

**Expert Group Meeting on Slum Mapping  
21-23 May 2008**

<b>Wed 21 May 08:30-10:30 Room 3-008</b>	<b>Session 1 Opening</b> <i>Chair: Richard Sliuzas</i> <i>Rapporteur: Alex de Sherbinin</i>	
<b>Time</b>	<b>Speaker</b>	<b>Topic</b>
8:30	Arrival and registration of participants	
8:50	Richard Sliuzas, ITC Alex de Sherbinin, CIESIN, Columbia University, USA	Welcome and general purpose of the EGM
9:00	Prof Dr. Martien Molenaar, Rector ITC	Official welcome to ITC
9:10	Ron Spreekmeester	Word of welcome from representative VROM (The Netherlands' Ministry of Housing, Spatial Planning and the Environment)
9:20	Personal introductions	Quick round of the table to allow participants to briefly introduce themselves
9:30	Dr. Gora Mboup Head of the Global Urban Observatory, UN-HABITAT	Slums, shelter deprivation and spatial concentration
10:15	Time for discussion and clarification	
10:30	<i>Coffee/tea break</i>	
<b>Wed 21 May 11:00 – 12:30</b>	<b>Session 2: Developments in urban remote sensing and the diversity of slum conditions</b> <i>Chair: Jan Turkstra</i> <i>Rapporteur: Kirsten Hackenbroch</i>	
<b>Time</b>	<b>Speaker</b>	<b>Topic</b>
11:00	Christiane Weber University Louis Pasteur, France	From slums detection to slum definition
11:30	Richard Sliuzas ITC, Netherlands	Diversity of global slum conditions – is a universal spatial definition of slums feasible?
11:50	Alex de Sherbinin CIESIN, Columbia University USA	Urban Poverty Mapping: Data and Methods
12:10	Q&A and discussion	What key spatial variables for characterising slums can be obtained from remote sensing?
12:30	<i>Lunch (Buffet)</i> <i>ITC Restaurant Annex</i>	

**Expert Group Meeting on Slum Mapping**  
**21-23 May 2008**

<b>Wed 21 May</b> <b>13:40-14:30</b>	<b>Special Guest lecture in ITC auditorium</b> <b>Prof. Uptal Sharma</b> Center for Environmental Planning and Technology (CEPT), School of Planning Ahmedabad, India	
	<b>Title:</b> Slum Development Strategies for Dharavi Slum in Mumbai, India	
<b>Wed 21 May</b> <b>14:30-16:00</b>	<b>Session 3 Advanced methods for urban image analysis</b> <i>Chair: Reinaldo Machado</i> <i>Rapporteur: Chris Small</i>	
<b>Time</b>	<b>Speaker</b>	<b>Topic</b>
14:30	Thomas Kemper and Martino Pesaresi JRC Italy	Examples of robust and replicable feature extraction for the study of built-up surface, using VHR data
14:50	Mauro Barros Filho University Recife, Brazil	Slums detection through lacunarity-based texture analysis of remote sensing images
15:10	Carsten Jürgens Ruhr University Bochum	A multi-scale remote sensing strategy for slum detection and continuous slum monitoring
15:30	Q&A and discussion	
15:45	<i>Coffee/tea break</i>	
<b>16:15 – 18:00</b>	<b>Session 4: Statistical issues in urban poverty mapping</b> <i>Chair: Mauro Barros Filho</i> <i>Rapporteur: Monika Kuffer</i>	
<b>Time</b>	<b>Speaker</b>	<b>Topic</b>
16:15	Alfred Stein ITC, Netherlands	Spatial statistics and their application in (urban) remote sensing
16:35	Chris Small Lamont-Doherty Earth Observatory Columbia University USA	Objectives, Strategies and Limitations of Remote Sensing for Slum Mapping
16:55	Peter Hofmann Leibniz University Hannover Germany	Detecting informal settlements using methods of object based image analysis
17:15	Q&A and discussion	
17:30	Richard Sliuzas and Alex de Sherbinin	Brief introduction to break out groups planned on Thursday afternoon
18:00	<i>Informal drink</i>	
18:30	<i>Informal buffet dinner at ITC Restaurant</i>	

**Expert Group Meeting on Slum Mapping  
21-23 May 2008**

<b>Thurs 22 May 09:00-10:30</b>		
<b>Session 5: Methods and examples of slum mapping</b> <i>Chair: Christiane Weber</i> <i>Rapporteur: Huang Zhengdong</i>		
Time	Speaker	Topic
9:00	Reinaldo Perez Machado University of Sao Paulo	Precarious settlements studies. Actual situation in São Paulo, Brazil
9:20	Iffat Huque CEGISBD, Bangladesh	Urban slum mapping in Bangladesh
9:40	Kirsten Hackenbroch Germany	Land use and cover mapping in informal settlements: the case of Dhaka, Bangladesh
10:00	Pratima Joshi Shelter Associates	GIS based poverty mapping for integrated development of slums
10:20	Q&A and discussion	
10:30	<i>Coffee/tea break</i>	
<b>Thurs 22 May 11:00 – 12:30</b>		
<b>Session 6: Methods and examples of slum mapping</b> <i>Chair: Alfred Stein</i> <i>Rapporteur: Maharufa Hossain</i>		
Time	Speaker	Topic
11:00	Sadhana Jain IIRS India	Urban remote sensing for slum mapping in India
11:20	Monika Kuffer ITC, Netherlands	Measuring of spatial configuration of informal versus formal urban development using Spatial/Landscape Metrics
11:40	Huang Zhengdong and Zhan Qingming Wuhan University China	Mapping slums and urban villages in China
12:00	Jan Turkstra UN-HABITAT Libya	Visible and non-visible slums, Libya and Somalia
12:20	Q&A and discussion	
12:30	<i>Lunch (Buffet)</i> <i>ITC Restaurant Annex</i>	

**Expert Group Meeting on Slum Mapping**  
**21-23 May 2008**

<b>Thurs 22 May</b> 14:00-15:30	<b>Session 7 Break Out Groups</b>	
<b>Time</b>	<b>Topics</b>	
	<p><b>Room: 3-008</b>  <i>Chair: Christiane Weber</i>  <i>Rapporteur: Alex de Sherbinin</i></p> <p>A: What spatial criteria and indicators can be added to the currently applied slum definition and can they be universally applied?</p>	<p><b>Room: 2-008</b>  <i>Chair: Alfred Stein</i>  <i>Rapporteur: Sadhana Jain</i></p> <p>B: Are there efficient methods for up-scaling data from one spatial level to another?</p>
15:30	<i>Coffee/tea break</i>	
<b>Thurs 22 May</b> 16:00 – 17:30	<b>Session 8: Break Out Groups</b>	
<b>Time</b>	<b>Topic</b>	
	<p><b>Room: 3-008</b>  <i>Chair: Mauro Barros Filho</i>  <i>Rapporteur: Thomas Kemper</i></p> <p>C: How reliable does the spatial and statistical data on slums have to be for policy development and decision making? Can this be quantified and can the costs and benefits associated with the required level be assessed?</p>	<p><b>Room: 2-008</b>  <i>Chair: Richard Sliuzas</i>  <i>Rapporteur: Pratima Joshi</i></p> <p>D: What institutional issues need to be addressed if local governments are to be able to be able to undertake slum mapping as a routine task? Can advanced technical approaches be combined with community based approaches?</p>
17:30	<i>Free evening programme: e.g. to visit Enschede city centre</i>	
<p><i>Note: An evening session may be arranged for some participants to formulate draft statements and recommendations of the meeting</i></p>		

**Expert Group Meeting on Slum Mapping  
21-23 May 2008**

<b>Friday 23 May 09:00-10:30</b>	<b>Session 9: Break Out Groups</b> <i>Chair: Prof Martien Molenaar</i> <i>Rapporteur: Monika Kuffer</i>	
<b>Time</b>	<b>Speaker</b>	<b>Topic</b>
9:00	Presentations of key findings and recommendations from break out groups A, B & C	Groups to report back in plenary 15 minutes and present proposals for amendments if desired.
10:30	<i>Coffee/tea break</i>	
<b>Fri 23 May 11:00 – 12:30</b>	<b>Session 10: Finalising conclusions and recommendations</b> <i>Chair: Prof Martien Molenaar</i> <i>Rapporteur: Iffat Huque</i>	
<b>Time</b>		<b>Topic</b>
11:00	Presentations of key findings and recommendations from break out group D.	Groups to report back in plenary 15 minutes and present proposals for amendments if desired.
11:30	Plenary discussion	Final round of discussion on conclusions and recommendations from the EGM to be brought forward at the World Urban Forum in Nanjing China, November 2008
12:20	Dr. Gora Mboup Dr. Richard Sliuzas Alex de Sherbinin Prof. Martien Molenaar	Closing of main programme
12:30	<i>Lunch (Buffet)</i> <i>ITC Restaurant Annex</i>	

*In the afternoon a short follow-up activity may be organized for some participants to finalise the reporting and conclusions and to discuss the programme for presenting outputs at WUF 4 in November.*

## Abstracts (in order of sessions)

### Session 1

#### Slums, shelter deprivation and spatial concentration

Gora Mboup,  
UN-HABITAT, Nairobi Kenya

In order to promote harmony in the city by improving the lives of slum dwellers, local policy needs to be informed about the consequences of vastly different living conditions experienced by poor urban communities. It is crucial to know *how many slum dwellers are, what their basic needs are* in terms of shelter, water, sanitation, health, education, employment, and *where they are located*. This paper focuses on the measurement of slum dwellers by first counting them using the definition of slum households adopted in the EGM organized by UN-HABITAT in 2002; second breaking the number of slum dwellers into a type of deprivation that can be later aggregated into moderately deprived and those who are severely deprived (two or more deficiencies); and third focusing on geographic area where slum dwellers are located to help better direct programmes to the most needed. The spatial dimension of slums will also facilitate urban planning in all aspects (land policy, master plan, community infrastructures, etc.).

### Session 2

#### From slum detection to slum definition.

Dr. Christiane H. Weber,  
University Louis Pasteur, France

Slums definition seems to be lacking of site and morphological aspects to be able to cover the variety of slum's configurations. Perhaps some pragmatic assumptions could be added regarding these two aspects:

- 1) slums have morphological and spatial characteristics (contiguity, density, lack of network, specific material...);
- 2) slums are often located in areas that are environmentally deficient: unstable slopes, riverbanks, drainage basin, interstitial tissue (proximity of network, industrial areas...), non vegetated areas, etc.

From there, other rules might be set up:

- 3) slums look generally like a morphological chaos without geometric features, heterogeneity of the spatial structure, size and density of buildings, lack of vegetation...
- 4) slums could be fare away from network but also embedded inside network structures, in general they are in derelict zones or periphery areas not yet concerned by urban formal expansion ...

More can be done to describe spatial characteristics and to focus on these specific areas, nevertheless this general description must be added to demographic and sanitary data. Regarding these assumptions and the information provided (reports and peer review report), is it really feasible to recognize this type of areas with spatial and/ancillary data? If yes, are all the areas slums? This recognition may be one step in the detection and identification of slum areas process and very high spatial resolution data might be of some interest in such approach, advocating that spatial structure could be recognized. Fractal measurements or morphological algorithms might be of interest for image processing developments regarding the characteristics of urban elements.

#### Diversity of global slum conditions – is a universal spatial definition of slums feasible?

Richard Sliuzas  
ITC, The Netherlands

**Expert Group Meeting on Slum Mapping  
21-23 May 2008**

This paper examines the diversity of conditions that are found in slums in several countries from around the world. The scope for using VHR imagery to map slum conditions and develop spatially based indicators that can complement existing indicators of slum dwellers is discussed. In the process, examples of slums and informal settlements from different contexts will be examined. Examples will be drawn from Tanzania, Kenya, Egypt and India.

## **Expert Group Meeting on Slum Mapping 21-23 May 2008**

### **Integration of Poverty and Remote Sensing Data**

Alex de Sherbinin  
CIESIN, USA

In this paper I first address the measurement of poverty and well-being, and then discuss the advantages of high spatial resolution poverty data and the sources of such data. I then touch on the importance of addressing spatial autocorrelation in statistical analyses involving poverty and remote sensing derived data, and then turn to some research examples drawing on data from Sao Paulo, Accra, Hanoi, and Cape Town. The paper concludes with some next steps for the integration of a broader array of socioeconomic and remote sensing data.

### **Session 3**

#### **Searching for robust & objective EO based indicators for slum characterization**

Thomas Kemper  
Institute for Protection and Security of the Citizen, JRC, Italy

Although Earth Observation (EO) will never be the only means to identify and characterize slum conditions, it provides valuable complementary information to field surveys due to the synoptic overview it provides. This presentation discusses possibilities for analysing settlements using very high resolution (VHR) optical satellite data with a spatial resolution of 1 meter or below in panchromatic mode and 4 meters or below in multispectral mode.

The methodology aims to extract basic “image descriptors” from the data that allow to discriminate between “poor” and “normal” residential settlement patterns in a given geographical context, and to compare “poor” settlement patterns extracted from different urbanized regions across the world. It is tailored to work in a sustainable way at global level, and consequently it is a compromise between completeness and exhaustiveness of the possible analytical solutions and the simplification needed for processing data at global level with a sufficient robustness and generality.

The methodology of image information extraction is knowledge-driven: based on a priori knowledge a list of criteria or “descriptors” that describe the settlement characteristics is defined. These descriptors correspond to specific image processing chains that can be run automatically using the VHR satellite data as input. All the parameters needed are in the descriptor conceptual definition (a priori) or can be estimated from the image statistics (a posteriori). No free parameters needing expensive tuning and/or learning steps are included in the proposed methodology.

#### **Slums detection through lacunarity-based texture analysis of remote sensing images**

Mauro Barros Filho  
University Recife, Brazil

The concept of lacunarity was established and developed from the scientific need to analyze multi-scaling texture patterns in nature (mainly in medical and biological research), as a possibility to associate spatial patterns to several related diagnosis. Regarding texture analysis of urban spaces registered by satellite images, lacunarity is a powerful analytical tool as it is a multi-scale measure which permits an analysis of density, packing or dispersion through several scales. It can also indicate the level of permeability in a geometrical structure.

In this context, it is proposed a multi-scale method based on the concept of lacunarity to recognize and classify textures of remote sensing images from urban areas with different inhabitability conditions. Experiments were done with several fragments of Recife (Brazil) intra-urban tissue. Initially, 250 x 250 meters samples from a QUICKBIRD image with 0.70 m spatial resolution were selected. Half of these samples are from slums, while the others are from non-slums areas. Then, these samples were enhanced through histogram equalization and converted to binary images. Finally, lacunarity values were estimated through a sliding box algorithm.

## **Expert Group Meeting on Slum Mapping 21-23 May 2008**

The results suggest that it is possible to detect slums through their textures, and that there is a strong correlation between their morphological and social patterns. In general, slums present lower lacunarity values than non-slums areas. The gaps of slums' texture patterns are smaller and more uniformly distributed than those of non-slum areas. These results are coherent with other experiments done in different cities, applying different images and algorithms.

### **A multi-scale remote sensing strategy for slum detection and continuous slum monitoring**

Carsten Jürgens  
University of Bochum, Germany

Abstract: Starting with an pixel-based view on informal settlements one will be introduced to a strategy on how to identify slums on a large scale imagery and then on larger scales. In those scales one could gain detailed information on slums and deliver information to authorities. Once informal settlements are detected, a regular monitoring could be applied to see the development/changes with time and in context of official measures planning etc..

In this context the ISPRS WG "Human settlements and Impact Analysis" and the EARSeL SIG "Urban Remote Sensing" will be presented shortly to give an overview about their interests.

## **Session 4**

### **Spatial statistics and their application in (urban) remote sensing**

Alfred Stein  
ITC, The Netherlands

In this presentation issues are addressed that deal with data collection and interpretation in spatial statistics applied to (urban) remote sensing. Special attention is given to slum indicators, treated here as quantitative spatial variables that have to be calibrated using location or remote sensing data. A central element is the issue of scale and resolution. It is shown how small-scale (large area) information at the city level can be obtained using coarse resolution remote sensing images. Image segmentation procedures are useful for that purpose. With increasing resolution, e.g. towards the 1m resolution, the type of information becomes different, requiring more complicated segmentation and interpretation methods. An interesting issue emerges when dealing with collected point data, such as the location of health services and water facilities. In modern spatial statistics we distinguish point pattern analysis, leading towards intensity maps, and lattice analysis, leading to autocorrelation models that are useful to interpret spatial relations and causality. Both procedures serve to integrate site observations and remote sensing images with slum indicators. Spatial statistics can also be useful to identify and quantify patterns at the continental scale. It further helps to quantify uncertainty and deal with error propagation.

**Expert Group Meeting on Slum Mapping  
21-23 May 2008**

**Objectives, Strategies and Limitations of Remote Sensing for Slum Mapping**

Chris Small  
Lamont Doherty Earth Observatory Columbia University, USA

The urban environment presents a number of challenges to mapping with remote sensing. Discrimination of slums from other forms of urban land cover can be particularly challenging - because of both the nature of the land cover and the definition of the problem. However, some of these challenges can be mitigated by defining slums in terms of measurable physical properties within the context of the specific application for which the map is intended. For instance, maps needed for targeting infrastructure development may have very different characteristics from those needed to hazards and vulnerabilities.

Combining multiple sensors and mapping methodologies can reduce mapping uncertainty enough to provide a valuable reconnaissance tool to help focus resources on peripheral validation and field data collection.

**Detecting informal settlements using methods of object based image analysis**

Peter Hofmann  
Leibniz University Hannover, Germany

Informal settlements behave very dynamical over space and time and the number of people living in such housing areas is growing worldwide. The reasons for this dynamic behaviour are manifold and are not the matter of this article. Nevertheless, informal settlements represent a status quo of housing and living conditions which is from a humanitarian point of view in the most cases below acceptable levels. Sub-standard sanitary situations and high crime rates are only a few of attributes which go aside with the phenomenon informal settlement. Due to their informal character, reliable and accurate data about informal settlements and their inhabitants is rarely available. On the other side there is a strong need to transform informal into formal settlements and to gain more control about the actual spatial development of informal settlements. Consequently, reliable procedures for detecting and monitoring the spatial behaviour of informal settlements are required in order to react at an early stage to changing housing situations. Thus, obtaining spatial information about informal settlement areas which is up to date is vital for any actions of enhancement in terms of urban or regional planning. For these tasks, conventional data sources, such as maps, statistics or even GIS data are usually obsolete, not available, not as accurate as needed or do not hold the information needed. The article present will demonstrate how informal settlements can be detected from VHR satellite image data using an object based approach of image analysis. The classified areas can act as basic information for further GIS-based tasks.

**Session 5**

**Precarious settlements studies. Actual situation in São Paulo, Brazil.**

Dr. Reinaldo Paul Pérez Machado  
University of São Paulo, Brazil

The city of São Paulo, the most populous of the country, hosts 10,434,252 inhabitants. Here, the occupation in informal settlements – slums, squatters and irregular subdivisions and tenement houses – has been part of the urban landscape over the last four decades.

Deprived of the access to the formal housing market, the poor people do not find alternatives except to occupy land of low commercial interest or of restricted use because of urban legislation. These areas are, in general, disregarded by the formal sector of housing production. Some efforts have been made to understand and intervene over these precarious or informal dwellings, by the academic environment and by the Municipality of São Paulo as well. Nevertheless, the last official housing census on precarious settlements was taken in 1987 and, since then, there was no systematic updating of this kind of data regarding the demand for housing in public policy. There were barely

## **Expert Group Meeting on Slum Mapping 21-23 May 2008**

punctual updates considering areas object of projects and interventions or sample researches for the development of studies, forecasting and estimative referring to this demand.

Since October 2005, the City of São Paulo has reached the possibility to improve the analysis of slum areas, developing a special system – called HABISP - dedicated to observe, plan and make decisions on the slums and other forms of precarious dwellings. Here, a strong integration of different sources of data, combining high resolution satellite imagery, aerial photographs, cadastral vector maps and socio-economical data, coming from several Municipality census updates including slum and irregular subdivision perimeters and the official technical archives, integrates a unique planning, monitoring and assessment tool that can be accessed through the World Wide Web. We will discuss here how this system has been developed and how it contributes to more effective planning and sustainable development, seeking an improvement in the lives of slum dwellers.

### **Slum Mapping in Bangladesh**

Iffat Huque,  
Center for Environmental and Geographic Information Services (CEGIS),  
Dhaka, Bangladesh

The slum population in Bangladesh has increased alarmingly in the recent years. In Dhaka city alone, the slum population has doubled since 1996 and the number of slums has increased by roughly 70%. There have been quite a few exercises in mapping and census of slums in the country. Each study has used different definitions and criteria for identification of slums. Some of these have also involved the use of satellite imagery to various degrees. In this study, different methods of identification of slums in Dhaka City, from high resolution satellite images have been tested. The satellite images used are IKONOS pan and multispectral, QuickBird pan, multispectral and pan-sharpened images. A thorough field investigation was made of the physical characteristics of different types of slums in Dhaka city which can help identify them from satellite images e.g. roof material, size, orientation, density of structures etc. and how they appear in the images. Pixel based classifications were tested but not found to be useful. However, texture analysis appeared to be promising for initial identification of slum clusters. Further investigation of this method is required. The field observations were used in visual interpretation of the images for on-screen digitization of slums. The results were compared to available GIS data on slums from other reliable sources.

### **Land use and cover mapping in informal settlements: the case of Dhaka, Bangladesh**

*Kirsten Hackenbroch (TU Dortmund), Oliver Gruebner (HU Berlin)*

Dhaka is the 11<sup>th</sup> largest megacity in the world with more than 12 million inhabitants. Mainly due to rural-urban migration, the slum population increased rapidly from 20% in 1996 to 37% in 2005. With the Centre for Urban Studies (CUS) regularly carrying out a slum mapping and survey (latest surveys: 1996, 2005) to identify all slum clusters in Dhaka, there is valuable information available on the existing number, size and spatial location of informal settlements. However, the surveys lack specific information on the different types of informal settlements, which for example may be differentiated by considering the prevalent building and land use structures.

This paper aims at techniques for establishing a more detailed picture of slum areas in Dhaka using GIS technology and GPS. Very high resolution (VHR) satellite imagery was used for initial interpretation of land cover like building structures, road networks, vegetation and water areas followed by field-based approaches to map these land covers and land uses in detail. For this, a classification key for land use and land cover mapping has been developed explicitly for urban slums and squatter settlements.

The data generated will provide input to research on the 'spatiality of livelihoods', i.e. the interdependencies between space and livelihoods. The main assumption here is that urban public space is an important livelihood asset and a certain land use structure (and thus a certain livelihood composition) has a considerable influence on the shape of urban public space and the spatial organisation of an informal settlement.

## **Expert Group Meeting on Slum Mapping 21-23 May 2008**

Furthermore, a data model for the spatial data base focussing on public health issues is developed. By combining field mapping and remote-sensing data with spatially related data on public health, ecology, economics, socio-demography and livelihoods an integrated analysis of the complex human-environment system is possible.

### **GIS based poverty mapping for integrated development of slums**

Pratima Joshi  
Shelter Associates, India

This presentation explains how community based approaches incorporating remote sensing images and GIS can be used for slum mapping and improvement programmes.

## **Session 6**

### **Approaches for extraction of slum areas from high resolution satellite imagery**

Sadhana Jain  
Human Settlement Analysis Group, Indian Institute of Remote Sensing,  
Dehra Dun, India.

A number of techniques have been developed to identify the slum areas from remotely sensed data. Here, an attempt has been made to discuss different approaches to capture the information about slum areas from high spatial resolution satellite imagery. It includes some basic and advance image processing operations i.e. merging of higher spatial resolution panchromatic image with multispectral image as well as object based analysis. Erdas Imagine (version 8.7) and E-cognition (version 4.0) packages have been used for image procession and object based analysis respectively. The output processed imagery have been used for the detailed mapping of slum areas. Identification of slum areas in these imagery is based upon five basic elements of visual interpretation i.e. size, shape, tone, pattern and association, which is supported by field verification. Interpretation of satellite imagery has shown tremendous potential not only for the mapping but also for the monitoring of slum areas in Dehra Dun during 2001 to 2005.

### **Measuring of spatial configuration of informal versus formal urban development using Spatial/Landscape Metrics**

Monika Kuffer, ITC

The concept of spatial metrics origin from landscape ecology has the potential to analyze the spatial arrangement formally and informally built-up areas with the objective to define metrics that can distinguish these two types of areas. The software used is Fragstats which is a spatial pattern analysis program for quantifying landscape structure. It has a large set of statistical measuring tools, able to analyze spatial primitives such as location, distance, direction, orientation, linkage, and pattern.

The case study is using feature information extracted from large scale topographic data for the city of Dar es Salaam, Tanzania. Several metrics have been tested for their potential to distinguish between formally and informally built-up areas e.g. internal configuration, clustering of buildings.

**Expert Group Meeting on Slum Mapping  
21-23 May 2008**

**Mapping of urban villages in China**

Huang Zhengdong and Zhan Qingming,  
School of Urban Design / Research Center for Digital Cities, Wuhan University, China

With the rapid expansion of urban areas in China, urban villages have formed and have made big challenges to large cities. Urban villages may have negative effect on city image, but the existence might be economically feasible for both city authorities and local residents. In many cities, the mapping of urban villages is accomplished by ground survey. However, remote sensing technology has provided alternative means for urban village mapping. This presentation will explain the formation of urban villages in Chinese cities, discuss their features, and demonstrate a case of Shenzhen using satellite images for mapping and information acquisition. Alternative technology like laser scanning is also introduced and an example is presented.

With the rapid expansion of urban areas in China, urban villages have formed and have made big challenges to large cities. Urban villages may have negative effect on city image, but the existence might be economically feasible for both city authorities and local residents. In many cities, the mapping of urban villages is accomplished by ground survey. However, remote sensing technology has provided alternative means for urban village mapping. This presentation will explain the formation of urban villages in Chinese cities, discuss their features, and demonstrate a case of Shenzhen using satellite images for mapping and information acquisition. Alternative technology like laser scanning is also introduced and an example is presented

**Visible and non-visible slums, Libya and Somalia**

Jan Turkstra  
UN-HABITAT

The presentation will focus on the definition of Slums and the possibilities and limitations of slum mapping using High-Resolution Satellite images. Slums are defined by UN-HABITAT by dwellings with deficiencies re. water, sewerage, building materials, overcrowding and tenure. These variables are difficult to detect from the air or space. However slums are also associated with informality, high-density, irregular morphology and spatial clustering. An example of these “visible” slums will be shown of a variety of countries with a special emphasis on a UN-HABITAT project in Somaliland where Quickbird images were used to develop a building inventory of all constructions.

An example of “non-visible” slums will be shown from Libya where social housing projects consist of poorly constructed dwellings and without maintenance are converted into slums. These housing projects cannot be identified without extensive local knowledge.

The presentation ends with describing the limitations and possibilities of high-resolution images in improving the quality on slum data.

**Expert Group Meeting on Slum Mapping  
21-23 May 2008**

## **Resumés of participants (in alphabetical order)**

### **Filho, Mauro Barros**

Dr. Mauro Barros Filho is an architect and urban planner who graduated at the Federal University of Pernambuco – Brazil in 1993. He got a specialization degree in Geoprocessing at the same university in 1998. He did his Masters and a PhD in Urban Development at UFPE in 2000 and 2006, respectively. He did a split-PhD in the Centre for Advanced Spatial Analysis at University College London from 2004 to 2005. He participated on the elaboration of urban plans for slum upgrading programmes in the city of Recife - Brazil, from 1994 to 1997, and on the development of a geographic information system, from 2000 to 2002, for slum detection and monitoring in Recife. He is currently a professor at Faculty Esuda – Brazil where he lectures on Urban Planning and Geoprocessing in both undergraduate and post-graduate courses, and he is carrying out a research on Urban Texture from Satellite Images, which is funded by FACEP – a Brazilian foundation that supports science and technology.

### **Hackenbroch, Kirsten**

Kirsten Hackenbroch is a PhD-student at the Technical University of Dortmund, Faculty of Spatial Planning. Her PhD is titled “The spatiality of livelihoods – negotiation of urban public space in informal settlements of Dhaka”. The research aims at exploring and explaining the interdependencies between livelihoods and urban public space in informal settlements. Urban public space and its functionality are regarded as important livelihood assets for inhabitants of informal settlements and slum areas. On the other hand it is assumed that urban public space is shaped, often in a detrimental mode, by the livelihood activities of informal dwellers. The research scope includes the production of urban public space and its accessibility, or to put it more general, the rights to the city:

### **Hofmann, Peter**

Dr. Peter Hofmann obtained his PhD in GIS and remote sensing from University Salzburg, Austria. He is now employed by Leibniz University Hannover, Institute of Photogrammetry and GeoInformation (IPI), where he is Research Associate and Project Manager in the compound project DeCOVER: development and prototypical realization of a concept for change detection; organization and coordination of working package *innovations (methodology)*, developing concepts and methods for quality management and quality assurance; research in enhanced methods for feature extraction. Prior to joining Leibniz University he worked for 5 years with Definiens Imaging GmbH in various capacities including software and application development of advanced image processing.

### **Huque, Iffat**

Ms Iffat Huque is Head and Principal Specialist of the Remote Sensing Division of Center for Environmental and Geographical Information Services (CEGIS). She manages and coordinates CEGIS' remote sensing related research and applications projects in the water, environment and related sectors. Ms. Huque has 20 years experience in application of remote sensing and digital image processing for flood monitoring, river and coastal morphology, landuse, landcover, crop mapping and monitoring and forest cover mapping. She has carried out remote sensing applications in support of some major Environmental Impact Assessments in the water sector.

She was the Project Leader of the UNDP funded project on Impact of Sea Level Rise on Landuse Suitability and Adaptation Options. She led the development of a Decision Support System (DSS) for landuse strategies in the southwest region of Bangladesh and provided Remote Sensing and GIS Support to SEMP Component: Coastal Land Use Zoning in the South West.

Ms. Huque led a project which involved setting up a transportable ERS Ground Receiving Station (RAPIDS) for Flood Mapping and Monitoring funded by the European Space Agency (ESA). Responsibilities included coordination between various national and international partner organizations e.g. Space Research and Remote Sensing Organization (SPARRSO) of Bangladesh and national and private sector remote sensing agencies in the Netherlands and the UK.

As Project Leader, she managed the Jamuna Bank Monitoring for O&M unit of the River Bank Protection Project, RBPP. The project involved application of RS and GIS techniques for carrying out

## **Expert Group Meeting on Slum Mapping 21-23 May 2008**

time series analysis of morphological information and making short and long term predictions of bankline and planform changes of the Jamuna River for the operation and maintenance of bank protection structures.

She manages the CEGIS distributorship of satellite images from National Remote Sensing Agency (NRSA), India, MDA Geospatial Services, Canada and Space Imaging South East Asia (SISEA), Thailand. She was member of the Financial Commission of the International Society for Photogrammetry and Remote Sensing (ISPRS) during the period 2000-2004.

### **Huang Zhengdong**

Dr. Huang Zhengdong received his PhD degree in geographical sciences from Utrecht University in 2003. He is currently working at the School of Urban Design, Wuhan University where he is assistant to the Dean. His main research interest is in transportation planning but he has prepared a paper for this meeting together with his colleague Dr. Zhan Qingming, who is an urban remote sensing specialist.

### **Jain, Sadhana**

Dr. Sadhana Jain received here PhD from IIT, Roorkee, India in 2006. She is currently employed as specialist in remote sensing and GIS in urban management, by Indian Institute of Remote Sensing (IIRS), Dehradun, India. In addition to teaching activities at IIRS she has been involved in a number of research projects related to urban remote sensing: LULC 50k mapping of human settlements for Punjab and Haryana states (2006 onwards); Comparative evaluation of Resourcesat, Cartosat and Ikonos satellite sensors for detection of urban micro objects (YY: 2005-2008); Urban sprawl mapping of Shillong (YY: 2000- 2001) (with B. S. Sokhi and K. Rynngnga). She has published more than 20 papers in international journals, national journals and conferences.

### **Joshi, Pratima**

Ms. Pratima Joshi is Pratima Joshi Director of founder-member of the NGO Shelter Associates that is located in Pune, India. She is an architect from Chennai who has completed her post-graduation degree in Building Designs for Developing Countries from the Bartlett University, UK. Her field of specialization: Working on federation activities with Baandhani and all housing and basic infrastructure projects in Pune and Sangli. Shelter Associates comprises Architects, Social workers, GIS Experts and Community Workers who work with the urban poor, particularly women in informal settlements to facilitate, and provide technical support to, community-managed housing (slum rehabilitation) and infrastructure projects.

### **Jürgens, Carsten**

Dr. Carsten Jürgens is Professor of remote sensing at the geography department at the Ruhr-University Bochum since 2005. He studied applied physical geography with the subsidiary subjects remote sensing and hydrology at the Universities of Trier and Salt Lake City. After finishing his degree dissertation (Diplom) in 1989 he did a graduation on "Kontrollmöglichkeiten der Flächenstilllegung mit Hilfe der Fernerkundung" in 1992. Subsequently he worked as assistant lecturer at the Geography Department of the University in Regensburg. In 1999 he qualified as a university lecturer on a topic about flood water modelling. There upon he established an international symposium serial on urban remote sensing and worked at different committees in leading positions (EARSeL SIG "Remote Sensing of Urban Areas", ISPRS-WG VIII.1 "Human Settlements and Impact Analysis"). His exploratory focus lies in application oriented information retrieval from optical remote sensing data of urban and rural areas.

### **Kemper, Thomas**

Dr. Thomas Kemper has a degree in physical geography (1997) and received a PhD from the University of Trier (Germany) for his work on quantification of heavy metals in soils using laboratory and airborne reflectance spectroscopy (2003). From 1998 to 2004 he was working at the Institute for

## Expert Group Meeting on Slum Mapping 21-23 May 2008

Environment and Sustainability of the Joint Research Centre (JRC) in the context soil degradation and desertification.

In 2004 he joined the German Remote Sensing Data Center (DFD) of DLR (German Aerospace Center) working in the Center for satellite based crisis information (ZKI), where he was providing satellite based crisis information in natural disasters, humanitarian and complex crisis situations to support decision making and field teams. Since November 2007 he is working at the Institute for Protection and Security of the Citizen of the JRC where he is working on the exploitation of imagery and geospatial information to describe, assess, visually depict and model security issues relevant to EU policies.

### **Kerle, Norman**

Dr. Norman Kerle received Masters degrees in geography from the University of Hamburg (Germany) as well as from Ohio State University (US), and a PhD in geography (volcano remote sensing) from the University of Cambridge, UK (2002). His activities in volcanology started with project work in Costa Rica in 1994, followed by hazard research in the Philippines (1996). Remote sensing started to become more prominent in 1997 during a project at NASA's Goddard Space Flight Centre, followed by extensive work on a multi-national project in Nicaragua (1998-2001). Since then he has moved into more methodological work, related to hazards, risk and disaster damage assessment with multi-type geodata.

He has published results from those projects in a range of articles in international journals, and presented at various conferences. Before coming to ITC, he also taught at graduate and post-graduate levels in the US, the UK and in Greece. His professional affiliations include the American Geophysical Union (AGU), the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), and the Remote Sensing and Photogrammetry Society (RSPS).

For the International Society of Photogrammetry and Remote Sensing (ISPRS) he co-chairs the Technical Commission VII Working Group 8 "Innovative problem solving methodologies for less developed countries" ([http://www.isprs.org/technical\\_commissions/wgtc\\_7.html](http://www.isprs.org/technical_commissions/wgtc_7.html)). He is a member of Sidney Sussex College at Cambridge University, and a fellow of the Cambridge Philosophical Society.

His principal research interests relate to geoinformatics applied to hazard and disaster management. In particular they include questions of assessment of vulnerability, risk and post-disaster structural damage. He is involved in the SLARIM project (Strengthening Local Authorities in Risk Management), working on image-based vulnerability and damage assessment. In addition he contributes to a research project on data mining (DAMIN), and works on issues of quantitative geomorphology and data quality. Recently he also started to focus on wireless sensor networks and their potential in environmental monitoring, in particular for volcanic hazard assessment and when integrated with remote sensing data. Within the ITC UNU School on Disaster Geo-Information Management (DGIM) he regularly contributes to disaster response activities through the Disaster Information Analysis Group (DIAG), and coordinates the ITC link to GEOSS. He also helped to set up the University Network for Disaster Risk Reduction in Africa (UNEDRA).

### **Kuffer, Monika**

Monika Kuffer is a lecturer in urban remote sensing and GIS at ITC. She completed her MSc degree at the Technical University of Munich on the use of SPOT imagery in informal development monitoring in 2001. Before joining ITC she has worked as a GIS specialist for a spatial planning agency in Austria. Monika is currently engaged in remote sensing research on slum development in Delhi in conjunction with Richard Sliuzas, Norman Kerle and colleagues from the University of Amsterdam and SPA, Delhi.

### **Pu Hao**

Pu Hao obtained an MSc in Urban Planning from Wuhan University and an MSc in Geoinformation Science and Earth Observation from ITC in 2007 as part of a double degree programme. In December 2007 he commenced his PhD studies which will be jointly carried out at ITC and Utrecht University with funding from the Chinese Scholarship Committee and ITC. His research interest is the development and management of urban villages in Chinese cities. His research will be based on the city of Shenzhen, China's first major Special Economic Zone where more than 200 urban villages are currently located.

## Expert Group Meeting on Slum Mapping 21-23 May 2008

### **Hossain, Maharufa**

GIS and Local Urban Observatory Coordinator, UN-HABITAT

Maharufa Hossain, graduated in Urban Planning from the Asian Institute of Technology (AIT, Bangkok Thailand) in 1998, had received her B.Sc. and M.Sc. degree in Geography from the University of Dhaka in 1990. She also completed her advance degree in 'Geo-spatial technology application' from McMaster University, Canada in 2001.

Ms. Hossain started her professional career in Dhaka, Bangladesh working in community health research (ICDDR, B) as a GIS specialist in 1990 where she was involved in analyzing spatial component of epidemiological research in informal settlement. She was actively involved in conservation GIS field from 1999 to 2002 with IUCN, WWF and Federation for Ontario Naturalist in Canada and Thailand. She joined United Nations Development program (UNDP) in 2003 and was the country coordinator of AIMS/UNDP and managing six regional GIS capacity building and governance programs in Afghanistan. Since joining UN-HABITAT in 2006, she has been appointed as the GIS coordinator and later the Local Urban Observatory coordinator for the Global Urban observatory of the Monitoring Research Division. She has been involved in various Projects and activities around the globe: Project planning, spatial planning and disaster management in various countries beside her active involvement in Urban Observatory initiatives. She is the active member of UN-HABITAT Global Project review committee and successfully incorporated Geo Spatial Application in most of the field projects of the Agency to have better information for better planning. She is also one of the contributor in 'State of the world cities Report'-09 and other research publication of the Monitoring Systems Branch.

### **Mboup, Gora**

Sr. Demographic and Health Expert, Ag. Chief Global Urban Observatory, UN-Habitat

With 20 years of experience, Gora Mboup joined UN-HABITAT in 2004 after having coordinated for over a decade the International Programme of Demographic and Health surveys implemented by ORC Macro (USA) and sponsored by USAID in collaboration with United Nations agencies. Since 2003, Dr. Mboup has been in charge of the Global Monitoring of the Millennium Development Goals Target 11 (slum) and the Habitat Agenda for UN-HABITAT. In 2003, based on the agreed definition of slum, Dr. Mboup led a team to develop a statistical method for the computation of population and proportion of slum dwellers for all MDGs countries as published for the first time in the MDGs Glossary report in 2004 and in various UN-HABITAT Flagships such as the State of the World's Cities Report 2006. Since March 2008, Dr. Mboup is appointed Acting Chief of the Global Urban Observatory of the Monitoring Research Division. Dr. Mboup has authored numerous publications of scientific reports on population, health, and urban poverty/slum conditions, and contributed to the promotion of the utilization of statistics by policymakers. Dr. Mboup holds a Ph.D. in Demography from the University of Montreal (Canada, 1992), a MSc. in Demography from the United Nations International Institute of Demography (IFORD, Cameroon, 1987), a Bsc. in Statistics and Applied Economy from the International Institute of Statistics and Applied Economy (ISPEA, Cameroon, 1984), a BSc in Economics from the University of Yaounde (Cameroon, 1987) and a University First degree (DUES1) in Mathematics and Physics from the University of Dakar (1981, Senegal).

### **Pérez Machado, Reinaldo**

Dr. Reinaldo Pérez Macahdo received his PhD from University of São Paulo (USP), Geography Department in 2001. He is currently Professor of Cartography, Geographic Information Systems and Remote Sensing at University of São Paulo (USP), Geography Department where he teaches courses in Thematic Cartography, Remote Sensing, Geomatics and Spatial Analysis and Geomatics. Between 1990-2005 he was Director of IGASA Geoprocessamento Ltda. Brazil. Specialized consultancy firm in GIS/LIS, Automated Cartography and Remote Sensing. In this period he was engaged in various consultancy projects in Brazil and other Latin American countries, including projects related to slum development and monitoring.

### **de Sherbinin, Alexander**

Alex de Sherbinin is a Senior Staff Associate for Research at Columbia University's Center for International Earth Science Information Network (CIESIN), an environmental data and analysis center

## Expert Group Meeting on Slum Mapping 21-23 May 2008

within The Earth Institute at Columbia University specializing in the human aspects of global environmental change. He also serves as the Coordinator of the Population-Environment Research Network (PERN), a global network of 1,500 social and natural scientists researching population-environment relationships that is sponsored by the International Union for the Scientific Study of Population (IUSSP) and the International Human Dimensions Programme on Global Environmental Change (IHDP). He is a geographer whose research interests focus on the human aspects of environmental change at local, national and global scales. He has written peer-reviewed articles, chapters, and reports addressing population dynamics and the environment; U.S. population policy; consumption-environment linkages; climate change vulnerability assessment; environment and security; environmental indicators; land-use and land-cover change; remote sensing applications for environmental treaties; social science applications of remote sensing; and community-based natural resource management. Mr. de Sherbinin serves as deputy manager of the NASA-funded Socioeconomic Data and Applications Center (SEDAC), and has served as PI or co-PI on a number of other research projects. He is part of the core team that developed the Environmental Sustainability Index (ESI) and the Pilot Environmental Performance Index (EPI). Prior to joining CIESIN, Mr. de Sherbinin served as a USAID-funded Population-Environment Fellow with the Social Policy Program of IUCN-The World Conservation Union (Gland, Switzerland), and a Population Geographer at the Population Reference Bureau (PRB, Washington, DC). From 1984-1986 he served as an agricultural extension agent with the U.S. Peace Corps in Mauritania, West Africa.

### **Small, Chris**

Dr. Christopher Small is a geophysicist at the Lamont-Doherty Earth Observatory of Columbia University. Prior to receiving a Ph.D. from the Scripps Institution of Oceanography in 1993, his formative experiences ranged from shipboard studies of the circulation of the Chesapeake Bay with the University of Maryland to satellite mapping for frontier petroleum exploration with the Exxon Production Research Company. Current research interests focus on measuring changes of Earth's surface and understanding the causes and consequences of these changes. Details available online at <http://www.LDEO.columbia.edu/~small>.

### **Sliuzas, Richard**

Dr. Richard Sliuzas graduated as a Town Planner from the South Australian Institute of Technology (now known as University of South Australia) in 1979. He completed a MSc degree in Urban Survey and Human Settlements Analysis at the ITC in 1988. In 2004 he obtained a PhD from the Faculty of Geographical Sciences, Utrecht University, for his research entitled "Managing Informal Settlements: a study using Geographic Information Technology in Dar es Salaam Tanzania. Richard's professional career began in Adelaide, Australia where he worked for a firm of Town Planning Consultants, for a local government body as a Town Planning officer mostly involved in development control. Since joining ITC in December 1983, he has held various positions in research and education and is currently Associate Professor in Urban Planning within the Department of Urban and Regional Planning and Geoinformation Management. He has been involved in numerous project activities abroad and over the last 10 years has been active in the following countries: Egypt, Malawi, Tanzania, Mozambique, Ethiopia, Vietnam and China. Richard is a member and Coordinator of the International Committee of the *GIS for Developing Countries network (GISDECO)* and is involved in several other national and international networks related to urban planning and Geographic Information Sciences. He is currently coordinator of the research theme Sustainable Urban and Regional Dynamics (SURD) at ITC.

Currently he is supervising 4 PhD students working on issues related to spatial planning and sustainable urban development in China. The cities of Wuhan, Beijing and Shenzhen serve as case studies for this work. He is also involved in the supervision of a PhD working on spatial data infrastructures for vulnerability analysis with case studies in Lalitpur, Nepal and Medellin, Colombia.

### **Spreckmeester, Ron**

Ron Spreckmeester was trained as an urban sociologist (University of Amsterdam). He worked for the Municipality of Amsterdam where he got of experience in housing distribution at local level (head of department Municipal Housing Service. Hereafter, in 1978, he started working for the Ministry of Housing and Spatial Planning, in several functions. During ten years as Head of Department for

## **Expert Group Meeting on Slum Mapping 21-23 May 2008**

Minorities and Special Groups he built his experience in housing and urban policy regarding minorities. From 1988 till 1997 he worked as Head of Department for International Affairs in Ministry of Housing, Planning and Environment. He left the Ministry in 1997 to become Director of the Dutch Habitat Platform to implement and support the UN Habitat Agenda in the Netherlands as well as in international programs. In 2007, he re-entered the Ministry of Housing, Spatial Planning and the Environment as Adviser on international affairs to the two Ministers. Ron is familiar with methods for citizen's participation, at national and international level; he tries to apply them to several issues, like local development, local habitat agenda's, integration and sustainable development. During his career he functioned as board member or chairman of several organisations. In Gouda he is chosen chairman of a neighbourhood association with members of many nationalities.

### **Stein, Alfred**

Prof dr. Alfred Stein received his MSc in mathematics and information science, with a specialization in applied statistics from Eindhoven University of Technology. He obtained a PhD in 1991 at Wageningen University on spatial statistics. He started his career at the soil science and geology department of Wageningen university. In 1995 he was appointed a visiting professor at the ITC, in the soils department. In 1999 this changed to the department of spatial data acquisition.

In 2000 he was appointed a professor at the chair of mathematical and statistical models in Wageningen university (0.2) and in 2002 he became a 0.8 professor at the new department of Earth Observation Science at ITC, which he is currently heading. His research interests focus on statistical aspects of spatial data, also to include monitoring data, in the broadest sense. Optimal sampling, image analysis, spatial statistics, use of prior information, but also issues of data quality, fuzzy techniques and Bayesian procedures. In 2000 he also became a senior consultant at the Zentrum für Entwicklungsforschung in Bonn, Germany.

From 1998 onwards he has been working with several PhD students on a range of spatial (and temporal) statistical topics. Alfred Stein is chairman of the biometrical section of the Dutch Statistical Society and has long been a chairman of the National Studygroup on Statistics for Earth Sciences. He is a member of the CT de Wit Research School for Production Ecology and Resource Conservation and is editor-in-chief of the International Journal of Applied Geoinformation and Earth Observation, the former ITC Journal. Currently, 9 PhD students are working under his supervision. He is editor of several books and of various special issues of journals.

### **Turkstra, Jan**

Jan Turkstra is with UN-HABITAT and since 2005 based in Libya working with the Urban Planning Agency of Libya. As the technical manager of UN-HABITAT in Libya he coordinates support from UN-HABITAT to a major spatial planning project with extensive use of satellite images and aerial photographs. He was also involved in an urban development project in Somalia using Quickbird images to develop a database for property taxation. In 2004 he was seconded to the Global Urban Observatory of UN-HABITAT and working on slum mapping, urban inequities studies and the development of a slum calendar.

Before joining UN-HABITAT he was for 20 years with ITC and worked in a variety of urban projects, especially in China, Colombia and Peru. He holds a special interest in urban land administration, spatial-temporal urban development and poverty mapping.

Jan Turkstra graduated from the Technical University of Delft and holds an Engineering degree (MSc) in urban planning with a thesis on social housing and slum upgrading projects in Madras (Chennai), India. He holds a doctorate from Utrecht University with a thesis on urban development and land values with a case study from Villavicencio, Colombia.

### **Weber, Christiane**

Dr. Christiane H. Weber has got her thesis (PhD) in 1982. The subject was a comparative analysis between Rhine valley cities: Strasbourg and Mulhouse (F), Bale (CH), Fribourg (G). And in 1997 the HdR thesis devoted on Urban environment modelling. This topic corresponds to her field of researches: Urban environment, Urban quality of life and environmental urban quality, risks in urban

## **Expert Group Meeting on Slum Mapping 21-23 May 2008**

areas, ecologic compensation. She is since 1986, full time researcher at the Centre National de la Recherche Scientifique (CNRS) in France and works in the geography department of the Louis Pasteur University (Strasbourg). She is now Director of research (senior scientist).

She has a wide experience on urban and spatial analysis, remote sensing applications particularly in urban field, and in Geographic Information System. She is a member of the remote sensing research group in the CNRS laboratory (UMR 7011) and works with several students on European sites and abroad. She gives lectures for graduated students in remote sensing and GIS in master programs in various places in France, for professionals in courses managed abroad by the French Ministry of Cooperation (Ethiopia, Libanon, Indonesia) for instance or in the development and training centre of remote sensing (GDTA) in Toulouse.

Dr. Christiane H. Weber is involved in different remote sensing and GIS networks set up in Europe (ESF, AGILE, ISPR, SIGMA-CASSINI). Her domain of expertise is mainly in urban geography and planning, and urban environment. She is widely involved in remote sensing urban applications and GIS. She is involved in several national or international research programs. She took the direction of the "Image et Ville" laboratory in 2000. She is the adjoint manager of the SIGMA-Cassini Network devoted in GIS, gathering computer scientists and geoscientists in France (around 60 laboratories) Invited by the "Catedra Elisée Reclus" (Excellence Chair supported by the Mexican research ministry and French Embassy) to participate to several conferences in various research centres.