

BUILD SOLUTIONS

SYMPOSIUM ON BIO-TECH AND URBAN RENATURALIZATION REPORT

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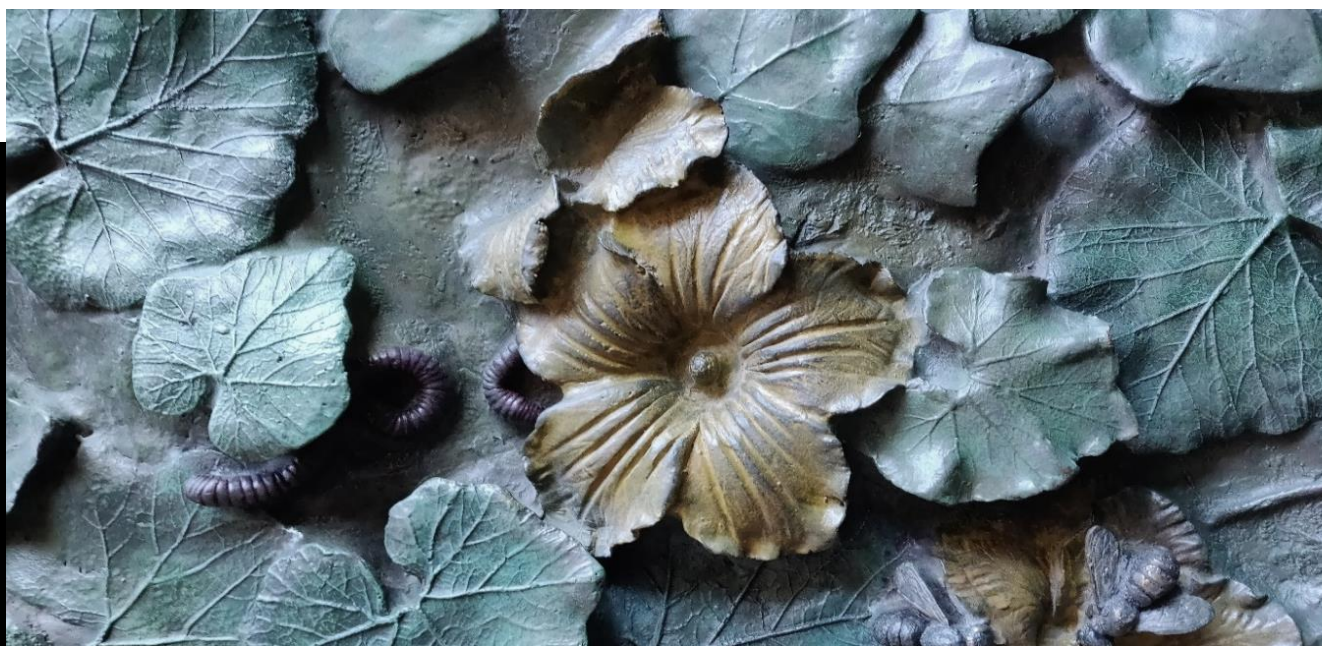
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1 – FOREWORD

Building Urban Intelligent Living Design Solutions

Building Urban Intelligent Living Designs Solutions (BUILDs) project aims at developing a transdisciplinary educational programme in the fields of Biotechnology, Intelligent Design and Business. Its objective is to fill the gap in the biotechnology sector applied to smart architecture and design by bringing intelligent living solutions for cities to the market through research, education, entrepreneurship and industry leaders' cooperation.

BUILDs is a project developed by Institute for Advanced Architecture of Catalonia (IAAC), Université de Lorraine -UL- (France), Vienna University of Economics and Business -WU- (Austria), Ersilia Foundation (Spain), ECONICK (France), Plant-e (Netherlands), City Facilitators -CF- (Denmark), GreenTech Challenge -GTC- (Denmark), co-funded by the Erasmus+ Programme of the European Union.



Living design solutions provide sustainable, cost-effective, multi-purpose and flexible alternatives for several urban challenges.

2 – ABOUT THE ORGANIZATION – UL AND PARTNERS

The Symposium on Bio-Tech and Renaturalization entitled “Nature-Based Solutions (NBS) to improve biodiversity in anthropized environments” was organized by Université de Lorraine (UL), with the support of Econick. Beyond these partners, the Symposium was organized jointly with the International Ecoland Laboratory, extending the partnership to international institutions, in particular from China.

Université de Lorraine (UL) is a multidisciplinary, technological, and entrepreneurial University. With more than 3,900 teaching and research faculty and more than 60,000 students, including nearly 18% international students from 145 countries, and about 12,000 students involved in entrepreneurship programs, UL is one of France’s largest multidisciplinary universities. Its location in the heart of Europe, with borders on three European member states (Germany, Belgium and Luxembourg) offers to UL a privileged position for strong international partnerships. On a larger scale, UL is committed to numerous European and international collaborations and exchanges, including multi-partnership projects and initiatives that, in many cases, go beyond European borders. A dedicated European office, responsible for project support over the entire life cycle, supports this dynamic in European funding projects. From an educational point of view, UL is structured in 8 Collegiums, which include the various schools, faculties, and institutes. One Graduate Schools is ENSAIA (Ecole Nationale Supérieure d'Agronomie et des Industries Alimentaires of Nancy). It enrolls 170 Agronomy Engineers and Food Science Engineers each year, placing it second in all the French “Grandes Ecoles” in this sector. In 3 years, these future engineering graduates are qualified to fulfil high-level technical and economic functions in Agronomy and Agro-Industries, Food Industries and Biotechnology, in Environment, and all other related activities. The programs at ENSAIA are taught by 70 teacher-researchers who work closely with research units housed within the School. These certified research units guarantee a high-level scientific environment, reinforced by numerous, often unprecedented, resources.



ENSAIA is a Graduate School of the University of Lorraine that prepares engineering graduates in the fields of Agronomy and Agro-Industries, Food Industries, Biotechnology, and Environment.

The start-up ECONICK is based on the “agromining chain” aiming at the recovery by plants of strategic metals from secondary resources. The chain covers from cultivation of special plants on metal-bearing matrices, to harvest, and finally to process the biomass with the production of energy and recovery of metals by hydrometallurgy. Econick is the outcome of the research work conducted by 2 research institutes from UL, CNRS and INRAE, one specialized in agronomy and the other in chemical engineering.

ECOLAND (Ecosystem Services provided by Contaminated Land) is an international joint laboratory created in 2015 by the Laboratoire Sols et Environnement of the Université de Lorraine and INRAE and the Laboratory of Environmental Pollution Control and Remediation Technologies of the Sun Yat-sen University (SYSU) of Guangzhou, China. ECOLAND aims to develop science and technology to improve knowledge and promote solutions to improve the ecosystem services provided by vast urban and industrial territories contaminated by persistent pollutants, using nature-based solutions and promoting circular economy. The main objectives of ECOLAND are to understand the dynamics of pollutants in soils and the potential of large contaminated territories (*e.g.* farmland contaminated with mine effluents, former mining sites, urban areas) to generate a wide range of ecosystem services (*e.g.* non-food and food supply, water quality, pollution mitigation, biodiversity, carbon storage, landscape). Three main strategies being studied to improve the value of these territories are: i) the production of healthy food on contaminated soils based on genetic resources and the modification of soil properties; ii) the production of biomass for industrial or food use on degraded and contaminated soils (*e.g.* mining sites); and iii) the recycling by agromining of the metals present in contaminated soils. The cooperation is based on intensive exchanges of students (*e.g.* masters and doctorates) and professors. Annual workshops are organized alternately in France and China. ECOLAND is also a gateway for other French, European and International scientific groups to initiate new collaborations and broaden the scope of cooperation between the institutions.

The context and objectives of the symposium are closely linked to the growing anthropization of ecosystems, especially in cities, and to the necessary development of sustainable solutions. Biodiversity collapse is a major global issue. NBS are the recognition that Nature may help to solve environmental problems and is a major tool to build sustainable cities. But are those NBS efficient enough to preserve and improve biodiversity?

The purpose of the symposium was to provide information to enable the analysis of the actual impact of nature-based solutions on biodiversity in highly anthropogenic environments. The first step was to describe the state of biodiversity in anthropized environments, then present NBS that are used to restore or build ecosystems in urban areas and identify short- and long-term benefits and limits on biodiversity. The symposium has then focused on urban planning and the means that should be used to disseminate knowledge about NBS and its implementation in full scale.

Alongside teachers, researchers, experts and entrepreneurs, the symposium was aimed at young researchers (masters and PhDs) who wish to acquire knowledge on urban planning, restoration of degraded sites and tools available for a sustainable development that places biodiversity at the forefront of its goals. The symposium has mobilized a wide range of disciplines: microbiology, soil biology, plant physiology, (functional) ecology, ecology of socio-ecosystems, (eco)toxicology, (eco)physiology, genetics, agronomy, soil science, ecological engineering, soil engineering, chemical engineering, city management, living-design, law, business, entrepreneurship, citizen sciences.

The event brought together during the 3 days more than 70 participants (including master and PhD students, researchers, teachers and professors, and industry stakeholders) from more than 10 different nationalities (e.g., Austria, Burkina Faso, China, Denmark, Germany, Italy, Lebanon, Spain, Mexico, France). Detailed information about the Symposium can be found online at <https://www.build-solutions.org/symposium/>.



Participants of the Symposium on BIO-TECH and Urban Renaturalization. Auditorium, UL (Nancy, France).

3 – UL SYMPOSIUM

Seven sessions have been organized, each opened by a keynote speaker (20mn + 10mn questions/discussion). Then flash presentations (5mn each) have addressed questions that have been discussed during the last phase of the session, which has been organized in the form of a round table (20mn + 10mn questions/discussion). Session 7 was a roundtable dedicated to Business Case for NBS and the future of NBS.

Detailed Symposium programme (download it [here](#)):

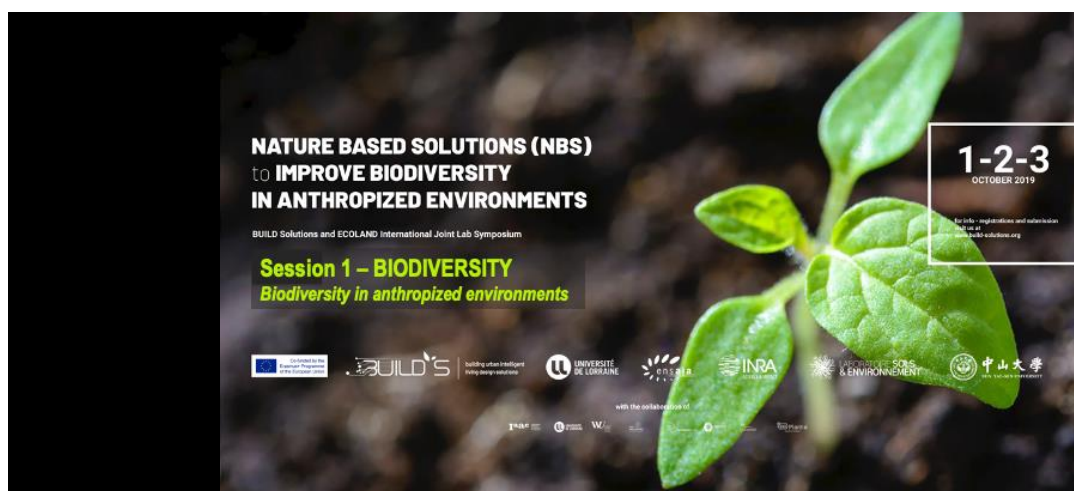


DAY 1 – Tuesday 1 October 2019

09:30 - 10:30 **Welcome & Introduction**, *Christophe Schwartz, UL-Inra*

- BUILDs, *Chiara Farinea, IAAC*
- Ecoland, *Jean Louis Morel, UL-Inra*
- Nature in cities, how to face the challenges of tomorrow? *Mélanie Bascon, Ninon Dell'Acqua, Juliette Gravis, Mary-Eve Henrotte, Vincent Heurtel, Alexandra Martin, Myriam Planque, Chloé Sachot, Alice Ubelmann, UL-ENSAIA BUILD students*

10:30 - 12:00 **Session 1 - BIODIVERSITY**
Biodiversity in anthropized environments



Chairpersons: *Apolline Auclerc, UL-Inra & Shizhong Wang, SYSU*

- Keynote (20+5mn)
Formation mechanism of biological soil crusts in downstream wetland of a mine tailing pond
Shizhong WANG et al., SYSU, China
- Flash (5+4mn)
Soil fauna as a catalyst for Technosols' ecological reclamation - a matter of humus form?
Gabin COLOMBINI et al., UL-Inra, France
- Flash (5+4mn)
Study of the soil biodiversity along a chronosequence of a abandoned ionic rare earth element mine tailings
Justine PIGOT, Ecoland, China-France

- Flash (5+4mn)
EndoSeed Project: a seed stock of plant growth promoting bacteria shared between several hyperaccumulator species?
Alexis DURAND et al., UL-Inra, France
- Flash (5+4mn)
Parameters driving the diversity of hyperaccumulator's rhizobacteria depend of the study scale
Emile BENIZRI et al., UL-Inra, France
- Flash (5+4mn)
Bio-uptake of cerium oxide nanoparticles in the freshwater algae Chlamydomonas reinhardtii
Feida ZHENG, SYSU, China
- Rountable (20mn)

13:30 - 15:10 **Session 2 - NATURE BASED SOLUTIONS**
Definition, processes, and functions



Chairpersons: *Catherine Sirguey, UL-Inra & Yetao Tang, SYSU*

- Keynote (20+5mn)
The 3RAP integrated system for remediation of non-ferrous mine watersheds in South China
Yetao TANG et al., SYSU, China
- Flash (5+4mn)
Construction of Technosol: a reclamation approach inspired by pedology
Geoffroy SERE et al., UL-Inra, France

- Flash (5+4mn)
Soil formation on Ni contaminated materials
Shengsheng SUN et al., SYSU, China
- Flash (5+4mn)
Potential of using endophytes to improve phytoextraction
Catherine SIRGUEY et al., UL, France
- Flash (5+4mn)
Potential of agromining of land contaminated by mine sites
Wenshen LIU et al., SYSU, China
- Flash (5+4mn)
Industrial Ramie growing on Rare Earth Elements contaminated soil in Southern China:
Defibration and fibers quality
Nicolas BROSSE et al., UL-Inra, France
- Flash (5+4mn)
Natural metal-bearing nanoparticles formation in contaminated cropland soils
Kengbo DING et al., SYSU, China
- Rountable (20mn)

15:10 - 15:30 Poster viewing

15:30 - 17:00 Session 3 - IMPACTS
Quantification of services supported by NBS



Chairpersons: *Hermine Huot, UL-Inra-SYSU & Geoffroy Séré, UL-Inra*

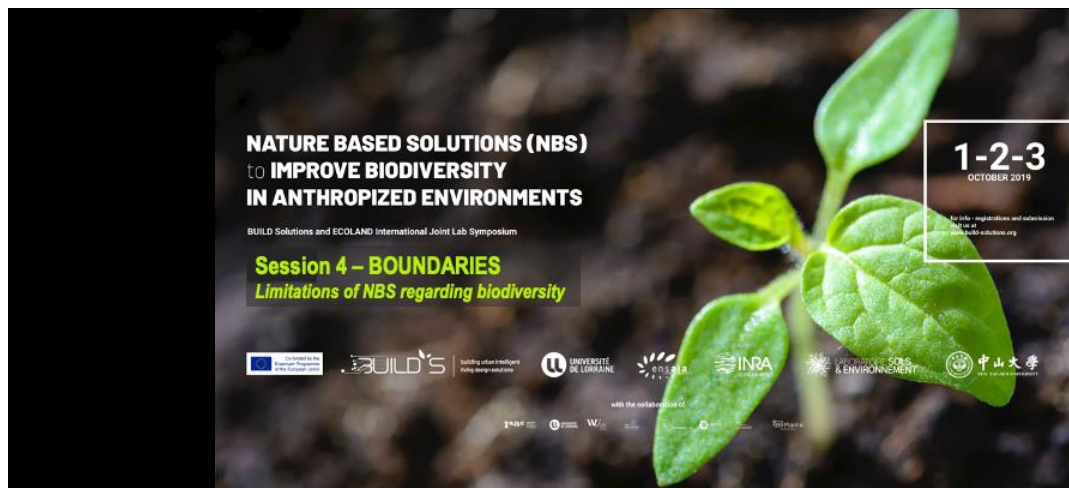
- Keynote (20+5mn)
Evaluation of ecosystem services provided by urban soils in various urban planning contexts
Geoffroy SERE et al., UL-Inra, France
- Flash (5+4mn)
Contribution of Technosols to carbon sequestration
Victor ALLORY et al., UL-Inra, France
- Flash (5+4mn)
Soil structure formation on mine tailings during natural attenuation
Meina GUO et al., SYSU-UL-Inra, China-France
- Flash (5+4mn)
Factors and properties that affect green roof hydrological and thermal performances
Mithun HANUMESH et al., Cerema-UL-Inra, France
- Flash (5+4mn)
Phytoremediation of ionic rare earth element mine tailings in South China (field trial)
Hermine HUOT et al., Ecoland, China-France
- Flash (5+4mn)
Root development during phytoremediation of mine tailings
Shichen ZHU et al., SYSU, China
- Rountable (20mn)

DAY 2 – Wednesday 2 October 2019

- 08:00 - 18:30 **Field trip: Agromining**
- 18:30 - 20:00 **Visit of “Jardin Éphémère”, Place Stanislas & Daum shop**
- 20:00 **Dinner at Nancy City Hall, Place Stanislas**

DAY 3 – Thursday 3 October 2019

09:00 - 10:30 **Session 4 - BOUNDARIES**
Limitations of NBS regarding biodiversity



Chairpersons: *Marie-Odile Simonnot, UL-CNRS & Chunmei Zhao, SYSU*

- Keynote (20+5mn)
Life Cycle Assessment to evaluate the impacts of NBS
Marie-Odile SIMONNOT et al., UL-CNRS, France
- Flash (5+4mn)
Phytohormones to alleviate abiotic stress in phytomanagement strategies
Stéphanie OUVRARD et al., UL-Inra, France
- Flash (5+4mn)
Ecological risk assessment of neodymium and yttrium on rare earth element mine sites
Chunmei ZHAO et al., SYSU, China
- Flash (5+4mn)
Urban agriculture: soil fertility vs contamination
Christophe SCHWARTZ et al., UL-Inra, France
- Flash (5+4mn)
Constructed wetlands for urban wastewater treatment improvement: a biodiversity heaven
Nicolas MAURICE et al., UL-CNRS, France
- Flash (5+4mn)
Soils of the underground
Jean Louis MOREL, UL-Inra, France

- Rountable (20mn)

10:30 - 11:00 Poster viewing

11:00 - 12:30 Session 5 - DESIGN
Urban planning, development, and design of NBS



Chairpersons: *Chiara Farinea, IAAC & Laura Ohler, City Facilitators*

- Keynote (20+5mn)
Advanced Living Urban Systems
Chiara FARINEA et al., IAAC, Spain
- Flash (5+4mn)
Building a conception and design tool for multifunctional green cities: assessment of ecosystem services provided by tree species
Marylou DUFOURNET et al., Cerema, France
- Flash (5+4mn)
Development of a Decision Support Tool to develop urban agriculture on urban soils
Geoffroy SERE et al., UL-Inra, France
- Flash (5+4mn)
The strategy of the Métropole du Grand Nancy regarding biodiversity
Christophe SCHWARTZ et al., C3D Métropole du Grand Nancy, France
- Flash (5+4mn)
The redevelopment of Copenhagen
Laura OHLER et al., City Facilitators, Denmark
- Flash (5+4mn)
Citizen science, involvement of the public in scientific research:

Jardibiodiv, a tool to quantify biodiversity in green urban soils
Apolline AUCLERC et al., UL-Inra, France

- Rountable (20mn)

12:30 - 14:00 *Lunch break*

14:00 - 15:30 **Session 6 - LEARNING FOR CHANGE**
Teaching and implementation of Nature Based Solutions
Transdisciplinary learning & Innovation



Chairpersons: *Marité Guevara, Ersilia & Christophe Schwartz, UL-Inra*

- Keynote (20+5mn)
Learning by doing Nature Based Solutions
Marite GUEVARA et al., Ersilia, Spain
- Flash (5+4mn)
How to transfer knowledge on ecosystem functioning: from nature observation to implementation
Catherine SIRGUEY et al., UL-Inra, France
- Flash (5+4mn)
Biodiversity assessment of the Cerema's green roof: a partnership between Cerema and Ensaia educational team and students
Nadjwa PAILLOUX et al., Cerema, France
- Flash (5+4mn)
Workshop with landscape architects and agronomists about transversal regards on urban planning
Geoffroy SERE et al., UL-Inra, France

- Flash (5+4mn)
A didactic experiment between agronomy and urban planning
Alain GUEZ et al., UL-Ensan, France
- Flash (5+4mn)
From blahblah towards sustainability action
Hannah FROST et al., WU Wien, Austria
- Rountable (20mn)

15:30 - 16:00 **Poster viewing**

16:00 - 17:00 **BUSINESS CASE FOR NBS**
The future of NBS – roundtable



Moderator: Martin Petersen, GTC, Denmark
Participants: Hannah Frost, WU Wien, Austria
Laura Ohler, City Facilitators, Denmark
Christophe Schwartz, Sol&co-UL, France
Marie-Odile Simonnot, Econick-UL, France
Yetao Tang, SYSU, China

3.1. Sessions Pictures

Session 1:

BIODIVERSITY - Biodiversity in anthropized environments



Session 2:

NATURE-BASED SOLUTIONS - definition, processes, and functions



Session 3:

IMPACTS - Quantification of services supported by NBS



Session 4:

BOUNDARIES - Limitations of NBS regarding biodiversity



Session 5:

DESIGN- Urban planning, development, and design of NBS



Session 6:

LEARNING FOR CHANGE - Teaching and implementation of Nature-Based Solutions; Transdisciplinary learning & Innovation



Roundtable:

BUSINESS CASE FOR NBS - The future of NBS



Poster Session:



Day Two:

One-day field trip was dedicated to present solutions that are being implemented in a city (Nancy) to provide Nature inside the walls and solutions used for the remediation and restoration of brownfields to improve the ecosystem services (phytomanagement of degraded land - GISFI experimental platform).



Day Two:

Visit of the European Center for Research and Training in Glass Arts.



During the Symposium:

A visit of the “Jardin Éphémère” was organized on Place Stanislas, historical square in the hearth of the city of Nancy. The carbon footprint and the environmental footprint are concepts evoked in the ephemeral garden.



The Jardin Éphémère (The Ephemeral Garden, Nancy):
without the tree that provides shade and breathing at the heart of the heat wave,
without the plant that generates biodiversity, life simply cannot develop.



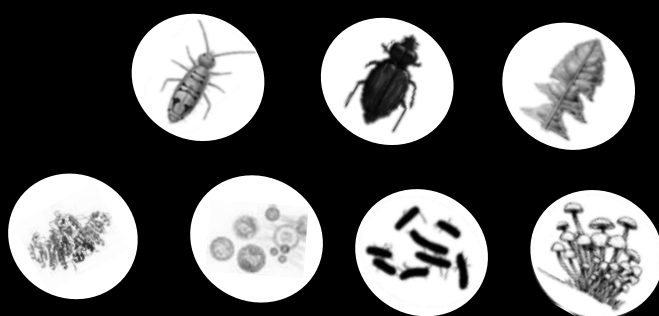
4 – MAIN FINDINGS AND RESULTS

Session 1: BIODIVERSITY - Biodiversity in anthropized environments

The session on Biodiversity brought together six presentations proposed by French and Chinese speakers from the Ecoland international joint laboratory.

Biodiversity can be defined as the variability among living organisms from all types at different scales (*e.g.*, genes, cells, species, populations, communities). Biodiversity includes all managed and unmanaged ecosystems (terrestrial, aquatic). Biodiversity is functional as organisms provide essential functions for the functioning of ecosystems. Decline of biodiversity is a threat for worldwide ecosystems (UN Report - Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services IPBES, 2019).

In this context, the session dedicated to biodiversity made it possible to focus on the interactions between soils, plants, fauna and microorganisms in highly anthropized urban, mining and industrial environments. These environments are sometimes extreme from the point of view of their physico-chemical and biological properties. Soil fertility is often very different and altered compared to forest or agricultural ecosystems. Human activities also induce the release of waste and pollutants that can lead to contamination of the environment, soil being the main receptacle of those unwanted elements or molecules that could potentially affect human and ecosystem health.



Plant species hyperaccumulating metals and associated organisms (Auclerc et al., Durand et. al.)



The main results concern the observation and description of organisms present in environments strongly modified by human activities. The presentations went into the detail of certain mechanisms of functioning of organisms present in highly anthropized soils. From this inventory of organisms and from the description

of their activity, targeted groups of organisms or selected species can be studied for their ability to be mobilized in ecological engineering processes. Certain plant species can indeed contribute to the phytomanagement of degraded sites and contaminated soils (*e.g.*, hypertolerant or metal hyperaccumulating plants; phytostabilisation; phytoextraction; nature-based solutions presented in session 2). If they are optimized, certain “plant-fauna-microorganism” consortia are able to improve the properties of soils and thereby the capacity of ecosystems to function and provide ecosystem services.

Session 2: NATURE BASED SOLUTIONS - definition, processes, and functions

The session on NBS brought together seven presentations proposed by French and Chinese speakers from the Ecoland international joint laboratory.

At the same time, biodiversity collapse is a major global issue and nature-based solutions are the recognition that Nature may help to solve environmental problems.

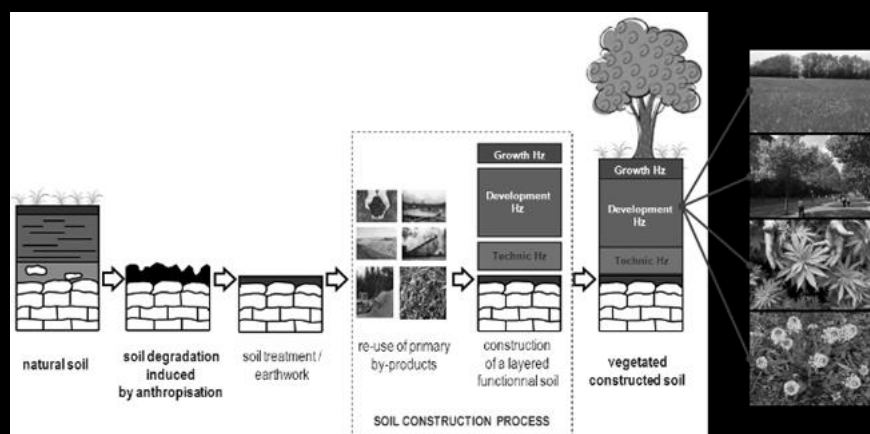
Nature-based solutions are (i) “Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN)” or (ii) “Living solutions inspired by, continuously supported by and using Nature designed to address various societal challenges in a resource efficient and adaptable manner and to provide simultaneously economic, social and environmental benefits (European Commission)”. So NBS could represent a major tool to build sustainable cities.



The NBS which have been presented are ecological engineering processes implemented for the management of polluted sites and soils. They are available on the one hand in soil engineering and on the other hand in plant engineering. Presentations have shown to what extent it is possible to generate substrates or constructed soils from waste and by-products. These soil construction processes are part of a logic of waste recycling and circular economy. The constructed soil can indeed be the support of biodiversity and biomass with energy value for example. In addition, presentations have demonstrated the ability of certain plant species, in

association with microorganisms, to stabilize soils avoiding erosion, extract toxic metals or even degrade organic pollutants. The development of phytomanagement is then intended to restore contaminated sites and allow them to provide ecosystem services. An original result was to demonstrate how the combination of different ecological engineering processes makes it possible to optimize the management of a site and its capacity to ensure ecological functions while generating economic benefits via the recovery of biomass (*e.g.*, fibers).

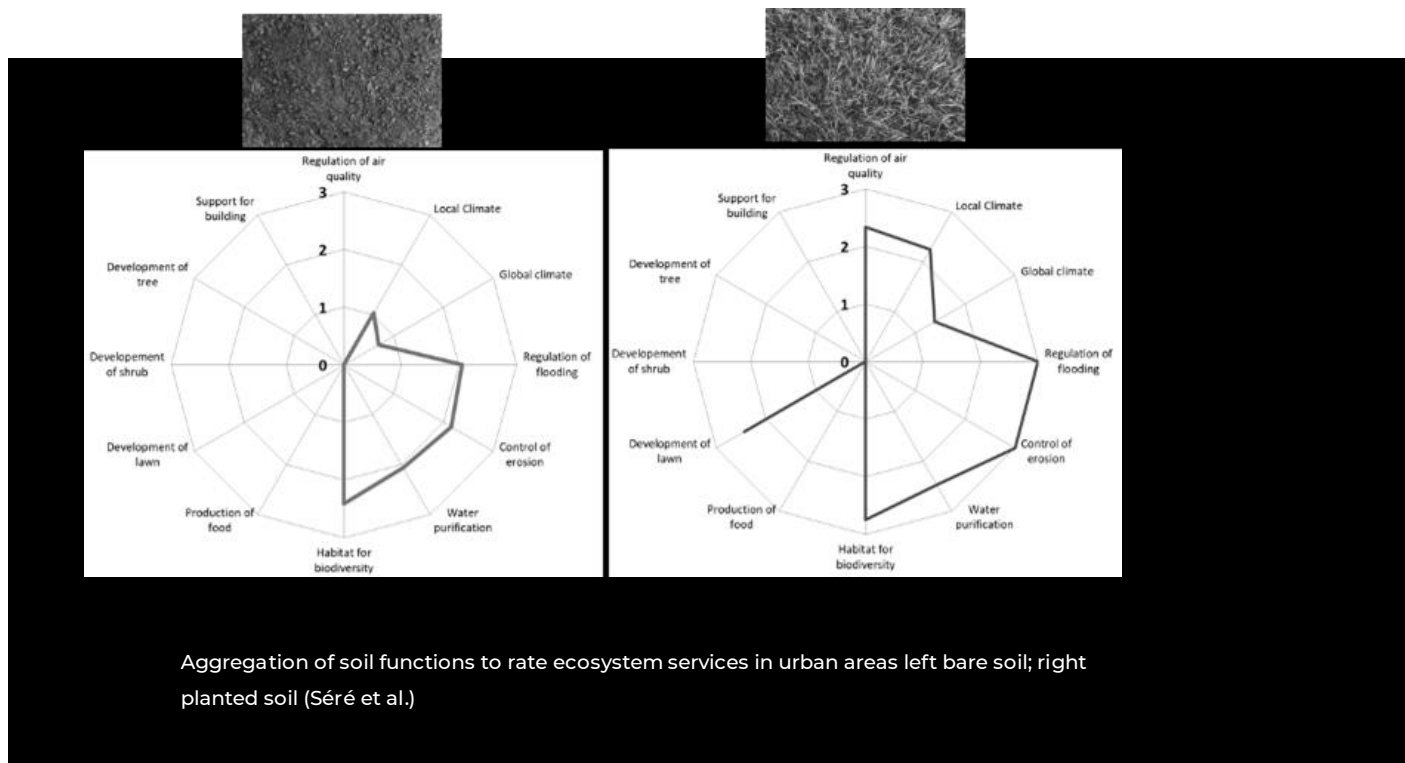
Soil construction associated to phytomanagement (Séré et al.)



Session 3: IMPACTS - Quantification of services supported by NBS

The session on IMPACTS brought together six presentations proposed by French and Chinese speakers from the Ecoland international joint laboratory.

This session was dedicated to assessing the capacity of nature-based solutions to improve the functioning of degraded ecosystems and to provide services. From the soil point of view, the works presented made it possible to approach different scales ranging from organo-mineral aggregates to urban territory, and also describing intermediate situations at the scale of the soil profile. The speakers thus described the ecological re-functionalization of soils which accompanies natural attenuation. They then demonstrated that soils constructed using soil engineering methods are capable of storing carbon. They then contribute both to the attenuation of the urban heat island (since they are vegetated) and have an effect on global warming. On the scale of the urban territory, a presentation proposed a semi-quantitative assessment of ecosystem services provided by soils, for example based on plant cover. A decision support tool is made available to developers in order to promote better consideration of quality of soils in planning strategies.



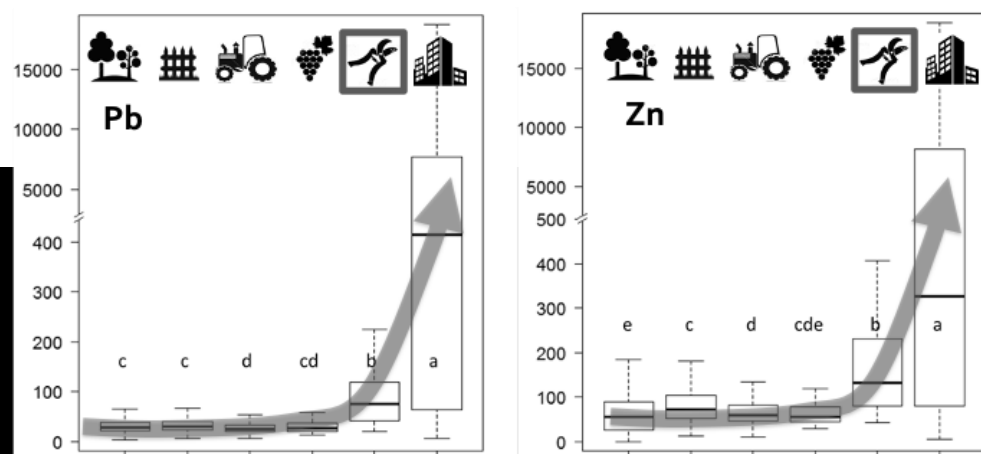
The oral presentations were then interested in the evaluation of the feasibility of phytomanagement and in particular phytostabilisation or phytoextraction of metals using hyperaccumulating plants in extreme cases of mining sites. The main results are that addition of amendment increased total and available concentrations of carbon and nutrients and planting increased significantly the bacterial diversity. Constructed soils are an efficient substrate for plant growth. Nevertheless, there is a need to further monitor the evolution of soil and plant development with time to assess the sustainability of the reclamation.

Session 4: BOUNDARIES - Limitations of NBS regarding biodiversity

The session on BOUNDARIES brought together six presentations proposed by French and Chinese speakers from the Ecoland international joint laboratory. The different presentations of the session addressed in an objective way the difficulties which can be associated with the implementation of nature-based solutions.

Life cycle assessment was presented as a tool to assess environmental impacts associated with all the stages of a process or of a product's life from raw material extraction through materials processing, manufacture, distribution, use, and end of life. This approach was applied to 2 phytomanagement solutions: agromining and large-scale wetland or lagoons. For example, the risk of introducing invasive plant species or the potential transfer of contaminants in the food chain (e.g. from hyperaccumulating plants to bees and honey) was highlighted. Other constraints appear like multicontamination of urban and industrial soils and their negative effect on plant growth or a problematic access to water for the plants.

Urban agriculture has been presented as a form of NBS. Challenges emerge then for several actors involved in the development of cities. First the importance of having pedological and agronomical approaches in cities to produce plant biomass for various ecosystem services urban. Then, soil sciences and urban agronomy are presented as keys to sustainable urban agriculture. Decision support systems are available and should be developed in the future in the field of urban agronomy and soil sciences to help landscape designers, urban planners and policy makers involved in the development of nature in the city.



Contamination: total Pb and Zn in French topsoils along a gradient of anthropisation: land management issues in (peri)urban and industrial areas (Schwartz et al; Joimel et al., 2016)

Session 5: DESIGN - Urban planning, development, and design of NBS

The session on DESIGN brought together six presentations proposed by partners of the BUILD project with both contrasted disciplinary entries and multidisciplinary approaches. The presentations made it possible to describe very diverse and contrasting living solutions. These examples were drawn from experiences carried out in European cities like Barcelona, Copenhagen, or Nancy.

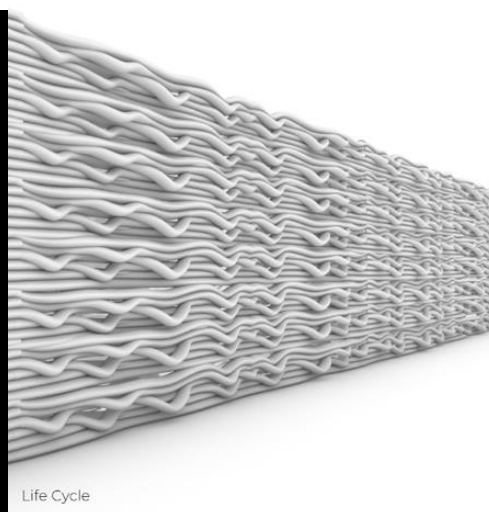
The question of evaluating the effectiveness of the solutions considered was discussed. If this assessment requires the development of decision support tools, it also requires defining the most relevant indicators to measure the capacity of the solutions proposed to provide the expected services. Specifically, for urban agriculture, a Decision Support Tool was presented, able to propose crops that fit to properties of the urban soils. The idea is to propose adapted plant species as a function of the fertility and the level of contamination of the soils. This approach has to be applied on current or future sites dedicated to urban agriculture.

Beyond the analysis of the different strategies implemented by the cities, interactions between university, industrial and political actors have been described. The case of Copenhagen then clearly demonstrates how a city can gradually go from car-centric status to people-centric status.

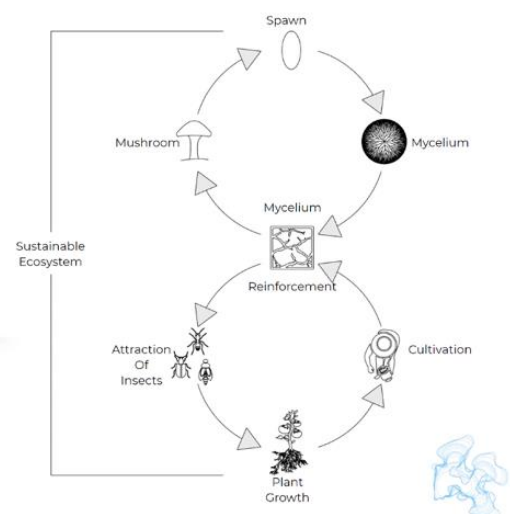


An advanced urban living system
(Farinea et al.)

As Design is made for people, emphasis was also placed on the essential and growing role played by participatory sciences. Citizen sciences refer to forms of scientific knowledge production in which non-scientific people participate actively and voluntarily. This is for example a way for biologists to share their knowledge and increase biodiversity awareness within the population. This approach has also the advantage to open to collaborations with other disciplines such as sociology and environmental psychology for investigation of the perception of biodiversity in cities.



Life Cycle

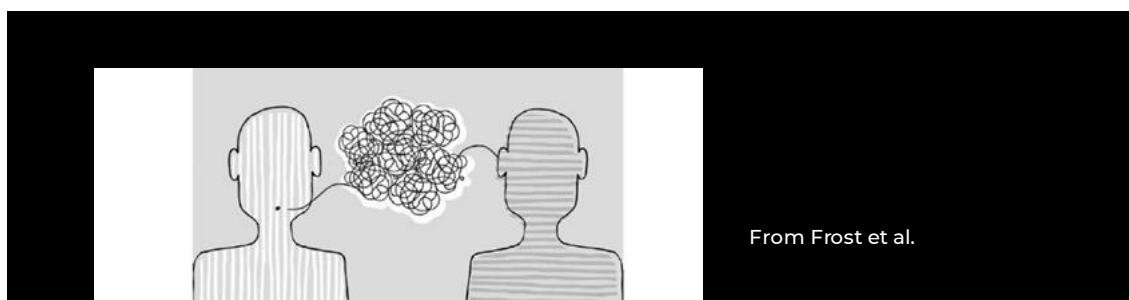


Claycelium: combining properties of clay and mycelium for both architecture and urban agriculture (Scheinberg & Gönül)

Session 6: LEARNING FOR CHANGE - Teaching and implementation of Nature Based Solutions; Transdisciplinary learning & Innovation

The session on LEARNING FOR CHANGE brought together six presentations proposed by partners of the BUILD project. The justification for this session, which is at the heart of the BUILD program, can be summarized with the following quote, which was taken up by a speaker. “The transition towards sustainability will require action and change that is guided by an understanding of the complexities that arise within an interconnected system, as well as the ability to collaborate with people from diverse backgrounds.” Frisk Larson (2011).

Several examples of crossings between disciplines and training were presented. These feedbacks were very useful for discussing the objectives and the method proposed in BUILD. A first example dealt with pedagogical and disciplinary interactions between agronomy-biology and architecture-town planning. In this case, there was (i) a need to develop collaborations between scientific and practical approaches, (ii) the opportunity to integrate agronomic, urbanistic, landscape and architectural research, (iii) the need for imaginative and pragmatical projects and the need to speak the language of your audience. Another presentation was about a collaborative workshop between landscape architects and agronomists. If both specialists are related to nature in cities, they require and mobilize different skills - for a landscape architect: creativity, design, plant palette; for an agronomist: scientific knowledge about ecosystems, diagnosis tools. The confrontation of cultures leads to the boosting of self-confidence (especially for agronomists that demonstrated their capacity to produce expertise) and makes innovative projects possible, multiplying what would have been produced by a single discipline (landscaping or biotechnology).



IT WILL BE HARD & PAINFUL, BUT DON'T BE AFRAID

The main strengths are that NBS need cross sector collaboration - from multidisciplinary to transdisciplinarity. Beyond transdisciplinary co-creation, NBS need care. NBS are conceived as an open process and need flexible and agile management. Learning by doing NBS is learning for change!

Roundtable: BUSINESS CASE FOR NBS - The future of NBS

The symposium ended with a round table which questioned the future of the NBS. The participants in this round table came from different countries, different disciplines and some being entrepreneurs. If the discussions of these 3 days posed many scientific and technical bases and demonstrated that solutions exist, still they must be applied. The main questions addressed were those of human values associated with NBS, the added value of NBS and their possible or necessary monetization, and finally the most likely future fields of application.

Regarding human values, we must retain the openness of mind for green solutions, the essential patience in connection with natural processes, the sense of effort, the respect for biodiversity, the curiosity for innovative solutions and the essential connection to nature.

From the point of view of added value from the NBS, the development of circular economy was highlighted. The discussion also focused on the monetarization of ecosystem services. A consensus has emerged that natural capital must be evaluated before monetarizing nature. Still it would be necessary to have the rules which make it possible to give an economic value to nature.

Finally, if cities are put forward as the main future field of application of NBS, we must not forget rural areas. It is then on all the territories that the decision-makers must be convinced of the urgent implementation of NBS. One of the keys to progress in the appropriation of NBS by the greatest number of people is the training of students who will, for some of them, be the decision-makers of tomorrow.

5 – CONCLUSIONS

The Symposium on Bio-Tech and Renaturalization entitled “Nature-Based Solutions (NBS) to improve biodiversity in anthropized environments” had the ambition to bring together multiple actors from research, development, training and companies concerned by the development of sustainable and resilient cities together with students. The success of these days was largely due to this mix of disciplines, cultures and perspectives on ecological planning and management of strongly anthropized territories that are cities. The challenge of bringing together and above all understanding players from such different backgrounds is that of the BUILD project.

The center of gravity of the Symposium was the ecological approach of cities and brownfields. A majority of presentations were then dedicated to describing and understanding the functioning of ecosystems strongly modified by human activities. It is indeed necessary to know in order to better manage the urban ecosystem.



The international and transdisciplinary actors of the Symposium Nature-Based Solutions (NBS) to improve biodiversity in anthropized environments- Gala Dinner at the Nancy City Hall

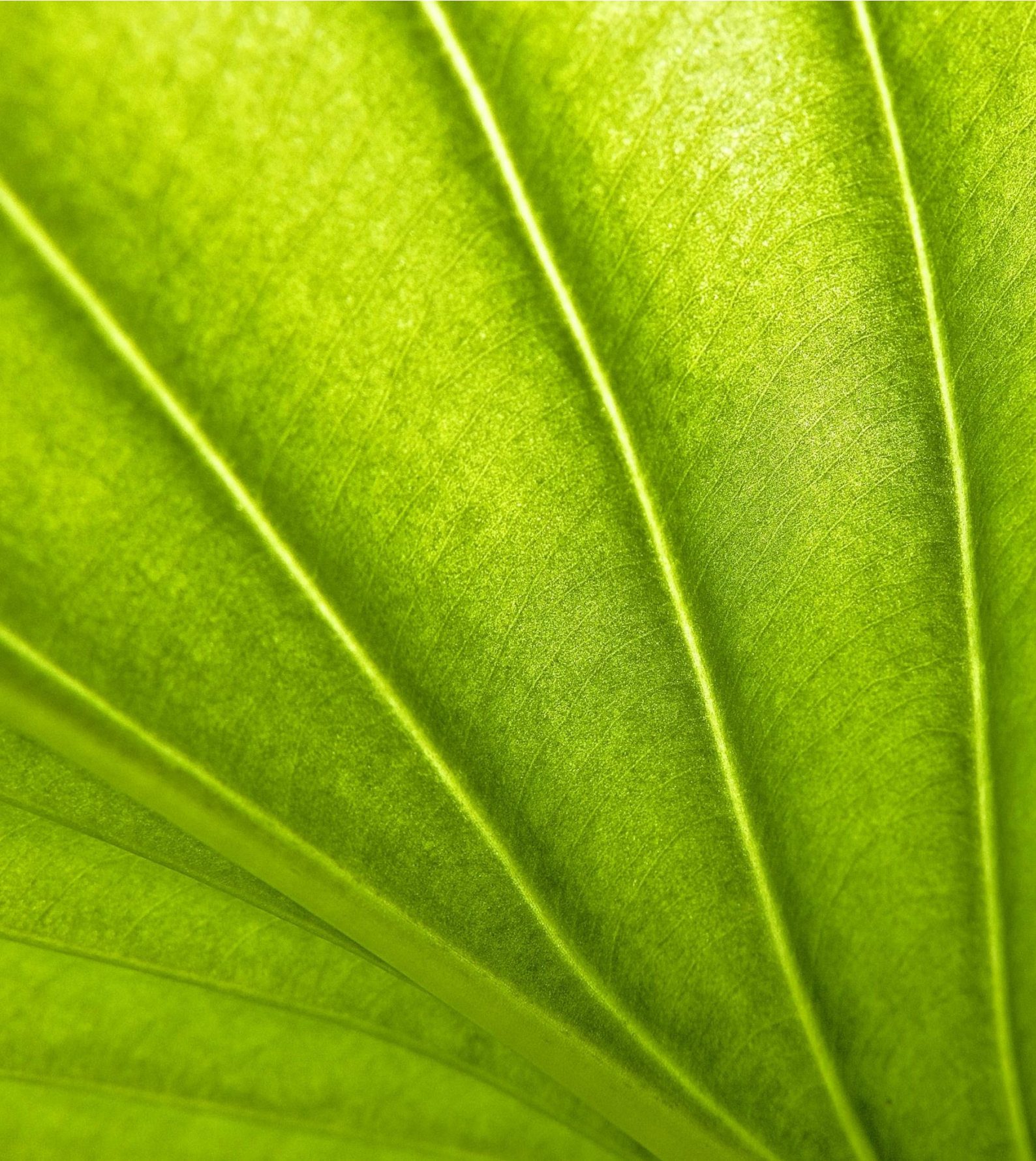
If acculturation is not always easy for colleagues from disciplines that are sometimes very distant, awareness of biological and ecological issues has been effective. On these fundamental bases, NBS have been described, mainly in the fields of soil engineering and plant engineering applied to degraded urban and industrial sites. The demonstration of the feasibility of these methods has not hidden certain constraints related to their implementation.

The city has been proposed as the playground for both biologists and architects-designers. It is in the urban context that these disciplines came together without necessarily collaborating. This opens up the field of multidisciplinary or even transdisciplinary projects. The experience was made more specifically for the training of students. Successful examples of innovative pedagogy at the crossroads of two disciplines were highlighted, paving the way for BUILD. The challenge is then to work together, biologists, designers, architects, economists, and entrepreneurs, to bring students on the path of entrepreneurship to develop Urban Intelligent Living Designs Solutions.

6 – CREDITS

The organisers wish to thank all the partners who contributed to the success of the Symposium: UL, OTELo, INRAE, LSE, GISFI, Laboratoire d'Excellence Ressources 21, Institut Carnot ICEEL, Métropole du Grand Nancy, Ville de Nancy (Parcs et Jardins), Daum, Cerfav, International Joint Laboratory Ecoland, Fermiers d'Ici, and all the partners of the BUILD project.

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