Living Labs as Leverage for a Sustainable Transition: Overview of
Student Research in the Caribbean Context
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Living Labs as Leverage for a Sustainable Transition: Overview of Student Research in the Caribbean Context

Sub-theme
Professional planning practice, education and training in the Caribbean

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Abstract

Awareness of the severity and consequences of global warming has increased in recent decades, and as a consequence the efforts to mitigate and adapt to climate change. The need to shift from a fossil fuel base economy to renewable sources of energy has also dramatic impact for the construction sector. However, despite internationally agreed paths of sustainable transition there has been limited, tangible actions in the Caribbean. The building industry seem to embrace a conservative energy inefficient and unsustainable position rather than moving to more sustainable alternative ways of building and construction.

Scholars in science and technology studies argue that unsustainable daily practices in the built environment are embedded in wider socio-technological systems that are locked-in to path dependent development and are resistant to change and innovation. However, under specific conditions, windows of opportunities can arise in which system wide innovations can take place. New approaches, such as Strategic Niche Management and Living Labs, provide a new orientation to societal change in which such opportunities are actively created.

In this paper we argue that higher education, and in particular curricula in the build environment can play an important role in triggering societal innovation. Moreover, the pedagogy of the architectural studio, when broadened to actors external to education provides potentials to act as a strategic niche or a living lab stimulating a broader innovation in the construction industry. We discuss our experience with pilot architectural studios in the Caribbean, focusing on energy efficiency on university campuses. The paper concludes that although the impact of the pilot studios remained limited, they have under a number of conditions, the potential to act as Living Labs.

Key words: Strategic Niche Management, Living Labs, Sustainability Transition, Architecture and Planning, Education

1. Introduction

The Sustainable Development Goals[1] (SDGs), build on the Millennium Development Goals[2] (MDGs), has increased global policy attention for transitions to a sustainable built environment[3]. Despite this policy attention, the abundance of scientific research, conducted, funding, and mainstream building practice does not demonstrate a shift toward more sustainable building concepts and technologies. Sustainable built development is limited, often isolated, with little market penetration. According to Edén (2002) "There seems to be a discrepancy between findings in research and the context in which designers carry out their work". Vandevyvere and Neuckermans (2005) make a similar claim: "Whereas knowledge on sustainable housing techniques expands more and more, it can be noticed that the widespread introduction of sustainable construction techniques in a typical market situation often fails to happen". Sustainable development is particularly challenging in the Caribbean where there is a dearth of research on green buildings, an absence of local green standards and limited policy direction in the area. There are occasional and limited newspaper reports on the construction of a few buildings with "green architecture" and the start of the first net-zero building (Dennis, 2016).

A main contributor to this problem is that the building industry, a socio-technical system which consists of many interrelated parts (e.g. building actors, policy, legislation, education), is resistance to change and innovation (Geels, 2004; Geels, 2011). Current building practice is the result of the interplay between existing building technologies and materials, cultural norms on building and construction, the education and norms of architects and construction firms, government policies and legislation and user demand. As the components of a socio-technical process have co-evolved in specific and path-dependent way, lock-in creates a considerable resistance to change (David, 1994). Achieving sustainability requires a fundamental change, a transition, both in the parts and the whole of this socio-technical system. The very nature of sustainable development (strategies, concepts, measures, etc.), is immature, 'messy' (Schön, 1983) and 'wicked' (Rittel and Webber, 1973) which further exacerbates the challenges of transition. Given the complication of the building process mainstreaming sustainability may fail if the process or object(ive)(s) is (are) unclear or unknown. Strategic Niche Management (SNM) aims to foster innovations in certain components of socio-technical systems (Kemp et al., 1998). It assumes that innovations in the socio-technical system can be triggered in specific niches which, under the right conditions, can upscale to system-wide transition and become the standard practice. The evolving concept of 'Living Labs', in which research actors together with users co-create new innovations might be seen as a specific application of SNM. SNM operationalized by Living Labs focuses on the development of potential proto-markets by the creation of real-life projects as test cases. These test cases can promote learning and enhance the rate of diffusion of innovation, by exploring and identifying processes, objectives and possibilities.

In this paper we suggest that architectural studios in higher education institutions can be used to create 'niches' of innovation and change. Educational settings, such as architectural design studios and student research, when developed in a network of different actors, can contribute in creating such living labs supporting innovation in construction practice.

After this introduction (Section 1), this paper holds three core sections. Section 2 provides a theoretical background on SNM and Living Lab, and interprets the concept of Living Labs in Higher Education Institutions (HEIs) for Architecture and Planning. Student research projects are identified and promoted as Living Labs, which may stimulate the creation of real-life projects, ultimately niches for radical innovations as a 'short cut' towards a sustainable build environment. Section 3 discusses our experience with design studios focusing on both new built and renovation projects within the

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[1] At the United Nations Sustainable Development Summit on 25 September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 SDGs to end poverty, fight inequality and injustice, and tackle climate change by 2030. This set goes further than the MDGs, addressing the root causes of poverty and the universal need for development that works for all people.

[2] The MDGs, adopted in 2000, included 8 anti-poverty targets that the world committed to achieving by 2015. By 2015, significant progress was made on achieving the MDGs targets, and these led to the SDGs.

[3] http://www.oecd.org/greengrowth/
http://www.eesc.europa.eu/

Caribbean urban context, conducted within the framework of two funded research projects. Finally, Section 4 provides a retrospection and outlook.

2. Theoretical background

2.1 The multi-level perspective on socio-technical innovation

While transition based on fundamental changes occurs throughout human history, to deliberately initiate fundamental changes and innovations, it is necessary to understand the mechanisms at work. Within the sociology of technology and the study of innovation in evolutionary economics, the initial focus was on technological breakthroughs and innovations. However, merely technological innovations are not sufficient to create societal changes as technology and its use is embedded in social systems. Later perspectives developed in Science and Technology studies on innovation focused therefore on the relationship between technology and social structures, or the transformation of socio-technological systems (Geels, 2004).

The multi-level perspective of Geels (2005) describes a pathway of change in socio-technological systems. Three levels are identified and defined that play a crucial role in socio-technical transitions: socio-technical systems, the socio-technical landscape, and technological niches.
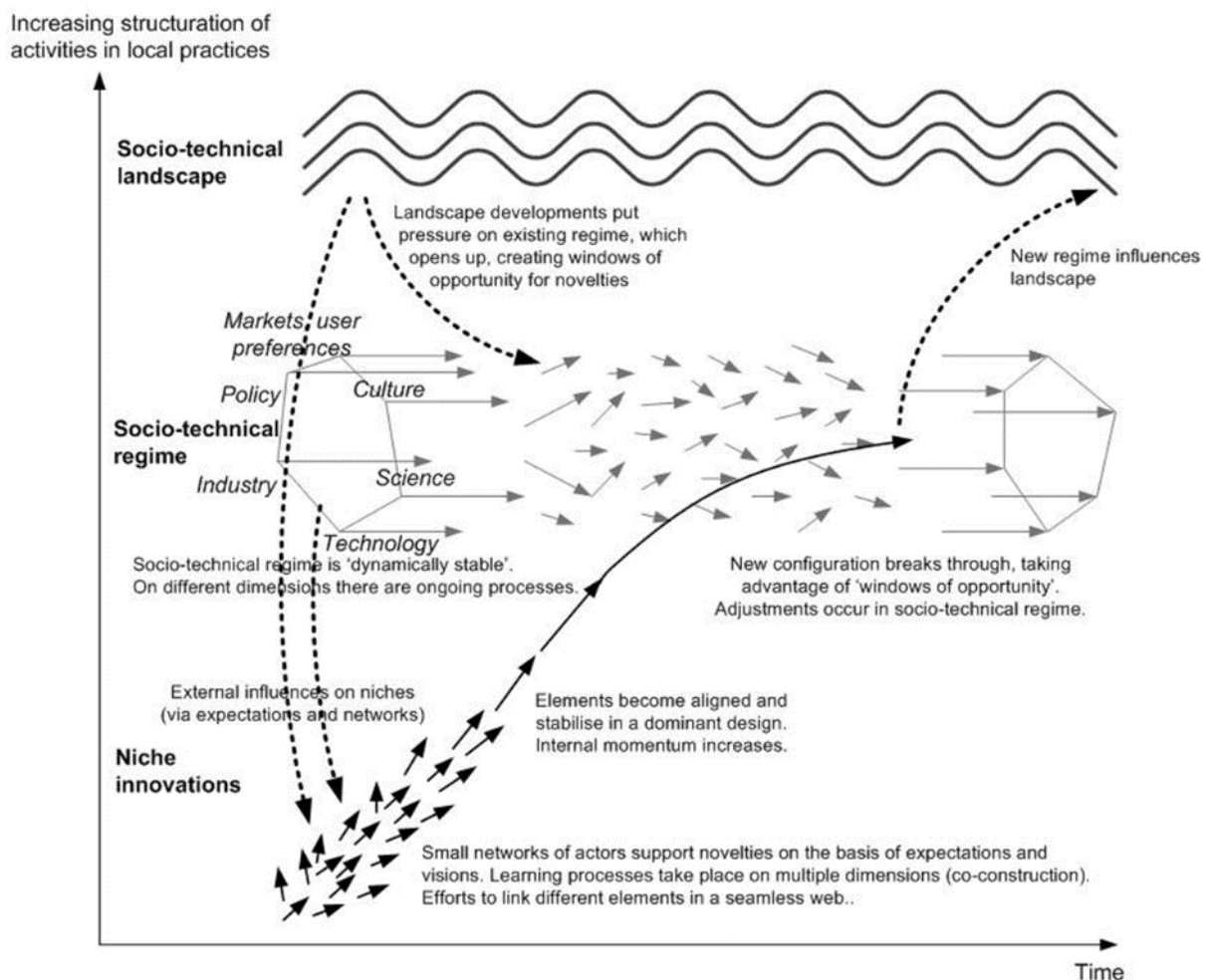

Figure 1: Three levels and their interplay crucial in socio-technical transitions: socio-technical systems, the socio-technical landscape, and technological niches (Geels, 2005); Niches as bottom-up approach in responding to changes in the socio-technical landscape.

Socio-technical systems are composed of different tangible and linked components that fulfill a societal function (e.g. transport, housing). For example, the components of the planning system in the built environment include the legislation, a professional community, a system of education, administrative routines, a specific set of beliefs, knowledge and planning concepts. Activities of and relationships between the different components are defined, coordinated and ruled by a system of institutions or structures, but are also actively constituted by groups of actors that interact in the system as the actors reproduce the system. According to Geels, this kind of system has considerable stability through the coordinative effects. Fundamental changes are avoided since they could lead to a loss of coordination and thus a failure of the socio-technical regime. Only a path of incremental innovation occurs, as a result of a co-evolution between the different subsystems. The socio-technical landscape is a set of macro-level variables that affect the functioning of socio-technical systems. These variables such as demographic changes, economic evolutions, climate change, and geo-politics cannot be controlled by the actors of the system. Changes in the socio-technological landscape, in the variables, generally occur gradual, although sudden shocks such as military actions and natural disasters are not ruled out. Also the building sector has to be considered as a socio-technical system. It is composed by a regime of actors such as clients, architects, engineers, developers, contractors, land surveyors, suppliers of building materials, regulators and planners, but also educational intuitions that interact around building techniques and modes of construction. The socio-technical landscape of the construction sector has been gradually changing over the last decades. Climate change, resource scarcity and international regulations put an increasing pressure on the existing construction sector regime to produce more energy efficient, less resource dependent buildings. The construction sector in the Caribbean is facing specific challenges. Tatem (2010) identities a narrow resource base, small domestic markets and heavy dependence on a few external and remote markets, high costs for energy, infrastructure, transportations, communication and servicing; long distances from export markets and import resources; low and irregular international traffic volume, little resilience to natural disasters, high volatility of economic growth, limited opportunities for the private sector and a proportionately large reliance of their economies on their public sector and fragile natural environments.

Despite these pressing challenges, innovations towards green buildings remain marginal, demonstrating a remarkable robustness of the socio-technical system of the construction industry. A survey among practitioners in the construction sector in Antigua and Barbuda of Jenkins (Jenkins, 2015) revealed for instance that only 23% of construction professional is familiar with the concept of sustainable buildings and that almost 80% of the projects do not meet green building standards. Lack of interest from the market, high costs and lack of support from the government where identified as the main reasons why green buildings are not popular.

2.2 Strategic niche management and living labs as agents of change
While changes in socio-technical regimes (systems and landscapes) are gradually and incremental, but can put increasing pressure and tensions on the existing socio-technical regime. Radical changes may occur in what evolutionary economics have called technological niches (Kemp, Schot and Hoogma, 1998). Niches are distinct, somewhat isolated spaces that have the potential to create specific market demands. In evolutionary economics, innovations in niches are explained as the result of particular selection pressures and adaptation that might operate in the environment of the niche. This mechanism of change is similar to how new species on islands might evolve as a result of local environmental conditions. In a particular niche specific consumer demands drives development, innovation and thus transition. During this process, innovations are optimized through social interaction leading to cyclical adaptations and adjustments. When the socio-technical regime becomes increasingly dysfunctional because of changes in the landscape, new niches will emerge for innovative practices. In this window of opportunity, new niches might replace existing socio-technical regimes, or merge into the existing socio-technical regime, leading to a system wide innovation. Reconfigurations thus occur when the three levels reinforce each other. System change is not only a bottom-up process, but should be understood as the interplay between macro-, meso- and microlevel developments. (See figure 1)

Strategic Niche Management , firstly introduced by Schot, Hoogma and Elzen (1994), responds to the fact that the market might not be ready for some innovations, e.g. on sustainability, because the established technologies are embedded in the existing sector (Kemp et al., 1998; Schot et al.,1994). Deep-structural rules and practices often lead incumbent actors to be blind to possible new

technologies (Geels, 2012). Innovative technology may thus be viewed as relatively crude. Living Labs, often credited to William J. Mitchell (professor at the Massachusetts Institute of Technology, MIT), are conceived as spaces where designers and researchers find inspiration by observing users and where they may test hypotheses through experimentation (Dutilleul, Birrer and Mensink, 2010). Operationalized by Living Labs, SNM aims to develop inexistent proto-markets by creating a relatively isolated social space, in which experiments can take place, geared at radical transformations towards sustainable development. According to Weber, Hoogma, Elzen and Schot (1999), SNM advocates 'the creation, development and controlled break-down of test-cases (experiments, demonstration projects) for promising new technologies and concepts with the aim of learning about the desirability (for example in terms of sustainable development) and enhancing the rate of diffusion of the new technology'. According to Markard and Truffer (2008) SNM suggests that successful sustainable innovations originate from real-world experiments or demonstrations. While Living Lab innovations have a very uncertain future, might stay local or just disappear when selection conditions in the niche are changing, they can provide the seeds of potentially structural changes.

To ensure that Living Labs can nurture innovation, Kemp et al. (1998) states that three internal niche processes are critical: voicing and shaping of expectations, building of social networks, and learning process. Expectations are seen as promises of new technologies and play an important role in attracting actors. They can be 'problem oriented and deal with the specifications for the technology', 'function oriented and more qualitative', or 'scenario oriented, general and broad' (Van Lente, 1993). Expectations are believed to be powerful when they are (a) accepted and shared by more actors (robust); (b) clear and specific; and (c) supported by experiments results (high quality) (Schot & Geels, 2008; Raven, 2005). Different actors have different perceptions and different expectations. Actor networks aim at creating coordination and convergence of diverging expectations (Mourik and Raven date?). A supportive social network is considered to be effective when more different actors are involved, and when alignment between these actors increases (Van Der-Laak, Raven and Verbong, 2007).

Learning means that opportunities and/or barriers are discovered so that innovations could develop properly (Mourik and Raven, undated). Learning processes are considered to be adequate when they entail both first-order and second-order learning (Schot and Geels, 2008; Schon, 1983). First-order learning focuses on the accumulation of facts and data about different aspects such as technology, infrastructure, policy and user practice. Second-order learning aims at questioning the given norms and rules in order to reformulate expectations, redesign the technology and reconstruct the social network (Mourik and Raven, undated). According to Van Der-Laak, Raven and Verbong (2007), these three internal niche processes must be taken into account in order to understand failure and success of sustainable technologies.

2.3 The potential role of higher education as a living lab in the construction sector
Higher education in architecture, and more in particular the design studio might have a large potential to act as strategic niches or living labs. The Design studio work is a common feature of Architecture and Planning training programmes. They tend to provide real-life problem-based learning, test-case research by design and design by research. Design studios are done by engaged students, assisted by lecturers, advised by specialists, and guided by "clients" and "users". The output consists of plans, sketches, 3D visualizations, scale models and narrative texts, which can be used for communication, dissemination, and/or provide incentives for further discussion and follow-up adjustments or (research) projects.

An increasing number of HEIs for Architecture and Planning endorse the relevance of adding a built output to their traditional Design Studio work. These so called Design & Build projects, also referred to as Live Projects, offer a different approach to the traditional architectural studio work. By actually designing and building, students get to value and to understand the close connection between – and equal relevance of – their artistic vision (aesthetics) and technical solutions (regarding e.g. materials, construction methods) (Krötsch and Gampfer, 2013). As these projects are real-life, and the target is to actually build the design, an integrated design process must be followed in which students work and make decisions within a framework of professional interaction with other actors, rather than in isolation. By this personal experience, they are better trained for their future involvement in integrated design teams.

Figure 2: Example of a Design & Build project / Live Project, conducted in Nairobi by students of the Technical University of Munich (TUM), Germany: from design, over testing and prototypes to construction and use. (source: Faculty of Architecture TUM)

Both traditional Design studio work and Design & Build projects / Life Projects are mostly conducted in relatively isolated social spaces, address projects which have a rather experimental and innovative nature, and often do not fit the regular design and building practice. Moreover, Design & Build projects / Life projects possibly result in technologically innovative concepts. However, when conducted in relation with a variety of social actors with the socio-technical building regime they have the capacity to act as a Living lab and to new innovation niches. The social environment of higher education institutions is also a less conventional and safe meeting place for actors in the construction industry which might increase their openness and receptiveness to innovative approaches. As Krötsch and Gampfer argue, design-build projects provide *"are an excellent method of improving social and environmental awareness through personal experience."* (Krötsch and Gampfer, 2013)

3. Practical illustration of student work conducted in de Caribbean context

The student work of the Faculty of Design Sciences at the University of Antwerp (UA) positions itself within the context of two (2) successive research projects: first, a joint two-year VLIR-UOS SI[7] project of DS Faculty and Anton de Kom University of Suriname (AdeKUS), and second, a joint three-year ACP-EU[8] EDULINK II project of Faculty of Design Sciences (UA), AdeKUS, University of Technology (UTech, Jamaica), University of the West Indies (UWI, Trinidad & Tobago) and University of Guyana (UG).

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[7] VLIR-UOS stands for Vlaamse Interuniversitaire Raad – Universitaire OntwikkelingsSamenwerking (Flemisch Interuniversity Council – University Development Cooperation). SI stands for South Initiative.

[8] ACP-EU stands for African, Caribbean and Pacific Group of States – European Union.

VLIR-UOS SI projects are short-term, small development projects form the Flemish development agency targeted at cooperation in education between Flemish institutions and countries from the global south. The SI programme aims to facilitate and organize new partnerships and innovative forms of cooperation. The specific project of the UA and AdeKUS aimed at 'Strengthening the current Bachelor Programme Construction Engineering and infrastructure of AdeKUS, and feasibility study for the extension of the Bachelor Programme into a regional Master Programme in Urban Design'.

ACP-EU EDULINK II projects are EU funded projects. The global objectives of the EDULINK II Programme are to foster capacity building and regional integration in the field of higher education through institutional networking, and to support higher education of quality. The specific project of the UA, AdeKUS, UTech, UWI and UG was 'Mainstreaming Energy Efficiency and Climate Change in Built Environment Training and Research in the Caribbean (CarEnTrain)'. Two design workshops were built in to the project, which aimed to increase sustainability of campuses by targeting students, key administrators (e.g. facilities management) and decision makers.

Within both research projects, student work focused on architecture and planning, on research and design on both the built and yet to build environment. The central focus in all the projects was on addressing and incorporating the aspect of energy efficiency of university campuses both in research and design. All projects are Masters' Projects, a fundamental part of the students' final graduation year, spanning a full academic year (9 moths, from October to June).

3.1 Work model adopted
Within the studio year, the Masters' Projects attached to the two case studies evolve from a challenge to a project and from a question to a possible answer. The often experimental or exceptional nature of the assignments, and the non-European context, necessitates the students to conduct research. They are required to observe and listen better, to be more attentive to the spatial and social situation, to analyze more thoroughly, to inform themselves by reading about the place and their people and to inquire about the context. It helps them to understand that thorough and specific background research is necessary for each new project.

Throughout the academic year, a clear rectilinear sequence of activities is conducted in order to increase the efficiency and effectiveness of both process and result.
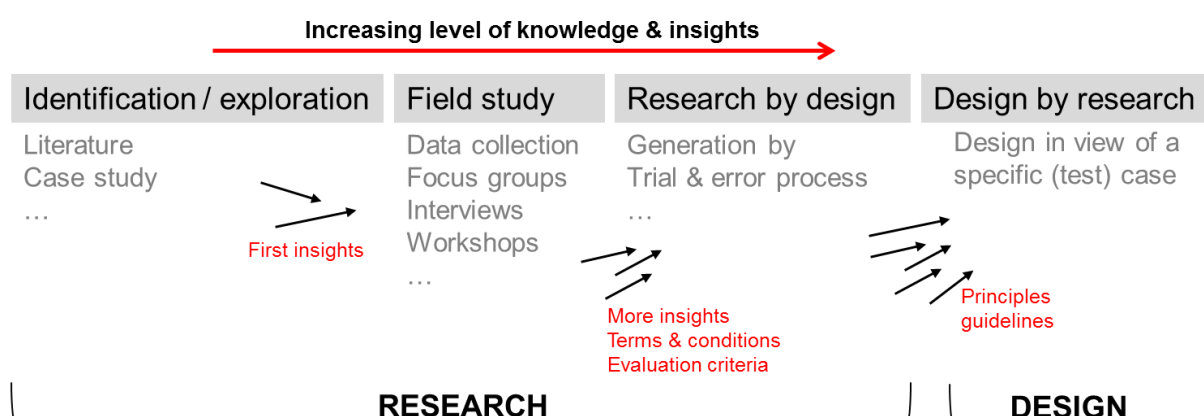

Figure 3: Work model adopted for Living Labs by students of the University of Antwerp, Belgium, highlighting the research-design nexus strategy.

As figure 3 indicates, a research-design nexus strategy is adopted. The research part aims for an increasing level of knowledge and insights, necessary for the design part.

The research phase consists of three phases: identification / exploration, field study, and research by design. A series of lectures, literature study on the state-of-the-art and case study research on relevant precedents/references are part of the identification / exploration phase, and provide first

insights to start the research. Next, field study research is conducted during a four to twelve week research stay. Here, both quantitative and qualitative data are collected. Besides collecting predetermined data, different aspects of daily life and building are explored and visualized in a personal logbook. Some common research methods are: focus group meetings, interviews and workshops with stakeholders, users, etc. The field study phase results in deeper insights, by which terms, conditions and evaluation criteria necessary for the research can be derived by the design phase. The latter phase explores/generates a wide range of possibilities during a trial & error process. The amount of iterative cycles of this trial & error process is lowered as outcomes of earlier research phases are considered and included.

Supported by developed principles / guidelines, derived from the outcomes of the research part, the design part can be executed. Here, a design is made in view of a specific selected or given case. A spatial concept and program is elaborated into a coherent architectural intervention. The architectural project contains information on volume, organization, inter-relationship with the public space surrounding it, and on the constructive, environmental and technical concept. After an interim marked presentation, the conceptual perception point of view is translated into a tangible spatial design, a coherent project that seems evident and justifiable at every scale: relation with urban space will interfere with the organigram of the projects program, the volume will interfere with the construction, construction will interfere with organization, materialization will interfere with architectural expression, detail and construction, environmental impact will interfere with the choice of materials and techniques, etc. A complete urban and architectural project from public space, over internal organization to architectural expression, materials, construction, technical installations and performances must be presented to a jury.

Throughout the research-design process, discussions with involved actors and stakeholders are held in which students present intermediate findings and results. Feedback and recommendations towards the next phase (literature, reference projects, technical or constructional advices, etc) is received/given. This interactive, multidisciplinary and experimental approach underlines the Living Lab aspect.

Figure 4: Photos illustrating the adopted research-design nexus strategy. Above left: research on materials; Above right: conducted workshop with stakeholders (users); Below left: research on construction; Below middle: concept sketch; Below right: discussion with experts on a scale model.

3.2 Overview of Living Labs

In the Strengthening the VLIR-UOS SI project and the execution of the ACP-EU EDULINK II project, various Living Labs focusing on sustainable built development were undertaken including education facilities (school and university campuses), healthcare facilities, heritage areas, residential neighbourhoods, dense housing projects. Three selected Living Labs are briefly described below.

3.2.1. Results of the School Living Lab

The Living Lab on school campuses explored the feasibility of developing a sustainable broad school in the suburbs of Paramaribo (Suriname). The concept of broad schools consists of uploading the main educational function with other functions serving the surrounding neighbourhood. Two architecture students focused on different sites/neighbourhoods.
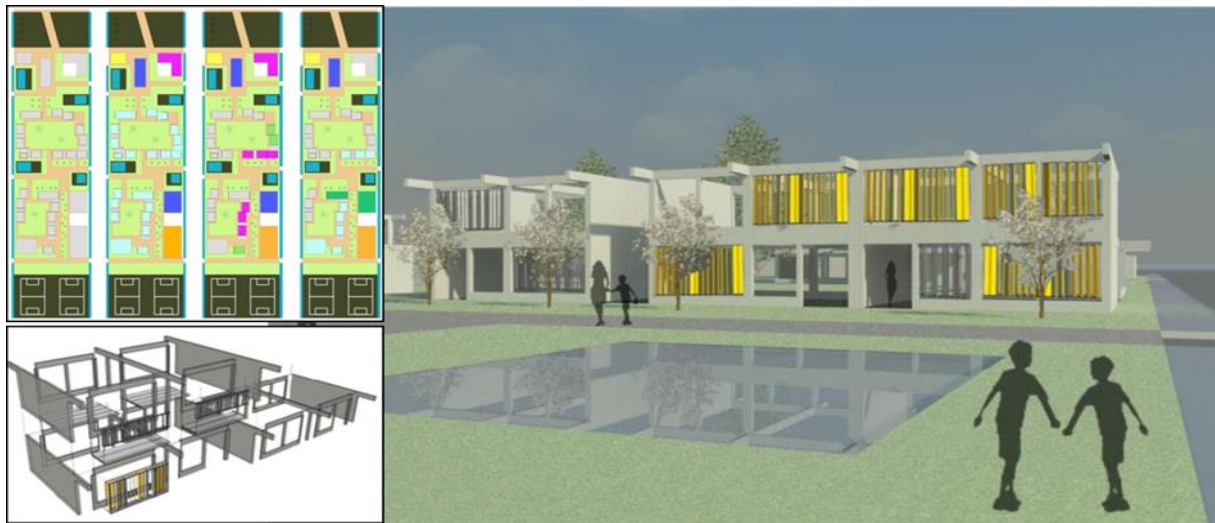

Figure 5: Student work on the Living Lab on school campuses, displaying the research on the spatial design (above, left), de construction (below, right), and the visualization of the final result (right).

The resulting design was a two story building with large glass windows to facilitate the entry of light. A large open space was incorporated to aid in cross ventilation. Shade trees were strategically placed to provide a shaded walkway. All these action were targeted to reduce electricity usage in lighting and cooling given the tropical environment of the area.

3.2.2. Results of the University Campus Living Lab

Sustainable university campuses were addressed as Living Labs as topic for both Masters' Projects of students and for two 'train the trainers' workshops within the ACP-EU EDULINK II project. Campuses were addressed as practical laboratories for addressing urban sustainability and mitigating and adapting climate change impacts. Two university campuses were selected to serve test-case research: AdeKUS (Suriname) and Sir Arthur Lewis Community College, Saint Lucia (SALCC). In both cases, the focus was on three scale levels: the urban context, the campus site and the building.

Figure 6: Student work on the Living Lab on university campuses, displaying a design (visualizations and section plan) for a new multifunctional pavilion.

3.2.3. Results of the Healthcare Living Lab

The Living Lab on healthcare was suggested by the United Nations (UN) and the Regionale GezondheidsDienst[10] (RGD) of Suriname. Both districts illustrated the aging infrastructure of healthcare centers in Suriname. Alternative approaches were requested by both the UN and the RGD to rehabilitation of existing centers in a sustainable were required as there were limited funds for either renovating existing centers or constructing new centers. Sixteen (16) interior architecture students worked on hospitals, day care centers, and urban and rural clinics to develop alternative approaches.

Figure 7: Student work on the Living Lab on healthcare, displaying an experiment for mobile micro modular healthcare buildings.

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[10] RGD stands for Regional Healthcare Service.

3.2.4. Results of the UN-Habitat Living labs

The Urban Planning and Design Lab (UPD-LAB) is an initiative of UN-HABITAT to promptly respond to the requests of national and local governments to support sustainable development and uses spatial planning as the tool coordinating economic, legal, social, and environmental aspects of urban development, translating them into concrete and implementable projects. The focus areas of the LAB are: citywide strategies; planning city extensions (and new towns); urban infill, densification and renewal; planning guidelines and capacity development; and climate change and urban planning. The LAB is currently working on more than 20 countries and 40 cities in Latin America, Africa, the Middle East, Europe and Asia.

In the LAB methodology, planning is applied as an iterative process reliant on a multi-stakeholder approach and aims to replace the sequential planning processes with an iterative planning process where plans are developed, tested and improved. It adopts a three-pronged approach focusing on urban legislation, urban planning and design and urban finance and aims to produce urban areas which are more compact, better integrated, better connected, socially inclusive and resistant to climate change (UN-HABITAT LAB, undated).

A UN-HABITAT Planning laboratory was held on the 26th April 2016, as part of pre-conference activities leading up to the Caribbean Urban Forum 2016 in Suriname. Key planning challenges were identified and prioritized challenges determined. Four key transformative projects were identified: *Keep Paramaribo Dry*; *Modern Public Transport*; City *Center Rehabilitation and Public Space*; and *Flooding and Water Management*. It was recognized that the key instruments for implementation would be: system level changes such as changes in the regulatory framework, institutional coordination, creation of a separate authority for supervision of water management and proper land administration. Infrastructure required included improvements in the drainage infrastructure, creation of bus lanes, bus terminals and perchance of buses. A more detailed longer-term Urban Lab project for Paramaribo is on the drawing board as a collaboration between UNHabitat, CNULM and the City of Paramaribo

3.3 Balance: impact and lessons learned

Based on feedback of stakeholders, it is concluded that conducted Living Labs have successful outcomes. By conducting the Lab as such, and by its output (sketches, plans, 3D visualizations, scale models and texts), they increased awareness regarding sustainability, not only by involved students, but also by academics, practitioners and policy makers. Concerning the Living Labs conducted within the framework of the ACP-EU EDULINK II project, dissemination of the outputs at the annual Caribbean Urban Forum (CUF) and through the established network of planners and urban professionals has been an important manner of up-scaling the results of the Living Labs and thus in achieving the objectives.

It is clear that the Living Labs developed in the Caribbean through the various Surinamese student projects and the "train-the-trainers' workshops at the two CUFs have experimented with the interesting and evolving methodology and generated both interest and involvement of a network of Caribbean urban practitioners. While we have earlier described some of the lesson learnt we are far from an assessment of either overall lessons learnt and the development of a Caribbean model of Living Labs. The network of practice involved needs to be expanded and diversified. There is also need for more post-activity evaluation of uptake and diffusion of outcomes. It is already clear that there is an increased potential impact if a building (design implementing) component could be added. Design & Build projects would increase both visibility and testing, two important success factors of innovation (Rogers, 2003).

4. Retrospection and outlook

This paper adds to the literature on sustainable transition in the built environment from the perspective of SNM. It interprets Livings Labs in the context of architecture and planning and its education.

SNM and Living Labs see structural change and innovation as the result of upscaling niches under specific windows of opportunities. These niches are part of a decentralized innovation strategy towards a possible future, rather than a coordinated innovation strategy towards a rigid agreed wished future. This strategy includes seed planting without guarantees, instead of certainties. It is promising

for a sustainable transition as it: in general stimulates radical change, and in specific has the potential to adjust socio-technical regimes. The latter includes for instance articulating (new) policy (makes it tangible and coherent), influencing new policy, and effectuate new education.

An interpretation of Livings Labs is given for the building industry: Demonstration projects within the built environment, Design studio work and Design & Build projects / Life Projects within HEIs for Architecture and Planning.

Conducted student Living Labs in the Caribbean context have contributed to a sustainable transition towards a volume market for sustainable projects. Driven by creativity, and not required to make stringent compromises so common in daily practice, this academic student work often results in innovative integral and integrated concepts. Disseminating both the design process conducted and the design results achieved, has the power to take practitioners, policy makers, users, etc. one step further, to incentivize and inspire the rather rigid socio-technological building industry for needed innovation and change towards a sustainable environment.

However, lessons are learned for future Living Labs. As Design & Build projects / Life projects are agreed to be successful models for education, research and societal services, and have the ability to initiate, support or scale up the needed sustainable transition even more, the ambition for future Living Labs is to add a build component to the traditional design work.

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