Chaire
éco-conception

CHAIR IN ECO-DESIGN OF BUILDINGS AND INFRASTRUCTURE

2014 - 2018 Agenda

ParisTech
INSTITUT DES SCIENCES ET TECHNOLOGIES
PARIS INSTITUTE OF TECHNOLOGY

VINCI

The eco-design Chair produces tools that enable good decision-making throughout the process of reducing the environmental impact of buildings and infrastructure.

The Chair is the product of a long-term partnership in scientific philanthropy between VINCI and three ParisTech schools : MINES ParisTech, l'Ecole des Ponts ParisTech and AgroParisTech. It has a budget of 7 million euros across 10 years (2008 – 2018).

5 characteristics :

- Multidisciplinary
- Systemic approach
- Life cycle assessment
- Modelling
- Action

3 research areas :

- Energy
- Environment
- Territory

Part 1 : Neighbourhood scale

MINES ParisTech

Reliability and extension of life cycle assessments (LCA)

Enourage the evolution of LCA tools by integrating:

- updated versions of environmental databases ;
- new knowledge in terms of performance indicators, particularly those related to health (which is linked to air quality) and biodiversity ;
- and by improving certain methodological aspects, linked, for example, to recycling and biogenetic carbon modelling.

These topics will be dealt with in conjunction with sociologists.

Guaranteed energy performance

- Develop techniques for identifying those parameters that are most influential to building energy performance, which must be measured with care ;
- Identify uncertain parameters ;
- Analyse the sensitivity of performance to user behaviour parameters ;
- Analyse the source of discrepancies between predicted results and measured performance.

Ecole des Ponts ParisTech

Detailed modelling of how buildings are functionally allocated and frequented

Model in detail the use of different buildings in a neighbourhood context.

Residential usage and everyday activities will be especially studied - namely the purchase of services and professional uses, which will be distinguished according to activity type, in connection to the recent reassessment of the «Transport de Marchandise en Ville » study and the « Freturb du Laboratoire d'Economie des Transports» study (Université de Lyon).

Public spaces and multimodality of transportation in a neighbourhood

Characterize standard spatial forms for an eco-designed neighbourhood.
We will pay particular attention to the distance between zones of activity and to the choice of transportation mode depending on distance.

AgroParisTech

Modelling urban biodiversity

Deepen Alexandre Henry's original research on Biodi(v)strict and NewDistrict, which are both urban biodiversity simulation models. NewDistric, for example, allows different actors to :

- understand their interactions (awareness raising) with stakeholders and with the environment concerned ;
- build and facilitate dialogue between actors ;
- construct « what-if » style scenarios providing possible ways to move forward and take action.

Urban agriculture

Open a field of study on the impact of agricultural production on the economic development of cities, a rapidly emerging area of research. Projects will include :

- fine tuning and evaluation of technical systems of agricultural production in urban areas ;
- inventorying the diversity of urban agricultural production systems ;
- developping practical applications for designers (design guides, evaluation tools), based on the data and knowledge acquired.

Part 2 : Infrastructure and networks

MINES ParisTech

Smart cities

- Anticipate evolutions in financial flows between the building and energy sectors: energy saving certifications, sale of renewable energy, smart grids ;
- Study the implementation of « intelligent meters » ;
- Study how design choices (for example, choices that allow energy storage) and management strategies can help improve the environmental performance of buildings and neighbourhoods.

These aspects will be treated in relation to the field of Big Data, smart networks, and command-control.

Ecole des Ponts ParisTech

Integrated road and traffic life cycle assessments

- Develop a road LCA methodology that is sensitive to the composition of local traffic and to the state of roadway maintenance.
- Apply to a series of typical configurations to evaluate a range of technical procedures.

Economic and ecological returns from roadways

Develop in ecological terms (impacts in terms of pollution emissions and wear) and economic terms (the contribution of vehicles to the state of trafic, across different congestion phenomena) different traffic configurations for a variety of roadways.

AgroParisTech

A new field of research on ecological corridors

- Rehabilitate funcitonal connections in a landscape where breaks exist due to the construction of infrastructure ;
- Couple a multi-agent simulator (such as NewDistrict) to be constructed within an actual region with scenario generating models ;
- Build tools that enable the co-creation of blue and green corridors.

Part 3 : Intersectoral strategy

MINES ParisTech

Consequential LCA

Study the relevance of appealing to input/output assessments, which predict the influence of changes in a specific activity sector or the changes in consumption on the rest of the economy.

LCAs have been carried out until now without consideration for the interactions between the system studied (building, neighbourhood, infrastructure) and the background system. Consequential LCAs distinguish themselves from this approach by modelling the consequences of choices made at the level of the system studied on the background system.

The consequential approach, in this way, links those macro-economic analyses that show interactions between different sectors.

Ecole des Ponts ParisTech

Urban Function

Integration of large-scale infrastructure equipment into the concept of an eco-neighbourhood.

The key strategy is to consider the trade of impacts between the neighbourhood and the outside, which inludes the rest of the urbanized area, by highlighting the contribution of the neighbourhood to the greater urban area in general.

Ecologically-conscious urban planning : diagnosis of built areas and identification of needs

- Identify eco-design needs for the planning of a city and local territorial policy ;
- Evaluate the potential and economic profit of different GHG reduction levers.

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Biodiversity offsetting

Make progress on the question of ecological equivalence and effectiveness of compensatory measures, in particular :

- **on participatory processes between actors** aiming to reveal different options among the possible issues to give shape to (1) avoidance (cost-benefit analysis of project alternatives, multi-agent simulation method, scenarios, projections) or (2) a rational, non-imposed compensation ;
- **on larger equivalences** that allow exchanges between habitats, which are theoretically different between impacted and compensatory zones (functionality indicators, associated socio-economic data, notion of « trading up », gains and losses at a different scale requiring a consensus and regulatory framework) ;
- **at the regional scale**, to collectively build compensation when it is unavoidable, by optimizing biodiversity across several sites, while also integrating socio-economic activities.

Governance

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