



Modelling the Spatial Distribution of Five Natural Hazards in the Context of the WHO/EMRO Atlas of Disaster Risks as a Step Towards the Reduction of the Health Impact Related to Disasters



World Health Organization

Regional Office for the Eastern Mediterranean

Modelling the spatial distribution of five natural hazards in the context of the WHO/EMRO Atlas of Disaster Risk as a step towards the reduction of the health impact related to disasters

Zine El Abidine El Morjani¹, Steeve Ebener*², John Boos¹, Eman Abdel Ghaffar¹ and Altaf Musani¹

Address: ¹Emergency Preparedness & Humanitarian Action, World Health Organization Regional Office for the Eastern Mediterranean, P.O. Box 7608, Nour City (11371), Cairo, Egypt and ²Evidence and Information for Policy, World Health Organization, 20 av. Appia, 1211 Geneva 27, Switzerland

Email: Zine El Abidine El Morjani - elmorjaniz@gmail.com; Steeve Ebener* - ebener@who.int; John Boos - jboos@bushnet.net; Eman Abdel Ghaffar - aghaiffar@emro.who.int; Altaf Musani - cha@emro.who.int

* Corresponding author

Published: 7 March 2007

Received: 22 December 2006

Information of *Journal of Health Geographics* 2007, 6:8 doi:10.1186/1476-072X-6-8

Accepted: 7 March 2007

This article is available from: <http://www.ij-healthgeographics.com/content/6/1/8>

© 2007 El Morjani et al; licensee BioMed Central Ltd.
This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

Background: Reducing the potential for large scale loss of life, large numbers of casualties, and widespread displacement of populations that can result from natural disasters is a difficult challenge for the individuals, communities and governments that need to respond to such events.

While it is extremely difficult, if not impossible, to predict the occurrence of most natural hazards; it is possible to take action before emergency events happen to plan for their occurrence when possible and to mitigate their potential effects.

In this context, an Atlas of Disaster Risk is under development for the 21 Member States that constitute the World Health Organization's (WHO) Eastern Mediterranean (EM) Region and the West Bank and Gaza Strip territory.

Methods and Results: This paper describes the Geographic Information System (GIS) based methods that have been used in order to create the first volume of the Atlas which looks at the spatial distribution of 5 natural hazards (flood, landslides, wind speed, heat and seismic hazard).

It also presents the results obtained through the application of these methods on a set of countries part of the EM Region before illustrating how this type of information can be aggregated for decision making.

Discussion and Conclusion: The methods presented in this paper aim at providing a new set of tools for GIS practitioners to refine their analytical capabilities when examining natural hazards, and at the same time allowing users to create more specific and meaningful local analyses.

The maps resulting from the application of these methods provides decision makers with information to strengthen their disaster management capacity. It also represents the basis for the reflection that needs to take place regarding populations' vulnerability towards natural hazards from a health perspective.

Zine El Abidine El Morjani, Steeve Ebener, John Boos, Eman Abdel Ghaffar and Altaf Musani

<http://www.ij-healthgeographics.com/content/6/1/8>

Launch of the WHO/EMRO Atlas of Disaster Risk: Volume 1 – Exposure to Natural Hazards

Musani A., Ebener S., El Morjani Z., Boos J., Thomsen I.

<http://unstats.un.org/unsd/geoinfo/17thunrccapIP9.pdf>

Outline of the presentation

- **The context**
- **The e-Atlas of Disaster Risk for the Eastern Mediterranean Region**
- **Volume 1**
 - **Content**
 - **Space based technology**
 - **Geographic Information System (GIS)**
- **Future steps**
- **Conclusion**



Eastern Mediterranean Region

- **Afghanistan**
- **Bahrain**
- **Djibouti**
- **Egypt**
- **Iran**
- **Iraq**
- **Jordan**
- **Kuwait**
- **Lebanon**
- **Libya**
- **Morocco**
- **Pakistan**
- **Qatar**
- **Oman**
- **Saudi Arabia**
- **Somalia**
- **Sudan**
- **Syria**
- **Tunisia**
- **United Arab Emirates**
- **West Bank and Gaza Strip**
- **Yemen**



The Diversity of Crisis



Complex emergencies: Afghanistan, Lebanon, Iraq, Sudan, Opt, Somalia



Natural disasters: Iran, Pakistan, Djibouti, Yemen, Morocco...

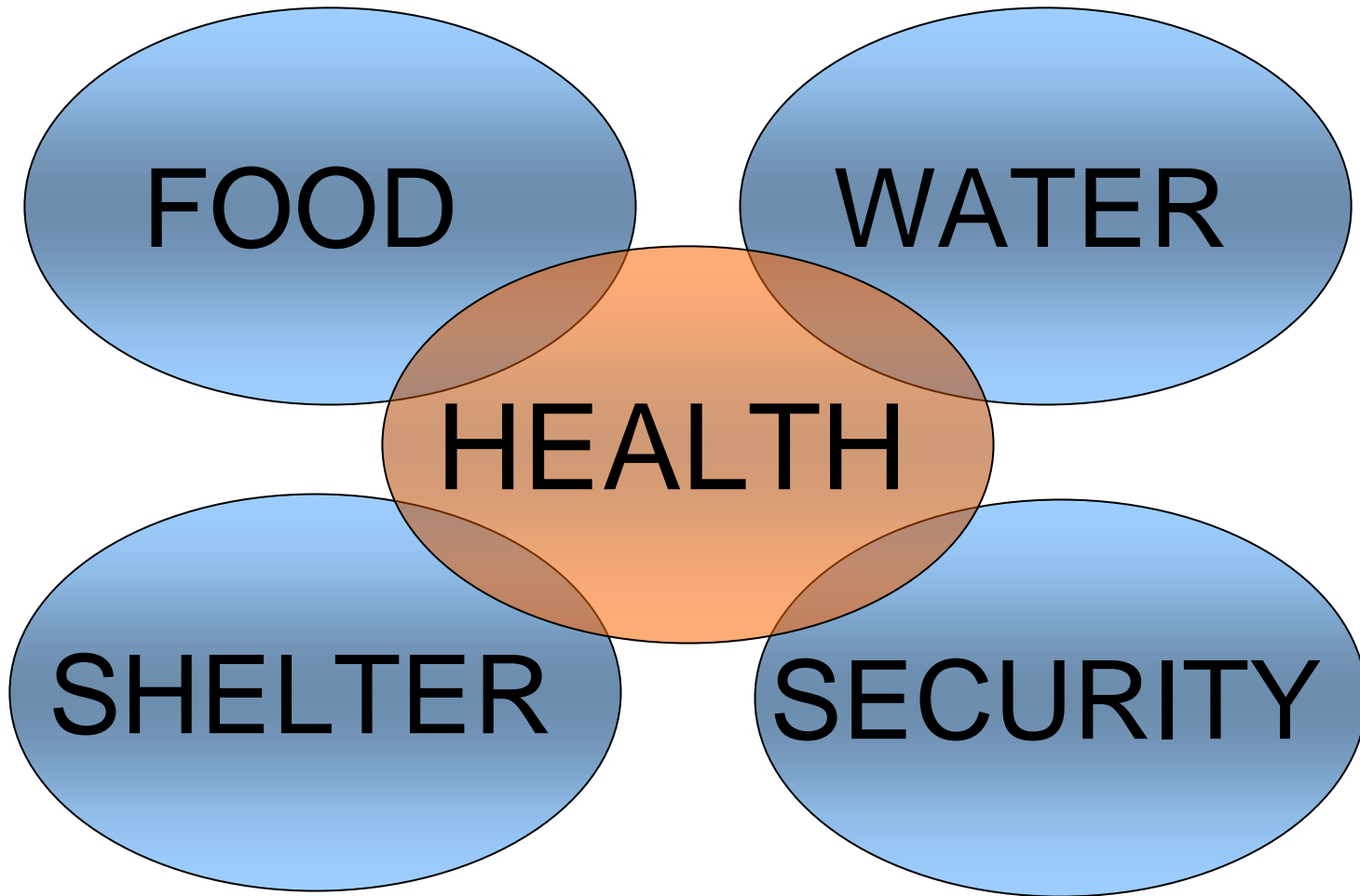
Recent trends in EMR Region

Four Major Emergencies over last 5 years:

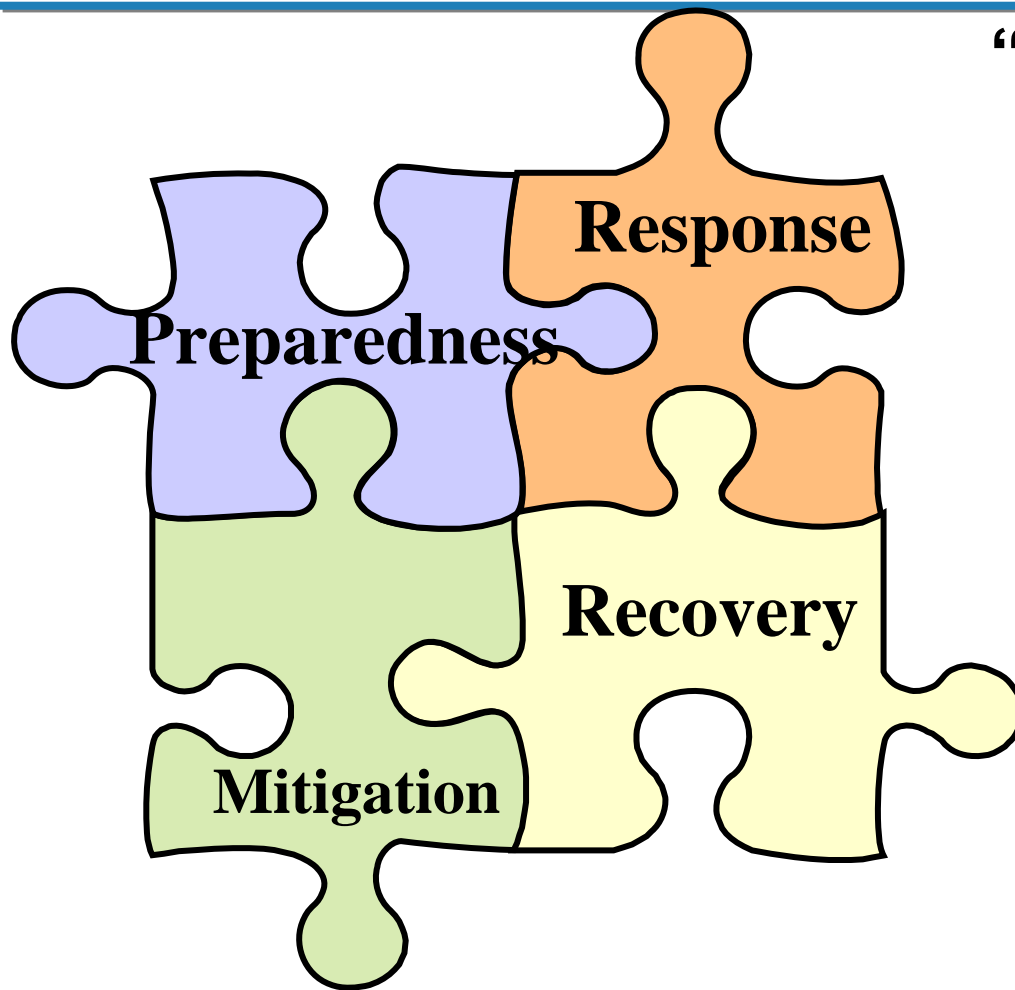
- **Lebanon Crisis** :\$5+ million, 900,000 people affected
- **Pakistan Earthquake**: \$15+ million, 3.2 million people affected
- **Darfur Crisis**: \$20+ million, 4 million people affected
- **Iraq Crisis**: \$100+ million, 25 million people affected

And others: Horn of Africa Drought, Bam earthquake, etc

Our challenge in response



Strategic framework provided by the World Health Assembly in 2005



“Urging all Member States to build up the national capacity for emergency preparedness and disaster reduction/mitigation and response, in order to reduce avoidable mortality and disability”

Health Survey in the EM Region

“Assessing the Level of National Disasters Preparedness”

Although 95% had experienced disasters in the past , however ...

	<i>Does not exist in ... countries</i>
National policy or higher committee	6
Regular simulation exercises	10
Health sector plan for emergency response	6
Mitigation measures for health facilities	10
Community involvement	6
Standard Operating Procedures for response	12
National Disaster database of hazards and risks	12
Donor cooperation and resource mobilization	13
Human resources strategy (training)	13

✓ 20 countries responded out of the 22 countries in EMR (did not respond: Saudi Arabia & Qatar)

The e-Atlas of Disaster Risk for the Eastern Mediterranean Region

Activities essential for effective disaster mitigation and planning include (Noji, 1997):

- **Mapping specific potential disaster locations,**
- **Pinpointing potential disaster-associated risks,**
- **Conducting a vulnerability analysis,**
- **Developing an inventory of existing disaster response capacities and resources,**
- **Planning and implementing appropriate preventive, preparedness, and mitigation measures, and;**
- **Conducting education, awareness raising and training of health personnel and the community to better respond to disasters if and when they occur**

The e-Atlas of Disaster Risk for the Eastern Mediterranean Region

Obtains the spatial distribution of the risks for five natural hazards (floods, heat, earthquakes, wind speed and landslides) with the objective to better understand the health impact and this in 3 phases:

- Exposure to natural hazards (Volume 1)
- Vulnerability (Volume 2)
- Risk reduction (Volume 3)

Risk = Hazard x Element at Risk x Vulnerability

Elements at Risk = population and health infrastructures

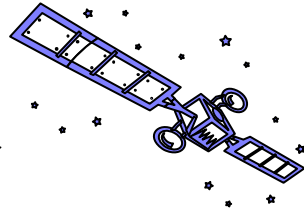
Volume 1 - Content

The first volume of the Atlas to be released soon (CD) will contain:

- **the data (when redistributable) and protocols that have been used in order to generate the spatial distribution of the five selected natural hazards,**
- **the resulting maps in pdf (country level) and GIS (regional level) format;**
- **regional and country level summary tables presenting the total and percentage of the population exposed to each hazard**
- **other information of interest regarding natural disaster risk assessment (glossary, web sites, reports, publications,...)**



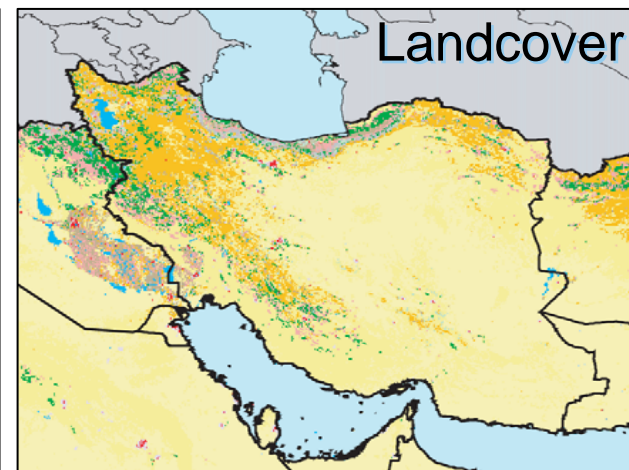
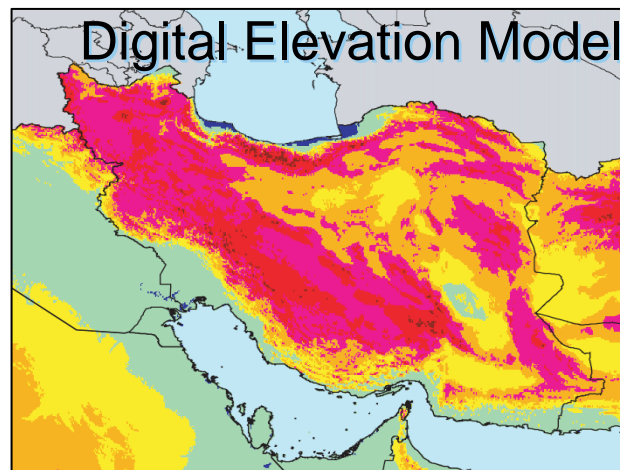
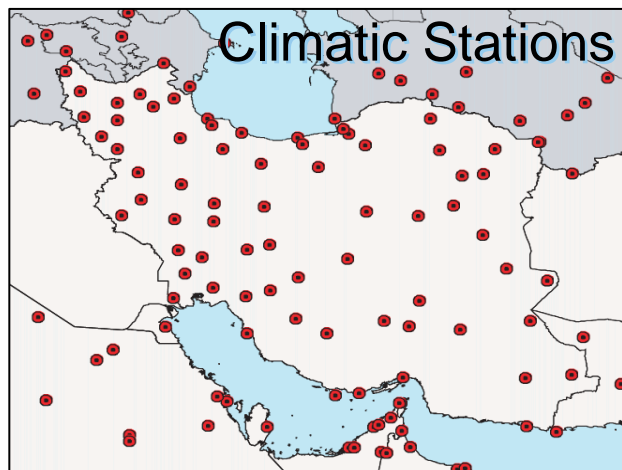
Volume 1 – Space-based technology



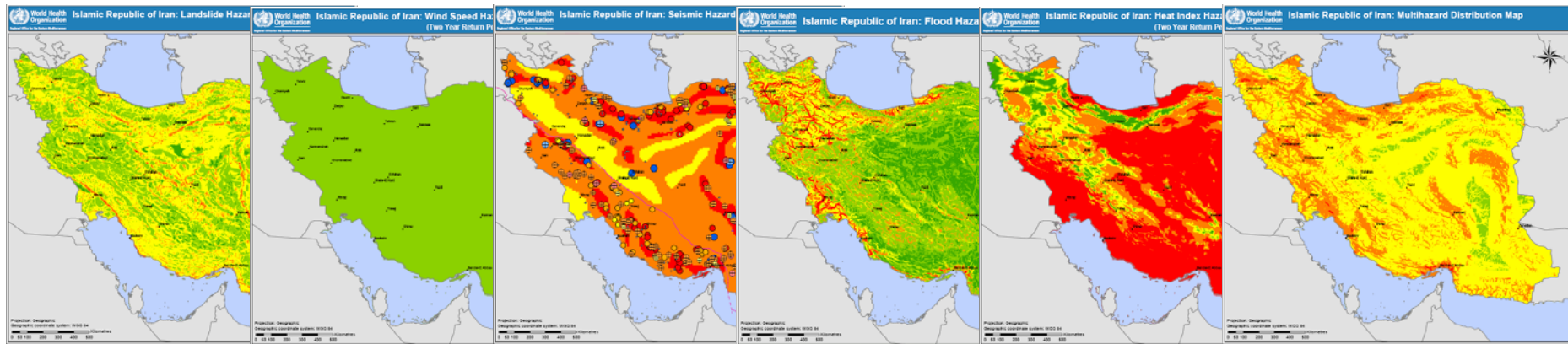
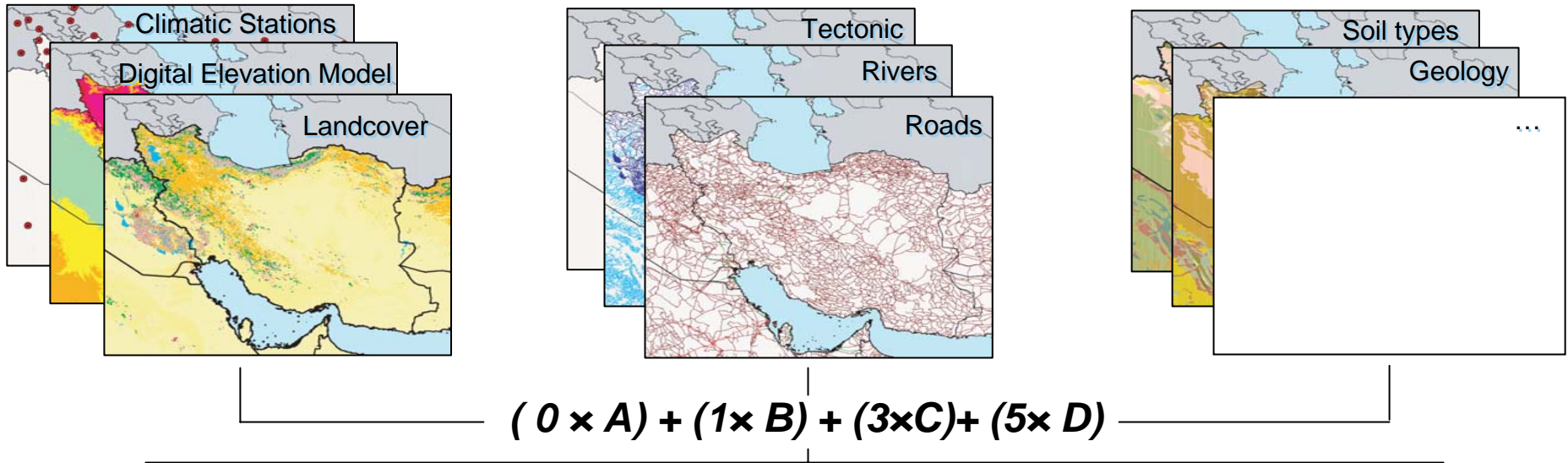
GPS

Radar
imagery

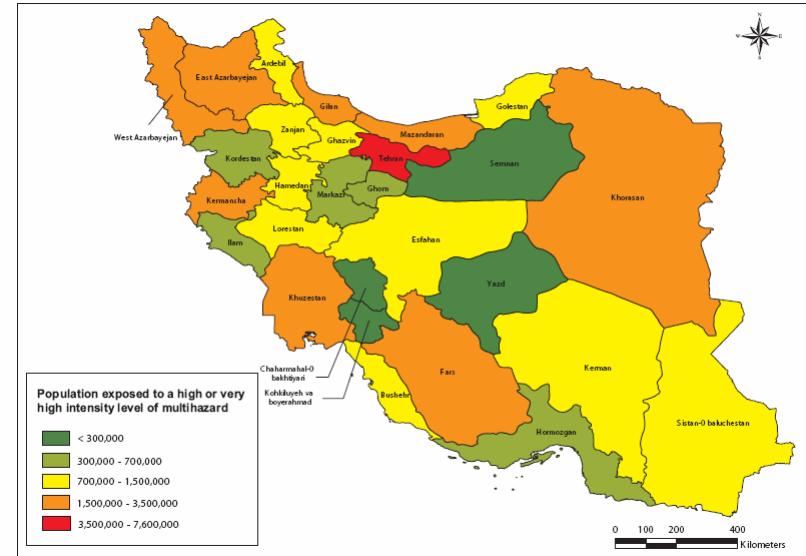
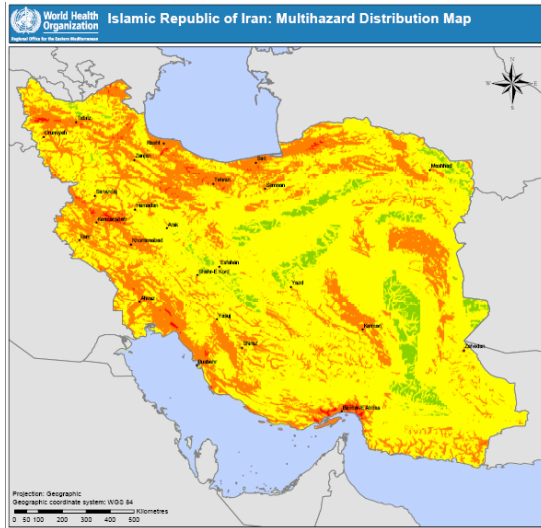
Optical
imagery



Volume 1 - Geographic Information System (GIS)



Volume 1 - Geographic Information System (GIS)



Population Distribution

Islamic Republic of Iran

Country total population: 69515206

Total and percentage of population exposed by level of intensity for each hazard

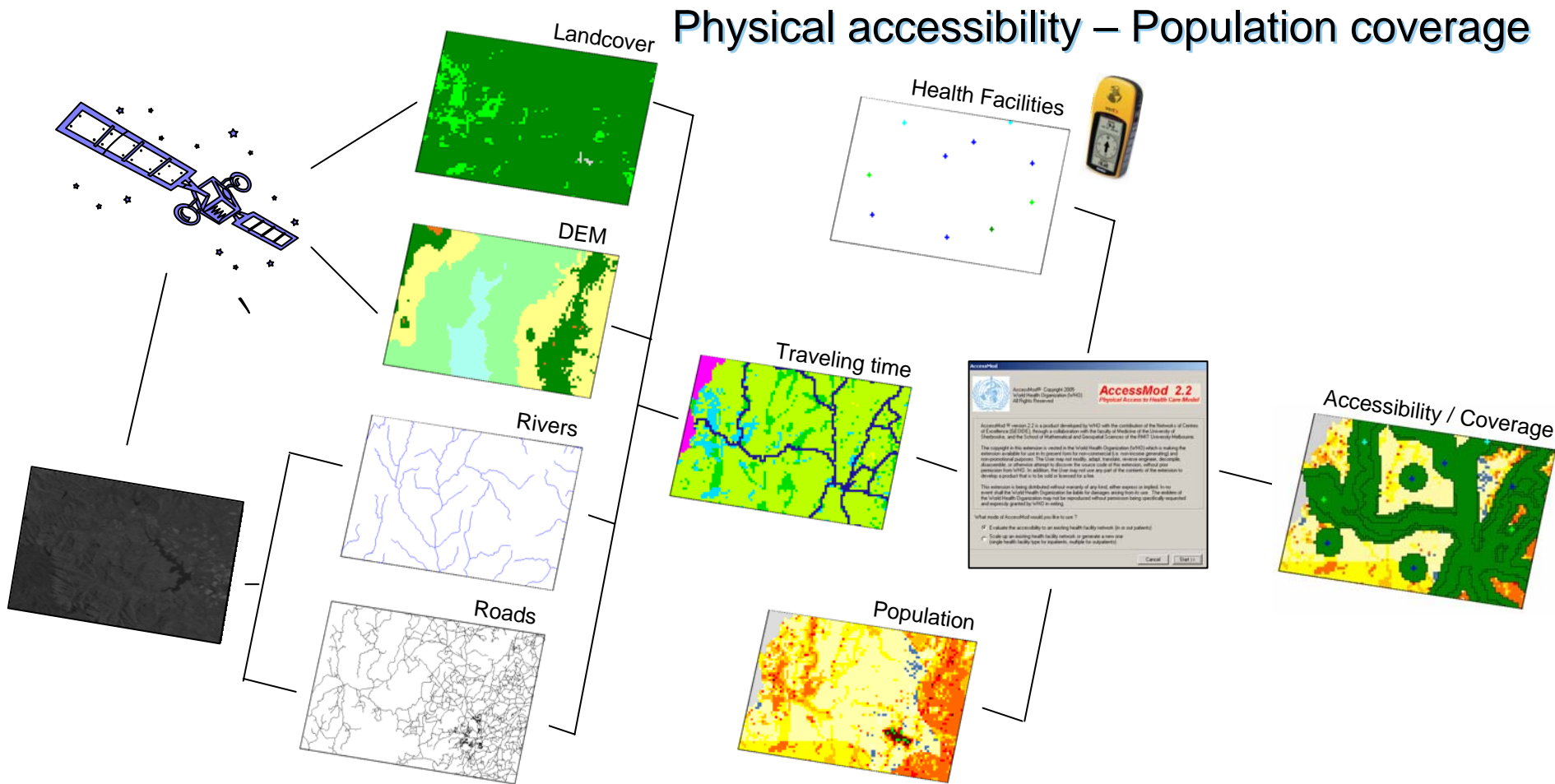
Level of intensity	Heat 2 year return period	Heat 5 year return period	Heat 10 year return period	Wind speed 2 year return period
Very low	465706 (1%)	666761 (1%)	399633 (1%)	1 (<1%)
Low	961489 (1%)	961072 (1%)	300619 (<1%)	69514234 (100%)
Medium	7929395 (11%)	3135395 (5%)	1733241 (2%)	921 (<1%)
High	23628384 (34%)	12152720 (17%)	8434744 (12%)	0 (0%)
Very high	36530183 (53%)	52609209 (76%)	58646919 (84%)	0 (0%)
No data	50 (<1%)	50 (<1%)	50 (<1%)	50 (<1%)

Future steps

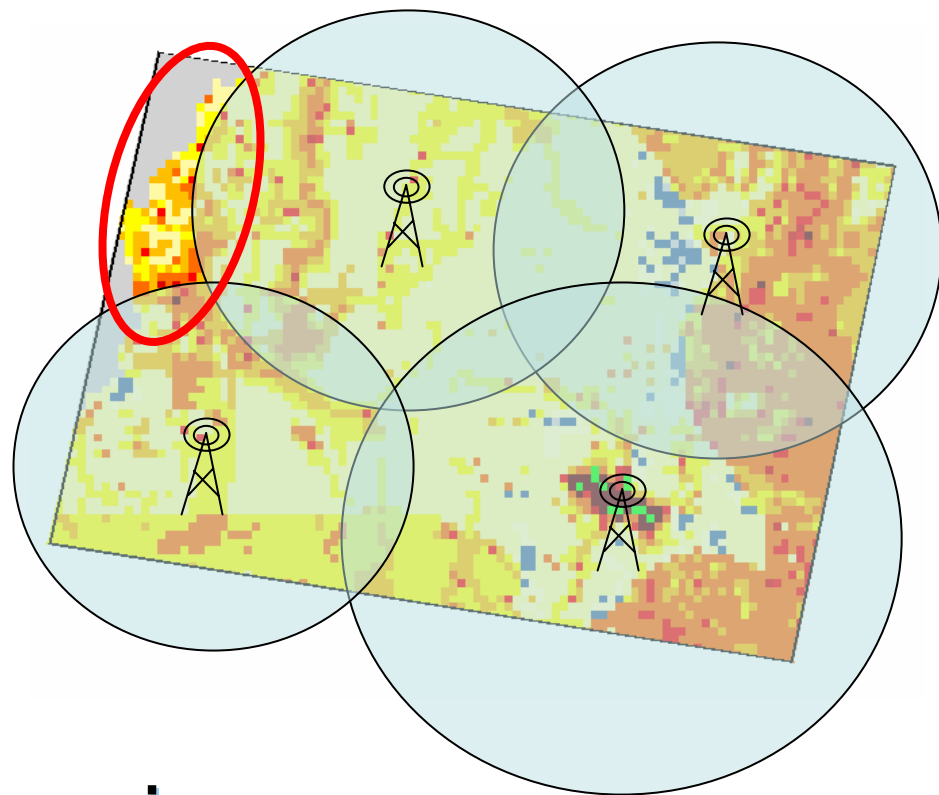
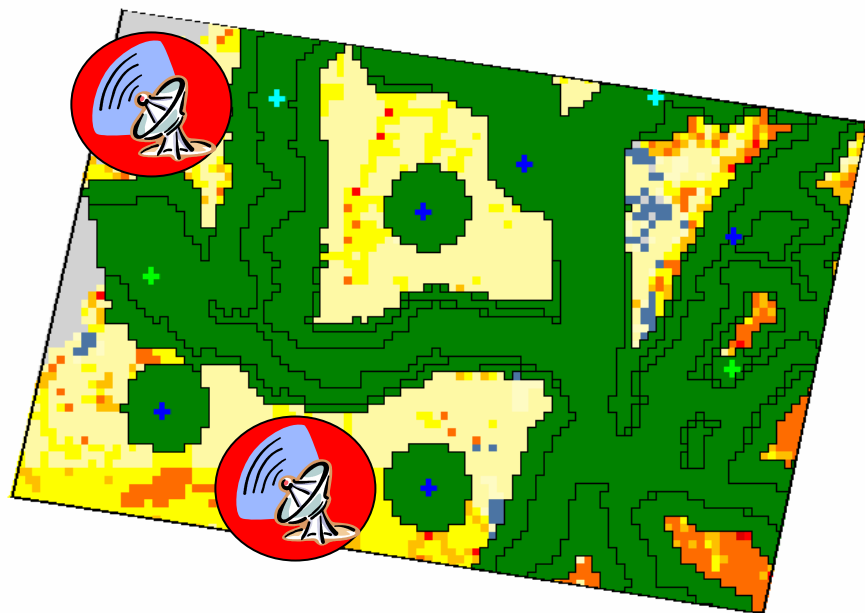
- **Finalize Volume 1 and insure its distribution**
- **Improve the method used for modelling the spatial distribution of the heat hazard (look at heat waves)**
- **Add new hazard in the list (drought and maybe cyclones) in collaboration with other partners;**
- **Apply the methods on national data to test their quality at that level;**
- **Allow for the estimation of population exposure at the sub national level (SALB)**
- **In collaboration with partners, compile and/or develop the content and methods for the 2nd volume of the Atlas that will look at population and health infrastructure vulnerability**



Future steps – Example of use of GIS



Future steps - Connection with Telemedicine / Telecommunication



➔ Planning

Conclusion

- **The maps that are produced in the context of the first volume can already be used by decision makers for disaster mitigation and planning thus demonstrating the possible use of GIS in this regards**
- **The methods that have been presented could be applied in other part of the world**
- **This type of application could be used to support the development of National Spatial Data Infrastructure (NSDI) as it requires the inputs and data from many sectors**
- **Work remains to be done and data to be found in order to develop the vulnerability layer.**



Thank you for your attention



**Mr Altaf Musani, Regional Advisor
Emergency Preparedness and Humanitarian
Action
Regional Office for the Eastern Mediterranean
World Health Organization**

**www.emro.who.int/eha
eha@emro.who.int**

SALB: http://www3.who.int/whosis/gis/salb/salb_home.htm

AccessMod: <http://www.who.int/kms/initiatives/accessmod/en/index.html>

**Dr Steeve Ebener, Project Manager
Evidence, Information and Research (EIR)/
Knowledge Management and Sharing (KMS)/
eHealth (EHL)
World Health Organization
Head Quarter, Geneva**

ebeners@who.int