VOL. 11, NO. 9, MAY 2016 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

CHALLENGES IN STRATEGIC SUSTAINABILITY APPRAISAL IMPLEMENTATION FOR TRANSPORT POLICY EVALUATION IN DEVELOPING COUNTRIES

Rudi Sugiono Suyono[1], Ofyar Z. Tamin[1], Sony S. Wibowo[1] and Heru Purboyo H. P.[2]
[1]Faculty of Civil and Environmental Engineering, ITB, Indonesia
[2]School of Architecture, Planning and Development of Policy, ITB, Indonesia
E-Mail: rudi.s.suyono@gmail.com

ABSTRACT

The concept of sustainability emerged in the early 1970s since the UN Conference in Stockholm in 1972. The sustainability concept must be implemented earlier in the strategic planning process, and the appraisal plays a key role. Through a good appraisal process, all the possibilities related to the impact of the implementation can be identified earlier. The infrastructure development in the developing countries, has some typical problems such as environmental, social and economic. Also, there is large demand of infrastructure development, but it is not supported by adequate funding and the issue arisen from the short term and long term impact from infrastructure development which often cannot be anticipated earlier. An appropriate working title for this new assessment approach is Strategic Sustainability Appraisal (SSA). The emphasis of SSA is on comprehensive transport policies, assessing policies simultaneously in order to detect possible interdependencies and cumulative impacts, managing the three basic aspects of sustainability equally.

Keywords: sustainability appraisal, strategic, integrated, developing countries, transport infrastructure.

INTRODUCTION

Developing countries are facing unprecedented challenges towards sustainable societies in the sense that they have to balance economic growth and environmental factors even though they are not major contributors to environmental problems. There are numerous constraints that restrict societal development. (Fujiwara *et al*,2005). Developing countries have many unique issues related to the development of infrastructure. In transport infrastructure, one of the most popular issues is about sustainability, the basic problem is the huge demand for infrastructure development, but there are limited resources such as funding and efforts to maximize the benefits of infrastructures with the minimum resources. Developing countries according to the World Bank is a state in the world that has: "..gross national income per capita as follows: (a) low-income, $ 1.025 or less, (b) lower-middle income $ 1.026 - $ 4.035 "(World Bank, 2011). In this definition, the numbers of developing countries have the largest population in the world compared to the total population in modern countries.

The purpose of this study is to map and review some selected parts of Strategic Sustainability Appraisal research project. The researchers hope that a research problem can be generated to answer or to contribute for the development of suitable strategic appraisal approach for developing countries to arrange a better, effective, efficient and well targeted planning of sustainable transportation infrastructure.

PROBLEM

The concept of sustainability emerged in the early 1970s since the UN Conference in Stockholm in 1972. The sustainability concept must be implemented earlier in the strategic planning process, and the appraisal plays a key role. Through a good appraisal process, all the possibilities related to the impact of the implementation can be identified earlier.

Conventional assessment tools like cost-benefit analysis are widely used amongst economists and other decision-makers, though it is shown that such static concepts which perform point-to-point assessments cannot reasonably be applied for long-term assessments dealing with complex systems like social systems or interlinked social and ecological systems. Furthermore, the meaning of strategic is threefold. First, an assessment on a long-term time horizon is aspired; Second, an integrated or applied systemic perspective that covers the transport system as well as interlinked systems like environment or economy; Third, the spatial scope is aimed at transport policies and programs rather than on project assessment. (Schade and Rothengatter,2000). However, it is realized that there is a need for further integrated environmental assessment along with economic and social assessment to achieve sustainability. Therefore a so-called Strategic Sustainability Analysis or Strategic Sustainability Appraisal (SSA) is suggested. The SSA is applied for integrated long-term assessment of policies and programs. The emphasis of SSA is on comprehensive transport policies, assessing policies simultaneously in order to detect possible interdependencies and cumulative impacts, handling the three basic aspects of sustainability equally (economic, social and environmental). (Martino, A, *et al*, 2010) The focus of SSA is more on long-term consequences of policies rather than on infrastructure plans and programs as in SEA. (Schade & Rothengatter, 2000)

REVIEW STUDIES IN STRATEGIC SUSTAINABILITYAPPRAISAL

This study reviewed 7 (seven) research projects that related to the Strategic Sustainability Appraisal for the

sustainable development of several countries. The reviews are as follows:

a. ASTRA: Assessment of Transport Strategies Project

The ASTRA project started in October 1997 and ended in January 2000. It was carried out by a consortium consisted of IWW (InstitutfürWirtschaftspolitik und Wirtschaftsforschung) and Universität Karlsruhe, Germany (project co-ordinator). The study's summary was taken from Schade, W *et al*, (2000). The aim of ASTRA is to develop a tool for analysing the impacts of the Common Transport Policy (CTP) including secondary and long-term effects. The ASTRA project is in charge for enhancing present abilities of analytical tools and models to support strategic assessment of non-marginal impacts of transport policies and infrastructure investments. For this purpose, the System Dynamics Modelling method is applied. ASTRA used system of dynamics software platform and developed ASTRA System Dynamics Platform (ASP). The ASP is integrated and is consisted of four sub-modules: macroeconomics sub-module (MAC), regional economics and land use sub module (REM), transport sub-module (TRA) and environment sub-module (ENV). Results of the conventional models are used for calibration of the ASP sub-modules.

The ASTRA System Dynamics Platform (ASP) is not designed as a stand-alone system dynamics model. Instead it integrates for sub-modules, which are considered to be the today's most important systems that have an impact on the assessment of the Common Transport Policy (CTP) of the European member states.

b. Prospects (Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems)Project

This is a research project of Pfaffenbichler and Shepherd (2002). The summary of the study was taken from Pfaffenbichler and Shepherd (2002). This research aims to present a framework to appraise long term urban planning strategies. It consists of two main items: a dynamic land-use/transport model (termed Sketch Planning Model, SPM) and an evaluation/optimization procedure.

Both are results of the EU funded 5th framework research project PROSPECTS (Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems). Environment, Safety, Health, Land Use and Congestion are the domains of the STELLA Focus Group 4. All five of them are addressed by the framework of PROSPECTS. Environment, safety and health aspects are part of a sustainable objective function used in the evaluation procedure.

c. MARS (Metropolitan Activity Relocation Simulator) Model

This research is Dissertation of a Doctoral Thesis of Paul Pfaffenbichler at Institut für Verkehrsplanung und Verkehrstechnik, Technische Universität Wien in 2003. The summary of the study that taken from Pfaffenbichler and Paul (2003), the description is as follow:

This research proposed the high aggregated strategic, dynamic and integrated urban land model that is called MARS (Metropolitan Activity Relocation Simulation).

The proposed assessment framework simulates system of behaviour over time and is designed in a modular way. It consists of four modules: Policy instruments (Module - 1), MARS (Module - 2), Objective functions (Module - 3) and an optimization method (Module - 4). MARS was tested for the city of Vienna. An extensive model-testing program was carried out using observed data from 1981 to 2001. A back casting exercise and sensitivity tests have proven the usability of MARS. Nevertheless some weak points were identified. It was possible to find explanations for them. Potential fields for future improvements were identified and ranked. (Pfaffenbichler, Paul,2003)

d. ESCOT (Economic Assessment of Sustainability Policies of Transport) Project

The report of ESCOT Project was published by Schade, B and Schade, W (2003). The summary of the study that taken from Schade, B and Schade, W (2003). The objectives of ESCOT (Model for economic assessment of sustainability policies of transport) are to describe a developmental line towards a sustainable transport system in Germany and to assess its economic impacts. In ESCOT, the System Dynamics Methodology is applied for integrated modelling of transportation scenarios.

ESCOT is used to assess the developmental line towards sustainable transport in Germany in the project on environmentally sustainable transport (EST) of the OECD. Within the EST project, ESCOT contributes to the back casting strategy of EST. Besides environmental protection, the economic feasibility forms a fundamental part of sustainability.

e. MATISSE (Methods and Tools for Integrated Sustainability Assessment) Project

The MATISSE project (Weaver, P and Rotmans, J, 2006) is interested in the role that Integrated Sustainability Assessment (ISA) could play in the process of developing and implementing policies, its capability of addressing persistent problems of unsustainable development and supporting transitions to a more sustainable future in Europe. The core activity of MATISSE is to develop, test and demonstrate new and improved methods and tools for conducting ISA. The summary of the this project report that taken from Weaver, P and Rotmans, J (2006).

Within the MATISSE project (Weaver, P & Rotmans, J, 2006), Integrated Sustainability Assessment (ISA) has been defined as a cyclical, participatory process of scoping, envisioning, experimenting, and learning through which a shared interpretation of sustainability for

a specific context is developed and applied in an integrated manner. In order to explore the solutions to persistent problems of unsustainable development, this research suggests an approach to policy development that is fundamentally different from the prevailing sectoral approaches; a cross-sectoral approach with an explicit orientation toward sustainability.

f. The SASI Model

THE SASI MODEL actually is a part of a research project that conducted by ECORYS Nederland BV which contracted with European Commission, DG-REGIO. This published report was entitled "Study on Strategic Evaluation on Transport Investment Priorities under Structural and Cohesion funds for the Programming Period 2007-2013" with special project location for the study was Latvia. The summary of the this project report that taken from ECORYS N (2006).

The SASI model (ECORYS N, 2006) is a recursive-dynamic simulation model of socio-economic development of 1330 regions in Europe. The model was developed to assess socio-economic and spatial impacts of transport infrastructure investment and transport system improvements. It has been applied and validated in several large EU projects including the IASON and ESPON projects.

The SASI model differs from other forecasting models of regional development by modelling not only production (the demand side of labour markets) but also population (the supply side of labour markets). Regional production by industry is forecasted by regional production functions containing production factors capital, labour, regional endowment and accessibility. Regional population is forecasted by a demographic model including fertility, mortality and migration.

g. REFIT (Refinement and Test of Sustainability and Tools With Regard To European Transport Policies)

The REFIT Project is a research project co-funded by the European Commission within the 6th Framework Programme. This summary of project was taken from Martino A, et al, (2010) and summary of report from Martino A, *et al* (2010). The REFIT project idea was developed as a solution to this problem, to allow systematic, program-level (strategic) evaluation. REFIT tries to establish a linkage between these different sustainability domains enriching the modelling toolbox with new models able to assess the impact of transport policies on regional economic growth, on social equity and on local environmental quality.

The REFIT project objective is precisely to limit the inherent vagueness of the sustainability concept by linking the current EU transport policy priorities and indicators to a concrete set of possible quantification methods and models. The lack of a consistent approach, not just because of the lack of indicators or tools, but especially as most of these were concerned with individual projects and not programs, emerged during the ASSESS project, the mid-term evaluation of the White Paper (Transport Mobility Leuven, 2005) cited in (Martino A, *et al*,2010).

COMPARISON OF THE STRATEGIC SUSTAINABILITYRESEARCH

a. Research comparison

Based on the above reviews, several points that can be compared related to the implementation of the results are:

1. Parameters: parameters and indicators were developed largely based on the concept of sustainability, and it aligned on economic, environmental and social sector, in some cases of the research project all three aspects became detail indicators and they could include health, safety, etc.
2. Methods: Most of the developed method tried to adopt a new method that was based on a dynamic concept that used the Systems Dynamic platform and Structural Equation Models. Others developed a participatory approach. However, in some cases, the research project was still trying to use conventional methods such as CBA and MCA with some modifications.
3. Case studies and study locations: Most researches had employed a case study to examine the strategic policy assessment related to transportation policy and other development policies assessment. Whereas most of the study area was in European countries, but there were also some developing countries taken as an object of the research.

b. SSA Platform comparison and finding

SSA Platform comparison
i. Integration

Among the 7 studies reviewed. All reviewed research projects used integration platform of sustainability parameters and had aim as an assessment process and tried to develop public participatory approach.

ii. Path finding

It is interesting that among the 7 research projects reviewed. There were only two research projects that used back casting path finding approach while others used forecasting approach.

iii. Dynamic

The methods developed by the entire research projects used the dynamic approach and simulation, there were 4 (four) studies using Systems Dynamic platform, while others used a variety of methods but still using dynamic approach framework.

iv. Quantification

Not all researches applied quantification process alone, at least 3 (three) studies combined qualitative and quantitative parameters in the analysis process.

v. Consistency

In general, quantitative analysis research-based have a platform of consistency, whereas others used qualitative parameters have not use this platform.

c. Findings

Based on the results of this study and reviews, some findings can be presented as follows:

a) SSA approach is very rarely used in the evaluation process and assessment of transport policy, so this method has a potency to be explored.

b) SSA approach has great potency to be developed especially in developing countries. Countries that seldom made it as a research project case, and there is an urgent need in these countries to have assessment tools such as the SSA to maximize their development result.

c) Platform SSA is still very possible to be developed by taking into account a variety of issues. Those issues such as the availability of data, issue a combination of quantitative and qualitative approaches, short or long term time that are adequate for each type of policy studies (e.g. between highway modes comparing with airport, ports and others).

d) The use of a dynamic system simulation method is very interesting to be developed by observing and combining the advantages and disadvantages of each simulation method.

CHALLENGES FOR IMPLEMENTATION SSA IN DEVELOPING COUNTRIES

a) Sustainability Issues

Sustainable development, lays down the principle of sustainability on three major aspects of development: environmental, economic and social aspects, also known as the Triple Bottom Principles. Some points to be criticized are that the concept is developed largely based on the context of the conditions and developed countries, and it is unclear if the same concept applies to developing countries is suitable or not.

Table-1. Strategic Sustainability Assessment (SSA) platform comparison.

		Integration		PathFinding		Dynamics		Quantification		Consistency	
		Yes	No	Forecasting	Back casting	System Dynamics	Others Simu-lation	Pure	Monetized	Yes	No
ASTRA	Schade, W, (2000)	√			√	√			√	√	
PROSPECT	Pfaffenbichler and Shepherp (2002)	√		√		√		√		√	
MARS	Paul Pfaffenbicher (2003)	√			√	√		√		√	
ESCOT	Schade, B and Schade, W(2003)	√		√		√			√	√	
MATTISE	Weaver, P and Rotmans, J(2006)	√		√			ISA		√	√	
THE SASI MODEL	ECORYS, N (2006)	√		√			Recursive Dynamics		√	√	
REFIT	Martino, *et al* (2010)	√		√			TRAN STOOL, TRE-MOVE		√	√	

Source: Analysis Result

This approach needs in-depth study tailored to the characteristics of developing countries that have a lot of limitations. In addition, concerning the appraisal policy in the developing countries, the problem is that many of the processes and methods of partial appraisal (environmental appraisal and sustainability appraisal) is currently evolving from and based on the conditions in many developed countries (mostly from North America and Europe), but its characteristics are very different from those of developing countries. Therefore, further studies are needed in this field.

b) Budgets constraint issues

In many developing countries the need for infrastructure development, particularly transport

infrastructure is very high, but the ability to provide funding from the government is very limited.

The researchers believed that in order to solve the financials and budgets constraints in developing countries, priority should be set up for the very urgent infrastructure development. In return, this effort could give much benefits for both short and long-term and it can give broad positive impact for whole state development.

c) Time horizon and complexity of appraisal analysis issues

As the researchers stated above, transportation forms a complex system that is highly interrelated with socio-economic and ecological systems. Negative environmental impacts from the transport can present a major obstacle in achieving sustainability.

However, major determinants of the transport system can only be changed on a long-term horizon. Transport policy assessment approaches therefore have to be capable of reflecting these highly interrelated systems as well as of measuring long-term changes (Schade & Rothengatter, 1999). In this case, developing countries need an effective appraisal to anticipate those needs.

d) The emergence impact of infrastructure development issues

It is inevitable that the transport infrastructure development as a form of transport policy could encourage increased production of economic activity, improving social welfare and stimulate spatial development. But, we cannot ignore that there are so many negative effects caused by the transportation project either.

Unlike the modern countries that the conditions of the land use and society are quite stable, in developing countries the sensitivity due to changes in the system of public transport infrastructure and other components is very high, this factor should be taken into consideration. Particularly, the most important problem in the assessment of transport infrastructure projects in developing countries is the difficulty to identify the impacts which came from the construction and operation of transport infrastructure, in the medium and long term scale. This is because mainly due to the limitations of methods, data, funds and other resources.

e) Strategic policy appraisal issues

In developing countries, the fundamental problem in the appraisal process is not only at the project level, but also the policy decision making level, because it is related to limited of funding, resources and effort to produce a value of greater benefit to the community. However, other issue that may arise related to the strategic review is the quality and reliability of data, public participation, and uncertainty. Furthermore, one significant weakness is that the social and economic aspects are usually abandoned or ignored.

Studies on a strategic level in many developing countries were quite few. These happened due to resource constraints, poor understanding of concept at the strategic level assessment in developing countries. Also in developing countries, the choice of systematic plans and policies are very many and quite various. These choices "as if" have the same level of importance in the effort to accelerate the progress of society welfare, but in the practice these systematic plans mostly used in subjective way or as partial considerations. Also, interest factor or certain motive (read: politics) also influenced the final decision. Under these conditions, the unavailability of objective and transparent assessment tool in strategic level can produce bad impact for the community and environment in the long run.

f) Integrating methods in appraisal process issues

Developing countries require a set of simple, effective and efficient appraisal tool. This is needed to develop an integral and comprehensive appraisal method.

According to Eales, R, *et al*, (2003), the integration has a different meaning in the context of the appraisal despite frequent reference to considerations of economic, social and environmental issues in an single integrated appraisal. Other forms of integration in the context of assessment include vertical integration (i.e.: integration between levels of hierarchy appraisal process carried out at different levels in the hierarchy of decision-making), the integration between the processes of decision-making and appraisal processes, and integration of the role of stakeholders in the appraisal process.

CONCLUSIONS

The infrastructure development in the developing countries has the typical problems which often cannot be anticipated earlier. A new assessment approach was developed that was called Strategic Sustainability Analysis (SSA).

The emphasis of SSA is on comprehensive transport policies, assessing policies simultaneously in order to detect possible interdependencies and cumulative impacts, handling the three basic aspects of sustainability equally.

Some problem that must be faced for implementing this SSA in developing countries and need for in-depth research are sustainability issues, budgets constraint issues, time horizon and complexity of appraisal analysis issues, impact the emergence of transportation infrastructure development issues, strategic policy appraisal issues, integrating methods in appraisal processissues.

REFERENCES

Schade and Rothengatter (2000), Strategic Sustainability Analysis (SSA) Broadening Existing Assessment Approaches for Transport Policies, Paper Presented in the 3rd Biennial Conference of the European Society for Ecological Economics Entitled Transitions Towards a Sustainable Europe: Ecology - Economy - Policy Vienna, 3rd-6th May.

Schade W *et at*. 2000. ASTRA: Assessment of Transport Strategies, Final Report: EuropeanCommission Directorate

General VII - Transport - in the IV Framework ResearchProgramme.

Schade B and Schade W. 2003.Evaluating Economic Feasibility of Environmentally Sustainable Scenarios by a Backcasting Approach with ESCOT (Economic assessment of Sustainability poliCies Of Transport), Paper Presented in the 9th International Conference of The Society of Computational Economics Computing in Economics and Finance, Seattle,USA.

Martino A, *et al*. 2010. A Framework for Strategic Sustainability Assessment of European Transport Policies, Paper Presented in 12thWCTR, July 11-15- Lisbon, Portugal.

Weaver P and Rotmans J. 2006. MATISSE (Methods and Tools for Integrated Sustainability Assessment), Integrated Sustainability Assessment - What?Why? How?, MATISSE Working Paper 1, the 6th Framework Programme of the European Union. Contract number: 004059 (GOCE).

ECORYS N. 2006. Study on Strategic Evaluation on Transport Investment Priorities under Structural and Cohesion funds for the Programming Period 2007-2013, Report: European Commission, DG-REGIO, Rotterdam.

Pfaffenbichler and Shepherd. 2002. A Dynamic Model to Appraise Strategic Land-Use and Transport Policies, Journal of EJTIR. 2(3/4): 255-283.

Pfaffenbichler Paul. 2003. The Strategic, Dynamic And Integrated Urban Land Use And Transport Model MARS (Metropolitan Activity Relocation Simulator) Development, Testing and Application, Dissertation Doctoral Thesis, InstitutfürVerkehrsplanung und Verkehrstechnik, E231, TechnischeUniversität Wien, Unpublished.

Sheate WR and PartidárioMR. 2010.Strategic approaches and assessment techniques- Potential for knowledge brokerage towards sustainability, Journal of Environmental Impact Assessment Review. 30: 278-288

ECMT. 2004. Assessment and Decision Making for Sustainable Transport, European Conference of Ministers of Transportation and the OECD (www.oecd.org). Edited by Stanners David and Bourdeau Philippe. Copenhagen.

Eales R. *et al*. 2003. Integrated Appraisal Methods, R and D Technical Report E2-044/TR, Environment Agency, ISBN 1-844-32233-5, www.environment-agency.gov.uk

Forrester JW. 1969. Urban Dynamics, Cambridge MIT Press.