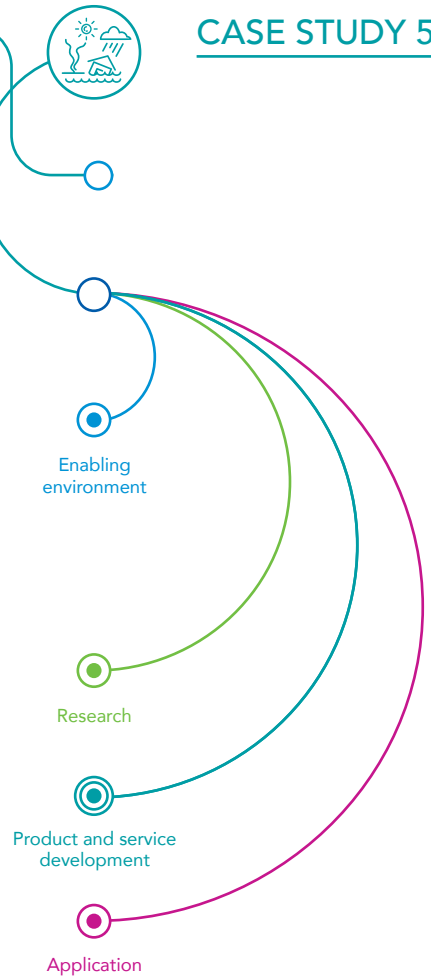

CASE STUDY 5D

MONITORING SYSTEMS AND INTEGRATED SURVEILLANCE

THE BRAZILIAN OBSERVATORY OF CLIMATE AND HEALTH: EXPERIENCE OF ORGANIZING AND DISSEMINATING CLIMATE AND HEALTH INFORMATION IN MANAUS, AMAZON REGION

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CONTEXT

Global environmental and climate changes have been increasing over recent decades, and may produce impacts on human health in various ways and intensities. Some of these changes have a direct impact on the health and well-being of the population, such as occurrences of extreme events (e.g. heat waves, hurricanes, storms and floods). However, most of the impacts are indirect and mediated by changes in the environment, such as changes to ecosystems, their biodiversity and their biogeochemical cycles *(22)*. The groups of diseases that may be affected by environmental and climate changes include vector-borne diseases, respiratory and cardiovascular diseases, water-borne diseases and a variety of health problems affected by prolonged drought or floods, such as hunger, malnutrition and mental illness *(23)*.

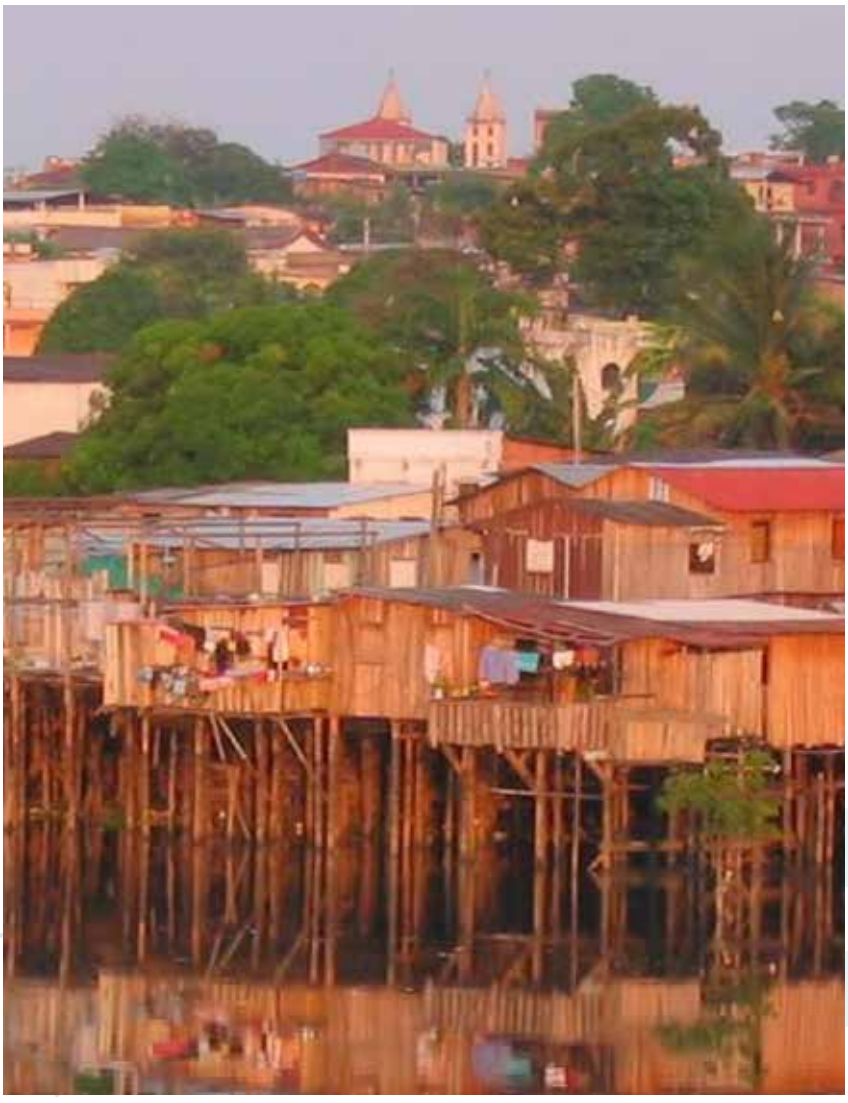
In view of the complexity of the processes that determine the impact of global environmental and climate change on health, it is essential to bring together and analyse data in such a way as to provide society, government agencies and the media with information on these changes. According to Vera et al. *(24)*, the main challenges for that purpose are: construction of partnerships between administrators, users and civil society and climate data producers; translation of long-term data into information a regional and local scales, in accordance with decision-making levels; maintenance of global climate observation systems; and procedures for integration, quality assessment, processing and analysis of relevant data for climate forecasting.

NEW APPROACHES

The objective of the Brazilian Observatory of Climate and Health (www.climasaude.icict.fiocruz.br) is to collect, organize and disseminate environmental, sociodemographic, climate, population and health data, with the aim of constructing indicators for monitoring the health-related effects of environmental and climate changes. Thematic workshops were held between 2009 and 2012 to define the data to be made available, the data sources and the integration strategies. In the workshops, a set of sentinel sites – settings where some local problems possibly affected by environmental and climate change were being studied – were selected based on the quality of data available, level of participation of local stakeholders (generally research institutions and civil society organizations) and the respective biomes of their location. These sentinel sites allow study of the temporal association between climatic variables and diseases, and act as 'warning posts' for changes in health conditions relating to climate.

Among the sentinel sites, Manaus, a large city in the Amazon region, was selected to monitor and analyse the associations between climate variables and water-related diseases.

Figure 5.9 Houses built on stilts (*palafitas*) along the Negro River (Manaus, Brazil).



CASE STUDY 5D

BENEFITS AND LESSONS

Climate and health indicators are made available by means of dynamic graphs that allow users to raise hypotheses regarding seasonality and long-time trends in association between variables. Users' requirements for information are transformed into data queries sent in real time to data producing sources. Studies carried out in sentinel sites such as Manaus focus on water-borne diseases (from the Health Informatics Department: DATASUS), land use (from the Institute of Space Research: INPE) and the water level in the Negro River (from the National Agency of Water Resources: ANA). They showed correlations between river water level, precipitation and disease incidence. A website was established to disseminate information in the form of media news, scientific papers as well as online climate and health data *(25)*. The diagram in Figure 5.10 shows the structure of the system.

Figure 5.10 Data loading model for sentinel sites.

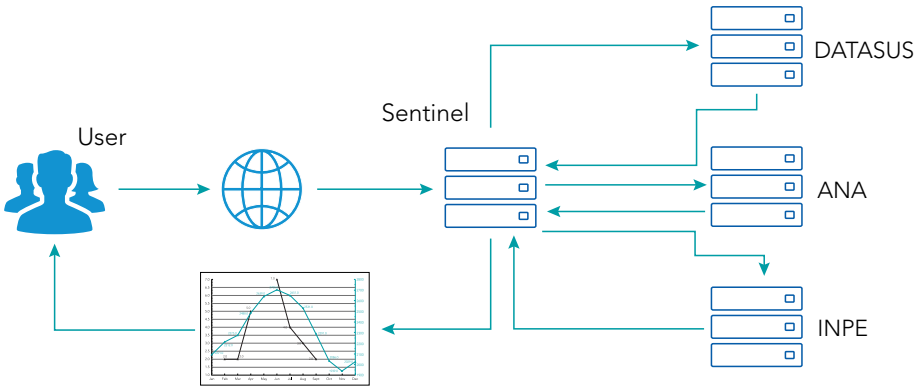
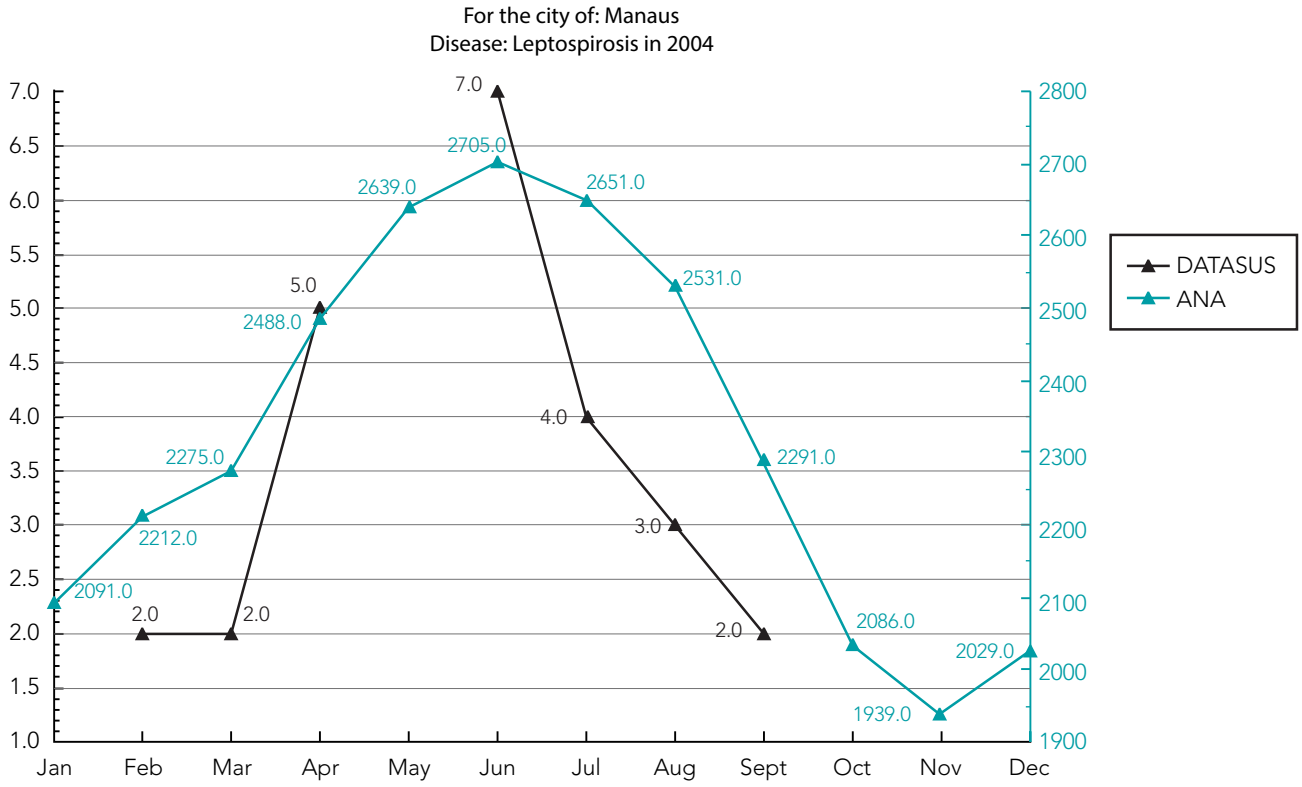


Figure 5.11 shows the graph resulting from a user query. It demonstrates the dynamics of the variables of the climate (i.e. level of the Negro River) and health (i.e. hospital admissions due to leptospirosis) over time. In the months of May to July, the river reaches its annual maximum level, which is immediately followed by an increase in the number of cases of leptospirosis.

Figure 5.11 Dynamic graph of river water level and leptospirosis incidence.



ACKNOWLEDGEMENTS

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The level of the Negro River is a strong regulator of the city's social and economic dynamics, a situation that the population has grown accustomed to *(25)*. The persistence of low-cost traditional houses built on stilts, known locally as palafitas (Figure 5.9), demonstrates the local population's capacity to adapt to river level variations, provided they occur within a range that does not compromise the functioning of the transportation, water supply, food supply and sewage systems.

Greater variations in extreme drought and extreme flooding, such as those occurring in the years 2005, 2009, 2012 and 2014, may cause these systems to collapse, increasing the risk for disease transmission. These events have been occurring with greater frequency over the past two decades, providing evidence of the increasing health risk. Adaptation is an urgent priority involving health, urban planning and environmental sectors. One of the recent measures taken was the establishment of a minimum altitude for the construction of residences and sanitation systems, which must now be built above the observed river peak levels.