlying concept of susceptibility to harm. However none of the reports introduces or talks about specific vulnerability assessment methodologies.

¹ “Vulnerability is defined as the extent to which a natural or social system is susceptible to sustaining damage from climate change. Vulnerability is a function of the sensitivity of a system to changes in climate (the degree to which a system will respond to a given change in climate, including beneficial and harmful effects), adaptive capacity (the degree to which adjustments in practices, processes, or structures can moderate or offset the potential for damage or take advantage of opportunities created by a given change in climate), and the degree of exposure of the system to climatic hazards” (Working Group II to the Third Assessment Report of the IPCC, 2001).

² “Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, the sensitivity and adaptive capacity of that system.” (Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007).

1.3 Vulnerability in the context of World Health Organization -WHO-

1.3.1 Early works

The second consolidated report of the WHO about climate change and human health in 1996, did not address directly the issue of vulnerability. This report addressed the possible impacts of climate change and stratospheric ozone depletion on human health. Even though the document is a contribution to the SAR of the IPCC, where a definition of vulnerability was included, no specific or detailed framework about vulnerability was considered. Nevertheless, it is possible to infer the concept and the incorporation of aspects of vulnerability like adaptive capacity.

The document *Climate Change and Human Health: Impact and Adaptation* (Kovats, Menne, McMichael, Corvalan, & Bertollini, 2000) includes a vulnerability definition, as function of the exposure and the adaptive capacity. However, it considers sensitivity differentiated from vulnerability and defines them both as part of an impact assessment. In this context, the document focuses on impact evaluation and briefly describes two principal methods: analogue studies and predictive models. No detailed information or examples about methodologies are given. The document addressed some of the mechanism by which health could be impacted due to climate variability and extreme weather events, natural disasters, vector borne diseases, food security, water quality and quantity, heat stress and air pollution and social disruption.

1.3.2 WHO Methodologies

1.3.2.1 Advances to 2003

In 2003, WHO defined vulnerability as a function of sensitivity to climate change and populations capacity to adapt to new conditions (McMichael, Campbell-Lendrum, Ebi, Githeko, Scheraga, & Woodward, 2003). Compared to the previous definition, sensitivity now is a part of vulnerability. More information is given about specific studies about the impact of climate on health.

In 2003 also, WHO published another document that specifically addressed methods of assessing human health vulnerability to climate change (Kovats, Ebi, & Menne, 2003). In this document the IPCC definition of vulnerability, sensitivity, exposure and adaptive capacity are used. According to the document, estimating future potential impacts in order to identify adaptive measures requires measuring the current vulnerability (including the adaptation base line) and the adaptive capacity as the actions that will possibly improve the future coping capacity. The document also approximates vulnerability and adaptation assessment with health impact assessment. The steps suggested to conduct the vulnerability assessment are:

- Determine the scope of the assessment: health event, region and time period.
- Describe the current distribution and burden of climate sensitive diseases: literature review or statistical methods if the data allows it. It is important to have in mind the interacting effects (for example: high mortality in heat waves and high level of air pollutants). It also recommends having in mind other factors different from climate which influence vulnerability (socioeconomic conditions). However it does not specify how to do that.
- Identify and describe current strategies, policies and measures which reduce the burden of climate-sensitive diseases: the impact or effectiveness of the strategies should be integrated to this step when possible.
- Review the health implications of the potential impact of climate variability and change on other sectors: health is affected by many factors dependent from other sectors and the impact of climate change on those factors should be integrated into the assessment (e.g. agriculture and food security).
- Estimate the future potential health impact: using the climate change scenarios estimate the change in the health status (increase or decrease of the disease).

- Synthesize the results and draft a scientific assessment report: uncertainties should be explicit and measured (qualitative analysis of uncertainties).
- Identify additional adaptation policies and measures, including evaluation procedures.

The document also addresses the importance of including stakeholders from the beginning of the assessment; it is also important to define a management structure and to have a detailed risk communication plan. A consideration about the use of qualitative methodologies is also included given the lack of sufficient data and some information and consideration about estimating population, climatic and socioeconomic scenarios. This document gives specific information about methodologies to estimate health effects of:

- Heat and heat waves (direct effects).
- Air pollution.
- Disasters (floods and windstorms).
- Vector-borne diseases.
- Waterborne and foodborne diarrhoeal diseases.
- Stratospheric ozone depletion.
- Food security.

Specific groups of people who due to some intrinsic characteristics should be specifically addressed (elderly, children, and indigenous populations).

1.3.2.2 Advances to 2011

In 2009 the WHO and Pan American Health Organization –PAHO- joined forces and outlined guidelines for vulnerability and adaptation assessment (Ebi, Berry, Campbell-Lendrum, Corvalan, & Guillemont, 2011). The guidelines were tested throughout the WHO regions. With the feedback of the countries, WHO and PAHO improved the guidelines in 2011.

An important issue in this document is the definition of risk and how it is related to vulnerability (risk as a function of hazard and vulnerability).

The guidelines recognize in the beginning that climate change is not the only driver of health and in some cases is the least important.

The steps suggested to conduct the assessment are.

- Frame and scope of the assessment: as in the previous document by defining the geographic region, health outcome of interest. The guidelines also recommend establishing a project team and a management plan, involving the stakeholders in the process and developing a communication plan.
- Establish and describe the health risks of current variability and recent climate change and the public health policies and programmes to address the risk.
- Describe current risks of climate sensitive health outcomes, including the most vulnerable populations and regions: what is the current burden of climate sensitive diseases. Using visualizing tools like Geographic Information Systems is recommended. Additionally, in this step a preliminary identification of vulnerable populations is recommended.
- Analyze the relationship between current and past weather/climate conditions and health outcomes (sensitivity analysis). For this step, the use of methodologies like expert judgment or observational epidemiology is recognized. Once again, this document also calls the attention onto the problems of correlating a health outcome with climate change given the problems with short time series.
- Identify trends in climate change related process.
- Take into account the interactions between environmental and socioeconomic determinants of health.
- Describe the current capacity of the health and other sectors to manage the risk of climate change sensitive outcomes.

- Estimating future health risks and impacts under climate change.
- Describe the expected change of the risks of climate change sensitive outcomes without climate change.
- Estimate the possible additional burden of adverse health outcomes due to climate change: including the possibility of using qualitative and quantitative methods.
- Identify and prioritize policies and programmes to address current and projected health risks.
- Identify additional health and health care policies and programmes to prevent future health burdens.
- Prioritize public health and health care policies and programmes to reduce likely future health burdens: feasibility, costs and effectiveness.
- Identify resources and barriers for implementation.

This document does not address specific methodologies to estimate the impact of climate on health, but gives examples of the successful implementation of the steps proposed in the methodology.

1.3.3 Conclusions

The last two documents could be complementary in the sense that the first one gives examples and explains more about how to measure the health impacts of climate and the second one gives examples of the successful implementation of the steps proposed in the methodology. In terms of the methodology itself, both documents, in one way or another, address almost the same steps. Nevertheless, none of the documents are explicit about the conceptual framework, and even though they define vulnerability as a function of exposure, adaptive capacity and sensibility, they do not specify specifically how to measure those.

2 Methodologies implemented to assess vulnerability

For the scope of this report, the vulnerability definition used was the one in IPCC Third Report³. Consequently, this means that assessing vulnerability goes beyond estimating the correlation between a climate variable and a disease. Unfortunately, there are not many examples of vulnerability assessments that include all components of it (sensitivity, exposure and adaptive capacity). Many studies published as vulnerability assessment do not go beyond using qualitative or quantitative tools (i.e. statistical modeling) to estimate the correlations between a specific climate index or single variable with a disease and no consideration of the adaptive capacity is taken into account. This linear approach does not allow to capture the complexity involved behind a vulnerability assessment and integrate the interaction between climatic and non-climatic risk factors.

Consequently, the first step to assess vulnerability is to build a conceptual framework with a methodology⁴. The tool used will depend on the conceptual framework and the methodology chosen.

Brazil uses a quantitative methodology to assess the vulnerability of the population to the health impacts of climate and it ends up with a composite index. Brazil decided to frame the assessment in terms of the social-terms of the social-environmental vulnerability and the methodological framework was based on an exposure-response exposure-response model. The vulnerability definition used integrates the concepts of exposure, sensitivity and response

³ "Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, the sensitivity and adaptive capacity of that system." (Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007).

⁴ Methodology: "a complete framework that prescribes and entire process for the assessment of vulnerability and adaptation and offers a broad strategic approach" (UNFCCC, 2008)

"Tool: A means or instrument by which a specific task is accomplished" (UNFCCC, 2008)

sensitivity and response capacity. Three dimension of vulnerability were included: socio-economic, epidemiological, and climatologic. An index was developed for each dimension Table 1

Table 1 Vulnerability Dimensions

Dimension	Indicators
Socio-economic	Demography, income, education, sanitation, health
Epidemiologic (cholera, malaria, dengue, leptospirosis, leish. cutaneous, leish. visceral, hantavirus)	Incidence rate, proportion of hospital admissions, proportion of cause specific mortality, proportion of the total cost of hospital admission
Climatologic	Number of months with anomalous precipitation

No specific weights were given to each of the dimensions. The geographic delimitation was state (Confalonieri, Marinho, & Rodriguez, 2009).

Even though the diseases of interest for Brazil are not the same for Macedonia, the conceptual framework and the methodology is an example of how to measure the concepts behind a conceptual framework.

In terms of tools, in the document produced by UNFCCC (UNFCCC, 2008) about methods and tools to evaluate vulnerability and impact, include some tools like:

- MIASMA (Modeling Framework for the Health Impact Assessment of Man-Induced Atmospheric Changes)
- CIMSiM and DENSiM (Dengue Simulation Model)
- LymSiM
- Mapping Malaria Risk in Africa (MARA) Low-end Information Tool (LITe)

Nevertheless, the tools should be used according to the conceptual framework defined. Without a clear conceptual framework, using a tool could be confusing and the interpretation of the results be misunderstood.

In addition, it is important to evaluate how the tools go beyond estimating the impact and integrates concepts like adaptive capacity.

3 Conclusion

Given that vulnerability is absolutely dependent on local characteristics, it is difficult to find such a thing as a best practice in vulnerability assessment. Experiences from other countries could be used as a lesson learned. In addition, many studies named as vulnerability assessment, when are evaluated in deep, turn out to be health impact assessment that only get to establish correlations between health events and climate variables without including adaptive capacity and other sensitivity aspects.

About for using statistical and dynamic model one must first understand and analyze the conceptual framework under which the model was developed and identify whether the terms of the conceptual framework and characteristics fit the specific situation of the place.

The key step in assessing vulnerability is defining the most suitable conceptual framework for the specific characteristics of the country. In that sense, when defining the conceptual framework, different approaches could be used. Some authors differentiate between two vulnerability categories, external and internal. The interpretation depends on the author, but in general terms, the external refers to vulnerability related to outside factors from the system to be assessed. The Internal vulnerability refers to those aspects related to intrinsic characteristics of the system to be assessed. The United Nations when addressing disaster reduction activities distinguishes four groups of vulnerability factors: physical, economic, social and environmental (United Nations International Strategy for Disaster Reduction, 2004). Therefore, it is possible to find in literature multiple definitions and frameworks of vulnerability. In this regard, Fussel (Fussel, 2005) recommends distinguishing between two main factors of vulnerability: scale and domain Table 2.

Table 2 Vulnerability Domains

Domain	Socioeconomic	Biophysical
Scale		
Internal	Response capacity <i>e.g.</i> , household income, social networks, access to information	Sensitivity <i>e.g.</i> , topography, environmental conditions, current climate
External	“External social factors” <i>e.g.</i> , national policies, international aid, economic globalization	Exposure <i>e.g.</i> , severe storms, earthquakes, sea-level change

(Fussel, 2005)

In terms of the application of the conceptual framework, it is possible to find different options:

- Risk-hazard framework where risk is a function of the hazard and the vulnerability. This approach is widely used in disasters and some countries have integrated this approach to climate change vulnerability.
- Social constructivism: it is exclusively used for people. Includes only the socioeconomic vulnerability using models to try to analyze who is the most vulnerable and why.
- Hazard of place framework. It is a combination of the two previous ones.

In general terms, all vulnerability frameworks, when defining the scope, should integrate four aspects:

- The system or region to be assessed.
- Hazard.
- Attributed value.
- A temporal reference.

4 Recommendations

4.1 Define the scope

In general terms, all vulnerability frameworks, when defining the scope, should integrate four aspects:

- The system or region to be assessed.
- Hazard.
- Attributed value.
- A temporal reference.

For example, in the specific case of Macedonia it would be: “current vulnerability of human health to climate variability and change in Macedonia”.

This scope of the assessment should also consider the following aspects:

- Hazard:
 - Extreme climatic events (heat waves, torrential rains).
 - Climate variability (seasonality).
 - Climate change (long term change).
- The geographic region:
 - Rural.
 - Urban.
- The climatic variable:
 - Temperature (increase, decrease).
 - Precipitation (increase, decrease).

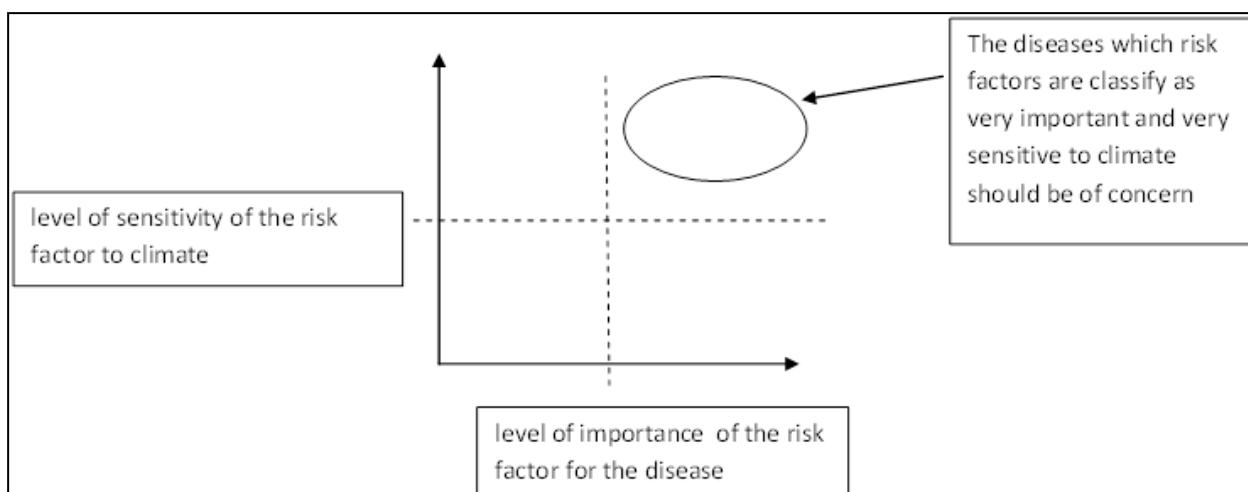
Defining which of the aspects will be part of the vulnerability assessment, will define the sensitivity, exposure and adaptive capacity aspects to be included.

4.2 Guiding questions to assess vulnerability

Once the scope of the assessment is clear, the following questions could be used to identify the specific sensibility, exposure and the adaptive capacity:

1. What is the diseases burden of the region (epidemiologic profile)? Table 3
2. What diseases of the epidemiologic profile are sensitive to climate? Specifically to the hazard identified in the scope definition. If long term climate change is the focus, it is important to have in mind the conditions expected from the climate change scenario for the region: increased or decreased temperature increased or decreased precipitations.
3. What are the risk factors/health determinants of those diseases? Literature review, expert judgment or evidence. (This would also help to identify what should be included in adaptive capacity)? Table 4
4. How important are risk factor/health determinants for the disease? If expert judgment or literature review are going to be used, the way to measure the importance should be chosen (from 1 to 10, high, high-medium, medium etc.) Table 4
5. How sensitive are the risk factors to climate (specifically to the conditions expected from climate change)? Literature review, expert judgment or evidence. If expert judgment or literature review is going to be used, choosing the appropriate way to measure the sensitivity is important (from 1 to 10, high important, high-medium, medium, etc.)Table 4. Risk factors that are highly sensitive and very important for the disease, should be included in the assessment.
6. Figure 1

Figure 1 Sensitivity vs. importance



7. What current health or other policies/strategies/programs are in place to attend the risk factors and/or the specific disease? (adaptive capacity) Table 5
8. How effective are the current health or other sector policies and programs in managing climate-sensitive health outcomes and its associated risk/determinants factors? (adaptive capacity) Table 5
9. How well are the current health or other sector policies and programs prepared for changes in demand due to changes in the geographical distribution, incidence or timing of climate-sensitive health outcomes? Table 5

Table 3 Epidemiologic profile

Disease burden or epidemiological profile	Type of measure (cases, incidence/prevalence, DALYS, QALYS)	Population exposed	Sensitivity to climate	Country specific evidence
Stroke (cerebrovascular disease)	DALYS	Elderly	yes	no
Malignant neoplasm (skin cancer)	DALYS	All population	yes	no
Acute respiratory Disease	Incidence Mortality > 5 years	All population specially children	yes	no
Acute Diarrohea Disease (ADD)	Incidence Mortality > 5 years	All population specially children	yes	no
Heat exhaustion	Incidence	All	yes	yes

		population, specially elderly		
Undernutrition				

Some examples were taken specifically for Macedonia from (Institution for Health Metric and Evaluation, 2013)

Table 4 Disease Sensitivity to Climate

	Sensitivity to climate*			
	Sensitivity to temperature Does the risk factor changes when temp increases?	Sensitivity to temperature. Does the risk factor changes when temp decreases?	Sensitivity to precipitation. Does the risk factor changes when precipitation increases?	Sensitivity to precipitation. Does the risk factor changes when precipitation decreases?
Disease name 1 (stroke)				
Risk factor 1 (in order of importance) (ambient particulate matter)				
Risk factor 2 (Household air pollution from solid fuels)				
Risk factor 3 (tobacco smoking)				
Disease name 2 (malignant neoplasm-skin cancer)				

Risk factor 1 (occupational exposure-farmers)	no	yes	yes	no
Risk factor 2				

*the question and the answer will change depending on the hazard definition (extreme event, seasonality, climate change), the climatic variable definition (temperature, precipitation) the region (urban, rural).

Table 5 Current adaptive capacity (policies)

Disease or risk factor	Policy/strategy/program	Level of effectiveness	Does the policy/strategy/program could be improved in the short/medium/long term (changes in demand)

5 Bibliography

Confalonieri, U., Marinho, D., & Rodriguez, R. (2009). Public health vulnerability to climate change in Brazil. *Climate Research*, 175-186.

Ebi, K., Berry, P., Campbell-Lendrum, D., Corvalan, C., & Guillemont, J. (2011). *Protecting Health from Climate Change. Vulnerability and Adaptation Assessment*. World Health Organization.

Fussel, H. (2005). *Vulnerability in Climate Change. Research: A Comprehensive Conceptual Framework*. Stanford University.

Institution for Health Metric and Evaluation. (2013, 06 05). *Global Health Data Exchange*. Retrieved 06 08, 2013, from <http://viz.healthmetricsandevaluation.org/gbd-compare/>

Islam, B., Kamberi, M., Demira, E., & Fida, E. (2002). *The First National Communication of the Republic of Albania to the United Nations*. Ministry of Environment.

Kovats, R. S., Menne, B., McMichael, A., Corvalan, C., & Bertollini, R. (2000). *Climate Change and Human Health: Impact and adaptation*. Geneva: World Health Organization.

Kovats, S., Ebi, K., & Menne, B. (2003). *Methods of assessing health vulnerability and public health adaptation to climate change*. Geneva: World Health Organization.

McMichael, A. J., Campbell-Lendrum, D., Ebi, K., Githeko, A. K., Scheraga, J. D., & Woodward, A. (2003). *Climate change and human health. Risk and responses*. Geneva: World Health organization.

The Climate Change and Health Committee of the Ministry of Health. (2011). *Climate change health adaptation strategy and action plan of the former Yugoslav Republic of Macedonia*. Skopje: World Health Organization.

UNFCCC. (2008). *Compendium on methods and tools to evaluate impacts of, and vulnerability and adaptation to, climate change*. UNFCCC Secretariat.

United Nations Development Program-Capacity Development, Group Bureau for Development Policy. (2008). *Capacity Assessment Methodology*.

United Nations Framework Convention on Climate Change. (2011). *Report of the Conference of the Parties on its sixteenth session, held in Cancun*. Cancun: United Nations Framework Convention on Climate Change.

United Nations Framework Convention on Climate Change. (n.d.). *United Nations Framework Convention on Climate Change*. Retrieved May 28, 2013, from <http://unfccc.int/resource/docs/cop7/13a04.pdf#page=7>

United Nations International Strategy for Disaster Reduction. (2004). *Living with Risk: a Global Review of Disaster Reduction Initiatives*. Geneva: United Nations.

Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. (2007). *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Cambridge: Cambridge University Press.

Working Group II to the Second Assessment Report of the IPCC. (1995). *Climate Change 1995. Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses*. Melbourne: Cambridge University Press.

Working Group II to the Third Assessment Report of the IPCC. (2001). *Climate Change 2001: Impacts, Adaptation and Vulnerability*. Melbourne: Cambridge University Press.

