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INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Durham Pilot: A Transit-Centered, Multi-Sector, Systems Approach for Sustainability

The Challenge of Integration

EPA's Sustainable and Healthy Communities Research Program (SHC) is conducting transdisciplinary research to inform and empower decision-makers. EPA tools and approaches enable communities to effectively and equitably weigh and integrate human health, socio-economic, environmental and ecological factors into their decisions to promote community sustainability.

EPA researchers are developing systems modeling approaches to account for linkages among resources and assets managed by a community. Understanding the dynamic interactions among sectors such as land use planning, energy and water infrastructure, waste management and transportation will help communities maximize benefits while avoiding unintended consequences.

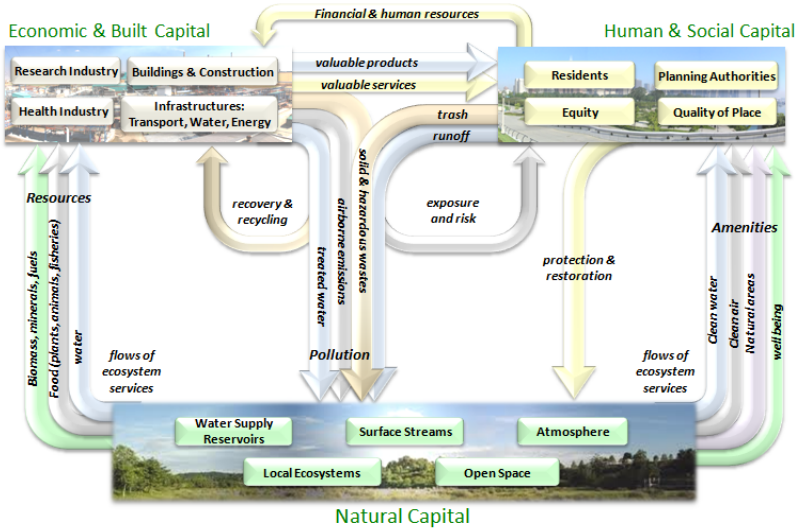
The Durham, N.C. Pilot project focuses on developing and demonstrating integrated approaches for sustainability based on the foundational information, tools, models and approaches developed by EPA, culminating in the Total Resource Impacts and Outcomes (TRIO) method. Since evaluating net risks and benefits of a policy or decision often requires a multi-sector approach, EPA is engaging a variety of local and regional stakeholders to explore regional sustainability through the lens of a pending light rail transportation project.

A Modeling Approach

The integrated modeling approach under development is based on Joseph Fiksel's triple value model (see diagram on this page), which reflects the three pillars of sustainability – social, economic, and environmental capital – as a conceptual framework. The triple value model enables communities to evaluate net changes in aggregate value (i.e. sustainability), as well as identify interactions that provide leverage within the system. A dynamic systems model team for the light rail project (LRP) demonstrates how understanding the interactions among sectors can lead to more sustainable outcomes, as well as assist in identifying how an alignment of actions can yield greater net value and possibly offset unintended consequences.

The goal of the light rail project is to enhance mobility, capture untapped markets, and support desired development patterns in the region. In order for this project to positively impact the Durham-Orange Corridor, it is crucial for decision-makers to be able to identify how the project might interact with other sectors, such as land use change, housing, and water resource management to maximize benefits and avoid or limit negative

Triple Value Framework for Sustainability



Fiksel, Joseph, et al. "The triple value model: a systems approach to sustainable solutions." *Clean Technologies and Environmental Policy* (2012): 1-12.

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unintended consequences. This transferable modeling approach is designed to enable communities to better advance multiple goals simultaneously and to communicate their decisions more effectively.

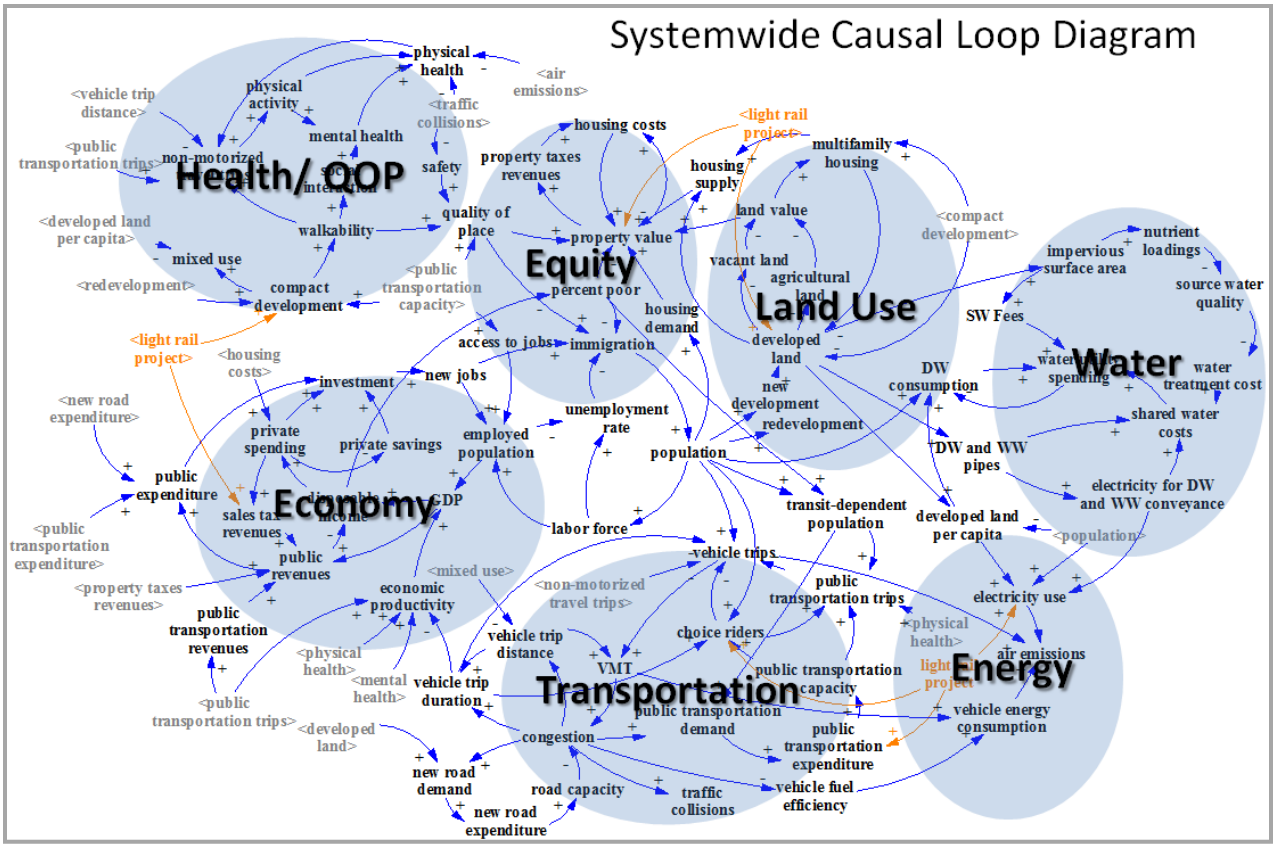
The light rail dynamic systems model modeling application represents the interacting sectors – transportation, land-use, water management, human health and well-being, and economics – as a series of causal loop diagrams depicting the stocks and flows of the risks and benefits, as well as the mechanisms of the interactions. The model will help community decision-makers and stakeholders explore alternative decision-making scenarios, as well as test the assumptions on which they are based.

In the case of the light rail application, the assumptions behind the primary goals of increased mobility, decreased vehicle miles traveled (VMT) and reduced GHG emissions can be tested. The interactions and aligned policies that may lead to increased public health and safety, economic development, improved water quality and resources, reaching vulnerable and underserved populations, and creating an overall improved sense of "place" can also be tested with this model. Through this approach, EPA will help communities understand the extent to which these seemingly disparate components are actually inextricably interrelated, and identify actions that align to yield net greater benefits.

Outputs and Outcomes

The model results will be delivered via a user-friendly interface that allows stakeholders and researchers to select the social, economic, and environmental indicators of interest for display. Moreover, the interface will include mechanisms that allow the user to test model assumptions and sensitivities, including alternative model structures, and to capture alternative scenarios for comparisons.

The present model is expected to be applicable in communicating the Durham-Orange Light Rail plans and its impacts, and in the design of concurrent decisions, such as housing policies, infrastructure investments, water resource management, and health promotion, that either build on or mitigate implications of the light rail itself. Transferable guidance and tools will also be developed to enable other communities to utilize systems models to holistically analyze and communicate complex issues, whether in transportation or other sectors. Using such tools to evaluate the social, economic and environmental impacts of decisions, and aligning decisions across sectors, will help advance the goals of community well-being, prosperity and sustainability.



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