

Geog 461 Learning Objective Outline

LOO 02 Decision Support for LUTWR in PPI Decision Situations

02.1 What is the significance of decision situation topics land resource, transportation resources, and water resources management? [Nyerges and Jankowski GISDS Chapter 1](#) Section 1.2.1

Land, Transportation, and Water Resource Management Issues

Many people would agree that land, transportation, and water resources, and the relationships between and influences among them are fundamental issues in an urban and regional context. Each of those substantive topics when taken separately and when addressed together can benefit from an integration of GIS and decision analysis.

Land Resource Decision Issues

- Landscape/land cover – the “lay of the land” in regards to surface characteristics.
- Land parcel ownership – rights to a surveyed portion of land for carrying out various kinds of activities; this ownership can be public, private, quasi-public.
- Land zoning –the permissible uses for the portion of land according to certain regulations as defined by the governing body having jurisdiction over the land. Some land is not zoned for certain uses, that is certain uses are prohibited to reduce external effects.
- Land use – relationship between particular parcels and their interpretation of use, e.g. commercial, residential, recreational uses all have peculiar externalities
- Land environmental hazards occur when use results in degraded landscape, prohibiting certain kinds of land uses to take place safely.

Transportation Resource Decision Issues

- There are many approaches to addressing sustainable transportation development issues; all having geospatial implications.

Table 1.1 Issues in Transportation and Sustainable Development

Vehicle / Fuel Technological Changes

- Improved Efficiency of Conventional Vehicles
- New Vehicle Technologies
- New Fuels

Road / Vehicle Operations Improvements

- Conventional Traffic Flow Improvements
- Intelligent Transportation System Improvements
- Driver Education
- Improved Logistics and Fleet Management

Demand Management

- Modal Substitution
- Telecommunications Substitutions
- Pricing Incentives / Disincentives
- Land Use –Transportation Strategies

- Mobility improvement within a transportation system often requires social and environmental disturbance mitigation. Impact analysis can be performed to compute the degree and nature of disturbances associated with various alternatives for transportation system improvements. Choosing among the alternatives is a matter of minimizing or maximizing the beneficial/detrimental affects associated with those alternatives. Mitigation involves increasing the beneficial effects while reducing the detrimental ones. What mitigation approaches are better than others in the context of a particular transportation system?

Water Resource Decision Issues

- Impacts on environment and people often involve a tradeoff among improving conditions. Farmers and salmon both need Columbia River water. Giving to one is taking from the other. How can we balance conflicting needs by considering the location and changes in water flow through dams?
- Access to fresh drinkable water continues to be a major global problem. Groundwater and surface water rights and resources are sometimes managed separately, but they have an influence on each other. Water management has a direct effect on access.
- Water quality, and in particular water contamination, is a significant public health issue.

02.2 What is the significance of decision situations for planning, improvement programming, and project implementation? [Nyerges and Jankowski GISDS Chapter 1](#) Section 1.2.2

The terms “planning, programming, implementation, management, and decision making” are five situations, each involving a process that is somewhat routine work in an everyday world.

A sixth is considered “emergency situations”. Unforeseen circumstances occur from time to time for which we might act in the current to be prepared for such emergency circumstances. The emergency management decision situation is one that is recognized as significant and important. As mentioned earlier policy, major investment, and emergency situations are not addressed in this book due to space limitations.

Consequently, our focus is on planning, programming, and implementation decision support situations, and particularly land, transportation, and water resources, due to their routine and pervasive nature.

Considering GIS and its relationship to society, it is possible to speak of various realms of discourse and decision support situations for which GIS might or might not be useful. In effect, we identify eight realms of discourse to address concerns, e.g. those regarding land, transportation, and water resources (See Table 1.2). These eight realms can be seen as different levels of meaningful activity undertaken by people, some more connected to everyday life than others. The institutional realm is the most abstract, and the community realm is where most people live in their everyday life. Changes occur slowly in the institutional realm, and more rapidly at the community level. Nonetheless, GIS affects all realms to varying degrees, hence there are GIS applications in every realm.

Table 1.2 Eight Realms of Discourse for GIS and Society
(Adapted from material presented by Patrick 2007)

Institutional realms

- Paradigm – societal-cultural values formulation among living generations
- Politics – expressions of values by those elected/appointed to office
- Policy statutes– general articulation of values as interpretations of what to be done

Public-private organization realms

- **Planning** – well-formed scope of the vision, i.e., a plan, on the ground projects
- **Programming** – budgeting elements of a plan which are a collection of projects
- **Project implementation** – building individual projects that have social, economic, and environmental impacts to improve extant conditions

Community realms

- Place – discourse about projects within places wherein those places are impacted
- Public – conversations among people who are actually impacted within the places at various times

Looking more closely at the decision contexts in the public-private realm, we can differentiate them by spatial and temporal scales just to provide a “gut feeling” for how important geospatial information can be in the context of GIS use for decision support – as in Table 1.3.

Table 1.3 Geospatial decision making in terms of spatial and temporal scale

Decision Making Scale	Spatial and temporal scaling: number of sites and extent of situation over time
Planning	Large, continuous spatial domain with single or multiple function, long-term temporality, consider all sites and situations in relation to each other in general; system-wide performance investigated, but no specific places
Programming	Multiple, discrete sites with single function, medium-term temporality; no relation to other sites analyzed; no system performance investigated
Implementation	Single, continuous domain with potential single or multiple functions; short-term temporality; immediate surrounding and external factors investigated in detail, locational performance in general

A plan is implemented over a long period of time. From time to time (e.g. every 5 years) plans are updated, as are the transportation plans for metropolitan planning organizations across the U. S. as mandated by federal law.

Capital improvement programs fund capital improvement projects across a six-year time period, composed of a two-year scope, two-year design, and two-year build phases. Budgeting for water recycling capital improvement programs commonly occurs every two years to move projects along, and address several facilities at a time – the priority list.

A program is commonly linked to a plan, e.g. transportation or water resource plan, whether it is broad-based comprehensive plan or single-purpose functional plan. Consequently, a program is the implementation of a plan.

Project implementation is initiated and completed to build out a plan as funded through a program. Projects differ in size from very large (mega) projects to rather small projects.

A mega project

redevelopment of an Interstate Highway Corridor for several miles or a large bridge or a regional wastewater facility. Those size projects could cost hundreds of millions of dollars.

A small project would be realignment at a two-lane highway intersection for perhaps a few hundred thousand dollars, or the redevelopment of a park.

Plans, programs and projects are linked. There is a direct connection between community values and plans.

“Plans are meaningless without intentions, and intentions are derived from knowledge and values. Intrinsic values set the basis for deriving instrumental values by determining what values will not be traded off with others. Instrumental values organize means by establishing how much something is worth as an input to achieving these intentions. These values are at least in part derived from individuals and are inherently subjective. Values might be assessed objectively, that is, assessed in such a way as to be replicable if assessed by some other observer of the subject. Values are better interpreted, however, as inter-subjective, which implies that both an individual’s interests may be distorted and that socially shaped values may lead to desirable behaviors. Shaping attitudes about the consumption of land for urban uses may be more effective toward the survival of humans and other species than either regulations or incentives directed at behavior.” (Hopkins 2001 p. 168)

If we do not know the assessment level of the values referred to in the above quoted passage, then we risk losing some, and/or misprioritizing others.