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A spatial hedonic approach on land use change anticipation

Ghislain Geniaux, Claude Napoleone, Jean-Sauveur Ay

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CNRS / INEE / PIRVE

Institut Ecologie et Environnement
Programme Interdisciplinaire de Recherche
Ville et Environnement

**MISSION CNRS CHINE 3-11 OCTOBRE 2009
COMPTE-RENDU SCIENTIFIQUE**

Xiamen et Hong-Kong



Xiamen, Institut de l'Environnement Urbain, oct. 2009

16 novembre 2009

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INTRODUCTION

Contexte

Le PIRVE s'est associé à l'Institut Ecologie et Environnement du CNRS (INEE) dans le développement de la collaboration scientifique du CNRS avec l'Académie des Sciences de Chine (CAS) : depuis novembre 2007, un partenariat s'est établi entre le Bureau des Sciences et Technologies des Ressources Naturelles et de l'Environnement (BSTRE) de l'Académie des Sciences de Chine (CAS), et le département EDD (maintenant INEE) du CNRS dans le domaine des sciences de l'environnement. Cette coopération prend notamment la forme d'un séminaire annuel se tenant alternativement en Chine et en France. Pour 2009, l'organisation scientifique du séminaire était pilotée par Yongguan Zhu, Directeur adjoint de l'Institut de l'Environnement Urbain de Xiamen, pour le volet chinois et par Sabine Barles pour le volet français.

Objectif de la mission d'octobre 2009

La venue de la délégation CNRS en Chine poursuivait un triple objectif :

- La participation active au colloque franco-chinois de Xiamen sur l'environnement urbain et le développement durable (6 et 7 octobre) – dont le PIRVE assurait l'organisation scientifique conjointement avec l'Institut de l'Environnement Urbain de Xiamen (CAS).
- La signature officielle d'un Memorandum of Understanding entre le CNRS et la CAS
- Une première prise de contacts avec des chercheurs hongkongais travaillant dans le champ de la recherche interdisciplinaire urbaine-environnementale en vue de développer des collaborations futures.

Participants

Composition de la délégation PIRVE :

Sabine BARLES, Pr. FRE 3221, Université de Paris 8, Institut français d'urbanisme et Directrice-adjointe du PIRVE, Edith BESSON, UMR 8134 – LATTIS, secrétaire scientifique du PIRVE, Nathalie BLANC, DR UMR 7533 – LADYSS, Laurent CHARLET, Pr. IUF - UMR 5559 – LGIT, Petros CHATZIMPIROS, PhD FRE 3221 – AUS, Solène CROCI, post-doctorante UMR 6553 – CAREN, Hervé Daniel, MC. – Agrocampus Ouest – Angers INHP, Cyria EMELIANOFF, MC. – UMR 6590 – ESO GREGUM, Mindjid MAIZIA, PR – FRE 3221 – AUS, Claude NAPOLEONE, Chercheur INRA – UR 767 Ecodéveloppement, Jonathan RUTHERFORD, Chercheur – UMR 8134 – LATTIS, Jean-Paul THIBAUD, Chercheur – UMR 1563 – CRESSON.

La liste complète des participants français et chinois, ainsi que leurs coordonnées, figure en annexe de ce rapport.

Composition de la délégation INEE :

Luc ABBADIE, Chargé de mission Ecologie, Catherine BASTIEN-VENTURA, Chargée de mission – Chef de projet Chine, Coralie BOTTON, Chargée d'affaires européennes et internationales, Yvan LAGADEUC, Délégué scientifique pour les Zones Ateliers.

Informations complémentaires

Des informations complémentaires sur la coopération franco-chinoise entre le CNRS et la CAS, ainsi que le rapport de mission de l'INEE, sont disponibles sur le site de l'Institut :

http://www.cnrs.fr/inee/relationinternationaleseurope/Chine_2009.htm

Autres sources d'information :

- Le site de l'ambassade de France - <http://www.ambafrance-cn.org/Accord-de-cooperation-CNRS-CAS-sur-l-environnement.html?lang=fr>

- Le site de l'Académie des Sciences de Chine - <http://english.cas.cn>

- Le site de l'Institute of Urban Environment de Xiamen - <http://english.iue.cas.cn>

- Le site du Programme Ville et Environnement (PIRVE) – <http://www.pirve.fr>

Objectif du rapport

Le présent rapport a pour objectif de présenter les grandes lignes des échanges scientifiques qui ont eu lieu durant le séminaire de Xiamen et les rencontres de Hong-Kong, et de proposer des premières pistes de collaboration scientifique.

**SINO-FRENCH WORKSHOP ON URBAN ENVIRONMENT AND
SUSTAINABLE DEVELOPMENT
4-7 OCTOBER 2009 XIAMEN, CHINA**



Yong-Guan Zhu, Directeur Adjoint de l'Institut de l'Environnement Urbain (Photo : Coralie Botton)

PROGRAMME (1/2)

Day 1: Tuesday 6 Oct, 2009 Venue: Conference Room 208		
Opening Ceremony		
Chair: Yong-Guan Zhu		
09:00-09:10	Welcome address by Wei-Ming Fan (Bureau of Science & Technology for Resources & Environment, CAS)	
09:10-09:25	Speech by a Catherine Bastien-Ventura (CNRS) & Luc Abbadie (INEE)	
09:25-09:35	Memorandum signing between BSTRE/CAS and INEE/CNRS	
Session 1	The Urban Environment as a Living Environment (1)	Chair: Xing-Yuan He
09:35-10:00	Nathalie Blanc	Greenways: towards a new urban design?
10:00-10:20	Coffee Break & Group Photo	
10:20-10:45	Xing-Yuan He	Physiological Response of Main Tree Species in Urban Forest to elevated CO ₂ and O ₃ Concentration
10:45-11:10	Yvan Lagadeuc	The "Zone atelier": the French experience on long-term research in socio-ecological systems
11:10-11:35	Xiao-Ke Wang	The Seasonal and Spatial Variation of Membrane Emission from Lakes in Beijing Urban Area
11:35-12:00	Chuan Tong	Carbon Biochemical Characterization of Urban Greenspace Soil from Fuzhou, China
12:00-13:30	Lunch (Canteen at 2 nd floor)	
Session 1	The Urban Environment as a Living Environment (2)	Chair: Gan Zhang
13:30-13:55	Tao Lin	Using Variation of Flight Initiation Distance as a Indicator of Bird Tolerance to Urban Environment
13:55-14:20	Solène Croci	Urban biodiversity: how do animal communities respond to urban landscape? A French city case study.
14:20-14:45	Gao-Ming Jiang	Invasion Possibility and Potential Impacts fo Staghorn Sumac (<i>Rhus typhina L.</i>) on Urban Ecology of Beijing Municipality
14:45-15:10	Hervé Daniel, Jeanne Vallet, Véronique Bezujouan	Assessment of plant diversity in woodlands along a rural-urban gradient in three cities of north-western France, implications for biodiversity conservation and urban green infrastructure planning.
15:10-15:30	Coffee Break	
Session 1	The Urban Environment as a Living Environment (3)	Chair: Mindjid Maïzia
15:30-15:55	Gan Zhang	DDTs, Chlordances, Hexachlorobenzene and Endosulfan in the Atmosphere of 37 Chinese Cities: implication to current sources
15:55-16:20	Nathalie Blanc, Cyria Emelianoff	Environmental requalification: a new basis for empowerment?
16:20-16:45	Jian-Su Mao	The Eco-efficiency of Lead in China's Lead-Acid Battery System
16:45-17:10	Jean-Paul Thibaud	The Sensory Experience of the Urban Environment: towards a methodological framework
17:10-17:40	Session Discussion	
18:00	Dinner (Canteen at 2 nd floor)	

Day 2: Wednesday 7 Oct, 2009 Venue: Conference Room 208		
Session 2	Urban Metabolism (1)	Chair: Yong-Guan Zhu
09:00-09:25	Sabine Barles	Urban metabolism, territorial ecology, urban and regional planning: how complementary and how compatible?
09:25-09:50	Sheng-Hui Cui	Carbon Footprint Analysis of the Bus Rapid Transit (BRT) System: a case study of Xiamen City, China.
09:50-10:15	Mindjid Maïzia	The Principle of Energy Mutualisation at Urban Scale.
10:15-10:40	Luo-Ping Zhang	Environmental Risk Assessment for Coastal Engineering Planning in Coastal Cities
10:40-11:00	Coffee Break	

Session 2	Urban Metabolism (2)		Chair: Sabine Barles
11:00-11:25	Yong-Guan Zhu	Phosphorus Inflow into Cities through Food.	
11:25-11:50	Laurent Charlet	Environmental Stewardship of Water Resources in Megacities: An integrated approach.	
11:50-12:15	Petros Chatzimpiros	Growing urban population and food demand. Tracking the physical and virtual flows of nitrogen and water to sustain the pork meat consumption of Paris, 19 th -21 st century.	
12:15-12:35	Session Discussion		
12:35-14:00	Lunch (Canteen 2 nd floor)		
Session 3	Urban Foresight and Urban Futures (1)		Chair: Jean-Paul Thibaud
14:00-14 :25	Cyria Emelianoff	Towards a Post Carbon City: a variety of local approaches.	
14:25-14:50	Xian-Jing Xiao	The Analysis of Policies, Measures and Social Barriers to the Reduction of Greenhouse Gas Emission in Chinese Cities-A Case Study about Beijing	
14:50-15:15	Claude Napoléone	A spatial hedonic approach on land use change anticipations.	
15:15-15:40	Xiao-Feng Zhao	Urban Planning Information System in China-Its Past, Present and Future.	
15:40-16:00	Coffee Break		
Session 3	Urban Foresight and Urban Futures (2)		Chair: Cyria Emelianoff
16:00-16:25	Li-Na Tang	Redefining the Digital City to Enhance its Roles in Attractive, Harmonious and Sustainable Urban Development	
16:25-16:50	Jonathan Rutherford, Oliver Coutard	Cities in a post-networked era: combining ecological, infrastructural and urban transitions.	
16:50-17:15	Yi-Jun Liu	Strategic Thinking for Low Carbon Cities in China	
17:15-17:35	Session Discussion		
17:35-18:00	Conclusion & General Discussion		Chair: Yong-Guan Zhu & Sabine Barles
18:00	Dinner (Jia-Li Seafood Restaurant)		



Catherine Bastien-Ventura, Chargée de mission CNRS-INEE – Chef de projet Chine (Photo : Coralie Botton)

*** Speakers**

• Greenways: towards a new urban design ?

Nathalie BLANC*

The new forms of urbanity show a strong aspiration to more nature in the city by valorizing the urban landscapes and an ecological management. The need for nature in cities is expressed by the inhabitants, but also by the representatives of the State, the actors of urban policy and the scientists. Ecological engineering is developing whereas biodiversity conservation develops even in cities which implies circulation of species between their habitats. Landscape is essential to sustainability as it is a place of interaction of human beings with nature, but which landscape? Which landscape to live the town of tomorrow? A question which thus concerns directly ecology, social representations and practices, and the act of governing commons ! Grenelle of the Environment also promotes the green and blue ways in an urbanized context ; it is even a strong new topic of inner cities planning and at the scale of urban areas.

How to define a green way ? Grenelle of the Environment defines, moreover, the green and blue ways as a "tool for town and country planning, made up by great natural units and corridors connecting them". We will thus talk about a tool for town and country planning and develop political visions in that direction, and not only in technical or ecological terms. About forty French researchers from about ten laboratories try to evaluate the role of the urban green networks and to provide a reference frame usable by the communities.

The French national program, one I copilot, "Assessment of urban green frames and development of a referential: an infrastructure between aesthetic and ecology for a new urbanity" summed up as "TrameVerteUrbaine" funded by the french national agency for research (2009-2012) tries : -to evaluate the interest of urban green continuities in their capacity to render ecosystemic services ; -to work out some referential frames which can be used by the operators and the municipalities. Finally we want to explore the socio-ecological interactions around the green frame project (national perspective of the « Grenelle de l'Environnement ») to give some elements of response to: what landscape for the future city?

Our point is divided into four parts. The first part is devoted to the definition of green ways, the second part to the way in which these greenways can contribute to policies aiming to increase citizens' quality of life, the third part to what such a policy may mean in terms of city and country planning and local development as well as in terms of participative democracy.

• Physiological response of main tree species in urban forest to elevated CO₂ and O₃ concentration

Xing-Yuan HE*, Sheng XU, Wei CHEN, Dali TAO:

In recent years, many studies related to urban forest and climate change were carried out by our Works based on "forest city" is constructing in Shenyang city, the biggest city in the northeast of China. By using of open top chambers (OTCs) for simulating global climate change, the responses of growth, photosynthesis, antioxidative system, endogenous hormones, secondary metabolism to the simulated elevated CO₂ and elevated O₃ concentration were studied for the four major urban tree species: Ginkgo biloba, Pinus tabulaeformis, Quercus mongolica and Pinus armandii. The photosynthesis and growth of trees increased by elevated CO₂ but decreased by elevated O₃ and the adverse effect of elevated O₃ was compensated by elevated CO₂. Elevated O₃ increased activities of antioxidative enzymes in leaves of G. biloba, and P. tabulaeformis, and the elevated CO₂ had no significant effect on them. The products of secondary metabolisms show significant differences in different tree species in urban forest. Isoprene was the major volatile organic compounds (VOCs) from G. biloba and Q. mongolica, and monoterpene was the major volatiles emitted mostly from P. tabulaeformis and P. armandii. Elevated CO₂ significantly increased the emission rate of isoprene from G. biloba, and elevated O₃ increased the emission rates of both isoprene and monoterpene. These results would provide some scientific bases for the selection of urban tree species and the building of climate model in accordance with the predicted climatic change in future.

Keywords: Climate change, Elevated CO₂, Elevated O₃, Tree species selection, Urban forest

- **The Zones Ateliers: an original device to study dynamic of socio-ecological systems**

Yvan LAGADEUC*

Twenty years ago the CNRS and the ministry of research created a French network of long term research dedicated to the socio-ecological systems. Inside this network, called the Zones Atelier (ZA), interdisciplinary research, involving most of French research institutes, is undertaken with a direct link with stakeholders. The ZA research is developed at the scale of a territory showing a degree of functional unity (*e.g.* a forest, river catchment basin or mountain range). Within the ZA, different sites with a greater or lesser degree of instrumentation are developed to collect data from observations or experiments (*e.g.* small catchment basin, forest compartment or city ward). The entire system is networked on several levels - a network of sites for each ZA and networks of ZA at the national and international levels (ILTER).

The ZA share, with the US LTER, the ISSE (Integrative Science for Society and the Environment) theoretical framework. This framework is based on an interactive and iterative scheme to describe socio and eco-systems relationship.

Currently, none of the ZA is totally dedicated to urban system, however most of them include an urban site. The nowadays goal is to build an urban ZA network to promote long-term research on urban ecosystems.

The main questions, shared by this network inside the ZA, are: What are the changes inside the cities? When, where, why changes are observed? This project is based on the shared know-how of the ZA and mainly focused on 1) Water (quality, quantity, aquatic ecosystem, groundwater, waste water...) and 2) Biodiversity (component of ecosystem in city) integrating the ISSE framework.

This urban network allows increasing diversity of case studies due to historical, political, sociological, geomorphologic, etc, inputs of each city concerned. Moreover, methods (*e.g.* observation, data management, model validation and sociological quantitative approach) are also enhanced.

This urban network will be presented in the context of the ISSE theoretical framework.

Keywords: Long term research, Zones ateliers network, urban water, biodiversity

- **The seasonal and spatial variation of methane emission from lakes in Beijing urban area**

Xiao-Ke WANG*, Yong-Ping AI, Zhi-Yun OU-YANG

Urbanization has changed the urban ecosystem in many aspects: land use, biodiversity, biogeochemistry, water cycles, etc. With the increasing concerns in global change, the carbon sequestration and other greenhouse gases emissions have been drawn attention recently. Although lakes have been believed as important methane (CH₄) sources across the world, there are few investigations into the CH₄ emissions from lakes in urban area. In Beijing urban area, there are 9.6 km² area of lakes, which have been altered by rapidly spreading out and strongly intensifying of the urban with the rise of population, domestic production (GDP) and living conditions. The CH₄ emissions from these lakes were measured by floating chamber methods in this study, and the seasonal and spatial patterns of CH₄ emissions were analyzed. Higher CH₄ fluxes were measured in urban lakes and seasonal peaks occurred in summer when the air temperature is high. There are significantly differences in CH₄ emissions among lakes with seasonal change. Statistical analyses showed that air temperature and water qualities are major factors influencing the temporal and spatial variation.

- **Carbon Biochemical Characterization of Urban Greenspace Soil from Fuzhou, China**

Chuan TONG*, Yan DONG

With the expansion of urban area and the transformation from primarily non-urbanized landscapes to urbanized ones, the studies on the effects of urbanization on urban ecosystem carbon cycle began to be paid more attention. Urbanization process had induced a larger influence on urban soil carbon biochemical characterization. The characterization of soil organic carbon, soil dissolved organic carbon, soil microbial biomass carbon and soil enzyme activity at different urban greenspaces types in Fuzhou City were investigated. Compared with natural forest and riverine meadow, the contents of soil dissolved organic carbon in different soil horizons at human-manipulated urban greenspaces significantly increased ($P < 0.05$), however, the average contents of microbial biomass carbon and soil urease activity in soil horizons decreased distinctly. The contents of soil dissolved organic carbon, microbial biomass carbon and enzyme activity in both natural greenspaces and human-manipulated all dropped with the increase of soil depth. The soil catalase activity and dissolved organic carbon at 0–10 cm soil depth had a significantly positive correlation, the soil urease activity and microbial biomass carbon at 10–20 cm soil depth also had a significantly positive correlation.

Keywords: Natural green land; Human-manipulated greenspace; Soil organic carbon; Soil dissolved organic carbon; Soil microbial carbon; Soil enzymes.

- **Using variation of flight initiation distance as a indicator of bird tolerance to urban environment**

Tao LIN*, Qing-Xian LIN, Kai YIN, Qian-Jun ZHAO, Sheng-Hui CUI

Urbanization is dramatically altering both biotic and abiotic ecosystem properties at local and regional scales and change of bird biodiversity in the urbanizing area is an important hotspot in Biological conservation. Flight initiation distance (FID) is usually used as a quantitative method to indicate the bird tolerance to human disturbance and a decision making tool for bird conservation. In our study, we assume that species with strong urban environmental tolerance are likely to reduce its' FID gradually for adaptability. Thus, the variation of FID (VFID) of bird can be used as an indicator of the bird tolerance to urban environment. 9 places at the Xiamen coastal area were selected for coastal birds FID investigation during 2008 to 2009. Totally 254 FID trials of 36 bird species from 3 orders, 7 families and 23 genera were tested. The coastal birds' FID was significantly correlated with body height positively and external conspicuousness negatively. Taking body height as the major factor affecting birds FID, we test 11 regression models to simulate the FID and finally use the linear curve to estimate VFID. There are 17 species of birds showed tolerance to urban environment in Xiamen coast. FID, migratory type, the avifauna, external conspicuousness and occurrence frequency are significantly correlated with VFID. Our study found that the bird with big size or small distribution range may have stronger tolerance to urban environment than the bird with small size and wide distribution range. The results are critical to prevent or mitigate negative impacts of urbanization and subsequent coastal landscape change on shorebird populations.

Keywords: Flight initiation distance, Indicator, Bird tolerance, Urban environment

- **Urban Biodiversity: how do animal species respond to urban landscape? A French city case study**

Solène CROCI*, Alain BUTET & Philippe CLERGEAU

To respond to the logistical needs of the increasing populations of town dwellers, urban areas expand spatially to the detrimental of natural or agricultural lands. For example in France, 60,000 ha of agricultural lands are urbanised every year. In parallel, more natural areas, such as parks and private gardens, are created in cities to respond to a growing social demand for nature. As a result, urban areas are heterogeneous landscapes dominated by a man-made matrix (impervious surfaces or buildings, etc.) where semi-natural patches and corridors are intimately intermingled.

Thus, habitats for animals and plants are fragmented and quite isolated in a man-made matrix more or less permeable for the movement of organisms. Such barriers to dispersion may affect population recruitment or food research as well. In addition, management of urban green spaces or private gardens may disturb the local conditions of these habitats and thus, the availability of resources. Consequently, urbanisation can have effects on ecological processes that allow maintenance of animal communities and populations. For ecologist, understanding the impact of urbanisation on ecological processes appears as an important challenge, as urbanisation becomes an important cause of environmental changes.

In this context, we sought to characterize the response of animal communities and populations which are facing changes of habitat and landscape induced by urbanisation.

We first analysed the impact of habitat and landscape changes along a rural-urban gradient on the diversity of animal communities. This was done with 3 animal communities (insects, birds and small mammals) having different dispersal abilities. Second, we investigated the morphological variations of a wingless species of carabid beetle, *Pterostichus madidus*, between urban and rural populations in relation to landscape changes among these two contrasted sectors. The study took place in Rennes, Brittany France, and was realised in the ECORURB French Programme.

At the community level, our results illustrated how important is to take into account the dispersion abilities of animals and different environmental scales to propose some assumptions on the mechanisms underlying the diversity of animal communities along rural-urban gradients. At the population scale, variation of body size of *Pterostichus madidus* are still being analyzed but previous results tend to show differences in body size between rural and urban populations. The mechanisms underlying these biometric changes (resources, genetic drift, moving characters...) remain to be explored.

Keywords: urbanisation, biodiversity, community, population, landscape, habitat, body size

- **Invasiveness and potential impacts of staghorn sumac (*Rhus typhina* L.) in the Beijing municipal region**

Guang-Mei WANG, Gao-Ming JIANG*, Shun-Li YU, Ying-Hao LI, Hui LIU

Predicting the invasiveness or the risk of naturalized species is critical to cope with growing biological invasion. Staghorn sumac (*Rhus typhina* L.), an alien species introduced from North America, was widely planted in Beijing municipal region as one of the eight main afforestation species. To evaluate its potential invasiveness and impact to Beijing's natural ecosystem, we firstly used two screening tools (North American Screening System and Australia Screening System) to preliminarily predict the invasive possibility of *R. typhina*. Then we surveyed its geographical distribution and assessed its population features against the native plant communities. Although both screening system assessed *R. typhina* as "reject", the alien species has been dispersed to most local habitats of Beijing with anthropogenic assistance, from downtown to mountains, roadsides, farmlands, even in the protected areas. As a clonal shrub, *R. typhina* possessed a high spreading rate varying from 6.3 m/3yr at sterile habitat to 6.7m/3yr at fertile one. Significantly lower species richness, individual density and diversity were noted in the *R. typhina* community than the native Heterophyllous Negundo Chastetree (*Vitex negundo* Linn.var.heterophylla (Franch.)Rehd.) community. At sterile habitat, *R. typhina* in *R. typhina* community had a coverage, relative coverage, relative density and relative importance value of 89%, 96%, 73% and 80%, respectively those values changed into 97%, 85%, 52%, and 51% at fertile habitat, indicating its absolute dominance behavior and strong suppression to other species. Continuously wide plantation may further foster its population expansion which helps the species to overcome spatial isolation. That each root fragment can develop into a new individual makes *R. typhina* very difficult to be eradicated once established. From a biological point of view, we might believe that *R. typhina* is a plant invader in Beijing. We therefore suggest the government should remove *R. typhina* from the list of main species in afforesting Beijing.

Keywords: Alien species, Beijing, Ecological impact, Evaluation, invasiveness

- **Assessment of woodland plant diversity along a rural-urban gradient - Implications for biodiversity conservation and urban green infrastructure management and planning**

Hervé DANIEL*, Jeanne VALLET, Véronique BEAUJOUAN

The increase of urbanization during the last decades (and the related losses of biodiversity) has resulted in a need to consider biodiversity conservation in urban areas. The aim of this paper is to better understand the relations between plant biodiversity, management intensity and landscape planning by comparing several results obtained in cities of western France. First, we compare three urban greenspaces presenting a large management intensity gradient. These observations show that large urban parks with low management intensity can constitute a local "hotspot of biodiversity", even if it is not their management target. The second part focuses on isolated woodlands and aim to assess the response plant species richness to urbanization. A global pattern of increase in species richness is observed along the rural-urban gradient, but contrasted responses occur according to the origin (native or not) of species. Urban woodlands are richer in exotic species but native and forest species are dominant in all woodlands. Spatio-temporal distribution of areas with trees along an urban-rural gradient (so not only woodland, but all tree cover that can be seen by aerial photograph) is analyzed in the third part. Two dates (1958 and 2001) are compared. The total surface area and total number of tree patches did not change between 1958 and 2001. However, the three classes (woodlands, hedges and treelines & isolated trees) of area evolved differently. The areas of semi-natural tree cover (sum of woodlands and hedges) appear quite similar for rural and recently urbanized district (about 8%), in opposition to more ancient urban district where they are almost absent. Thus, such spatio-temporal urban-rural gradient allow considering changes in landscape planning practices. This work contributes to a better understanding of the response of plant species to urbanization and could improve the integration of woodlands in urban planning and management.

- **DDTs, Chlordanes, Hexachlorobenzene, and Endosulfan in the Atmosphere of 37 Chinese Cities: implication to current sources**

Xiang LIU, Gan ZHANG*, Jun LI, Li-Li YU, Yue XU, Xiang-Dong LI, and Kevin C JONES

Passive air samplers (PAS) were therefore utilized to obtain seasonal data from 37 Chinese cities in 2005. Concentrations and spatial and seasonal distribution of dichlorodiphenyltrichloroethanes (DDTs), chlordanes (CHLs) and hexachlorobenzene (HCB) are presented in this paper, and their potential sources

are discussed based on the dataset. The authors suggested that approximately 95% of DDTs in the Chinese cities was still technical DDT, for which DDT application for public health control and DDT activated antifouling paint for fishing ships may be the major sources. A low TC/CC ratio was observed across China in the winter to spring, maybe related to the secondary emission from past use of chlordanes for house protection. The data showed that China is an important global source for HCB, and combustion may be an important HCB source.

- **Environmental mobilization: a new basis for ecological urbanism ?**

Nathalie BLANC*, Cyria EMELIANOFF*

This article presents the results of a research project on the topic of "*the investment of inhabitants in their living environments*" in France, Germany, Netherlands, Russia and United States¹. It relates to the ways in which people, ordinary individuals or groups, transform their immediate environment in response to a degradation of their living environments and contribute to ecological urbanism. Our hypothesis is that inhabitant investment constitutes an endogenous and therefore powerful process of reappropriation of places, improving their value and conditioning ecological understanding of one's living space, both in its localised form and in its more general form of rehabilitating life in the city when it takes place in towns. Requalification of milieu by the residents themselves involves processes of construction/reconstruction of collective and individual identities, whereas exogenous forms of value-improvement (redevelopment aimed at up-scaling, branding aimed at transforming the area's image, social assistance etc.) do not generally act on the heart of feelings and representations.

At least two kinds of mobilization based on environmental issues were identified. The first one is based on requalification of green areas in disinherited districts. The transformation of landscapes is leading to an environmental, social, even economic revitalization, as in Arnhem (Netherlands). The ecological and thus urban renewal induced by the transformation of one's living space is progressive, incremental. It differs from more alternative living initiatives, aiming at building a living space including new ecological standards.

The second is occurring through new ways of life, developing at the time of the rehabilitation of wasted lands or of projects of eco-construction. These experiments participate fully in the requalification of the daily lives in cities. The eco-neighbourhoods designed by inhabitants, and more generally the co-housing experiments existing in Europe and in Quebec, inspired these groups of inhabitants, determined to build their eco-place, by questioning at the same time the meaning and the practices of inhabiting in cities.

- **The Eco-efficiency of Lead in China's Lead-acid Battery System**

Jian-Su MAO*, Zhong-Wu LU, Zhi-Feng YANG

Improving eco-efficiency can contribute to sustainable development. This article defines the societal services and environmental impacts of the lead-acid battery (LAB) system and offers definitions of eco-efficiency, resource efficiency, and environmental efficiency in the context of LAB systems. Based on the actual lead-flow in the LAB system, we develop a model that considers changes in production, the time interval between production and disposal, direct linkages between the final product and the societal service it provides, and the fiscal year as the statistical period. From this model, equations for eco-efficiency are derived and changes in eco-efficiency are predicted. The results show, not surprisingly, that increased lead recycling and reduced lead emissions will both improve eco-efficiency. The resource and environmental efficiencies for LAB in China are 119 and 131 kilowatt-hour-years per metric tonne (kWh yr/t), respectively, versus a value for both of 15,800 kWh yr/t in Sweden. The difference results from a lower lead recycling rate (only 0.312 tonne/tonne, which means that nearly 70% of the old lead scrap is not recycled based on official statistics) and higher lead emissions (0.324 tonne/tonne, which means that nearly 33% of the lead inputs used in the LAB system were lost into the environment) in China. Further analysis shows that these problems result from inefficient management of lead scrap, poor quality lead ore, and an abundance of small-scale lead-related plants. Ways to improve eco-efficiency are proposed.

Keywords: Element flow analysis; Environmental impact; Lead recycling; Lead emission; Societal services; Substance flow analysis

¹ Blanc N., Emelianoff C. (coord.), 2008. *L'investissement habitant des lieux et milieux de vie: une condition du renouvellement urbain ? Etude prospective. France, Etats-Unis, Russie, Pays-Bas, Allemagne*, PUCA, rapport final, 123 p.

- **The sensory experience of the urban environment: towards a methodological framework**

Jean-Paul THIBAUD*

This paper focuses on the relationship between city dwellers and their environment. How is it possible to account for the urban environment as experienced? By addressing this question, the goal is to better understand the way inhabitants deal with their sensory environment in their daily behavior and participate in its transformation. Such a problematic points out that environmental issues and ecological problems can be dealt with in everyday life in the most habitual and ordinary practices. In trying to understand the experiential aspects of everyday environment, we have to develop new perspectives on urban ecology, new ideas on what urban dwelling is all about. The notion of *urban ambiances* will be considered as a conceptual and methodological tool that helps us to implement those basic arguments in concrete fieldworks and effective research.



Tao Lin, Institute of Urban Environment, CAS (Photo : Catherine Bastien-Ventura)

SYNTHESE

Les 13 présentations de cette session ont couvert un large panel de thèmes de recherche dans le champ de l'écologie urbaine et de ses liens avec l'environnement comme milieu de vie.

La présentation de Nathalie Blanc a introduit la session en montrant **l'intérêt d'une démarche interdisciplinaire** à l'aide de la présentation d'un projet ANR en cours, rassemblant chercheurs en écologie et en sciences sociales autour de l'objet trames vertes. La discussion a permis de souligner l'importance de croiser les regards scientifiques pour comprendre le fonctionnement écologique de ces espaces et ainsi encourager les autorités locales à dépasser des visions parfois réductrices (trames vertes comme espaces verts, trames vertes comme outils de planification...)

Plusieurs présentations chinoises étaient axées sur des **recherches assez pointues en sciences de l'environnement** et visaient notamment à analyser les liens entre différents types de végétation urbaine et la chimie de l'air, de l'eau et des sols urbains. La présentation de Xing-Yuan He – « Physiological response of main tree species in urban forest to elevated CO₂ and O₃ concentration » – propose des pistes de sélection des espèces d'arbres à privilégier en zones urbaines dans un contexte de changement climatique ; La présentation de Xiao-Ke Wang – « The seasonal and spatial variation of methane emission from lakes in Beijing urban area » – a montré le lien entre l'eutrophisation des zones humides urbaines et les émissions de méthane ; les discussions ont permis de souligner l'importance d'intégrer ces différentes recherches dans des démarches communes et, au-delà, de prendre en compte les dimensions sociales et spatiales : la présentation sur les émissions de méthane illustre la complexité de l'écologie urbaine dans le sens où il faut s'employer à distinguer les émissions de méthane qui sont de source anthropique et celles de source naturelle (ce qui pose la question des limites entre ces deux catégories – l'anthropique et le naturel – et de la pertinence scientifique de leur distinction) ; et au-delà, réussir à produire des approches intégrées pour l'analyse de la circulation du carbone dans la ville. De plus, il faudrait pouvoir lier les recherches sur les végétaux et les eaux urbaines dans un même système. Concernant la présentation de Chuan Tong – « Carbon biochemical characterization of urban greenspace soil from Fuzhou, China » –, des remarques ont été faites sur l'importance de ce type de travail pour comprendre l'histoire carbonique des villes mais également sur l'intérêt d'un approfondissement au regard des implications pour la planification urbaine. Concernant la présentation de Jian-Su Mao sur l'éco-efficacité du plomb, plusieurs remarques ont porté sur le changement des habitudes de consommation – figurant à la marge dans le modèle d'amélioration présenté.

Le concept de **Zones Atelier** présenté par Yvan Lagadeuc a suscité un réel intérêt chez les collègues chinois. Durant la discussion, plusieurs questions ont porté sur les résultats concrets de la démarche (ex : un cadre de référence commun concernant la qualité de l'eau), ainsi que sur les modalités de mise en œuvre (pour l'instant il n'existe pas de ZA Ville – seulement des sites urbains dans des ZA existantes) et les liens entre les différents sites (comparaisons en termes de fonctions et de services écosystémiques). Xu-Liang Zhuang (Directeur Adjoint du Bureau of Science and Technology for Resource and Environment, CAS) s'est déclaré très intéressé par une collaboration sur ce thème et a expliqué qu'il existe un réseau équivalent à un ZA en Chine : le Chinese Ecosystem Research Network (CERN). Une de ces zones concerne les steppes et les services rendus par ces steppes². Au-delà, il existerait beaucoup de sites expérimentaux en Chine – notamment à Beijing mais pas seulement – et un projet d'en développer également en Chine du Sud par l'intermédiaire de l'IUE. Des échanges avec l'expérience française des ZA pourraient dans ce cadre être très utiles avec l'objectif de monter des recherches à grande échelle. Shen Yu (Institute of Urban Environment, CAS) serait plus spécifiquement intéressé par des collaborations sur le thème de l'impact des usages sur la qualité de l'eau.

On a pu observer une bonne résonance entre les présentations de Tao Lin – « Using variation of flight initiation distance as an indicator of bird tolerance to urban environment » – et Solène Croci – « Urban biodiversity : how do animal species respond to urban landscape? A French city case study » – qui interrogeaient notamment des questions d'échelle comparables pour comprendre la biodiversité urbaine. Les travaux de Tao Lin et Al. doivent être prolongés par des études comparatives permettant de comparer plusieurs villes et d'introduire une distinction entre les oiseaux côtiers et ceux vivant à l'intérieur des terres. Ceux de Solène Croci montrent à quelle échelle il est pertinent d'agir (entre urbain et péri-urbain) mais ne permettent pas encore de définir quel système est le meilleur pour la préservation de la biodiversité : des

² <http://www.cern.ac.cn:8080/intro2.jsp?select=1&id=324>

recherches plus pointues sont nécessaires, notamment sur les variables locales (températures...) afin de définir des critères de qualité des sites ('good quality sites', 'poor quality sites').

Concernant la présentation de Gao-Ming Jiang sur le Sumac de Virginie comme espèce invasive, il semble que des comparaisons entre la Chine et la France soient possibles car cette espèce est également présente à Paris, bien que moins invasive. Les pistes de recherche complémentaires évoquées dans la discussion concernent les dimensions économiques et sociales (représentations) de la culture de cette plante : cette espèce étant cultivée dans certaines zones (revenu économique) et bénéficiant d'une image positive dans l'imaginaire des populations ; comment l'éliminer dans ce contexte ? La présentation d'Hervé Daniel – « Assessment of plant diversity in woodlands along a rural-urban gradient in three cities of north-western France, implications for biodiversity conservation and urban green infrastructure planning » – a montré les liens croisés entre différents types de biodiversité urbaine et les pratiques de gestion.

Les questions de mobilisations environnementales (Blanc, Emelianoff) et d'ambiances (Thibaud) ont conclu la session côté français et se sont avérées les plus éloignées thématiquement des présentations chinoises. Durant la discussion, beaucoup de questions concernaient les aspects techniques des écoquartiers, mais les aspects politiques (mobilisations) et sensibles (ambiances) ont été relativement peu discutés car il existe peu de recherches chinoises sur ce thème. Cependant, l'approche ambiances a suscité l'intérêt de deux chercheurs chinois (Tao Luo et Tao Lin) dans le cadre d'un futur projet chinois d'évaluation esthétique du paysage au regard des traditions et de la culture chinoises³.

En conclusion, 2 grands thèmes ont marqué cette première session : (1) la nature en ville (différentes approches concernant les animaux, les hommes, les plantes, les milieux de vie et la ville...), (2) une question récurrente : comment intégrer les populations dans la ville, au sens de populations qui produisent et expérimentent la ville, capables de produire un environnement.

³ Voir 'concrétisation de la collaboration scientifique', p. 25

*** Speakers**

- **Urban metabolism, territorial ecology, urban and regional planning: how complementary and how compatible?**

Sabine BARLES*

The analysis of urban metabolism helps understanding socio-natural interactions, weighing the material and energy dimensions of urban life, and connecting urban and environmental issues. Since Wolman, Odum and Duvignaud pioneering studies during 1960s and 1970s, a growing number of scholars has emphasized the increasing urban material and energy inputs and outputs, the need for better describing these flows and the importance of improved flow management. At the same time, urban environmental policies have long considered the output issue – the reduction of solid, liquid and gaseous wastes being the core of those policies –; more recently it appeared that output reduction was only possible if inputs themselves were reduced, and that the output issue was not the only way to achieve sustainability as resource exhaustion was also at stake. As a consequence, urban environmental policies should now shift from an output approach to a metabolic one on the basis of urban, regional and industrial ecology.

There are several ways to achieve this goal. In most of the cases, and as a consequence of previous policies and of various routines, urban metabolism management is just an evolution of air pollution, solid waste and wastewater management; then it does not differ much from classical urban engineering. The connection of territorial ecology to urban and regional planning issues is lesser developed: except for some obvious topics like energy consumption and urban sprawl, it seems impossible to link material and energy flows to spatial issues and to urban and regional planning in their first sense: land use management and allocation. At the same time, urban (and regional) planning has evolved from land use to strategic management and project management, so the spatial issues of land allocation and zoning are of secondary importance in present-day urbanism (although differences exist from one country or one city to another).

The present paper aims at emphasizing the need for a better connection of metabolic and spatial issues in the perspective of material and energy flows management and reduction (even if it is not the only way to achieve sustainability that needs a wide set of policies). It rests on own research about urban metabolism in French cities (especially Paris), on an on-going research project about the governance of material and energy flows, and on an international literature review. It does not give definitive results but wishes to help filling the gap between territorial ecology and planning perspectives.

Keywords: Material flow analysis, urban planning, industrial ecology, territorial ecology, proximity.

- **Carbon footprint analysis of the Bus Rapid Transit (BRT) system: a case study of Xiamen City, China**

Wei WANG, Sheng-Hui CUI*, Guo-Qin ZHANG Li-Jie GAO, Jian-Yi LIN, Yong LIU and Bin CAO

Transport sector is responsible for a large and growing share of global emissions affecting climate change. Bus Rapid Transit (BRT) systems have been identified as an efficient public transportation option, but its total emissions across entire operation chain has not been quantified. This paper proposed a carbon footprint model of the BRT system based on the Life Cycle Assessment (LCA) approach, which including three components: infrastructure, fuels and vehicles. A case study of Xiamen City was carried out to offer a broader perspective on the greenhouse gas (GHG) impact. Results showed that the total carbon footprint of Xiamen's BRT system was 55,927 t CO₂e per year. As the main emission phases, infrastructure operation, vehicle fuel consumption and infrastructure material production respectively accounted for 31%, 30% and 23%. The direct emission from fuel consumption was 13,059 t CO₂e per year, accounting for 23% of the total carbon footprint. If only considering the direct emissions, BRT system could reduce approximately 25,255 t CO₂e per year than no-build option. It is demonstrated that the carbon footprint model is effective in identifying and measuring the GHG emission from each activity of the life cycle.

Keywords: Carbon footprint; Bus Rapid Transit (BRT); Life Cycle Assessment (LCA); Transport; Greenhouse gas (GHG) emission

- **The principle of energy mutualisation at urban scale**

Mindjid MAÏZIA*

This paper describes a method to optimize energy supply in urban contexts through the concept of mutualisation. The mutualisation is presented as a mean to save energy thanks to a decentralized production and an optimized network respecting to energy inflows and the distances between production centres and buildings. The paper makes an analogy between urban transportation models and energy issues thanks to the theory of graph and the gravity model. Efficiency of the supply network is achieved when one includes energy losses and specific features as for instance low temperatures of fluids.

- **Environmental Risk Assessment for Coastal Engineering Planning in Coastal Cities**

Luo-Ping ZHANG*, Paolo F. RICCI, Weiwei WANG

Most strategic environmental assessments for Coastal Engineering Planning (CEP) involve routine environmental impact assessments, often without environmental analysis and assessment of non-routine and transient events. Current environmental risk assessment (ERA) practices focus on either a limited set of factors or a single project. This study sets up a scientifically sound and practical framework of ERA for CEP, accounting for precautionary principles, ecological security, and community-based principles, thus providing scientific support for decision-making processes. The innovations of this work include: a general ERA framework and approach for CEP, and a retrospective risk analysis that is the basis for prospective risk assessment for CEP.

Keywords: Environmental Risk Assessment; Coastal Planning; Probabilistic Analysis

- **Phosphorus inflow into cities through food consumption: A case study in China**

Guilin LI, Shen YU, Hua ZHANG, Yong-guan ZHU*

Urbanization has caused the increase in food consumption and subsequently nutrient enrichment in global urban area, which has intensified aquatic eutrophication, especially in developing countries. In this study, phosphorus (P) content in 201 types of food consumed daily by urban households was analyzed and urban P inflow associated with food consumption was calculated. The annual import of P (calculated as P₂O₅) by urban dietary consumption increased from 196.73°—103 tonnes in 1985 to 491.29°—103 tonnes in 2006 for China. After subtracting export through wastewater discharge and sewage sludge disposal, the calculated dietary P accumulation in urban area also increased over the period. In 1985, the net input of dietary P in urban area was 141.15°—103 tonnes and that increased to 234.41°—103 tonnes in 2006. Mass balance calculation indicated that about 3.87 million tonnes of dietary P had been accumulated in urban area over the 1985-2006 period, which accounted 53.53% of total dietary P inflow. The results indicate food consumption is an important urban phosphorus source. The increasing dietary P loading might be responsible for deteriorating P eutrophication in urban aquatic environment and high P content in urban soil in China.

Keywords: Phosphorus geochemistry, Urban food consumption, Urban area, Urbanization, China

- **Environmental Stewardship of Water Resources in Megacities: An Integrated Approach**

Laurent CHARLET*

The cycle of water in the megacities is investigated, from the top of the roofs and toilets to the deep aquifers underlying the City. Three examples are considered, two megacities (Mexico-City and Los Angeles) and one medium size city, Grenoble (France). Human-made waste transported by grey and brown waters will be discussed only in terms of early separation and treatment of the waste (urine). We will thereafter focus (i) on the water contaminants originating from the megacity weathering (construction material, pipes, emitted nanoparticles) and (ii) on the groundwater present below the City. For the later, we will show how a managed aquifer recharge (MAR) is required (i) to keep the quality of the water resource (e.g. against subway and sewer drainage intrusion and pollutant facilitated transport, but also the release of geogenic contaminants) and (ii) to keep the stability of the City against seismic (resonance site specific effect) and subsidence (clay dehydration) hazards.

Keywords: Water cycle, water resources, weathering of construction materials, nanoparticles, upstream treatment and separation, aquifer overexploitation, seismic hazard, subsidence hazards

- **Growing urban population and food demand. Tracking the physical and virtual flows of nitrogen, land and water to sustain the pork meat consumption of Paris, 19th-21st centuries.**

Petros CHATZIMPIROS* and Sabine BARLES

Over the last 200 years, Paris and its surrounding area experienced an unprecedented urbanization, with an almost 20-fold increase of the urban population. The increase of the food demand is an obvious outcome needing new rural areas to undertake the generation of the necessary food surpluses for the urban consumption. The consumption of pork meat of the capital in the period running from the early 19th to the early 21st century has increased 50-fold as a concomitant result of the demographic increase and the escalating share of the pork in the urban diet. The areas producing swine for the urban use have moved from within the broader city's suburbs in the 19th century to sites located at distances up to 250 km in the early 20th century whereas in the early 21st century the demand for pork meat is in part met by international trade. Along with the evolution of the spatial origins of the finished meat, the origins of the feed inputs in support of the swine sector have evolved from local in the 19th and early 20th centuries to global in the early 21st century since a fraction of the swine intake is provided by soybean crops grown in Argentina, Brazil and the USA. Following the trade of feeds, environmental externalities occur in both the exporting and importing regions due to the physical and virtual flows of nitrogen, water and land. The nitrogen transferred in the feeds remains in part unrecovered in the producing sites and becomes a potential polluter for water-bodies and the atmosphere. In contrast, the land and water used to produce the imported feeds are resources that are not physically imported but are set aside for the production in the exporting sites thus constituting virtual flows. The total area required for the supply of the pork can be referred to as the pork imprint and is measured in spatial units (ha or km²). The Parisian pork imprint was in 2004 about 230 000 ha, 17 % of which was located in Brazil, probably putting pressure upon the Amazonian forest. On the other hand, the nitrogen losses from French swine operations within the range of the Paris imprint are likely to reach rates of up to 300 kg N/ha, constituting major N inputs in the local aquatic systems.

Keywords: Virtual flows, nitrogen, water, land, urban consumption, imprint



Sabine Barles, Université de Paris 8, Directrice-adjointe du PIRVE (Photo : Coralie Botton)

SYNTHESE

Cette session sur le métabolisme urbain était certainement la plus cohésive des trois, avec une bonne résonance entre certains des différents travaux présentés qui avaient pour objet l'analyse des flux de matières liés au fonctionnement urbain et leur lien avec la question environnementale et/ou le développement durable urbain.

La présentation de Sabine Barles sur le Material Flow analysis a suscité beaucoup de questions de méthode : quelles limites de la ville choisir, comment obtenir les données, notamment historiques ? Ces questions se posent peut-être complètement différemment en Chine et en France (limites administratives, culture d'archives...). Les autres points d'intérêt concernaient les effets bénéfiques du rapprochement des circuits de production et de consommation (réduction des coûts économiques et écologiques du transport, réduction de l'étalement urbain, développement de boucles de matières...) et les modalités de traitement des déchets. Yong-Guan Zhu a ensuite présenté le cas des flux de phosphore en milieu urbain, en montrant que sa prise en compte est aussi importante que celle de l'énergie pour le développement durable urbain. Il a insisté sur l'importance de ce type d'études sur le métabolisme urbain, qu'il faudrait détailler (quid du phosphore qui 'disparaît' entre le moment où il rentre dans la ville et les déchets ?), généraliser à toutes les grandes villes chinoises et appliquer en développant des technologies de recyclage du phosphore. L'approche de Petros Chatzimpiros, qui s'intéressait aux flux directs et indirects d'azote, et d'eau ainsi qu'à la consommation d'espace supportant la consommation de viande de porc, a également suscité beaucoup d'intérêt et des questions principalement d'ordre méthodologique.

Les trois autres présentations de la session avaient des objets sensiblement différents : celle de Sheng-Hui Cui sur l'empreinte carbone du système de transport de Xiamen (BRT) a montré l'intérêt de cette approche pour évaluer l'efficacité écologique d'un système de transport local ; des comparaisons avec d'autres villes chinoises seraient nécessaires pour généraliser les conclusions d'efficacité du système choisi à Xiamen.

Mindjid Maizia a parlé de l'intérêt de la décentralisation d'une partie de la production d'énergie, comme cela se fait déjà dans d'autres pays européens (Danemark...), au niveau urbain, ainsi que de l'apport scientifique de la notion de mutualisation énergétique. Il serait intéressant dans ce contexte de coupler les recherches de faisabilité technique, et les impacts écologiques et économiques à une approche science politique : qui gère ces réseaux décentralisés ? Comment identifier ces gestionnaires ?

La présentation de Laurent Charlet montrait l'intérêt d'une approche intégrée de la compréhension et de la gestion de l'eau dans le contexte de mégapoles – en insistant sur le fait que la Chine a la chance de pouvoir réfléchir en amont de l'urbanisation à la question d'une gestion optimale de l'eau.

En conclusion, cette session a montré l'intérêt de la thématique générique du métabolisme urbain (avec toute la prudence nécessaire quant à l'utilisation de cette analogie), qu'il s'agisse des bilans de matières brutes, de l'analyse des flux de substances, ou des effets différés des villes sur la biosphère, qu'il s'agisse aussi de la compréhension du fonctionnement biogéochimique ou énergétique des villes ou de l'évaluation et du soutien à l'action. Ces approches mériteraient néanmoins d'être plus socialisées et spatialisées, ce qui implique une interdisciplinarité accrue.

*** Speakers**

- **Towards a post-carbon city: a variety of local approaches**

Cyria EMELIANOFF*

The objective of this contribution is to give a glimpse of the variety of ways of ending fossil-fuel usage which have been conceived at the local level by those cities which are most active in the field of climate policies in Europe. By looking more particularly at two case studies, Hanover and Växjö, we shall analyse to what extent those policies converge or diverge, as well as the reasons for this diversity: political inheritance, environmental mobilisation, national potential in terms of energy, positioning in different market segments, the effect of size, etc. Then, on the basis of both bibliographical and empirical work, we will identify some elements of consensus on the potential, obstacles and hindrances to urban action for energy transition.

We shall also consider what the bases of common action are. Local authorities rely on networks of cities which are the bearers of certain visions and operating methods, with the support of international institutions. These networks, by drawing cities into experimental policies, legitimising risk-taking and providing partial financing, are putting a new mode of political action to work. The first part of the article is devoted to analysing that mode of action.

Keywords: Post-carbon cities, energy transition, climate protection policies, sustainable urban policies, sustainable cities, fossil fuel free cities, Hanover, Växjö, ICLEI, Climate Alliance, Energie-Cités.

- **The Analysis of Policies, Measures and Social Barriers to the Reduction of Greenhouse Gas Emissions in Chinese Cities - A Case Study about Beijing**

Xian-Jing XIAO*

The cities in China, have taken positive actions in investigating the situation of greenhouse gas emissions nowadays, and have established the corresponded policies and measures. However, it is very important to know the difficulties and obstacles which are happening during the process of implementation. Then the policies and measures can be improved and carrying out more effectively. This paper has taken Beijing for an example to analyze deeply of the above aspects.

- **A spatial hedonic approach on land use change anticipations**

Claude NAPOLEONE*

This paper estimates land use conversion anticipation when zoning is the primary tool of land use regulation. Extending the Capozza and Helsey model (1989) to the case of uncertainty in future land use zoning, a spatialized hedonic model is proposed to estimate such anticipation phenomena at a fine level (cadastral unit). Estimations use Mixed Geographically Weighted Regression (MGWR) techniques with a two-stage model that links agricultural and developable land markets. This allows for mapping varying spatial parameters that measure anticipation effects within the theoretical framework. Results confirm the influence of anticipation on agricultural land prices in the Provence region. Moreover, the level of data spatialization allows us to take into account intra-municipalities' heterogeneity of land use conversion anticipation.

Keywords: Land Use Planning, Agricultural land prices; Land use conversion anticipations; Spatial hedonic models; Mixed Geographically Weighted Regression (MGWR).

- **Urban Planning Information System in China-Its Past, Present and Future**

Xiao-Feng ZHAO*, Yan-Wei SUN, Run WANG, Sheng-Hui CUI

Urban planning information system (UPIS) has been used in China for two decades, to improve both the efficiency and effects of urban planning and management related affairs. This paper reviewed the history of UPIS development, and then drew a conclusion that the emphasis of UPIS in China has advanced from construction of standalone information systems to comprehensive and integrated applications. The UPIS of Guangzhou city was taken as an example to demonstrate this conclusion. The future direction of UPIS was also discussed in this paper, including 3D visualization, spatiotemporal simulation, integration and interoperability, decision support, ecological planning etc.

Keywords: Urban planning, Information system, China

- **Redefining the Digital City to Enhance Its Roles in Attractive, Harmonious and Sustainable Urban Development**

Jingzhu ZHAO, Li-Na TANG*, Guofan SHAO, Shenghui CUI, and Tao LUO

Digital technologies provide opportunities to develop digital city which is becoming more important to support sustainable urban development. There are different definitions for digital city but none of them provides a complete picture. We summarized current definitions of digital city and redefined it as an Urban Digital Operating System (Urban DOS) useful to improve life quality, socioeconomic functions, and sustainable development in a city and its surrounding areas. The technical basis for developing an Urban DOS is the intersection between Technology-Oriented Products (TOPs) and Customized Application Packages (CAPs). We designed a framework of digital city based on Urban DOS with TOPs and CAPs and demonstrate its initial application in Lijiang City, China as a case study.

Keywords: Digital City, Sustainable Urban Development, Urban DOS

- **Cities in a post-networked era: combining ecological, infrastructural and urban transitions**

Olivier COUTARD and Jonathan RUTHERFORD*

In this paper we offer some critical reflections on what the emergence and increasingly widespread promotion and adoption of small-scale, ‘decentralised’ technologies for the provision of particular services (water supply, wastewater removal, energy production...) – either in parallel to or as replacement for traditional large-scale, centralised forms of infrastructure – might mean for changing conceptualisations of cities and urban development, functioning and everyday life (in a European context).

Drawing on ongoing empirical research in several European cities, we analyse: (a) the mix of social, political/institutional and technical presuppositions/discourses mobilised to promote decentralised technologies; (b) the tools, instruments and mechanisms through which these technologies are or are planned to be rolled out; and (c) the implications and outcomes of these processes and practices.

In doing this, we highlight a number of continuities and discontinuities between networked infrastructure provision and the adoption (actual or prospective) of decentralised systems, and argue that we need to get beyond the dominant sustainability rhetoric underpinning the diffusion of the latter to focus on the shifting patterns of: (a) financing of urban service provision, (b) socio-spatial solidarities, (c) political/institutional functioning and accountability, and (d) urban metabolisms (environmental resource use and circulation), all of which the move beyond centralised infrastructure both implies and beckons.

Analytically, we suggest that this conceptualisation in progress of a post-networked city does two things. First, it helps us to get beyond the discourse, rhetoric and consensus of ‘sustainability’ and ‘sustainable cities’ which tends to dilute the possibility for any critical engagement with urban development and dynamics. Second, and at the same time, it moves us beyond a focus on individual or sectoral transitions per se (e.g. energy transitions, infrastructure transitions...) and towards exploration of a much broader, more cross-cutting and systemic urban transition. We argue indeed that the move towards decentralised infrastructure systems - uneven, partial and contested as it may be - begins to reflect nothing less than a changing urban paradigm as new technical forms of water, wastewater and energy provision and use are increasingly predicated on (and combine with) the recomposed and rebundled socio-spatial, political, economic and ecological forms and workings of a (coming) post-networked city. These forms and workings may have quite mixed implications (e.g. ‘relocalising’ the governance and provision of

infrastructure while undermining the socio-spatial solidarities which have long underpinned traditional networked infrastructure) which will vary between contexts and therefore require further study.

Keywords: infrastructure, ‘decentralised’ technologies, water, wastewater, energy, post-networked urbanism

- **Strategic Thinking for Low Carbon Cities in China**

Yi-Jun LIU*

City plays an important role during the national economic and social development. It is also a crucial and useful way to solving some complex or urgent problems, such as environment and recourses. So, strategic thinking for the development of China’s cities is really necessary. This paper starts from some concepts and ideas of low carbon economic and low carbon city based on that we make sense of the meanings of the low carbon cities in China. In turn, the background of low carbon city development, which mainly focuses on the issues of spatial structure analysis, relationship between urbanization and industrialization, and urban energy consumption is introduced. Then, it can be concluded that rapid urbanization and industrialization will promote energy consumption and a low carbon mode as developing direction should be adopted for cities. Accordingly, optimizing economic structure, enhancing energy efficiency, changing life style and developing low carbon technologies are defined as the key areas for developing low carbon cities. Finally, some typical cities combined with different political suggestions as strategic safeguard for low carbon cities will be discussed.

Keywords: Low Carbon City; Low Carbon Economic; Urban Energy Consumption



Tao Luo, Institute of Urban Environment, CAS (Photo : Catherine Bastien-Ventura)

SYNTHESE

Les 7 présentations de cette session étaient assez hétérogènes dans leurs approches. Les présentations chinoises étaient plutôt axées sur des solutions de mise en œuvre de politiques publiques et d'aide à la décision, alors que les présentations françaises étaient plus analytiques.

Les présentations de Cyria Emelianoff, Xian-Jing Xiao et Yi-Jun Miu étaient focalisées sur la contribution des villes (effective ou potentielle) à la réduction des émissions de carbone et spécifiquement sur les politiques locales à mettre en œuvre pour atteindre ces objectifs. La question du coût initial des investissements permettant à terme la réduction des émissions dans les secteurs de l'énergie, de la construction et des transports et de ses dimensions sociales et politiques est posée dans les deux contextes (européen et chinois). La question des perceptions habitantes du changement climatique est peu posée côté chinois : les recherches se focalisent surtout sur les stratégies à mettre en œuvre pour appliquer les politiques de réduction des émissions de gaz à effet de serre.

Les présentations de Xiao-Feng Zhao (sur le système de planification urbaine UPIS employé en Chine) et Lina Tang sur la 'ville digitale (Urban Digital Operating System) visaient à démontrer les bénéfices techniques et stratégiques des systèmes de modélisation d'aide à la décision en milieu urbain sur le développement urbain durable. Xiao-Feng Zhao a mentionné qu'une étude de cas intitulée 'Ecological Urban Planning Information System – EUPIIS' a été menée par le gouvernement chinois.

La présentation de Claude Napoléone montrait l'importance d'une meilleure connaissance de la formation des prix fonciers, en particulier de la prise en compte des effets d'anticipation par les propriétaires fonciers de la mutation des terrains agricoles sous influence urbaine. Le couplage de cette approche à d'autres telle que l'écologie du paysage, s'avère très prometteur.

La présentation de Jonathan Rutherford sur la ville 'post-réseau' analyse l'émergence des technologies décentralisées pour la provision de services urbains (eau, énergie, gestion des déchets) et suggère que, malgré certaines limites (le 'post-network' dans le secteur de l'énergie semble difficile à mettre en œuvre techniquement), la transition de systèmes centralisés (réseaux) vers ces infrastructures décentralisées ou hybrides reflète un changement de paradigme dans la conceptualisation plus générale des villes (avec recompositions de fonctionnements politiques, financements de l'urbain, solidarités socio-spatiales...). Il sera cependant nécessaire d'étudier dans quelle mesure ce changement pourrait apporter des actions radicales pour adresser les enjeux socio-environnementaux des villes contemporaines et dans quelle mesure il ne conforterait simplement les faibles idées existantes et hégémoniques de "la durabilité urbaine".

Conclusions : La question des politiques locales de réduction des gaz à effet de serre peut être un bon sujet de collaboration et constituerait une bonne entrée vers la question des mobilisations environnementales. Une autre piste possible de collaboration pourrait se construire autour des 'smart cities' (digital nets, info systems, utilisation des TIC dans la gestion des services en réseaux et des infras), même si pour l'instant le thème des infrastructures urbaines (assez central dans le PIRVE) est presque totalement absent de l'approche chinoise (et pourtant au cœur des dynamiques urbaines en cours et à venir dans les villes chinoises, cf. échanges au Civic Exchange, Hong-Kong, p. 26)

CONCLUSIONS



Yong-Guan Zhu (CAS) a évoqué les points suivants comme éléments de conclusions pouvant structurer la suite de la collaboration scientifique :

- Une approche conjointe pour la collaboration comprenant :
 - Des projets spécifiques avec une structure claire, qui peuvent se ramifier en différents sous-projets
 - Des projets majeurs ('overarching' projects) concernant un grand nombre de thématiques
 - Des projets 'ouverts' pour lesquels notre réseau se mobilise pour favoriser les collaborations scientifiques et fournir des crédits de collaboration
- Des objets de recherche communs :
 - Métabolisme urbain (Matériel Flow Analysis)
 - Ecologie du paysage (Landscape Ecology) et planification urbaine (comprenant les questions de biodiversité urbaine)

Un exemple de projet majeur pourrait être une Zone Atelier Ville ; un exemple de projet ouvert : tracer les éléments biochimiques en contexte d'inondations, 'smart cities'...etc.

Sabine Barles a salué ces idées, en indiquant que d'autres idées de sujets de collaboration sont les bienvenues. Elle souligne que le défi majeur de cette collaboration est que l'interdisciplinarité reste au centre des projets et propose :

- De promouvoir dans chacun des projets à venir des temps de discussion sur les questions de méthodologie, d'autant plus que les équipes de part et d'autres emploient des méthodologies très différentes
- De partager des études de cas, et de faire des études comparatives.

Gan Zhang (CAS) souhaiterait centrer la collaboration sur les thèmes suivants :

- Impact du développement urbain sur la santé des populations urbaines et sur l'environnement côtier
- Diagnostic intégré sur les villes côtières
- Biochimie des substances toxiques et des nutriments en milieu urbain
- Interactions avec les décideurs urbains (nouvelles idées et développement de modes de gestion urbaine en Europe)

Il souhaiterait également développer conjointement des observatoires de recherche ('research stations') communes entre les Zones Ateliers et l'équivalent chinois du CERN.

Perspectives conjointes de publication

Suite à ce séminaire franco-chinois, il est prévu de publier les papiers dans l'*International Journal of Urban Sustainable Development* dont la politique de publication cadre très bien avec le séminaire (interdisciplinarité et collaboration internationale).

Perspectives conjointes de financement

Côté français comme côté chinois, des budgets seront disponibles pour financer les échanges ; les recherches en revanche devront être financées par les canaux habituels (agences de financement de la recherche).

Concrétisation de la collaboration scientifique

La collaboration se concrétise avec une nouvelle mission scientifique prévue en avril 2010 à Xiamen et à Hong-Kong, centrée sur la thématique écologie et paysages urbains. Des chercheurs des laboratoires français représentés participeront notamment à un workshop pour commencer à travailler ensemble sur un projet de recherche chinois visant à développer une méthodologie pluridisciplinaire d'évaluation de l'impact paysager de l'urbanisation à venir d'une ville chinoise.

REUNION D'ECHANGE A HKUST (HONG-KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY)

9 octobre 2009

La délégation a été reçue par le département de 'Civil and Environmental Engineering' de l'Université de Hong-Kong ; Après une présentation du programme PIRVE et de ses 3 axes (la ville comme milieu de vie, métabolisme urbain et les futurs de la ville) par la délégation, les membres de HKUST ont présenté les axes thématiques de leur laboratoire – centrés sur des objets d'ingénierie urbaine : nouvelles technologies dans le traitement et le recyclage des eaux usées, systèmes sanitaires urbains, retrait des métaux lourds et des micro-polluants, systèmes de traitement des déchets urbains...

Plusieurs projets en cours ont été présentés par des chercheurs du laboratoire :

- Leur installation phare ; le 'wind/wave tunnel facility', une soufflerie permettant de reconstituer en modèle réduit impacts des vents et des vagues sur la ville de Hong-Kong ;
- Un système de modélisation permettant d'analyser les interactions entre les vents et les immeubles ;
- Un projet sur les perceptions de confort des habitants des gratte-ciel oscillant sous l'effet des vents ;

La visite s'est conclue par une visite de la soufflerie et du simulateur de mouvement (conditions gratte-ciels).

Kenny Kwok, Professeur émérite au département d'ingénierie environnementale et porte-parole durant la réunion, a souligné que le département n'a pas l'habitude de collaborer systématiquement avec des chercheurs en sciences sociales mais que les travaux du PIRVE semblent très intéressants. Il a souligné l'importance des questions sociales et culturelles dans la ville de Hong-Kong en prenant comme exemple la crise de l'épidémie de SRAS en 2003 qui a marqué le début d'une prise de conscience collective sur les liens entre environnement urbain et questions de santé.

Les attentes du département en matière d'interdisciplinarité sont cependant assez limitées, avec une attente d'implication des chercheurs en sciences sociales en aval des questionnements (questions d'acceptabilité sociale des solutions techniques, de mise en œuvre coordonnées des politiques environnementales...) plutôt qu'en amont. Les recherches du département sont très appliquées sur la ville de Hong-Kong et difficilement comparables avec les villes françaises.

REUNION D'ECHANGE AU CIVIC EXCHANGE – HONG-KONG

9 octobre 2009

Le Civic Exchange est une ONG dont la mission est d'analyser les politiques publiques et de promouvoir la prise de conscience collective sur un certain nombre de problèmes, en particulier environnementaux. Sur certaines thématiques, l'ONG collecte des fonds afin de mettre en place des programmes de recherche. L'ONG s'intéresse bien sûr à Hong-Kong, mais également à toute la Chine et aux autres pays asiatiques. Elle n'affiche pas un intérêt spécifiquement urbain mais dans les faits, s'intéresse beaucoup aux leviers d'action régionaux et locaux. Elle produit de nombreux rapports, accessibles sur son site (<http://www.civic-exchange.org/eng/>). La délégation a été reçue par Andrew Lawson, chercheur au Civic Exchange qui a présenté les différentes activités de l'ONG dans le champ de l'environnement urbain.

Qualité de l'air urbain

Le Civic Exchange a mis en œuvre un programme de 6 ans sur la qualité de l'air dans les villes asiatiques. Durant ce programme, des informations sur la qualité de l'air ont été collectées et analysées auprès de différentes communautés scientifiques afin d'initier des approches multidisciplinaires entre ces différentes disciplines. Le rapport insiste sur les dimensions politiques de la question de la qualité de l'air.

Ville et santé

A Hong-Kong, la prise de conscience environnementale passe d'abord par les questions de sécurité alimentaire et de santé au sens large : les questions de production locale d'énergie, de transport durable, de

bâtiments écologiques intéresse peu la population : l'impact des climatisations sur la santé en revanche est un bon exemple de levier d'action pour initier une réflexion politique sur ces questions.

Ville et économies d'énergie

Dans le secteur de l'énergie à Hong-Kong, les modes de gestion existants ne permettent pas de changement allant dans le sens d'une réduction de la consommation (la ville de Hong Kong est rémunérée par les entreprises d'énergie qu'elle a créées ; politique de 'zéro facture d'électricité'). Idem pour le mode de gestion de l'immobilier : la ville de Hong-Kong tire ses ressources du marché immobilier, la plupart des revenus retournent dans le développement d'infrastructures.

Ports 'verts'

L'ONG s'intéresse au système portuaire qui en l'état actuel des choses, ne peut pas se tourner vers des démarches environnementales : la compétition économique est telle que cela tire les standards environnementaux vers le bas.

Négociations pour le changement climatique et villes

Le Civic Exchange collabore avec le C40 (40 grandes villes du monde qui œuvrent pour produire des guides sur l'adaptation au changement climatique, notamment sur l'efficacité énergétique des bâtiments). Pour l'instant, Hong-Kong n'a pas de politique sur le changement climatique, mais la question de l'adaptation de ses infrastructures aux perspectives d'augmentation de la mousson va par exemple se poser très bientôt.

Mobilisations environnementales ?

Selon Andrew Lawson, les mobilisations environnementales sont inexistantes à Hong Kong par manque de stabilité politique (rétrocession à la Chine) ; il parle de Hong Kong comme d'une 'société de [riches...] réfugiés' dont le degré de conscience environnementale est très faible, notamment au regard de l'importance économique de la ville. Depuis 1997 cependant, le retour du gouvernement chinois n'ayant eu que peu d'impact visible sur les vies de Hongkongais, ceux-ci souhaitent maintenant vivre dans une ville plus 'vivable'. Mais le gouvernement reste timide, dans un contexte de démocratie limitée ('fuzzy democracy'). Pour Andrew Lawson, le rôle politique du Civic Exchange est de rassurer les élus politiques de Hong-Kong qui manquent d'assurance sur les questions environnementales, de les convaincre que ces questions sont importantes et soutenues par la population.

Au niveau de la Chine, le processus d'évolution de la politique environnementale est intéressant à étudier : il semble que la législation environnementale avance mieux que ce que l'on croit, mais que le principal problème réside dans la mise en œuvre au niveau des provinces. Des mobilisations existent au niveau journalistique (comme par exemple le journaliste Ma Jun⁴). Toutefois, il ne semble pas y avoir de chercheurs en sciences sociales travaillant spécifiquement sur ces questions en Chine.

Le Civic Exchange comportait à ses débuts une majorité de 'profils' sciences sociales et sciences politiques. Cela est toujours le cas mais de plus en plus de disciplines sont aujourd'hui impliquées dans leur travail, notamment sur les questions environnementales.

Déchets ?

Le Civic Exchange commence à s'intéresser à la question des déchets, et notamment à l'existence de réseaux informels de recyclage, qui laissent penser que des modes de gestion des déchets moins consommateurs d'espace sont possibles.

Ce temps d'échange avec le Civic Exchange a été très riche et a permis de clarifier un bon nombre de données de contexte sur la question urbaine-environnementale à Hong-Kong et en Chine. Le Civic Exchange semble travailler avec un important réseau de chercheurs et d'acteurs impliqués dans le champ. Il semble qu'à ce jour la recherche en sciences sociales sur ces sujets soit limitée en Chine, et que des think-tanks comme le Civic Exchange constituent des interlocuteurs privilégiés pour échanger sur les dimensions sociales et politiques des questions environnementales urbaines.

⁴ [http://en.wikipedia.org/wiki/Ma_Jun_\(environmentalist\)](http://en.wikipedia.org/wiki/Ma_Jun_(environmentalist))

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