Policy Analysis of an Airport Metropolis

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1 INTRODUCTION

The function, scale, and importance of major urban airports worldwide have changed over the past decade as a result of major economic, political, technological, and social changes. Modern airports are very different from traditional airports, and our previous knowledge is insufficient for understanding the complex roles and relationships now associated with airports. The airport can no longer be managed in isolation from the metropolitan region that it serves (Stevens, 2006). A new approach to regional planning is needed. It is therefore necessary to develop a theoretical and empirical basis for the new Airport Metropolis (Stevens, Baker, and Freestone, 2006).

This paper describes an ongoing research project in which policy analysis is being used to structure planning problems related to the Airport Metropolis. It also explains how a policy analysis framework is being used to organize the research into the four airport interface areas. This research will feed into the further development of the HARMOS Decision Support System (DSS) so that it can be used for strategic planning of the Airport Metropolis. The DSS will support regional planning professionals, decisionmakers, and other stakeholders to evaluate alternative Airport Metropolis development strategies while managing the impacts within the interface areas. The DSS will be used to systematically assess the performance of alternative policies and strategies for the development of the Airport Metropolis. The HARMOS DSS is therefore also briefly described in this paper.

2 THE AIRPORT METROPOLIS: MANAGING THE INTERFACES

Airports are emerging as important sub-regional activity centres with growing complexity of land use, infrastructure, transport, environmental impacts, and stakeholder relations. As a result of such changes, airport impacts now pose considerable challenges for both the airport operator and the surrounding region. These challenges can only be understood from a multi-disciplinary perspective that investigates and makes an integrated response to the major issues related to the Airport Metropolis concept. These issues can be conceptualized as different *interfaces* between the airport and its surrounding region: economic development, land use planning, infrastructure, and governance.

Economic development is of interest both for the airport and for the surrounding region as a result of airport-centric activities. It may have direct, indirect, induced, and catalytic impacts. *Land use* involves the geographical/geophysical resources of both the airport and the region. Its social and biophysical environmental impacts can be best managed by the cooperative development of government land use plans and airport master plans that incorporate development trends, existing land use patterns, land characteristics, identified human and physical characteristics of the land, and desired and possible future uses. *Infrastructure* includes large-scale installations that connect and service commercial, industrial, residential, and cultural nodes of the region, and that link the airport with the surrounding region. Typical elements are roads, railways, utilities, ports, airports, freight, and service interchanges, and (of increasing importance) information and communication technology (ICT). *Governance* refers to legislative arrangements and public and private institutionalised processes that are designed or have evolved to affect social structures and the behavior of individuals and organisations. The Airport Metropolis project[1] is developing a theoretical and empirical basis for the new airport metropolis. Its primary aims are to:

1. Define and determine the drivers and dynamics of the present airport metropolis and the resultant interface relations within regional contexts;

2. Design, develop, and test a sophisticated decision support system (the HARMOS DSS) for undertaking complex decisionmaking to improve the current system;

3. Establish economically viable and sustainable policy and planning options for developing the airport metropolis and world-leading best practices; and

[1] http://www.airportmetropolis.qut.com/

4. Contribute to the knowledge base of multi-dimensional complex systems mapping, integrated infrastructure framework development, and interface theory.

The primary benefit and significance of this project is the integration of all stakeholders in developing unified solutions to airport regions with reference to particular sustainability criteria: economic efficiency, environment, coordination, community, security, and resilience.

3 POLICY ANALYSIS

The policy analysis approach according to Walker (2000) is used to structure the problem under investigation and systematically assess the performance of alternative policies. The generic abstract framework is shown in Figure 1 and illustrates the policy analysis approach in terms of its *framework* (the boxes with the solid lines) and its *process* (the box with the dashed lines). The framework structures the investigation of problems related to the system in terms of data and information. The framework is subdivided into the *decisionmaking* domain and the *system* domain.

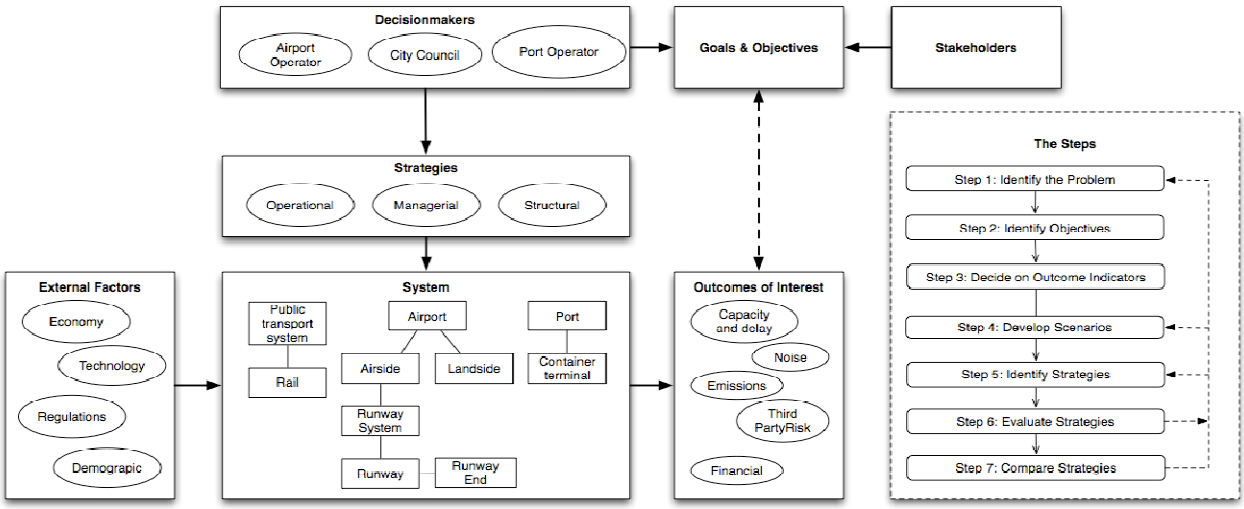

Figure 1 - The policy analysis framework and steps.

The system domain defines *the system*, the *outcomes* from the system, and the *forces* acting upon the system. Two sets of forces act on the system: *external factors* (captured through multiple scenarios) outside the control, and *policies* under the control of the actors in the decisionmaking domain. Both sets of forces affect the structure of the system and, hence, the outcomes of interest to *decisionmakers* and *stakeholders*.
The decisionmaking domain explicitly identifies:
The Decisionmaker(s): the person(s), group(s), or organization(s) that have the power to implement a policy. During the entire project, we will *interact* frequently and substantially with decisionmakers through workshops in order to gain insight into their perspectives on the regional transport and logistics system, and its sustainability.

Goals and Objectives: each decisionmaker pursues certain goals and objectives such that his/her vision becomes reality. Obviously, policies are designed to change the system such that the system's performance (measured in terms of the outcomes of interest) meets the objectives.

Stakeholders: parties affected by the system in one way or another. The system has many stakeholders -- *infrastructure operators, airlines, passengers, communities, municipalities, regional and national authorities, and air navigation service providers* -- each having different goals and objectives. Decisionmakers should therefore take into account not only their own goals and objectives, but also those of other stakeholders. This is not only a matter of courtesy, but is essential for the success of the implementation of the policies. Within a region, there is no single decisionmaker that has absolute power; cooperation among all stakeholders is absolutely necessary.

The system domain includes the following:

The system: At the heart of the policy analysis framework is the real-world system upon which policies are imposed (and external factors act) and from which outcomes are produced. The system model is a computer model of the system domain that represents its structure – the elements, and the links, flows, and

relationships among them – and serves as an experimental laboratory for testing policies and assessing their outcomes. For example, the physical elements included in an airport system are the airport (in varying levels of detail), ATM technology, and the aircraft.

Outcomes of interest and indicators: The outcomes of interest are those outputs of the system relevant for assessing policies for dealing with the problem at hand. The outcomes of interest are chosen such that regional development of the system can be monitored in terms of sustainability as the equilibrium among economic, environmental, and socio-cultural aspects. Each outcome of interest is associated with a set of measurable outcome indicators that can be estimated by the system model. An outcome indicator is a proxy for an outcome of interest.

External factors and policies: External factors are the forces that change the system and *cannot* be (directly) controlled by a given decisionmaker, while policies are the forces that change the system and *can* be controlled by a given decisionmaker. Note that while some external factors affect aviation but cannot be controlled by *any* decisionmaker (e.g. changes in population and income), the distinction between other types of external factors and policies depends on the *perspective* of the decisionmaker being considered. For example, a national aviation authority could impose policies on the system (e.g. airspace restructuring) that could subsequently be viewed as external factors from the perspective of a manufacturer, airport or airline, while policies under the control of any of these entities (e.g. introduction of new technologies, local airport expansion, or imposition of operating restrictions) would be external factors to the regulator.

The policy analysis process (the box with the dashed line in Figure 1) organizes the problem solving effort itself by providing seven steps that cover *formulation* (step 1-3), *analysis* (step 4-6), and *interpretation* (step 7) of a particular problem. The process generally involves performing the same set of logical steps (Walker, 2000). The formulation phase explores the problem space in order to come up with a well-defined problem with respect to the system, the decisionmaker(s), and its stakeholders. An important activity in this phase is to define the system and to operationalise *sustainability for regions*. The analysis phase first quantitatively develops multiple scenarios, describing *future socio-economic contexts* within which the system might have to operate. The next step is to design, and evaluate policy options and strategies. During the interpretation phase the evaluated strategies are discussed among the airport operator and its stakeholders.

An important observation is that the policy analysis process is very similar to the steps that are conducted in Master Planning. The advisory circular on Master Planning from the FAA is based on a Systems Analysis approach (FAA, 2005). Hence, the resemblance in steps is not surprising, since policy analysis evolved from systems analysis (Davis et al., 2005, p.32).

4 THE HARMOS DECISION SUPPORT SYSTEM

Figure 2 provides a conceptual map of airport strategic planning and is not meant to represent any specific airport's approach. The map has been determined empirically and shows that many resources are involved, both inside as well as outside the organization. A significant number of people (experts, planners, and advisors), some possibly using tools, participate in the effort to turn data into information that is relevant for decisionmaking by the airport's management.

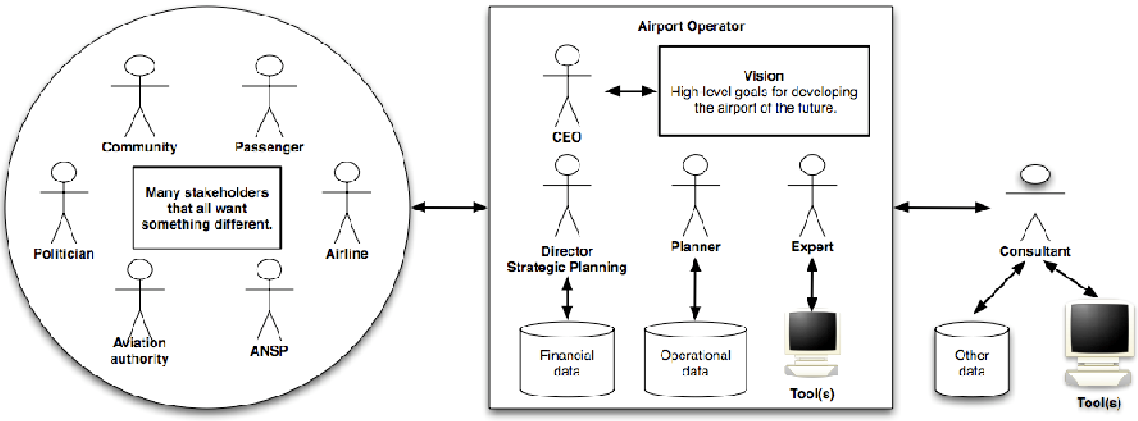

Figure 2 - Current airport strategic planning: conflicts of interest and a huge coordination effort

A concrete planning study, therefore, involves specific resources from the airport operator and from its stakeholders. Currently, those resources are not embedded in a unified structure, which makes it difficult to use them efficiently. Inherently, this leads to an inefficient problem-solving process that is not able to support the formulation of strategies for an airport's development that are agreed to by all stakeholders.

The HARMOS DSS (Wijnen, Walker, and Kwakkel, 2008) is designed such that each category of resources is integrated in a consistent way, as shown in Figure 3. HARMOS brings together the data within the airport operator's organization and its stakeholders and provides coordination for generating information that is relevant for decisionmaking. HARMOS also controls the tools for airport performance analysis. Finally, the DSS provides a means for all stakeholders to be involved in the strategic planning process.

HARMOS enables decisionmakers, planners, experts, and the airport's stakeholders to effectively share information and work together on their problems so that they gain an understanding of each other's perspectives and objectives. Only when there is a mutual understanding is it possible to look for strategies that are satisfactory to all parties involved (see the left side of Figure 3). As a result, an airport operator and its stakeholders can work together on a shared vision of the future airport.

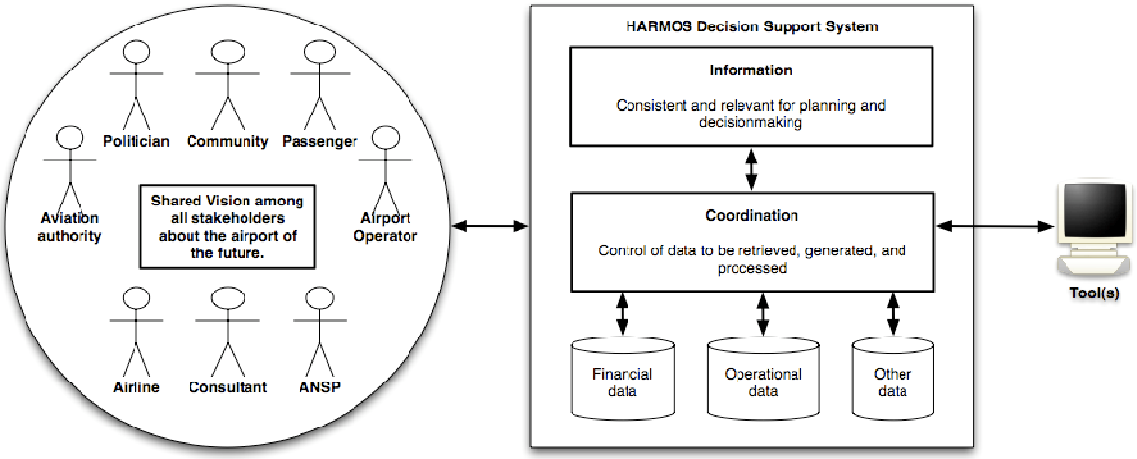

Figure 3 - HARMOS: bringing people together

5 NEXT STEPS

The four major interface areas (economic development, land use planning, infrastructure, and governance) will be investigated through case study analyses, which includes a detailed, quantitative case study of Brisbane, Australia. The core of the Brisbane case study will be the use of the HARMOS DSS by decisionmakers, planners, and other stakeholders. Preparing for this case study requires the following steps which are either ongoing or will be started shortly:

- Collect and categorize research results within each of the interface areas, through the use of the policy analysis approach;
- Extend the HARMOS DSS so that it captures the additional complexity of airport regions;
- Customize the HARMOS DSS for use in the Brisbane case study.

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