

CONTEXT AND PROSPECTS FOR INTEGRATED URBAN MODELS FOR METROPOLITAN POLICY ANALYSIS AND PLANNING IN DEVELOPING COUNTRIES: THE CASE OF METRO MANILA

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Abstract: Metropolitan areas in the developing world face a pressing need for policy tools to evaluate urban development strategies. This need, placed within the context of fiscal restraint, sustainable development, and public administrative regimes, has kindled an interest in the use of “integrated urban models” (IUM) that explicitly consider urban transportation and land use interactions. While the development and use of these models has helped science to better understand urban processes, they can only be useful to society as a whole if used to inform policy making and analysis. The objective of this paper is to put into perspective the necessary conditions for the formulation of an IUM useful for policy and planning in developing countries taking the case of Metro Manila. The paper frames the steps needed for development and application of a model of this type in the area.

Key Words: Integrated urban models, Policy analysis, Developing countries, Metro Manila

1. INTRODUCTION

The relationship between science and policy development has been variously described in terms that include “two separate worlds” (Goodchild, 1993), “tense” (Cahn, 2004), or even “colliding” (Tuite, 2004). These descriptors hold true for a majority of domains where the objectives and interests of science and policy intersect (including the environment, the economy and society), and are also naturally relevant from the perspective of urban land use and transportation planning. In the urban arena, planners and policy makers are charged with making important decisions about transportation infrastructure and services, investment, and spatial development. These decisions have tremendous implications for the sustained and sustainable development of metropolitan areas. Still, despite the high stakes involved, the relationship between politics and science-based planning has often been uneasy, as decisions concerning investments, infrastructure provision, management and other policies shaping urban areas have been muddled by competing interests and values leaving limited room for analytical methods to rationalize the process (Waddell, 2001). Given the potentially high cost of policy failures in these areas, it is surprising that the wealth of knowledge generated by scientific research in the course of the years, including a better understanding of the interdependencies between the land use and transportation systems in a city, has not been more applied for urban policy analysis and planning (Kanakoglou and Scott, 2002).

The constellation of metropolitan areas in the developing world in general, and Asia in particular, provide a critical context that highlights the potential of an improved science-policy relationship. In Asian cities of the developing world, it is estimated that funding should rise from \$38B in 1998 to \$292B in 2020 in order to provide sufficient infrastructure and services to sustain urban productivity and to achieve quality of life goals (ADB, 2003). Otherwise,

cities will become increasingly inefficient due to environmental deterioration and economic and social development constraints. Without funding from external sources, local governments (especially in developing countries with decentralized systems) will have difficulty meeting the financial requirement for sustainability. The situation will be even thornier in cases where local governments are given greater responsibilities for the provision and operation of urban services without the authority to raise extra revenues or enjoy fiscal independence under the premise of no external funding support. In the face of increasing demand for infrastructure and services to accommodate growth, there is an urgent need for policy tools to evaluate strategies within the context of fiscal restraint and sustainable development as well as to address political factors, which are prominent especially in countries with more democratic and decentralized systems. It is within this context that the use of Integrated Urban Models (IUMs – models that explicitly consider the interdependencies between land use and transportation in cities) provides a solid basis for projecting the evolution of urban form and function, exploring different scenarios, and understanding the potential implications of development policies.

The potential of IUMs to improve complex decision-making and, hence, to produce better policies for urban areas is now being realized in many places in the developed world (including North America, e.g., Waddell, 2003a, Miller et al., 1998, Hunt and Simmonds, 1993; Europe, e.g. Wegener, 1994, Echenique et al., 1990; and Japan, e.g., Miyamoto et al., 1996). This is in contrast to the situation in the developing world, where applications remain scarce. Accordingly, the objective of this paper is to put into perspective the necessary conditions for the formulation of IUMs useful for policy and planning in developing countries, with a special reference to the situation in Metro Manila. This region is chosen due to the authors' familiarity with the area and more importantly, the region's critical need for a more strategic and coordinated urban planning system particularly in intensifying transportation and land use plan integration (World Bank 2003). The paper provides an overview of the evolution of IUMs, their origins, the state of practice and recent developments. It also explores existing developments within the land use, transportation and environment in Metro Manila, as well as related policy and institutional set-up. The prospects for integrated urban models and the required steps to be taken for the development and application in Metro Manila of an IUM are discussed next. Finally, in concluding, the challenges of implementing and applying integrated models in the context of the metropolitan areas in the developing world are discussed.

2. EVOLUTION AND STATE OF INTEGRATED URBAN MODELS

2.1 Origins and Development

Most transportation and land use models were developed in the 1950s, at a time in planning when important technical (e.g. operations research) and technological (e.g. the computer) developments gave rise for the first time to the possibility of taking a comprehensive approach to urban planning. Since its development in the 1950s, the Urban Transportation Modeling System (UTMS – also known as the four-step model approach) and its variants has been the most widely used transportation model for travel demand forecasting. Starting in 1958, urban land use modeling also gained ground and efforts were initiated to link these models to consider the dynamic relationship between land use and transportation. Making such connections, it was thought, would improve the realism of the models, and would thus make them more useful as policy analysis tools. The 1950s was also an era of optimism and faith on the efficacy of science and technology that gave birth to new academic fields such as operations research, urban economics and regional science. According to Klosterman (1994), a great sum of money was spent in the development of “extremely ambitious” computer-based

models to study selected urban programs in American cities (e.g. Pittsburgh's urban renewal program). These efforts, however, collapsed around 1965 when they failed to live up to their stated objectives; by the early 1970s, their original promise had faded, and the remaining efforts retreated to academia (Lee, 1994).

It is in this context that Lee evaluated the "fundamental flaws in attempts to construct and use large models" and examined the planning context in which "the models, like dinosaurs, collapsed rather than evolved" (Lee, 1973). It is important to look back at the important points in Lee's review that have shaped subsequent urban models. Lee drew four conclusions on what policy models should be. The first is that they should be "transparent" or readily understandable by their users. Second, they must combine strong theoretical foundations, objective information and wisdom or judgment. Thirdly, planners should start with identifying a policy problem and not with a methodology that needs applying. Lastly, planners should build only very simple models because complicated models do not work. In this respect, he stressed that planning should be oriented around urban problems rather than around any discipline or science. Despite the persuasiveness of the integrated modeling approach, Lee's criticism and the failure of early models caused disillusionment within the planning profession. However, urban models continued to be developed, tested, and improved in the academic setting. For instance, Batty (1994) chronicled the flourishing of urban models in Britain and abroad when they slowed down in the United States, especially with respect to the promotion of new analytical tools (e.g. GIS). Moreover, recent reviews of the field (e.g. Wegener, 1994; Kanaroglou and Scott, 2002, Timmermans, 2003)) have noted progress in terms of comprehensiveness, theoretical foundations and the actual and potential applications.

Although disagreements remain (e.g. Lee, 1994), there is a growing consensus of ideas with respect to the importance of large scale urban models in future planning practice compared (Klosterman, 1994). In the case of developing countries, Echenique (1986) has strongly argued on the promise of urban models in the planning practice for both the developed and developing world considering that the criticisms leveled against their use have been overcome by present models and by the theoretical and operational improvements that are forthcoming. However, the concern that he raised with respect to the weak institutions that carry out planning in developing countries remains to be a big stumbling block to their adoption and application. Batty (1994) has termed this a problem of "orgware", where the incorporation of new ideas, processes and technologies in the planning organization remains a key issue in the mismatch between model design and application. The experience in Metro Manila discussed in this paper is a case in point.

2.2 Contemporary Urban Models

Recent reviews of existing models (see for example Kanaroglou and Scott, 2002; Timmermans, 2003) document a vigorous urban modeling renaissance. Partly propelled by technological (e.g. GIS) and theoretical breakthroughs (e.g. use of discrete choice analysis), the number of studies and applications, especially in the developed world, continues to increase. At the same time, there is a growing recognition that urban interactions (including well-documented land uses-transportation interactions) also extend to how these systems affect or are affected by the environmental, economic and social factors that result from policy initiatives or infrastructure choices. Land-use and transportation systems are now fruitfully studied as closely related elements within a larger urban system (land use, transport, environment, economy, society). The evolution in emphasis from comprehensiveness in terms of sectoral scope to ability to inform policy discussions pertaining the different sectors, has led

to the abandonment of the label “large scale urban models” in favor of the term “integrated urban models”. New directions in integrated urban model development are discussed next.

2.3 Emerging Considerations in IUM Design, Development and Application

2.3.1 Scope of IUM

Environment. The urgency for integrated land use and transportation models to incorporate environmental impacts has been highlighted following global discussions on sustainable development in the early 90s and their translation into country-policy formulation and legislation. In the US, it has been given greater attention with the passage of the Clean Air Act Amendments and the Intermodal Surface Transportation Efficiency Act (ISTEA) (Waddell, 2003b). The passage of these laws has resulted in lawsuits against large cities for the failure of their land use and transportation modeling and planning processes to take into account the complex interactions between transportation improvements, land use and air quality (Garrett and Wachs, 2003). In particular, the case was an oversight on the part of the government to account for the effects of increasing highway capacity on air pollution emissions by reducing transit use, increasing highway speeds, inducing highway travel, and encouraging urban sprawl (Waddell, 1998). Increasingly, governments in many developing countries have adopted similar environmental laws but the implementation and more so the incorporation of the environment in planning models have not been fully realized. For instance in Metro Manila, Republic Act 8749 or the Clean Air Act was passed in 1999 but programs to implement the law have been saddled by political “upheavals”, vulnerable to effects of changes in political leadership (Diaz, <http://www.un.org/esa/gite/iandm>). Environmental planning at the urban level is not without difficulties however, as in reality environmental processes take place at different levels and are affected by different urban processes. In this case, the environment is more fruitfully seen as an integral part of a system that also includes as elements other systems such as land-use and transportation. The level of sophistication of urban analysis models currently in operation is such that emissions, energy consumption, dispersal of pollutants and other environmental indicators and by-products of urban activity can be forecasted. Examples of modeling systems that incorporate sustainability measures include the System for Planning and Research in Towns and Cities for Urban Sustainability (LT Consultants/Echenique 1999), Planning and Research of Policies for Land Use and Transport for Increasing Urban Sustainability (Lautso et al., 2004) and the Integrated Model of Urban Land Use and Transportation for Environmental Analysis (Anderson et al., 1994; Buliung et al., 2004).

Urban Economic Processes. It has been strongly emphasized that an integrated model should not only be a model of travel and land development but a model of urban economic (and demographic) processes as well (Miller et al., 2003). These processes involve the dynamics of the labor market as well as those that generate person travel and goods movement within the urban area. The more recent IUMs under development incorporate most important economic processes occurring in urban areas. For instance, in ILUTE (Integrated Land Use, Transportation, Environment), a major emphasis has been placed on market demand-supply interactions especially in residential and commercial real estate markets (Miller et al., 2003). On the other hand, UrbanSim, incorporates components that demonstrate the dynamic processes and interactions of urban development and transportation by taking into account not only real estate development (infill and redevelopment) but also internal and external drivers affecting economic growth in the urban region (Waddell, 2002).

Policy Management. As was pointed out earlier, there is a growing expectation for integrated urban models to be a useful decision support tool for policymaking. The quest for well-designed analytical tools is not only confined to allow better decision-making in terms of implications to environmental effects but also to engage the public in managing the side effects of economic growth or investments with respect to urban sprawl, congestion, housing affordability and loss of open space (Waddell, 2001). As well, urban models have also been expected to respond to other issues such as poverty, criminal justice, public health and safety.

2.3.2 Technical Development Features

Behavioral Analysis. Recent advances in integrated urban modeling adopt a more realistic interpretation of the behavioral dynamics that make up an urban system. Aside from the theoretical discussions concerning the shift from zone-based modeling approach, significant interest has been placed lately to changes in the state of individuals and households given their relevance for equity analysis and for more focused policy interventions of particular types of individuals or groups. Agent-based modeling and activity-based techniques are now being developed to incorporate the behavioral dynamics of individuals, governments, real estate developers and investors (Kanaroglou and Scott, 2002; Waddell, 2002). So far a number of advances in activity-based approaches span applications such as simulation-based (computational process models), econometric-based (simultaneous equation, discrete choice and statistical models) and other methods that employ the use of hazard-based duration and structural equation models (McNally, 2000). A great stride has been undertaken in Canada with the development of ILUTE, a fully agent-based, integrated microsimulation model of urban land use and transportation (Miller et al., 2003). However, much work remains before it becomes a fully operational software package for planning applications.

Spatial Analysis. Urban analysis has been quick to adopt advances in geographic information systems (GIS) giving the impression that the discipline already embraces space in the modeling. It has been argued, though, that statistical models underlying conventional urban analysis remain, for most part, aspatial (Landis and Zhang, 2000). Most recently, however, spatial statistics has seen a rapid development. Based on an exhaustive review of the growing application of the technical developments in spatial statistics, the future would see urban analysis taking into account in a greater fashion the spatial characteristics of the urban processes (Páez and Scott, 2004).

2.4 Remaining Challenges

2.4.1 Refinement and Application of Existing IUM

The considerations outlined above highlight work in progress to refine the existing IUM, which does not preclude the development of new and better ones. In addition to the energy devoted of late in extending the scope of the model to encompass important environmental, economic and social policy variables and the shift towards microsimulation-based IUMs, a great deal of work is being given to the stronger IUM-GIS interface (Buliung et al., 2004; Kanaroglou and Scott, 2003), within a spatial visualization framework such as the Virtual Reality Modelling Language (Bell et al., 1999), and noteworthy efforts in operationalizing models within a GIS software environment such as the travel demand modeling in the TransCAD system (Walker 2005). At the heart of all these endeavors is the desire to develop an IUM with the end-user in mind, that is, for planners to use the model in actual planning and policy analysis and for decision-makers and the public to easily digest the implications of model results.

2.4.2 IUM Development in the context of Developing Countries

A challenge remains in the development of integrated transportation and land use models in developing countries. The need for integration of transportation and land use planning with environmental consideration in developing countries is said to be far greater than in the developed world, since urban change in metropolitan areas in the former is much more rapid and dramatic (Miyamoto, 1996). Even so, there is still dearth of models developed and or applied within the context of developing countries. This failure to develop decision-making tools is due mainly to the lack of institutional mechanism for land use and transportation integration and the financial constraint to support planning tools development in the face of competing economic and social development priorities. It is in this respect that Miyamoto (1994) suggested a framework to lay down the groundwork for model building for metropolises in developing countries. He emphasized the need to understand in a much more focused fashion, not only issues with respect to transport planning, land use planning but also those that relate to implementation of land use plans and transportation plans as the institutions that plan and implement may not be the same. The issues concerning integrated planning of land use and transport is as important as the lack thereof. It is important to bear in mind the methodological and institutional difficulties in this respect, as they will affect the model system that will be built. As has been mentioned in the early part of this paper, models must be developed with the end-user in mind so that the model will not be just an academic exercise but useful as a decision making tool. In addition, other unique features of the metropolis in developing countries need to find translation in the model. For instance, Tiglao and Tsutumi (2001) flagged the need to incorporate detailed socio-economic distribution of the population and the different demand structure between the rich and the poor and, related to this, the informal market mechanisms occurring in metropolises in developing countries.

2.4.3 Human Resource Development

In spite of the potential and promise of integrated models to study urban sustainability, a difficulty faced by new users of these models is the rather wide theoretical foundation on which they are built: most models use combinations of economic approaches (i.e. input-output models) with discrete choice theory (i.e. the logit model), statistical methods and/or mathematical programming. The lack of a coherent modern treatment of all the necessary theory and methods in a single source is enough to discourage all but the most determined students and practitioners. There is thus a need to address this gap in dissemination and the concentration of know-how to avoid what Lee (1994) has termed as the development of integrated urban models as sort of cottage industry, one that is dominated by a reduced number of consultancies and research centers around the world. The challenge is developing a model that is usable by planning staff and other users in the public sector while at the same time ensuring that they are trained to use and maintain the model for policy work and planning. This should be a challenging opportunity in the formulation of training agenda relating to urban development at both national and international levels.

3. MAJOR URBAN CHALLENGES IN METRO MANILA

Metro Manila or the National Capital Region, with a population of about 10 million in 2000, is the smallest of the 16 regions of the Philippines in terms of land area (636 square kilometers) but plays the most critical role in the country's development. It is the prime financial, commercial, social, cultural and educational center and the seat of the national government. It is also the national gateway for most trade and commerce. Its cumulative development through centuries has made of it the premier metropolis in the country – a role that new metropolises will find difficult to overtake. Given Metro Manila's national relevance, the rapid

growth in public expenditure needed to meet its social and physical infrastructure requirements has been a constant challenge that has been highlighted in recent years.

3.1 Rapid Urbanization and Economic Growth

Although Metro Manila's share in the total population is only 13 percent, it dominates the economy accounting for 43.5 percent of the country's GDP in 2000 (NSCB <http://www.nscb.gov.ph/secstat/>). This is largely because it handles the largest values and volumes of domestic and international transactions and accounts for the largest regional shares in industry (38%), services (45%), financial services (78%) and the transportation, communication and storage sector (>50%). Metro Manila's population is expected to rise dramatically becoming the 15th largest city in the world in 2015 (UN, 2002) from 17th in 2000. For this reason alone, on one hand, this will mean that Metro Manila will not be ignored as an attractive market and investment area. In fact, its economic resilience stems from being at present the largest concentration of consumers in Southeast Asia generating interest domestically, regionally and globally. On the other hand, while this rapid urbanization can be an opportunity for greater economic dynamism it will also pose unparalleled environmental, economic and political pressures on the metropolitan area. Given the country's fiscal problem, its struggle to remain competitive as evidenced by its lackluster economic performance relative to competitor countries in East Asia, and the bottlenecks and backlogs in urban infrastructure and services such as in education, health, employment, housing, transportation and other economic requirements, the metropolis would be in danger of further deterioration if it does not shape up. Hyper-urbanization (a condition where population increases exceed that of employment opportunities) which has intensified through the years will inevitably lead to environmental and social pressures that will constrain government ability to address both the symptoms and causes of urban problems and thereby may lead to political instability. Considering that Metro Manila is the center of political activity, its high sensitivity to political instability will endanger its growth prospects and the country as a whole.

Given the crucial role of the urban system in determining the future of the Philippines, there has been a strong call to adopt a more focused urban strategy, one that is characterized by a limited number of high leverage strategic thrusts around which efforts and resources can be focused (World Bank, 2003). In the case of Metro Manila, it has been suggested that energies be devoted to further position it as an attractive business and producer services center in East Asia capitalizing on its infrastructure potentials and the quality of its human resources. The adoption of such strategic thrust will require the alignment of efforts for better infrastructure (transportation and communication), amenity (attractive urban environment) and access to specialized human resources. A better understanding of the linkages and implications of land use, economic, and transportation decisions and investments to guide the formulation of suitable policies is therefore in order.

3.2 Transport and Housing Problems

Major roads in Metro Manila are no longer sufficient to accommodate the rapidly rising traffic volume, which has more than doubled within the last decade. Of the 4.2 million motor vehicles registered in the Philippines about 1.4 million (33%) are registered in Metro Manila (Creus and Oyama, 2003) compared to 685,000 in 1990. Chronic problems of insufficient road space, traffic congestion, increased demand for quality public transport services, and traffic management issues have been documented (e.g. Manasan and Mercado, 2002).. These issues remain as major transport challenges, in spite of efforts to address them through the expansion

of roads, urban rail transport services and the enforcement of more coordinated traffic engineering systems. Again this is because policy frameworks and interventions address the symptoms rather than causes of the transport problems. Long-term solutions to transport problems have to be in place especially with respect to housing development in consideration of employment location and livelihood activities. Transportation improvements have to take into account their effect on opening areas for affordable housing while at the same time providing accessibility to/from the existing and expected work places. A more coordinated effort is needed in this regard so that sectoral national agencies and local government units (LGUs) share the same direction in their development pursuits.

3.3. Land Use-Related Issues

Government presence in the land and real estate market through land use and planning and urban management remains weak. Severe problems affect the land markets in the country and these arise from unclear and inconsistent land laws, policies and inadequacies in land administration and management. In place of a comprehensive land policy, there are uncoordinated laws that guide the development of specific land types and a web of fragmented institutions that manage them (Mercado, 2002). A recent study (Ballesteros, 2000) on urban land markets in Metro Manila emphasized the urgency of correcting contradicting policies on land use planning and management as they lead to land misuse, land speculation and high transaction costs. It is thus, interesting to note that while Metro Manila has the lowest per capita unit costs of construction among neighboring cities in Asia, its housing is more expensive as a result of these transaction costs. Meanwhile, transportation network has strongly affected urban development direction and land use. Land use zoning, which was institutionalized starting in 1981, did not guide much the development process. Instead, strong market forces and active private sector played a key role in determining urban formation in which the availability of transportation infrastructure is the key consideration. Yet again, this is largely attributed to the fragmented institutional responsibilities and the unclear role of the LGUs in implementing land policy and determining land use classifications. This is exemplified by the traditional weak link between land use plans which LGUs are mandated to prepare and the transportation infrastructure strategy that national agencies formulate and implement. A more comprehensive definition of the future direction (vision and structure) of the metropolis could be a more effective strategy to guide LGUs in their development planning and the private sector in locating investments in lieu of inflexible land use plans and zoning which have been deemed to be ineffective planning instruments in large urban areas such as Metro Manila as they are often ignored or made irrelevant by market forces.

3.4 Environmental/ Air Quality Improvement

Air quality in Metro Manila has worsened from its condition in 1980 based on the concentration of Total Suspended Particulates (TSP) which have exceeded the national ambient air standard (DENR, 2003). A program to reduce vehicular emission was prepared in 1992 but implementation did not commence until in 2000, after the passage of the Clean Air Act in 1999 and funding from the Asian Development Bank facilitated implementation. The law provided the legal framework for the annual vehicle inspection, acceptable Lead content in gasoline and Sulphur in diesel. Inspection of vehicles prior to registration has been constrained by the insufficient facilities of the government to conduct proper safety and smoke emission inspections. Recent survey showed that 31% of motor vehicles were registered without proper inspection (Creus and Oyama, 2003). There are implementation problems also with respect to enforcement due to policy oppositions. For instance, the shift to fuel-efficient

engines for jeepneys and motorcycles has not been pursued due to a strong lobby by jeepney transport associations. Reduction of emissions from vehicular use should not only consider better inspection system but also a review of other related policies including the importation of second hand vehicles and engines, the setting of age limitation for both public and private vehicles and the introduction of emission technology measures.

3.5 Institutional Set-up and Coordination

The issues discussed above are manifestations of the problems in metropolitan governance and planning in Metro Manila. To begin with, the strong sectoral orientation in policy and planning in the country serves as an institutional impediment to an effective and efficient geographically-based development. At present, the Metropolitan Manila Development Authority (MMDA), in broad terms, serves as the planning, monitoring, coordinative, regulatory and supervisory authority over the delivery of metro-wide services within Metro Manila without diminution of the autonomy of LGUs comprising it. But effectively to date, except for traffic planning and management, this has not been the case. While the MMDA appears to have taken on more responsibilities in the delivery of metro-wide services, a large proportion of these services still remain with national government agencies as the latter continues to receive a sizable portion of the budget for metro-wide services (Manasan and Mercado, 2002). In other words, funding support for metro-wide services is principally retained in the budgets of national government agencies. Rather than serving the needs of the metropolis per se, these agencies, being line departments, are inherently concerned with their own sectoral priorities leaving MMDA with the very difficult task of having to orchestrate the sectoral programs of these agencies, including metro-wide services. Similarly, strategic planning is made difficult because proponents or stakeholders differ in their priorities and is heavily influenced by political pressures and intervention. It is in the metropolitan area that planning decisions are most difficult to undertake because there is no political representation (i.e the MMDA Chairman is not elected by Metro Manila residents) to attract political “champions”. This is why metro-wide projects thrive only if they coincide with a high priority project of the agency with approved sectoral budget, initiated or implemented by the private sector and/or if they are foreign-funded (World Bank, 2003). Unless changes are made in the governance structure and politics in Metro Manila, a more coordinated metropolitan development will remain a demanding challenge.

4. PROSPECTS FOR DEVELOPMENT OF URBAN PLANNING MODEL FOR METRO MANILA

4.1 Existing Urban Model

A fully integrated land use and transportation model for Metro Manila is yet to be developed. What has been made available in recent years is a transport model utilizing the traditional 4-step approach for forecasting travel demand in the metropolis. This pertains to the Metro Manila Urban Transport Integration Study (MMUTIS), where it used a land-use-transportation interaction model which exogenously forecasted possible land use changes for the planning period (under four scenarios) and then established estimates of trip generation per zone (ALMEC, 1999). One of the objectives of the MMUTIS was also to establish a common planning database for transportation planning in Metro Manila. The model has been promoted for use by key transport planning agencies including the Department of Transportation and Communications (DOTC), Department of Public Works and Highway (DPWH) and the MMDA. However, the model is not used in planning activities due to lack of capable staff to

undertake the same. The database, however, provides agencies with the needed information for use in their respective planning activities.

4.2 The Challenge for Development of an IUM for Metro Manila

It would seem that the weak institutional environment for metropolitan development looks formidable rendering the development of an IUM a futile endeavor in the case of Metro Manila. On hindsight, however, such development can be a rallying point for the metropolitan planning body to revitalize its development planning function that it has not adequately carried out of late. The effort to build a model for planning for use primarily by MMDA (as they have the legal mandate to carry out this function) and shared with key planning and infrastructure agencies including but not limited to NEDA, DPWH, DOTC and HUDCC, can be a platform for such institutional adjustment. The need to engender the widespread support for the adoption of strategic measures for Metro Manila would require a planning tool that will help visualize the directions for its development and competitiveness and evaluate and test alternative plans and policies. The recognition and appreciation of the need for a planning tool such as the IUM for Metro Manila is critical and must be promoted by a credible institutional “champion” (e.g. NCTS, NEDA and/or an interagency committee such as the INFRACOM). This recognition should also accompany a serious consideration to build up the technical expertise especially in urban planning and analysis within MMDA. Planning capabilities must be strengthened and supported with good and reliable database and decision support system. Research and development on the transport sector must also be expanded to improve and sustain scientific planning. In other words, the development of the IUM should be able to encompass the technical, organizational and human resources aspects needed for its use, maintenance, improvement and most especially its usefulness to policy.

4.3 Candidate Models for Further Exploration and Evaluation

4.3.1 Criteria for selection.

In the development of IUM for Metro Manila or for any developing country for that matter, there are benefits in learning from the advances already made in the development and application of IUMs in both developed and developing countries. They can be evaluated as to how they can be sensitive and useful to issues and conditions in the metropolis and how they will provide powerful predictive capabilities. General considerations in developing or adopting an IUM can be gained from the extensive reviews done in this regard ranging from Lee’s (1973) classic propositions to the most recent perspectives on the subject articulated by Timmermans (2003). In fact, specific criteria have been laid out by authoritative figures in urban modeling in classifying and evaluating IUMs (e.g. Lee, 1973; Wegener, 1994; Miller et al., 1999; Timmermans, 2003). The following more or less distills these criteria in the context of developing countries’ needs and requirements into three interrelated attributes: 1) theoretically sound; 2) operational and; 3) policy-oriented.

Theoretically sound. Miller (1999) suggests that a theoretically sound IUM should capture the determinants of the land-use interaction, which consider the spatial behavior of the urban actors (i.e. persons, households, investors and firms). As has been mentioned before, there has been significant theoretical progress in urban modeling since the first wave of IUMs. To date, theories to explain spatial choice behavior have shifted from aggregated spatial interaction models to disaggregated, utility-maximizing models, and lately, towards activity-based microsimulation models (Wegener, 1994; Waddel, 2002; Timmermans, 2003). Such theoretical shifts allow for the incorporation of spatial behavior in the models, and reflect the desire of

urban modelers to be both theoretically sound and produce more realistic forecast results. Timmermans (2003), however, cautioned that addressing the plea for behaviorally better models might expose IUMs to the usual complexity and “black box” criticism. This parallels Lee’s (1973) advocacy for balance between theory, objectivity and intuition: “Excessive concern for theory results in a loss of contact with the policy problem, but policy cannot be formulated well without a strong theoretical foundation”. Indeed, it should be recognized that such fundamental dilemma of addressing complexity of the urban system while avoiding the notion of models as black boxes remain a challenge for most IUMs.

Operational. There are at least three aspects of an operational IUM. First is the relative complexity (i.e comprehensiveness and sophistication) of the model to encompass a variety of urban development subsystems (e.g land use, housing/firm location, travel/activity, employment etc.). Although Lee (1973) argues for a simple versus a complex model to counteract the data hungriness of IUMs, perhaps it is more important to consider whether the data requirements can be made available to run the model and whether the level of details will be of use to answer specific policy problems. As Lee (1973) argues, “...building a model without specific purposes is about as helpful as collecting data without knowing who the users are”. Granting that policy goals of IUMs are clearly laid out, it is crucial to evaluate the IUMs with respect to their data requirements as most of them are still data hungry (Wegener, 1994). Furthermore, in the case of Metro Manila (and perhaps for most developing countries as well) data collection at the subnational/metropolitan level is relatively weak and irregular. Though data collection represents a regular effort in most major metropolises, this is true mostly of those in the developed but not in the developing world. The second dimension of “operationality” is the IUM’s actual application to real cities (Wegener, 1994) and its flexibility to accommodate the differing scales and magnitudes of different cities and regions (Miller, 1999). This reflects the model’s promise of both accuracy and versatility as a planning tool in various geographical contexts. The third aspect of an operational IUM is its understandability and manipulability by the users. Miller et al. (1999) argue that an IUM should be “practical to operate” which has “meaningful outputs and a traceable, defensible process”. This echoes Lee’s (1973) call for transparency i.e. the model must be “readily understandable to any potential user with reasonable investment of effort”. Considering the computational demands of IUMs, some models have progressed to become standard software running on PC platforms and this will undoubtedly be the direction of progress in the future (Wegener 1994).

Policy Oriented. IUMs should be oriented towards assisting urban policy and investments. At the very least, the IUM should be able to address what Wegener (1994) refer to as the traditional questions that IUMs seek to answer, i.e. how land use regulations affect land use development and transportation and how transportation improvements or costs would alter the distribution of activities in an urban area. In this regard, it is worthy to keep in mind Timmermans’ (2003) conception of IUM as aiming to produce policy scenarios that provide a platform for discussion instead of being accurate forecasting tools. Such policy scenarios have to be relevant to the issues faced by planning organizations, transit operators and other urban transportation planners and must be presentable in an understandable way to policymakers and the public (Miller et al., 1999). Wegener (1994) also advocated for IUMs to incorporate issues relating to equity (i.e distributional effects of policy measures in employment, housing or transportation) and environment as they are of growing importance in urban areas, and stressed that if they provide meaningful answers to these questions, the models can “establish for themselves a firm position in the planning process of the future”.

4.3.2 Potential Models

On the basis of the general criteria discussed above, two existing operational models may be potential candidates for further analysis and evaluation as to their adaptability in Metro Manila. These are the RURBAN Model (Miyamoto, 1996) and the URBANSIM (Waddell, 1998). These two models illustrate what can be gained from models that are developed in similar metropolitan context (RURBAN) and from those that depict the next generation of models that have transcended theoretical limitations and adapted technical and technological advances (URBANSIM). The following provides a brief description of these models and some of their potentials for replication/ adaptation.

RURBAN -Random Utility/Rent-Bidding Analysis (Miyamoto et al., 1996)

Description. This is an integrated urban model based on the random utility theory and the random rent-bidding analysis. The model presupposes that the general equilibrium of the land market is obtained under the condition that the demand for land derived from the random utility theory and the supply of land derived from the rent bidding analysis are equal. The improved RURBAN can model location behavior (land use and land price (or rent), transport choice (mode and route) and environmental impacts (air quality, solid waste)

Potential: The model has been applied to Bangkok, a metropolis similar in features with Metro Manila. The model has also been applied to Sapporo, Japan. There are no literature to draw upon the model's strengths and weaknesses when applied to actual context. There are also no information gathered as to how the model, if ever, has found its way in the planning processes in Bangkok Metropolitan Government or other transport related institutions. Nevertheless, given the availability of said information, lessons can be drawn helpful in crafting a similar model for other developing countries such as Metro Manila.

UrbanSim (Waddell, 2003a)

Description. The UrbanSim is a new model that has been developed to respond to complex questions of metropolitan institution concerning long-term plans for transportation, land use and air quality. It is unique from all the models as it is based on behavior approach and focuses on the key actions of principal urban actors, namely, households, businesses, developers and governments. The model is based on random utility theory and uses logit models for the implementation of key demand components. It simulates urban development as a dynamic process over time and space compared to a cross-sectional or equilibrium approach. UrbanSim produces transportation and land use forecasts by traffic analysis zones (households by income, age, size and presence of children business and employment by industry, acreage by land use, dwelling units by type, square feet of nonresidential space by type), and travel model outputs from zone to zone (travel time by mode, composite utility of travel using all modes). Another unique feature of the UrbanSim is that it serves as a support system for metropolitan planning in terms of testing the potential effectiveness of combinations of regulatory, infrastructure and pricing policies in achieving desired outcomes.

Potential: The model is the newest integrated urban model that that has been designed taking into consideration the criticisms of prior modeling efforts and the advances so far made in theory, computation and econometric methods. The design of the model is conscious of how it will be sensitive to the policies of principal concern, manageability of data requirements, usability by staff and other users with appropriate training and its suitability to the operational practices of the relevant institution. The model results are GIS-linked using the state of the art softwares such as ArcView to visualize the outputs in map form. It is a rather new analytical tool and still being improved with the application of the model in various places and contexts

(Hawaii, Oregon, Utah, Washington). The lessons drawn from the application of the model in these areas can be useful in guiding the replicability of the models in various situations and perhaps potentially can be extended to developing country-situations.

5. CONCLUDING REMARKS

Given their size and high-density character, metropolitan regions in the Asia Pacific region face severe environmental, land and transportation management problems (Stubbs and Clarke, 1996). In view of their inevitable and unprecedented growth, the need for intelligent management is seen as a major challenge given that mankind's future is seen to unfold largely in these urban settings (Fuchs, 1994). The development and application of IUMs provide an opportunity for science to address this necessity. This type of social science models can have powerful influences on the policy process in terms of clarifying the issues in question, enforcing discipline of analysis and discourse, as well as providing a powerful form of advice (King and Kraemer, 1993). As Goodchild (1993) notes, the use of models may help science to better understand nature but are only useful to society as a whole if they can inform policy making and analysis. The search for a model that possesses the ideal attributes for metropolitan policy analysis and planning attuned to a developing country situation will not be an easy journey but will be a worthy endeavor and useful in improving the policy process.

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