

A Conceptual Model for the Municipality of Vila Real

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Extended Abstract for Poster Presentation

The municipality of Vila Real is localized in the interior of Northern Portugal, occupies an area of 378 km², has a population of ca. 50000 residents, and an economy geared towards the tertiary sector. To manage present situations, such as housing, traffic, employment and environmental quality, as well as to path a sustainable future for the municipality, the town hall of Vila Real and the University of Trás-os-Montes e Alto Douro (UTAD) have jointly launched a project to enhance decision-making at key processes – namely strategic planning and management.

The joint project is structured along the classic “intelligence-design-choice” model of decision-making, with slight modifications. The first phase of the project is to describe the current situation in the municipality by means of producing a conceptual system model, and simultaneously seeking problem situations and opportunities. The second phase involves a numerical version of the system model, still descriptive in nature, and the creation of possible development or management scenarios. The third phase involves the simulation of these scenarios and the selection of the best one(s) against a set of community-wide value criteria. This last phase also features a global review of the project, with the intent to document the experience of the decision-making enhancement application in Vila Real.

The main feature of the joint project is the system model of the municipality, in various versions, which allows the identification of the dynamics of the principal actors within the municipality, the dependencies to exterior influences (e.g. national or EU politics, international economy), as well as to evaluate the possibilities for these dynamics to change and to what directions. Besides investigating these structural dynamics, the model also aims to replicate the system behaviour. Once validated, the model should permit the simulation of various development or management scenarios – the former being generally long-term action plans, while the latter being day-to-day operations.

The modelling tasks, from data collection to scenario simulation, are distributed over two calendar years – starting in the first quarter of 2002 and finishing in the fourth quarter of 2003. The human resources dedicated to the project are three town hall employees (one full time and two part-time), one academic faculty from UTAD, one post-graduate and four undergraduate students (all in part-time involvement). The information for the construction of the model comes mostly from the municipality's records, occasionally involving national statistics. It is expected that, besides quantitative data, qualitative information from trustworthy municipal sources (e.g. executives *via* interviews) shall be also used in the model, after a projection onto appropriate numerical scales.

This joint project is carried out under the auspices of the newly established inter-disciplinary field of Environmental Dynamics¹. Aiming at Environmental Systems (i.e. public-domain, large-scale systems that involve human activities plus natural processes), the objective of Environmental Dynamics is to promote sustainable development by directing key decision-making processes towards appropriate system control. System Dynamics holds a protagonist role among the means that Environmental Dynamics employs to attain its objective, accompanied by graphic arts, social interaction, academic dissemination, and collaboration with government bodies.

¹ Environmental Dynamics Consortium (EDC) | www.utad.pt/~tasso/edc

The target systems of Environmental Dynamics feature some specially challenging situations from the point of view of control: they are extensive and interaction-rich, sensitive to external economic and political influences, and define as their global objective the overall welfare of the community on a sustainable basis – which frequently requires satisfying various interest groups.

Due to the nature of these systems, it is not feasible to address all possible development or management solutions (i.e. scenarios). Therefore, it is not possible to prove that the scenario that seems best is a global best. Hence, instead of opting for system optimisation, “satisficing” solutions are sought. This way, the onus is transferred to the creativity of the team to come up with options (or scenarios). It is also important to define a methodology to select the best scenario among all produced. Environmental Dynamics points to a set of methods and techniques to deliver both of these tasks – i.e. option-making and decision-making – such as cause-and-effect analysis for creating scenarios that satisfy certain objectives, and Strategic Environmental Assessment techniques for the selection of the best scenario.

The descriptive system model of the municipality, presented in the poster and also available on the Internet², is encountered presently at the conceptual phase and contains the protagonist elements of the system as well as their principal interactions. Furthermore, the model identifies the existing feedback loops, as well as “problematic zones” and “opportunity zones” in terms of the municipality’s dynamics. These shall be used in the following phase to identify key positions for regulating agents.

The system model of the municipality of Vila Real has been divided in several inter-related sectors, such as economic activities and environmental media, to facilitate model building and communication – after the experimental and adaptable Generic Local Authority System (GLAS) template, developed in a

² Environmental Dynamics Academic Website (EDAW): R&D: Systems Model Repository | www.utad.pt/~tasso/edaw/projects/model_repository.html

previous R&D project³. A relatively high degree of detail has been maintained in the model, as the human resources of the project are able to guarantee the required effort.

The software used in the project is STELLA[®], which has been the students' choice for its interface simplicity. The option to migrate to other software, featuring more advanced analytic functions, is still considerable.

Of the following modelling tasks, the one to provide most challenge is expected to be the behavioural validation, which shall take place after the introduction of data into the model. The results from the next two phases as well as the global evaluation of the project shall be also communicated to audiences with relevant interests.

Key Words and Phrases

Environmental Dynamics, decision-making, municipality, Vila Real, Portugal

³ Environmental Dynamics Academic Website (EDAW): R&D: The Template Project | www.utad.pt/~tasso/edaw/projects/template.html