

The societal implications of Sustainable Energy Action Plans

Giovanni Bernardo

Simone D'Alessandro

The repeated failures of international agreements for GHG emissions reduction call for a new strategy that involves local communities in implementing effective transition to sustainability. This paper aims to investigate the societal implications of Sustainable Energy Action Plans (SEAP) at the local community level on the environmental, social and economic dimensions of sustainability. SEAP is based on the Covenant of Mayors, a mainstream European movement involving local and regional authorities, voluntarily committed for increasing energy efficiency and promoting the use of renewable energy sources on their territories. By their commitment, Covenant signatories aim to meet and even surpass the 20% CO₂ reduction objective of the European Union by 2020.

However, the local governments faces enormous hurdles in managing this crucial goal since they have to ensure that the aforementioned policies will not compromise on the improvement of quality of life, wellbeing and local economic development. Moreover, the complexity of political strategies is increased by specific budget requirements, considering in particular the presence of different budget constraints at the local level (e.g. internal stability agreement) and the reduction of the budget available due to the economic crisis. For this reason, there is a need to develop tools which are able to assess the effects of environmental and energy policies on the socioeconomic system and to assist policymakers in identifying the most effective choices.

The main objective of this paper is to develop an integrated model based on System Dynamics (SD) methodology, aimed at supporting the decision making process of public administrators. System dynamics modeling is an approach to understanding the behavior of complex systems over time. It allows for a modular approach to modeling, that permits the analyst to decompose a complex social or behavioral system into its constituent components and then integrate them into a holistic model e.g. of the residential energy use, that can be easily visualized and simulated. Based on stock-flow-feedback structure of SD, the models will capture the potential implications of energy policies for sustainable development goals. Consequently, we built three core modules able to capture the impact of SEAP on the three dimensions of sustainability taking into account economic (e.g. local economic growth, labor productivity and local debt), environmental (e.g. GHG emissions, use of renewable

and fossil energy sources) and social (e.g. health, job creation and the consequent impact on unemployment rate) attributes.

This paper is focused on the socio-economic impact of the Sustainable Energy Action Plan (SEAP) in the municipality of Cascina (Pisa). A conceptual map of the model was built through a participatory planning methodology that involved the local committee and officers of the administration. The discussion of the first round table was focused on the influence that SEAP actions can have in the quality of life on the surrounding territories. We worked on the map trying to clarify the causal links and the emerging dynamic feedbacks loops and we propose a final map of the model, which was presented at the second round table.

We develop different modules that include a structured representation of the financial statements using a double entry bookkeeping representation, dynamics of the population and migration, labor market and a simplified representation of the local economy, transport system, land use and housing. The final output would be a tool able to:

- assess the effects of environmental and energy policies on the socio-economic system by identifying a set of indicators;
- monitor the effects of policies over time and identify inefficiencies and weaknesses;
- detect the set of policies that maximize the effects both from environmental and socio-economic point of view.

Keywords: local policies, societal impacts, system dynamics.