

REPORT ON THE ISPRS INTERNATIONAL WORKSHOP ON SPATIAL PLANNING AND DECISION SUPPORT SYSTEM

8 – 9 December , 2005

Malaysian Centre for Remote Sensing, Kuala Lumpur, Malaysia

1. WORKSHOP ORGANIZATION AND PARTICIPATION

- 1.1 The workshop was jointly organized by the International Society for Photogrammetry and Remote Sensing (ISPRS), Institute of Advanced Technologies, University Putra Malaysia (ITMA, UPM), Malaysian Centre for Remote Sensing (MACRES) and Malaysian Remote Sensing Society (MRSS). The event was sponsored by the Ministry of Science , Technology and Innovation, Digital Globe, ESRI South Asia Sdn Bhd and Espatial Resources Sdn Bhd.
- 1.2 There were 69 participants - 40 locals and 29 foreigners (Figure 1, Complete list - Appendix 1). Mr Loh Kok Fook, Mr Faisal Khuder Mahmood Jeber, Mr Lawal Billa and Ms Seyedeh Zahra Pourvakhshouri were appointed rapporteurs of the workshop
- 1.3 Mr Darus Ahmed , the deputy director (R&D) of MACRES welcomed all participants to the workshop while Dr Ali Sharifi, the organizing committee chairman, briefed the workshop on the background of the working group on Spatial Planning and Decision Support System (II/IV) under the jurisdiction of the ISPRS Technical Commission II, which was responsible for the promotion of research and development on the theory and concept of spatio-temporal data handling and information. Within this framework, the working group II/IV was given the responsibility to promote research and development to enhance the role and application of geo-information in spatial planning and decision making for sustainable development of earth resources. He emphasized that the workshop was organized by the working group with the objective of enhancing the role of remote sensing and geographic information systems to support management decisions while simultaneously providing an international forum to exchange knowledge, and experiences related to the theory, concepts, design and development of spatial planning and decision support systems to support sustainable development of resources at various scales. He urged all participants to interact actively with the paper presenters of the workshop particularly the invited speakers - Prof Michael Batty, Dr Christopher Pettit and Prof Gerard Linden.
- 1.4 The workshop was organized through three sessions – Spatial Planning Support System, Spatial Decision Support System and Planning and Decision Support

System. Altogether 13 papers (5 foreign and 8 locals) were presented at the workshop touching mainly on applications of spatial planning and decision support systems for various fields including urban planning, agriculture, disaster management and forestry. The workshop ended with a panel discussion followed by a closing remark by Dr Ali Sharifi. A technical visit to MACRES was then arranged.



Fig. 1 Participants of the ISPRS International Workshop on Spatial Planning and Decision Support System on December 8-9, 2005 in Kuala Lumpur, Malaysia.

2. WORKSHOP AGENDA AND OUTPUTS

The participants unanimously adopted the workshop agenda as appeared in appendix 2. Abstracts of papers presented at the workshop are given in appendix 3 and Appendix 4 gives the salient points raised in the panel discussion. The workshop has decided that the proceedings (softcopies) would be distributed to all participants and some papers will be selected by ISPRS for international publications

LIST OF PATICIPANTS

No.	Name	Organization
1	Dr Shattri Mansor (OC)	University Putra Malaysia (UPM)
2	Mr Loh Kok Fook (OC)	UPM
3	Prof.Dr Gerard Linden (KS)	UG, Netherlands
4	A.Prof. Dr Ali Sharifi (OC)	ITC, Netherlands
5	Dr Christopher Petit (KS)	PIRV, Australia
6	Prof Dr Michael Batty (KS)	UCL, UK
7	Dr Ahris Yaakup (PR)	University Technology Malaysia (UTM)
8	Mr Sumaryono (PR)	Bakusurtanal, Indonesia
9	Mr Masoud Karamali (PR)	College University Science and Technology, Malaysia (KUSTEM)
10	Mr Ragu Ponusamy (PR)	Federal Land Consolidation and Rehabilitation Authority of Malaysia (FELCRA)
11	Ms Tok Siew Lian (PA)	Private individual
12	Ms Jah Salmihani Mansor (PA)	Malaysian Meteorological Service (MMS)
13	Mr Ng Kim Lai (PA)	MMS
14	Mr Zailani Khuzaimah(OC)	UPM
15	Mr Jamil Ismail (PA)	Espatial Resources (ESR)
16	Mr Kay Thoan San (OC)	ESR
17	Mr Amir Azizi (PR)	UPM
18	Mr Darus Ahmed (OC)	Malaysian Centre for Remote Sensing (MACRES)
19	Mr Zahid Ahmad (OC)	MACRES
20	Nur Fazzillah Mohamed Noordin	Geoinfo

21	Tn. Hj. Wan Hassan Wan Ismail (PA)	Department of Town and Country Planning (JPBD)
22	Ms Suzlyna binti Abdul Latib (PA)	JPBD
23	Mr. Mohd. Ali bin Abu Bakar (PR)	JPBD
24	Ms Robi binti Desa (PA)	JPBD
25	Ms Rozita binti Hamid (PA)	JPBD
26	Tn. Hj. Ahmad Tarmizi bin Ahmad (PA)	JPBD
27	Mr. Saifuddin bin Ahmad (PA)	JPBD
28	Mr. Ahmad Fauzi bin Yusoff (PA)	JPBD
29	Mr Zaiful Zahri bin Kamde (PA)	JPBD
30	Mr Ebarhim Johanshiri (PA)	UPM
31	Mr Azlikamil Napiah (OC)	Malaysian Centre for Remote Sensing (MACRES)
32	Mr Ng Su Wai (PA)	National Space Agency (NSA, Malaysia)
33	Mardiana Shafie	MACRES
34	Ms Seyedeh Zahra Pourvakhshouri (PA)	UPM
35	Mr Lawal Billa (PA)	UPM
36	Mr Mohamed Ahmed Maiyas (PA)	UPM
37	Mr Seyed Ali Zamani	UPM
38	Mr Biswajeet Pardan (PA)	UPM
39	Mr Mohd Shafry Mohd Rahim (PA)	UTM
40	Mr Mohd Taib Wahid (PA)	UTM
41	Mr Faisal Khuder Mahmood Jeber (PA)	UPM
42	Mr Mohamed Abdullah Al Shalabi (PA)	UPM
43	Mr Omar Mahmoud Sulaiman Alkouri (PA)	UPM

44	Mr. Muhammad Pilus Zambri (PA)	Golden Hope Research Centre
45	Mr Mohd Faiz Malik (PA)	Golden Hope Research Centre
46	Mr Chua Guan Liyong (PR)	Geoinfo
47	Ms How Seat Yee (PA)	ESRISA
48	Mr AS Mittal (PA)	Digital Globe
49	Mr Ibrahim selamat (PA)	MACRES
50	Ms Mariamni Halid (PA)	MACRES
51	Ms Suhaida Aini (PA)	MACRES
52	Mr Jasrul Nizam Ghazali (PA)	MACRES
53	Mr Enman Haizal Kamaruzaman (PA)	MACRES
54	Dr Hamid Assilzadeh (PA)	CILIX
55	Ms Azilah Othman (PA)	CILIX
56	Mr Mohd Dini Hairi Suliman (PA)	CILIX
57	Mr Mohamed Shekouhi (PA)	CILIX
58	Dr Sultan Alsultan (PA)	UOSA
59	Mr Mohammed Mustafa Al- Habshi (PA)	UPM
60	Mr Ang Huay Mein (PA)	Economic Planning Unit (EPU_Malaysia)
61	Ms Nicha Chalabi (PA)	KUSTEM
62	Mr Agus Hermawan Atmadilaga (PA)	Bakusurtanal, Indonesia
63	Mr Adi Rusmanto (PA)	Bakusurtanal, Indonesia
64	Mr Danoe Suryamiharja (PA)	Bakusurtanal, Indonesia
65	A.Prof Dr Abdul Rashid Muhammed Sharif (OC)	UPM
66	A.Prof Dr Ahmad Rodzi Mahmood (OC)	UPM

67	Dr Sultan Alsultan (PA)	Umm Alqura University, Saudi Arabia
68	Mr Jimat Bolhassan (PR)	Malaysian Centre for Remote Sensing (MACRES)
69	Mr Atoub Ahmed (PA)	UTM

OC – Organizing Committee

PA – Participants

PR – Presenters

AGENDA
ISPRS Workshop on Spatial Planning and Decision Support System

8 December, 2005 (Thursday)

0800 - 0845 : Registration

0845 - 0900: Welcoming Speech by the Director of MACRES, Malaysia

0900 - 1300 Session 1 : Spatial Planning Support System

*Chairman : Ali Sharifi, Dept. of Urban – Regional Planning and Geo-information,
ITC, Netherlands*

0900 - 1000 Paper 1 (invited paper) : Constructing and Using Virtual Cities: The Virtual
London Project
*Michael Batty, Centre for Advanced Spatial Analysis (CASA), University College
London (UCL)*

1000 - 1030 Light Refreshment

1030 - 1200 Paper 2: Biodiversity Data Components and Data Model
*Abdul Rashid Mohamed Shariff, Universiti Putra Malaysia (UPM), Malaysia and
Mohd Taib Wahid, Universiti Teknologi Malaysia (UTM), Malaysia*

Paper 3: Developing Spatial Growth : Modeling Potentials and Limits
G.L.Chua and Noordin Ahmad, Geoinfo Services, Malaysia

Paper 4: Geo-informatics for Oil Palm Plantation Management
*K.F.Loh, UPM, Malaysia, R. Ponusamy, FELCRA, Malaysia and J. Ismail, Espatiai
Respurces ,Malaysia, J. Ismail*

1200 - 1300 General discussion

1300 - 1400 Lunch

1400 - 1800 Session 2 : Spatial Decision Support System

Chairman : Prof. Dr Shattri Mansur, Institute of Advanced Technology, UPM

1400 - 1500 Paper 5 (invited paper) : Overview of Planning Support Systems
Christopher Pettit, Primary Industries Research Victoria, Australia

1500 - 1630 Paper 6 : Decision Support System in Coastal Prioritization
Shattri Mansor, S. Zahra, Z. Ibrahim and N. Ahmed, UPM, Malaysia

Paper 7: Effectiveness of the Decision Support System on the Supply Chain Management

A. Azizi, N. Ismail, Md. Y. Ismail, M.M.H.M. Ahma , UPM

Paper 8 : Spatial Decision Support System for Determining Protected Forest Zone (Case Study: Bandung Regency, West Java, Indonesia)

Sumaryono, Bakosurtanal, Indonesia

Paper 9 : Extraction of Shoreline by Canny Edge Detector from SAR Images

Masoud Karamali ., M.Lokman,H., M.Suffian,I.,H.Assilzadeh.,A.Chalabi, Kolej Universiti Sains dan Teknologi Malaysia (kustem)

1630 - 1730 General discussion

1730 - 1800 Refreshment

9 December, 2005 (Friday)

0830 - 1230 : Session 3 : Integrated Planning and Decision Support System

Chairman : Dato' Nik Nasruddin Mahmood, MACRES, Malaysia

0800 - 0900 Paper 10 (invited paper) : Integrated Planning and Decision Support Systems : Concepts, Potentials and Limitations
Ali Sharifi, Dept. of Urban – Regional Planning and Geo-information, ITC, Netherlands

0900 - 1000 Paper 11 (invited paper) : Planning Process Theory and Spatial Decision Support Systems: A Neglected Relationship
Gerard Linden, Faculty of Spatial Sciences, University of Groningen, The Netherlands

1000 – 1030 Light Refreshment

1030 - 1130 Paper 12 : Model Based System for Resource Management
N.N. Mahmood, Darus Ahmed and Jimat Bolhassan, Malaysian Centre Remote Sensing (MACRES) Malaysia

Paper 13 : Spatial Planning and Decision Support System for Urban Metropolitan Planning and Monitoring: A Case of Klang Valley, Malaysia
Ahris Yaakup, Siti Zalina Abu Bakar (UTM, Malaysia) and Ramli Zulkifli, Lily Hammadah Ramle, Ministry of Federal Territory, Malaysia

1130 - 1230 : Panel Discussion and Closing Remark by Dr. M.A. Sharifi

1230 - 1500 : Lunch and rest time

1500 - 1700 : Visit to MACRES

1700 - 1730 : Light Refreshment

ABSTRACTS

Constructing and Using Virtual Cities: The Virtual London Project

Michael Batty
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We are on the edge of a revolution in the way we visualize and query digital data about our environment. To date, computer displays of our environment in the third dimension have been limited to computer-aided design (CAD) packages and the query of related data limited to geographical information systems (GIS) packages in two dimensions. The current innovation wave across the spatial data information field is based on the development and dissemination of three-dimensional GIS (3-D GIS) which allows data to be visualized and queried on an x, y and z axis plane. A number of the key players in information visualization allow conventional two-dimensional data to be viewed and exported in a three-dimensional format, currently using the standard Virtual Reality Modeling Language 2.0 (VRML 2.0). However such methods of visualization and data query are limited in their practicality. The move towards 3-D GIS in standard packages has been rather hit and miss, with the third dimension often only used as a substitute for basic CAD-like visualization. We argue here that 3-D GIS will only become a reality when it is directly linked with CAD models; and that the Internet is the most appropriate medium through which this is most likely to occur. We illustrate these arguments in an overview of research into the virtual city in general and our own development of 'Virtual London' in particular. We will explore how the model is built as a geometric structure, how geography is added to it as layers, how it can be linked to other multimedia, and how it can be applied to communicate topical ideas. We will flood London, layer it with air pollution to examine the impact of such hazards, and we will replace and manipulate the skyline of a world city that for a long time has had a low building policy which is continually being challenged. However the real interest in all this is that once we have the model, we can embed it in itself, recursively in virtual world, and we can move the other way back to the material world and print it as hard copy. Furthermore, we can add it to the new infrastructure platform Google Earth as we will show and we will speculate that this project is as good as example of any which shows how layers of data, software and new hardware build on one another to provide new platforms for applications.

Biodiversity Data Components and Data Model

Abdul Rashid Mohamed Shariff¹, Mohd Taib Wahid²
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Biodiversity is the assortment of different types of organisms that co-occur in time and space. In this research, we will focus on plant diversity together with a county-level geographic information system to build a plant biodiversity mapping data model and information retrieval system for plant. The complexity of natural history collection information and similar information within the scope of biodiversity informatics poses significant challenges for effective management of plant biodiversity data through database system. Nowadays, many applications need data modeling

facilities for the description of complex objects with spatial and/or temporal facilities. Response to such requirements maybe found in Geographic Information Systems (GIS), in some other DBMS, or in other research area. A Geographical Information System (GIS) and its associated data sets are very powerful tools for mapping biodiversity and the intention of this paper is to demonstrate this using three important GIS functions: analysis, data integration, and data visualisation. Incorporation of the biodiversity and geographical data can make an enhancement for the biodiversity and geographical analysis and manipulation. Integration of spatial and temporal information has becomes a critical issue in the management biodiversity data. The main purpose of this paper is to discuss about data components and data model of biodiversity data.

Developing Spatial Growth: Modeling Potentials and Limits

Chua Guan Liyong and Noordin Ahmad

GeoInfo Services Sdn Bhd

Understanding of urban growth process is highly crucial to urban development planning. Urban growth planning is a very important issue to guarantee the sustainable development of modern towns. Thus, modeling urban growth prediction can be highly useful for exploring the interaction between built environment and natural environment to help urban planning regarding decision-making complexity. This paper briefly illustrates the significance of modeling potentials and limits of urban growth through the integrating Cellular Automata (CA) techniques and Multi-criteria Evaluation (MCE) within a GIS. Cellular automata (CA) provide an efficient tool for this purpose. MCE-AHP methods are used to determine the suitability of a land unit for different uses while CA transition rules provide dynamic suitability factors for land use conversion at each time step of the simulation. Under transition rule, multiple data source or factor are incorporated into determining the state changes. The result is a spatial representation of suitability for all cells to be converted to urban for a particular time cycle. To create realistic and predictive urban growth by time series, growth rate factor are calculated by determining the annual growth rate.

Geo-informatics for Oil Palm Plantation Management

K.F.Loh¹, Ragu.S² and Jamil.I³

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The Federal Land Consolidation and Rehabilitation Authority (FELCRA) of Malaysia is in the process of modernizing its oil palm plantation management using geo-informatiion technologies which include Remote Sensing (RS), Geographic Information System (GIS) and Decision Support System (DSS). Recently FELCRA has undergone a research collaboration with Espatial Resources, a private company, in exploring the potentials of geo-informatics for oil palm plantation management. The study area, Seberang Perak, consists of some 8000 hectares of matured oil palm. The collaboration has developed an oil palm database management system (OPDMS). RS provided the updated topographical base information. The bio-physical and climatic data were obtained from ancillary sources. All these information were input into a GIS as points (rainfall stations, spot heights, oil palm trees), arcs (roads, tracks, rivers, drains, canals, power lines) and polygons (soil, administrative boundaries). With the OPDMS in place, a decision maker can

query these information as well as compute distance and area measurements interactively. Further development of the OPDMS has included two applications –oil palm block management (BM) and oil palm tree inventory (TI) sub-systems. The BM has enabled monitoring of crop performance on a block by block basis (stand per hectare, yield per hectare and production cost). A program has also been written to enable interactive decision making on replanting based on relevant criteria ratings by experts in FELCRA. Using the TI system, individual oil palm tree records can be assessed. Displaying the spatial extent of diseased, healthy and missing trees (gaps) is pertinent to evaluating performance of different sources of planting materials especially in terms of yield and susceptibility to disease. The paper will highlight the OPDMS and its BM and TI applications

An Overview of Planning Support Systems

Dr Christopher Pettit
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One of the greatest challenges facing planners, policy and decision-makers today is the ability to synthesise vast amounts of information in order to envision possible future scenarios. Since the advent of the first computer based planning tools in the late 1950s and early 1960s, deterministic mathematical models were developed to predict spatial changes in land use patterns. In the 1970s these deterministic models became more and more complicated and less transparent, which led to Lee's (1973) scathing critique of large scale urban models. With the boom of desktop computing in the 1980s characterised by the release of Microsoft's Windows 3.1 operating system, resulted in the proliferation of spatial technologies including geographical information systems, photogrammetry and remote sensing software. Also in the 1980s saw the emergence of non-deterministic mathematical techniques such as Cellular Automata. These advances in computational power, spatial analysis and the emergence of non-deterministic modelling resulted in a new wave of computer based planning tools, referred to as planning support systems. In the 1990s planning theory and practice began to focus on deliberative and participatory planning, which influenced the development and testing of *collaborative* planning support systems. Since the early 21st century a growing number of books, reports and journal articles have been published which attempt to document, review, classify and highlight the strengths and weaknesses of planning support systems. This presentation reflects upon past endeavours, examines the current state of the art and offers some thoughts on possible future developments and applications of planning support systems.

Decision Support System for Coastal Prioritization

S. Zahra Pourvakhshouri¹, Shattri B. Mansor¹, Zelina Z. Ibrahim², Nordin Ahmad³

¹ Institute of Advanced Technology, UPM

² Faculty of Science and Environmental Studies, UPM

³ Faculty of Engineering, UPM

Prioritization is one of powerful approach to coastal area management. It is categorizing of coastal area to different level of importance to perform management planning and strategies. 180 km shoreline of two states of Negeri Sembilan and Melaka, in west Malaysia was chosen to examine the prioritization through Decision support system. Priority criteria have been selected based on local experts' knowledge in relevant domains. Knowledge extraction has been done via direct interview and questionnaire designing as well. Coastal data acquisition was based on

Malaysian ESI maps from 1989-1992, which have been validated by remote sensing data as well as field check on June 2004. Coastal prioritization ranking has been done according to coastal sensitivities in physical and biological resources along with human usage and activities. Provided computerized DSS with GIS-based produced maps and stand alone user interface was developed with VisualBasic6 program.

Effectiveness of the Decision Support System on the Supply Chain Management

A. Azizi

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This paper reviews DSS and SCM recent articles. DSS and SCM is the 21st century global operations strategy for achieving organizational competitiveness. DSS and SCM are important fields of study nowadays. The paper proposed a Decision Support System (DSS) to connect customer value to business targets, providing scenarios to show the customer responses and business results that will enable future funding, with optimization techniques to compare alternatives. And it described how have used simulation models to support product and marketing investment decisions. Also it shown how the model is used in business planning to explore a specific problem, and given one example of the model's value as an "engine" of a Decision Support System. The paper has used rough set theory to explore and induct the manager's experience into rules. These rules were shared between supply chain entities. The paper has developed a multi-agent system to simulate a supply chain, where agents operate these entities with different inventory systems. And also a solution was developed to forecast the ordering quantity for period $t + 1$ in a multi-echelon supply chain, where every entity was allowed to use different inventory systems.

Spatial Decision Support System for Determining Protected Forest Zone (Case Study : Bandung Regency, West Java, Indonesia)

Sumaryono

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One of the serious miss-management of protected forest is the inaccurate determination of protected forest zone/area. Indonesia government has a legal instrument that can be used as the guidance for protected forest determination i.e. "Surat Keputusan Menteri Pertanian No. 83/KPTS/UM/11/1980". Unfortunately, there is no reliable scientific description background of the content, such as the scoring and the weighting values method. So, it is still scientifically debatable. Geo-Information Technology is nowadays powerful for the purpose of database modeling, spatial analysis and decision support system. Geo-Information Technology can help decision makers to simulate the protected forest zoning using multi-criteria analysis. Some decision scenario can be applied to determine the optimum zone of protected forest. All criteria used in Surat Keputusan Menteri Pertanian No. 83/KPTS/UM/11/1980 are included and editable by decision makers. Close system of multi-criteria can be opened using Decision Support System

that allow the users interactively define the input value based on their own considerations. Cell-based database model (one pixel - many values) is one of the problem solving in spatial analysis especially in spatial overlay based on database calculations.

Extraction of Shoreline by Canny Edge Detector from SAR Images

Masoud Karamali ., M.Lokman,H., M.Suffian,I.,H.Assilzadeh.,A.Chalabi.
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Terengganu, Malaysia.

This paper introduces a new approach for extraction shoreline by canny edge detector from RADARSAT-1 SAR images on coastal erosion studies. RADARSAT-1 SAR data was acquired on the 25 March 2004. This study shows that canny algorithm provides edge detection for linear and concave features in radar images. The Gamma filter used removes speckles in the SAR image and Gamma filter 7x7 size gives the best results. The rate of shoreline change is finally determined by overlaying ground data measurements of DGPS acquired in 25 August 2005. The result shows the shoreline rate change can be easily estimated by using the edge detection concept based on canny edge detection.

Spatial Planning and Decision Support Systems: Concepts, Potential and Limitations

M.A. Sharifi
Chair ISPRS WG II/IV Spatial Planning and Decision Support Systems
And Associate Professor, Land use planning and decision support systems
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Demand and competition for various resources continue to grow almost everywhere, and integrated resource management based on reliable data, information and knowledge, is expected to provide reasonable solutions. Especially in the context of growing emergence of more accountable and inclusive governance style, which calls for more debates and require interfaces for an extended involvement and agreement of all relevant stakeholders over policy issues. While the political and socio-economic and institutional aspects may often be of dominant importance, still there is considerable demand for timely and relevant technical and scientific relevant information. Planners and decision makers, and increasingly the general public, need and demand information as a basic for informed decision.

Advances in geo-information technology have provided extensive information from the processes that are taking place in earth surface, many of which are organized in computer systems, some are freely available and others are accessible in affordable price, however not efficiently applied. Research in disciplinary sciences has produced significant insight into many physical and socio-economic processes, leading to development of knowledge formalized in various types of disciplinary models, many of them in public domain, but not well applied in practice. Development in management and decision sciences has provided opportunities to build decision aids and provide platforms for flows and exchange of different information and knowledge. Although we are moving from a poor to a rich data environment, yet many of the existing information and knowledge are not efficiently and effectively used to support better management of our resources. As information consumes attentions of its recipients, *wealth of information creates poverty of attention*; therefore there is a growing need for systems that make use of the

existing wealth of knowledge, information and data, and make them useful for the planners and decision makers.

If agreement is going to be based on consensual rules, then understanding, argumentation, reasoning and dialogue are the ways to arrive at inclusive solution considering the entire set of stakeholder's objectives. In this context, there is a need for a decision aid to make use of development in various related fields and provide facility to:

- Understand the cause-effect relationships between various socio-economic deriving forces and their impacts;
- Support for understanding the problem, and formulating alternative policy options,
- Support the analysis of the effects and impacts of alternative policies on allocation of resource and services;

- Further more and most importantly to provide a forum for debates facilitate dialogues, negotiation and deliberation of various issues affecting stakeholders and construct a common language for discussion and deliberation over allocation of resources.

Such facility, which integrates, all the relevant data, information and knowledge from different sectors and disciplines to support individuals and group collaboration process for more effective and transparent planning and decision-making process is called "Integrated Planning and Decision Support System (IPDSS)". In this context, this paper briefly describes a conceptual framework for planning and decision making, its required supports, and the related potential and limitations.

Planning Process Theory and Spatial Decision Support Systems: A Neglected Relationship

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The advent of computers in support of transportation planning in the fifties of last century gave rise to a structured step-wise approach to planning matched to the technology of those days. Based on the findings of these large scale projects the complex relationship between traffic and land use attracted the attention of the spatial science community. The ensuing quest for land use transportation models, supported by spectacular developments in the computer industry, incited a wide spread adoption of a systems approach to planning as a general accepted paradigm. This resulted in a decades long dominance of the rational planning model that still occupies a prominent position in the application and development of spatial decision support systems (SDSS).

The rational planning model attracted, mainly because of its obvious mismatch with reality, severe criticism rightfully and is hence, except for the area of computers and spatial planning or so it seems, not longer mainstream thinking in professional planning practice.

Current thinking on Planning Process Theory acknowledges the complexity of the planning environment by enabling a more flexible and comprehensive approach to interventions in spatial processes giving due credit to their societal embedding. The latter observation should, where applicable, result in a corresponding decision support system that in its design reflects the above mentioned requirements. The relative poor track-record of the application of SDSS in professional planning practice might be partially explained by a neglect to adapt to developments

in Planning Process Theory. The paper tackles the issue of making SDSS more successful by exploring developments in Planning Process Theory in relation to SDSS design.

Model Based System for Resource Management

Jimat Bolhassan and Darus Ahmad
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A wide range of thematic information can be derived from remote sensing data such as Landsat TM, SPOT, MODIS, Radarsat, ERS, IKONOS and QuickBird in order to meet the various spatial analysis requirements. These remote sensing derived thematic layers integrate with digital topographic data sets from the Department of Survey and Mapping Malaysia (JUPEM) and spatial data from other government agencies, will greatly help to expedite the creation of geospatial database to support natural resources management. Spatial modeling is getting more complex as more variables are required in order for the model to generate reliable outputs. A model base system equips with user friendly tools for building and managing spatial models is required to enable raster and vector, and their attributes to be used in spatial modeling.

This paper gives examples of outputs of spatial models to support the National Resource and Environmental Management (NAREM) Programme currently being implemented by MACRES with the main objective to operationalize the natural resources and environmental management system using remote sensing and related technologies such as GIS and GPS. The NAREM system encompasses three sub-systems, namely, the NASAT which is a satellite based information extraction sub-system, the NAMOS which focuses on spatial modeling using RS-GIS, and the NADES which is a decision making tool for integrated development planning, incorporating not only natural resources and environment but also economic, socio-economic and policy information.

Spatial Planning and Decision Support System for Urban Metropolitan Planning and Monitoring: A Case of Klang Valley, Malaysia

Ahris Yaakup¹, Siti Zalina Abu Bakar², Ramli bin Zulkifli³, and Lily Hammadah Ramle⁴

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Planning methodology has changed over the years following the shift of emphasis from producing plan, which described a state of affairs expected of some future date, to one acknowledging the continuous and cyclical nature of planning. This necessitates planning be based on the identification of needs and goals, the formulation and evaluation of alternative courses of action and monitoring of adopted programmes. It can be traced that the development of planning

support system run parallel from the 'database' to 'information' approach, starting from a focus on applied science in the 1960s through a profound consideration on the political process in the 1970s and to an emphasis on communication in the 1980s. The dynamic nature of planning and monitoring of development in Klang Valley, the fastest growing region in Peninsular Malaysia, apparently requires a 'tool' for continuous evaluation and analysis of current environment as well as the capacity for future development. As such, the concept of Integrated Land use Assessment (ILA) was introduced through the "Application of GIS for Klang Valley Region" (AGISwlk) project. The ILA model developed is implemented through incorporation with the use of What-if Planning Support System, a scenario-based, policy-oriented planning support system. A user interface is also developed to ease the access and preparation of data from the AGISwlk database to run the ILA model and generate alternative scenarios.

Apart from managing the comprehensive GIS database, evaluation becomes an essential step in the planning process especially in selecting the appropriate development scenario alternative to be implemented. Integrated Land Use Assessment (ILA) is a new concept of evaluation model that are recently introduced and developed within AGISwlk, aimed at developing an integrated spatial analysis model with the ability to generate alternative development scenarios by integrating physical and socioeconomic information. The introduction of ILA as an integrated land use planning approach that applies the GIS analysis capabilities while supported by the use of planning support system (*What if?*) is seen as a good alternative for achieving better and more rational decisions. The developed model is expected to dynamically support the preparation of the Klang Valley Regional Master Plan. The methodology was developed and organized based on the GIS spatial analysis process and planning support system framework as well the identification of policy and strategy to be used as guideline and direction of study in achieving the desired output. The GIS functions involved in the process are the overlay function, classification and measurement. The suitability analysis involves three steps which are selecting the suitability factors, specifying factor weights and ratings in producing the development scenario alternatives

SUMMARY OF PANEL DISCUSSION

The discussion was chaired by Dr Ali Sharifi and the panelists were Mr Darus Ahmed, DR Christopher Petitt, Prof. Gerard Linden and Prof. Michael Batty. Salient points raised are:

- Spatial planning and decision support systems are different. Both are specific to a problem, the former is focusing on finding/developing alternative solutions, and the latter is on evaluation of alternative options and choice of a solution.
- Both spatial planning and decision making require support from the professionals, planners, academicians , policy analysts and the public at large. If the public is neglected the solution generated will not get wide acceptance. Support can be qualitative and/or qualitative in nature.
- To-date spatial planning and decision support systems have not gained wide acceptance worldwide. This can be attributed to the following reasons:
 - (i) Lack of user involvement in the development and performance assessment of the systems
 - (ii) Miss match of the system's outputs with the user's expectations
 - (iii) Lack of users trust on system's outputs
 - (iv) Lack of clear objectives and systematic process in establishment of planning/decision supporting systems.
 - (v) Maintenance of the system to keep it updated and running smoothly has been costly
- It is also important to realize that the systems developed should provide support to spatial planning and decision making and NOT replace planners and decision makers.
- Currently there are many names for spatial planning and decision support tools. These include Planning Support System (PSS), Spatial Decision Support System (SDSS), Decision Support System (DSS), Geographic Information System (GIS) and Remote Sensing (RS). Although terminology is irrelevant as long as the user understands what each system can do, nevertheless it is timely for experts to iron out differences in functionalities of these tools to avoid confusion. For instance GIS and RS have already been regarded by some scholars as DSS tools.