

Chapter 17

Modeling the Effects of the Quality of the Environment on the Health of a Selected Population

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ABSTRACT

This chapter is focused on the modeling and analysis of the relation between environment and health. Many research papers have found links between environment and the health of a population and our starting point are these articles. The chapter is divided into three main parts and is focused on the regional level, Pardubice region. In the background basic concepts associated with the selected theme are described and defined. A description of the selected region, methods, calculations, modeling and analysis are included in the Experiments and Analysis section. Four methods were used for computations – correlation analysis, regression analysis, cluster analysis and association rules learning. The last part, Future Research and Conclusion, summarizes the output of our work and main recommendations.

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INTRODUCTION

This book analyzes selected connections among environmental, economic and social sustainable development aspects. This chapter deals with the issue of development of the quality of the environment, and the issue of health of the population. There is the link between environment and health of the population (Kotulán, 1991; Cole, 1998; Vasseur, 2009; Clark, 2005) which aims to represent and model this work. The effect of the quality of the environment on health is a nontrivial and complex problem. It is affected by uncertainty. The uncertainty is given by the state of scientific knowledge in this area, a certain degree of error in input data and also by the high degree of the openness of the whole system. The result of the openness is the impact of many hardly describable external factors. The goal of this chapter is to describe the situation in this area, to find the solutions for the above stated problems and finally propose the model describing the connections between quality of the environment and the population's health at a regional level.

The problem of harming the environment, its impact on human health and the subsequent research started to develop in the Czech Republic since the seventies (with certain delay compared to western countries). In the beginning, it was aimed towards the outermost part of our country, for example the so-called "black triangle" (Šrám, 2001). It was not before 1989, when this problem became of concern to the Czech population and extensive programs for the improvement the environmental status were started. It was obvious that negative effects of anthropogenic impact harm nature, lower the quality of the environment, become global and most of all retroactively influence human health (Kotulán, 1991). These negative effects can be supported by quantitative data on various human health indicators. In the Czech Republic nowadays monitoring of health status of citizens related to environment is carried out by the National Institute of Public

Health (National, 2009). Besides direct influence on health, the lifestyle and social connections of citizens is changing, which could lead to negative effects on their health. That is why it is crucial to intensively engage in these events and ask the following questions:

- If changes in the environment are related to some negative impacts on human health, how are they connected and why?
- Can we change them or limit them somehow?
- Can we model and analyze these events and how?
- What would be the costs of such steps?
- How can local and regional administration participate?

The following text is engaged mainly on the first and third question.

THEORETICAL BACKGROUND

The research of the relationship between environmental status and public health is the aim of this project. This topic is often solved within many scientific researches, grant projects and books and it has become real due to the worsening of the environmental status (ENHIS, 2007; Epley, 2008; Shackman, 2005; Merson, 2006; Janoušková, 2009; AIRNET, 2009; Obršálová, 1999; Vasseur, 2009). Many more projects are engaged in the financial expression of public health damages as a result of the negative impact of environmental damages or in the financial expression of environmental damages (Obršálová, 1999; Leiter, 2007), for more information see Table 1.

In these projects plenty of indicators, models and methodologies were designed for the analysis and evaluation of the relationships between environmental pollution and public health. Based on these methods a simplified and general model of the process of evaluation of the relationships

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