UN-HABITAT Lecture Award Series







GIS as a Planning Support System for the Planning of Harmonious Cities

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The UN-HABITAT Lecture Award

The UN-HABITAT Lecture Award is an annual award organized by the Global Research Network on Human Settlements (HS-Net) to recognize outstanding and sustained contribution to research and thinking in the human settlements field. Upon selection, the Award winner will be invited to deliver a thought-provoking lecture during a session of the World Urban Forum or another major international event. The Award winner will also be presented with a commemorative plaque engraved with his/her name and a prize of \$10,000.

The Award seeks to stimulate global dialogue on human settlements issues and capture and disseminate new thinking and trends in addressing the multifaceted challenges of sustainable human settlements. Furthermore, the Award is designed to enhance the visibility of the Habitat Agenda and of human settlements issues in general. It also keeps UN-HABITAT up to date with current research and thinking on human settlements thereby enriching the content of the Global Report on Human Settlements.

The Lecture Award is open to any individual with an outstanding and sustained track record of research in the human settlements field, both urban and rural. The ideal candidate will:

- a) Have made a significant and original contribution to human settlements research, thinking and practice;
- b) Have a sustained record of research and publication in reputable refereed journals, or in the form of books and book chapters;
- c) Have a substantive reputation, evidenced by widespread peer recognition, either globally or regionally;
- d) Be engaged in innovative research on current human settlements issues; and
- e) Be a citizen or permanent resident of a country in the region designated for the Lecture Award for the relevant calendar year.

Institutions or individuals can nominate candidates for the award. Individuals may also nominate themselves. The HS-Net Advisory Board, composed of experienced researchers in the human settlements field, serves as the selection committee for the award.

The theme for the lecture may be related to the theme of an upcoming Global Report on Human Settlements, or it may be a topical issue, as determined by the Award winner in consultation with the HS-Net Advisory Board. The lecture is widely disseminated through various media, and a written copy of the lecture is posted at the HS-Net website.

For further information, and to nominate candidates, visit the HS-Net website at http://www.unhabitat.org/hs-net

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GIS as a Planning Support System for the Planning of Harmonious Cities

It has long been the desire of human beings to be harmonious with the physical environment, society and inner self. In China, the earliest harmonious concept is *yin-yang* which originates from the *Book of Change (I-ching)*, a Chinese book often associated with fortune-telling and Taosim. It can be dated back 3,000 years to the transition period between the Yin (1600-1100 B.C.) and Chou dynasties (1122-256 B.C.). Yin represents softness (weak, submissive) and *yang* represents strength (strong, dominant). While being opposite, they work in harmony. The balance of *yin* and *yang* is needed to create a harmonious system. *Yin-yang* will lead to good health. When applied to cities, *yin* can represent the natural environment and *yang* the urban development. The balance between urban development and the natural environment will lead to sustainable cities.

The desire to strike a balance between human living and the nature of *yin*yang has led to the development of feng-shui (wind and water), geomancy in China. It can be considered as the earliest form of landscape architecture and site planning, although with a lot of superstitious elements in it. Feng-shui comes from multiple origins, such as Taoism, *yin-yang*, and the five elements (gold, wood, water, fire, and earth). It has been developed over many centuries by trial and error, through observation and mysticism. It reflects the ancient Chinese view of the environment and ecology and a mystical combination of Chinese philosophical, religious, astrological, cosmological, mathematical and geographical concepts (Yan, 1963). Although many people argue that feng-shui is superstitious, some of its theories and principles are also rational, explainable and scientific (Tam, Tso, and Lam, 1999). Feng-shui is used to find the right location for building a house or village that is in harmony with its environment. Feng-shui can also be computerized for site selection (Chiou and Krishnamurti, 1997). Information about the site is important in locating a house, building or village with good *feng-shui* that will bring prosperity and good health to the people living in it.

The desire to find harmony in society is well embedded in Confucianism, which like *yin-yang* and *feng-shui*, has strong influence over China, Korea and Japan for more than 2,000 years. The concept, *zhong yong* or the middle road,

first appeared in Lun Yu (The Analects of Confucius) and was explained in detail in Zhong Yong (The Doctrine of the Mean) which is one of the four classics of Confucianism. The purpose of the Doctrine of the Mean is to demonstrate the usefulness of the Confucius way (dao) to gain harmony in society and with the inner self. It gave much emphasis to the proper behaviour of a gentleman in society and the relationship among different groups of people in society as exemplified by the Three Mainstays of Social Order (social order between master and worker, parent and child, husband and wife) and Five Bonds of Human Relationships (relationships of master and worker, parent and child, husband and wife, brothers and sisters, and between friends). By having good courtesy and manners in accordance with the principles of the five basic relationships, there will be less conflict and society will be harmonious. The concept of the middle road has been used by the rulers of China as a way of informal social control to maintain social order and harmony in China for a long time. Although it has often been criticized for being too compliance, nevertheless it has helped to maintain social order and harmony in Chinese society for a long time.

In urban planning, the need to have a balance with nature is well embedded in the work of Ian McHarg's influential book, *Design with Nature* (1969). It is through better site design that we can achieve harmony with nature. The recent emphasis on sustainable development with concern for environmental, economic and social development to a certain extent is a manifestation and a more elaborated and extended version of the search for harmony with the environment, taking a middle approach of balancing economic development with the needs of society without destruction of the environment for future generations (World Commission on Environment and Development, 1987).

In the West, the urban planning paradigm has moved away from the technological approach of the 1960s and 1970s to a more participatory approach and greater role of civil society (Douglass and Friedmann, 1998). Planning decisions are no longer mainly based on the results of urban planning models generated by computers but more on consultations and negotiations with different stake holders in the planning process. The dominant role of urban planning models has diminished. They have become one of the tools for supporting the planning process. Despite the diminishing importance and role of planning models and computers in urban planning, geographic information system (GIS) is increasingly being used in urban planning (Yeh, 1999). This is mainly because even in the paradigm of participatory planning,

spatial information and analysis is important for facilitating informed discussion and decision making. As a computerized system for the storage, retrieval, visualization, analysis and modeling of spatial information, GIS can provide the textual and visual spatial information as well as the results of spatial analysis to aid public discussions and deliberations in the planning process and the making of plans that are in harmony with development, the environment and society.

Use of GIS as a Planning Support System in Urban Planning

The development of GIS has a very close relationship with urban planning. In Design with Nature, McHarg (1969) used blacked-out transparent overlays to identify sites that are in harmony with nature. Hand drawn map overlay analysis and land suitability mapping is a basic skill in urban planning (Steinitz et al., 1976; Hopkins, 1977). The concept of map overlay analysis was computerized by Carl Steinitz of the Department of Landscape Architecture of Harvard University into GRIDS in 1967 and later further developed by David Sinton (1977) into IMGID in the 1970's. These grid-based packages played a key role in the development of GIS in its inception stage in the 1970s (Chrisman, 2006). They laid the foundations of many spatial processing, statistical and analytical functions of modern GIS. Apart from these packages, Jack Dangermond, a graduate of landscape architecture in Harvard University developed MAGIS (Maryland Automatic Geographic Information System) in the 1970s and founded the Environmental Systems Research Institute (ESRI) in the late 1970s for its vector-based Arc/INFO (now called ArcGIS), with very strong map overlay and spatial analysis functions, which is now the leader in GIS.

In the early days of the development of GIS in the 1960s and 1970s, there were very few planning departments that installed GIS because of their expensive hardware and limited software and data. The decrease in the price of hardware, computer storage and devices, and accompanying improvement in the performance of hardware and software (particularly the speed of computer processors) and advancement in the data structure and related algorithms of vector-based GIS, has made the once expensive and time consuming GIS to be more affordable and workable. Since the early 1980s, there has been a marked increase in the installation of GIS in different levels and departments of urban and regional governments in the developed countries in Australia (Newton and Crawford, 1988), Europe (Bardon et al., 1984; Campbell, 1994),

and North America (French and Wiggins, 1990). With the further decrease in price and increase in performance of computer hardware and software, the use of GIS in urban planning in the developing countries has been increasing in the 1990s (Yeh, 1991). GIS is now more accessible to planners and is an important tool and database for urban planning both in the developed and developing countries (Yeh, 1999).

GIS is one of the formalized computer-based information systems capable of integrating data from various sources to provide information necessary for effective decision making in urban planning (Han and Kim, 1989). Other information systems for urban planning include database management systems (DBMS), decision support systems (DSS) and expert systems (ES). GIS serves both as a database and tool-box for urban planning (Figure 1). In database-oriented GIS, spatial and textual data can be stored and linked using the geo-relational model. This supports efficient data retrieval, query and mapping. Planners can also extract data from the databases and input them to other modelling and spatial analysis programs. When combined with data from other tabular databases or specially conducted surveys they can be used to make effective planning decisions. As a tool-box, GIS allows planners to perform spatial analysis using geoprocessing functions such as map overlay, connectivity, and buffer (Berry, 1987; Tomlin, 1990). Of all the geoprocessing functions, map overlay is probably the most useful tool. This is because planners have a long tradition of using map overlay in land suitability analysis which is an important component in urban planning (McHarg, 1969; Steinitz et al., 1976; Hopkins, 1977). The integration of multi-media data and the use of web-GIS in the internet/intranet environment has increased the

