The simulation of the influence of the environmental factors regarding the health of the population

❑ The quantitative study of the epidemiology refers to "how much of a health problem is a disease or an occurrence."

❑ The distribution studied by means of epidemiology refers to the distribution study of health problems in the population depending on location, time and personal characteristics.

❑ The purpose of the epidemiology consists in obtaining, interpreting and in useful information regarding health in order to promote health and reduce the impact of the disease.

❑ An unique collection of directives to prevent the spread of disease.

❑ Rapid reinforcement procedures for collecting information, determining when an event constitutes a risk to the public health and international aid request from OMS

❑ A tool for the 21st century - was predicted that RSI 2005 will take into account the propagation speed and progress of electronic communication

❑ Improving the response time if pathogens are detected in the target area, due to modern methods of acquisition, processing and transmission of data and information

❑ Improving the accuracy of both forecasts on the evolution of infectious diseases, and on the spread times of pathogens

Purpose

❑ To identify health hazards and the needs of the affected population in order to plan interventions, and to protect and prevent an uncontrolled evolution of the infectious diseases.

❑ To study the causes, conditions and mechanisms of morbidity among the human population and to develop and implement measures to prevent and combat this situation

❑ To develop a joint cross-border infrastructure able to monitor, detect and model the epidemiological risks

❑ Specific identification and monitoring for certain risk factors

❑ To increase the response/intervention capacity in emergency situations.

❑ The analysis using automated systems for the identification of the contaminant and thereby improve the intervention time with approx. 70%.

❑ To reduce the time spent collecting and processing the data. It reduces the time for collecting and processing the data with approx. 80%.

General Objectives

- ❑ To develop long-term solutions for emergency situations caused by epidemics, pandemics or bioterrorism actions.

- ❑ The project will develop the cross-border partnership between institutions legally empowered to monitor the occurrence and evolution of infectious diseases in the eastern border region.

❑ To establish a monitoring and warning system for emergency situations for the occurrence and evolution of infectious diseases in the eastern border region

❑ The monitoring and warning system will be developed in order to operate in all three emergency situations that may arise: epidemics, pandemics and bioterrorism

❑ Mathematical models that will predict how certain viruses spread in different situations will be developed within the project.

❑ The following *environmental parameters* are being monitored:

- temperature

- wind speed

- humidity

❑ The following *statistic population parameters* can be considered:

- total number of administrative units

- consistency

❑ The following *transport routes* are being monitored:

- railway

- roads

- naval

❑ The following information regarding an outbreak can be stored:

- outbreak position

- number of contaminated persons

- The type of the contaminating agent

❑ Pathogens with epidemiological significance for border areas with increased transmission risk:

- B,C,D Hepatitis viruses
- Seasonal flu viruses
- Herpes viruses (VVZ)
- Rotaviruses
- E.coli O157H7
- Salmonella typhi
- Vibrio holerae
- Corynebacterium diphteriae
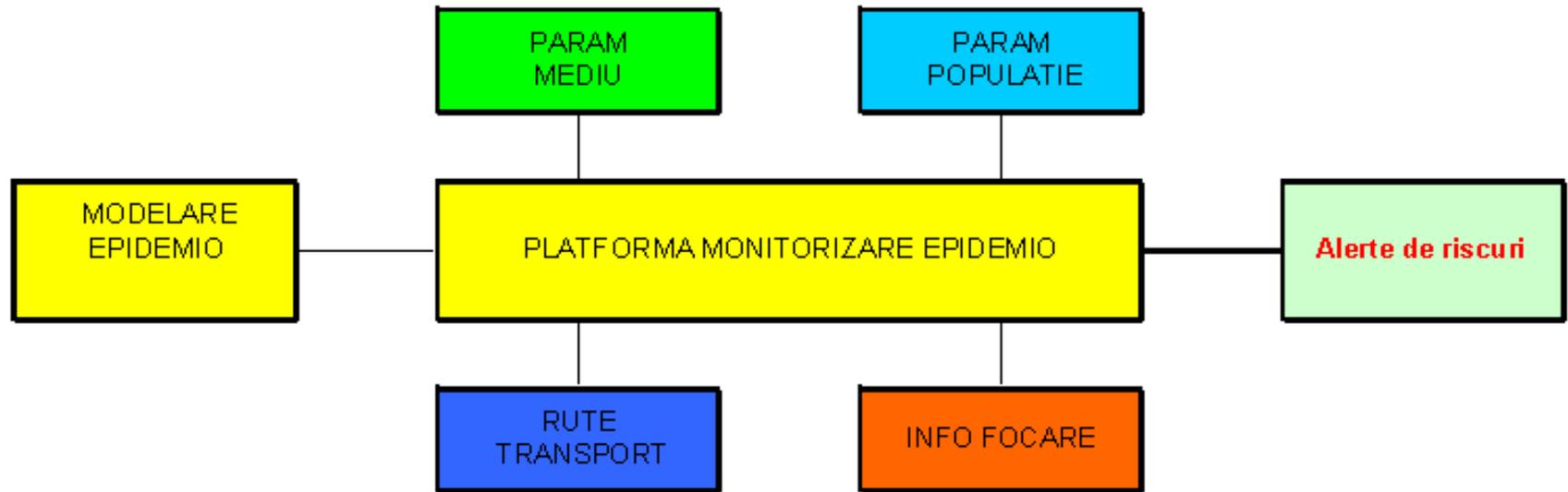- Mycobacterium tuberculosis

❑ Pathogens involved in the natural evolution or through bioterrorism in the occurrence of epidemics or agents with pandemic potential :

- Potentially pandemic flu viruses (H5N1, H1N1)
- Viruses with pandemic potential (SARS)

❑ Other types of pathogens:

- Cryptosporidium parvum
- Toxoplasma gondii
- Giardia lamblia

Solution architecture

❑ Mathematical model of differential calculation(differential equations system)

❑ The generation of simulations for the causal relationship between the occurrence of various diseases within the population and the variation/contamination of the environment factors

❑ The generation of simulations regarding the effect on the population health as a consequence of the environment factors alterations (accidental pollution of groundwater, air pollution, etc)

❑ The analysis and simulation on geographic regions with implications on the health of the population and possible similar effects on the neighboring regions

General elements of the simulation

❑ The division of the analyzed territory on regions

❑ The characterization of the territory in terms of environment parameters (water, air, soil, radioactivity)

❑ The statistical association of the environment factors values with a medical database of the associated diseases

❑ The influence of the environment factors in the occurrence of various pathologies (exposure to organic dust or chemical agents able to cause asthma, exposure to radon or asbestos which can cause lung cancer, etc)

❑ Interregional methods of communication – the method in which inter-regions influences can occur with the alteration of an environment factor from a certain region (ie: a situation of accidental pollution of a flowing water, transmitting ash and dust through air)

Statistical databases. Regional characterization

❑ Population - age, gender

❑ General health condition – statistical databases of the dominant pathologies

❑ Environment – multiannual statistics of the values of the environment parameters (air, water, soil, radioactivity, noise)

❑ Groundwater

❑ Industry – polluting or potentially polluting industrial agents

❑ Hazardous waste

Industry – Environment factors – Population health

❑ The characterization, on regional level, of the effect on the environment parameters of the industrial processes

❑ The identification of the environment risks related to industrial activities

❑ The simulation of the factors evolution by simulating an intervention on certain industrial processes and transitive, simulating the effects on the health of the population

❑ Industrial regional maps with the associated environment parameters

Waste – Environment factors– Population health

❑ The effects of treating/eliminating waste

❑ Monitoring the effects of the technological processes in terms of treating and eliminating the waste on the environment factors

❑ Monitoring the management of hazardous waste

❑ Regional waste maps

Graphical simulation. Own GIS
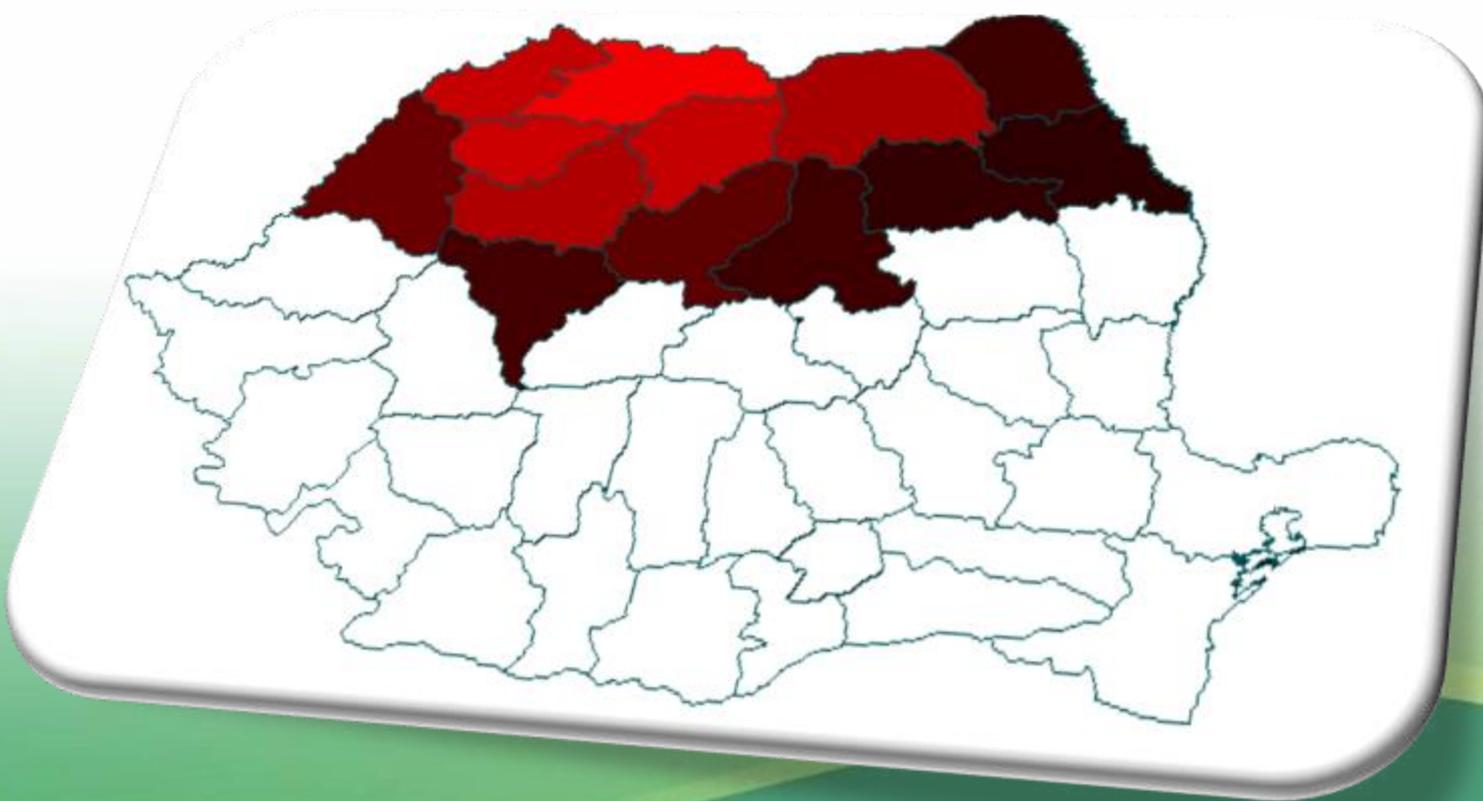
Graphical simulation. Google Earth integration