NSUS TECHNICAL ADVISORY GROUP MEETING

Network for the Application of Science and Technology to the Urban Sector (NSUS)

24th - 28th October 2011

The University of Amsterdam (Amsterdam, Netherlands)

Dr. Perry Polar
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<tr>
<td>B3</td>
<td>Technical Study (Best Practices in Urban Planning and Management Technologies)</td>
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<tr>
<td>C2</td>
<td>Technical Study (Monitoring and Evaluation Tools)</td>
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<tr>
<td>C3</td>
<td>Technical Study (Use, Adaptation and Management of Technology for the Urban Sector)</td>
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<tr>
<td>CARICOM</td>
<td>Caribbean Community and Common Market</td>
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<td>CCST</td>
<td>Caribbean Council on Science and Technology</td>
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<tr>
<td>EBS</td>
<td>Energie Bedrijren Suriname</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GPL</td>
<td>Guyana Power and Light</td>
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<td>GWI</td>
<td>Guyana Water Incorporated</td>
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<tr>
<td>HEI</td>
<td>Higher Educational Institutions</td>
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<td>HRST</td>
<td>Human resource in science and technology</td>
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<td>LCDS</td>
<td>Low Carbon Development Strategy</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and Evaluation</td>
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<tr>
<td>NSI</td>
<td>National Systems of Innovation</td>
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<td>NSUS</td>
<td>Network for the Application of Science and Technology to the Urban Sector</td>
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<tr>
<td>MEA</td>
<td>Multilateral Environmental Agreements</td>
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<tr>
<td>PLC</td>
<td>Programmable Logic Controller</td>
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<tr>
<td>PSA</td>
<td>Purchase Sales Agreement</td>
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<tr>
<td>PV</td>
<td>Photovoltaic</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>STI</td>
<td>Science, Technology and Innovation</td>
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<tr>
<td>UTECH</td>
<td>University of Technology (Jamaica)</td>
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<td>UWI</td>
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1. Introduction

The second Technical Advisory Group (TAG) meeting for the Network for the Application of Science Technology and Innovation to the Urban Sector [NSUS] project was held from 24th -26th October 2011 at the University of Amsterdam, the Netherlands. The meeting brought together planning practitioners from the Caribbean, Dutch technocrats from the energy and water sectors, as well as academics who are involved in teaching and research as it pertains to the urban sector. The goal of the meeting was to further advance the objectives of the NSUS project by examining possible mechanisms that can be used to overcome the constraints associated with the transfer and uptake of technology within the Caribbean urban and land sectors. The specific objectives of the meeting entailed:

(a) To review and synthesize the following draft technical working papers:

- C3: Use Adaptation and Management of Technology for the Urban Sector. Dr. Mark Bynoe and Dr. Patrick Williams
- B3: Best Practices in Urban Planning and Management Technologies. Mr. Urich Mans and Sarah Meerow

(b) To present the Dutch experiences in Science, Technology and Innovation and have a dialogue on technology transfer with Caribbean participants;

(c) To host a project management team meeting to report on project activities and set priorities. Minutes of this meeting will be circulated among partners and not included in the report.
2. Consultants’ Presentations

2.1 Overview: C2 - Review of Monitoring and Evaluation Tools Which Determine the Relevancy and Uptake of Research Involving Science, Technology and Innovation (STI) in the Caribbean

Nations which effectively develop and manage their knowledge assets perform better economically are more likely to achieve sustainable development. It is imperative that the Caribbean do so to address its socio-economic problems. To create a competitive economy, Technical innovation needs to be present or else the other pillars of competitiveness (of a country) (institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market development, technological readiness, market size, business sophistication) run into diminishing returns. A global innovation ranking of 142 countries ranked Barbados (47) the highest in the Caribbean as compared to Trinidad & Tobago (76), Jamaica (84), and Guyana (87).

The Caribbean Community (CARICOM) has made efforts to build STI capacity in the region includes the creation of the Caribbean Council on Science and Technology (CCST), a Regional Policy Framework for Science Technology and Innovation (2008) and ratification of several Multilateral Environmental Agreements (MEAs). However, there has been failure in the implementation of regional STI policies and development initiatives.

Characteristics of the STI industry in the region include (a) limited investment in STI (not more than 0.1% of GDP), (b) Research and Development (R&D) facilities of major local companies established outside the region (c) little incentive for researchers to address problems in industries (d) research in the region considered too academic and not synchronized with growth objectives (e) preference to publishing rather than bringing work to patentable levels (f) modest growth (22%) in the number of cited articles from the Caribbean between 2001-2005 (g) few Caribbean patents in local patent offices but more at the US Patents and Trademark Office (h) collaboration with research partners external to the region.

There is an underutilization of R&D skills in the region hence there needs to be a focus on competitive global R&D opportunities (e.g. the growing pharmaceutical R&D operations at The University of the West Indies (UWI) campuses in Barbados and Jamaica). Collaboration with external organizations is critical for adaptation of research.

The thinking in STI has moved beyond a focus on the elements of inputs, activities, outputs and outcomes and more towards a National System of Innovation (NSI) which addresses processes or pathways affecting the uptake of research. In NSIs, monitoring and evaluation (M&E) plays a central role. The formulation of STI policy and the development of STI plans and programmes require “up to date”, reliable and comprehensive data on a country’s STI potential and its resource base. Hence there is need to determine who are the innovators and what are the innovations; to differentiate between inventors, innovators and implementers and to establish public sector infrastructure to support innovation.
Flows of knowledge also needs to be measured and this can be done in a number of ways including actual financial transfers, flow of human capital, flow of intellectual property, licenses, patents or goods and services. The development, attraction and retention of the human capital are factors which affect quantity and distribution of the knowledge commodity. Human Resource in Science and Technology (HRST) is the basis of knowledge flows as it is not information or facts that move, but the first rate talent that can appropriate knowledge in ways that lead to competitive advantage. Unlike in developed countries, formal R&D may play a very small role in innovation with adaptation of existing imported technologies to local needs being the real source of innovation.

The higher education sector in English speaking Caribbean consists of over 150 institutions. Research culture, policy and management need to be reviewed in Caribbean Universities and other Higher Educational Institutions (HEIs) for them to fulfill their role. A range of critical issues affecting HEI’s were identified including decreasing government financial support, who should meet cost, access, quality versus quantity, etc. Most of the research in the Caribbean is being conducted through state agencies and is state funded. There has been less applied research compared to basic research, but applied research is increasing. Some universities in the region are beginning to commit to newer models of research including commissioned, applied and socially relevant research. In terms of the research environment, there are efforts to support funding, training, mentorship and establishing research goals.

Research management is not well developed in the Caribbean. There are research management offices/functions in UWI and the University of Technology (UTECH, Jamaica), but there is need for improvements in this area to overcome barriers in training, resources and support and research culture and output. The research culture needs to change. There is a one way flow of ideas and there is a need to realize the economic and social objectives of research. The linear model of research and innovation needs to be shifted to a model where research is a partner at all stages of innovation.

2.1.1 Discussion

The collective work (3 papers) needs to address adaptation, diffusion and use of research. One paper looks at innovation while the others deal with obstacles to innovation and the types of technology which can be adapted. There is a need to strengthen dialogue between researchers and policy makers so they influence each other’s work. This paper is specifically aimed at the University of the West Indies to assist them in rethinking how they reward innovative research. The issues of how to manage intellectual property and developing the human capital so that it fits into our research institutions through curriculum reform needs to be addressed.

Improving the policy framework is important. In the absence of national policy it is difficult for universities to develop a research agenda or guide individuals to conduct research in priority areas. Policy innovations are required to define what research needs to be done, how it should be done and how it should be implemented. Embedded in the policy framework should be the mechanism to foster dialogue between researchers and policy makers. The lack of dialogue is thought to be stumbling because policy is under developed.
It was also thought that the report was too heavily focused on the tertiary sector and should have looked at the cultural sector where innovation in the region is more likely to occur. In response, it was stated that cultural industries have their role to play but not necessarily purely in terms of STI contribution. The analysis of the national STI systems was not apparent. In response, it was stated that this particular study was more focused to address research issues at the University.

Identifying bottlenecks and solutions are a function of C3 rather than C2. However, the issue of incentives should be looked at as a possible solution in C2, given that in the agricultural sector, there is the perception that it is more cost-effective to import innovation rather than create it in the region.

Research needs to be aligned to growth objectives and be more practical. There is a problem in marketing innovations which in turn limits the returns which can be re-invested into research. Developing the human capital to support STI needs to be considered. Reform is needed not only at the tertiary level but the entire education system. The main goal is to build a citizen that is productive and a society that creates jobs in innovations can achieve this. The private sector needs to become involved and integrated in order to create persons who are entrepreneurial and innovative. There is a need to focus on strengthening the research flows/ pathways rather than just the outcomes (e.g. patents, inventions) of research.

2.1.2 Expert Feedback on C2 Report – Henk Waalajk – Agentschap, NL

The Dutch experience in STI focused on the drivers of innovation. The challenge in Holland is not the number of innovations but the implementation of innovation. Marketing of innovations remains a problem. This begs the question: how do you define an innovation and how do you determine if it should be selected for commercialization? For STI to be effective researchers and innovators have to be opportunistic; STI must be demand driven and solution oriented; investments must yield in the short term rather than long term; approach should be practical rather than academic; the drive should come from government not just Universities; and coordination is critical.

The examples given were: (1) Energy efficiency in Holland was supported because it was a foreign policy issue of not relying on energy needs from unstable countries. (2) Energy efficient real estate carries higher rates of rent which pays for the technology. (3) Energy efficient offices have higher productivity because the employees are not sick as often. (4) Government policy on renting only energy efficient buildings or procurement of only cars, computers, and equipment with certain labels will force suppliers to conform. (5) Holland and the Nordic countries have a community to coordinate research so that there is minimal overlap which is critical to optimize research resources.

The presenter created three focus groups which explored the following questions and a summary of the answers are provided.

1. Which STI issues are national and which are regional?
In the Caribbean there was not a clear distinction between national and regional STI issues as there is a strong overlap between the two. The difference between the two lies largely in the extent of their application.

2. How can we stimulate communication between research policy and the private sector? What role does interactive learning play in this?

Well established communication structures are needed, as well as greater involvement by the local Chambers of Commerce to financially support research and market innovations.

3. How can we stimulate R&D outside of academia?

Improving interaction and consultation between University, industry and general stakeholders particularly with community organizations that will help to define problems and come up with better solutions. The business community is more effective than the academic community in commercializing innovation. There needs to be more venture capital/ government incentives to support development of ideas. Indicators have to be clear cut –related to profits. There is a need to develop business incubators.

2.2 Overview: C3 -Use, Adaptation and Management of Technology for the Urban Sector

The study focuses on challenges in the water and energy sector in five countries: Barbados, St. Lucia, St. Vincent, Suriname and Guyana. The majority of work has been completed for Guyana-Suriname, which share commonalities.

2.2.1 Energy and Energy Technology Issues

Guyana is almost totally dependent on imported fossil fuel which leads to high electricity costs. Individuals and companies can generate their own power and sell to the national grid through a purchase sales agreement (PSA) with the Guyana Power and Light (GPL). This process can be onerous. Suriname generates electricity from a combination of diesel, hydroelectric power, biogas digesters and the use of agricultural waste. Energy is subsidized in Suriname which, along with Trinidad, has one of the cheapest sources of energy in the Caribbean.

In Guyana, there is a lower purchase tax on used or reconditioned vehicles as compared to new vehicles. While the policy is to make transportation more available in a low income country, it also leads to more fuel consumption, greater foreign exchange leakage, increased pollution and takes away the incentive for consumers to invest in more fuel efficient vehicles.

Guyana has a Low Carbon Development Strategy (LCDS) which aims to convert to renewable energy sources by 2020. In this regard, emphasis has been on developing two major hydro-electric schemes. However, the LCDS does not address transportation issues. In Suriname, the Ministry of Natural Resources has developed a 15 year plan for energy in consultation with management of major companies, institutions and key experts. This created a unique arrangement with industry as part of a national think-tank for energy and development in Suriname.
In Guyana there have been moves to install meters to encourage energy conservation. To increase energy supply and accessibility, there has been the provision of 11,000 households with stand-alone photovoltaic (PV) panels in rural hinterland. The country has also seen growth in the solar water heater industry by the private sector. Suriname has also been focusing on generating hydro-electric power. Guyana and Suriname have introduced more cost efficient technology i.e. computerized billing and customer information systems and computerized monitoring systems; improvement in the maintenance of their systems; encouragement of consumers to conserve energy, and provide more public education programmes.

Neither Guyana nor Suriname has a policy specifically targeted at the urban transport sector. The only known technological innovation has been the move away from lead-based fuel. Neither country has yet invested in energy saving vehicles, actively pursued car-pooling or charge fees for entering urban areas as a means of encouraging more energy conserving behavior.

Energy technologies management tools by GPL and the N.V. Energie Bedrijven Suriname (EBS) include investments, planning and scenario building. In Guyana, insufficient financial resources in the face of growing demand, has exacerbated the power supply issue. There is need for greater coordination and collaboration amongst stakeholders to allow for more cogent and cohesive planning; better assessment of risks involved with climate change and variability and the energy sector; and revision of energy policy to make it more current and appropriate. In both Suriname and Guyana the majority of the Human Resources managing the urban energy sector are graduates from local Tertiary Level Institutions, however, retention of skills in Guyana is a challenge due to a high rate of emigration.

2.2.2 Water Management Issues

There are a range of water management issues in both Guyana and Suriname including insufficient coordination between the requisite stakeholders; lack of a concerted public education and awareness building about the threats of climate change; water conservation including under pricing; outdated and insufficient enforcement of water regulatory policies and absence of risk management in the water planning scenarios.

The main source of water in Suriname is ground water while in Guyana it is underground sources, surface water (conservancies, rivers and creeks) and rainwater harvesting. The Guyana Water Incorporated (GWI) has been pursuing a metering system using a tariff system; however, for most of the country, a flat rate still persists. In most of urban Suriname, there is a metering system with a tariff structure in place. Recent innovations in Guyana include slow sand filtration that is both cheaper than using alum and produces a better quality of water. Furthermore, they are currently designing their facilities, being cognizant of climate change and extreme weather events. Within Suriname, their emphasis has been on new technologies to desalinate raw ground water to a purified state. Quality and reliability of supply remain problems. Less efficient revenue collection hampers investment in technology. Other challenges that these countries face are destruction or damage of water mains by other utility suppliers; leakage, limited wastewater treatment facilities, rising costs to provide water etc. Adaptation technologies being pursued in Guyana include the full metering of all households along the coast and programmable logic controller (PLC) for managing the flow of water. Within Suriname, the focus has been on the encouragement of wastewater treatment plants.
2.2.3 Discussion

The approach used has been more national rather than urban specific. There was debate on the countries chosen however the Guyana-Suriname nexus was shown to be critical to the study. Barbados is a leader in energy efficiency so it has selected itself. St. Lucia and St. Vincent are and similar to each other but may have different approaches and it was recognized that they were not as developed as Barbados. It was argued that Dominica may have been more interesting to look at for water management issues. However, in response it was stated that it was ambitious to survey five countries and even if all the countries were not covered it would not affect the potential use of the study. There is no need for a systematic comparison, rather just to provide examples. A good review of the literature is more important that the findings of the study.

The question was asked that between Guyana and Suriname, which one can best learn from the other? In response, it was stated that both countries have extensive adaptation measures, however, the human and technical resources may not be lending to innovation and technology development. Most technologies have been imported and not developed from an indigenous standpoint.

There is keen interest in the aspect of the work to identify the key constraints. The studies will allow us to map how technologies are used and adapted. It is expected that the types of issues should be similar in all five countries but with local differences. The typology in the B3 report can be used for classification. It was thought that the study should not only look at stakeholders from the productive sector but the social sector such as policy makers, large consumers (manufacturing, banking, service sector, hospital sector) and Public-Private Partnerships.

It was recognized that there is difficulty implementing technologies at a local level given that Caribbean governance structures are centralized. Caribbean standard setting is at a national level so there is need to harmonize at a regional level which is the role of CARICOM.

2.3 Overview: B3- Best Practices in Urban Planning and Management Technologies – Mr. Ulrich Mans and Ms. Sara Meerow

The report discusses a Dutch perspective on STI development in the field of urban water and energy management including a review of existing urban technologies and the drivers underpinning these innovations, the uptake, the potential applicability of these innovations in the Caribbean and the potential policy initiatives to allow for transfer.

The Netherlands is ranked 10th in the world on innovation policy and 3rd in the world on innovation effectiveness as it relates to input-output ratio despite its poor supportive environment for innovation according to the Global Innovation Index.

Four research questions were addressed in the report as follows:

1. What are possible categories of urban issues in energy efficiency, water supply and flood response management?

2a. What are matured technologies (in the broader sense) for each category?
2b. Which factors influence the uptake of innovative technologies?

3. Which of the technologies identified in 2A are applicable to the Caribbean context?

4a. What are the strengths and weaknesses in the Caribbean setting to implementing these technologies?

4b. Based on the analysis in 4a, what could be done to facilitate further implementation of these technologies?

For each of the three themes above (highlighted in italics), the scope (household level, community level) and type (environmental technology and appliance & product) were used as a classification system. The themes were further divided in to a series of 18 sub themes (Electrical appliances, Architecture/building design, Industrial solutions, Energy savings (behavior), Public infrastructure, treatment/storage/monitoring, Surface catchment, Rain/groundwater catchment, Wastewater treatment, Desalination, Information, Regulation, Pricing, Physical structures, Use of natural environment, Information and institutional capacity, Financial services and land use/surface runoff).

Seventy-seven (77) technologies were presented (largely within the jurisdiction of municipal authorities) that have been documented, tested and applied in the Netherlands although not all have been internationally utilized. These were classified according to scope and type.

The Dutch model of innovation and uptake thereof (Figure 1) was developed in this study and speaks to the relationship between knowledge workers, personal networks (informal works better than formal), policy coherence (disconnect between science as opposed to technology) and broker institutions (top-down; bridging technically feasible and socially acceptable). Key Dutch broker institutions were presented.

**FIGURE 1: Dutch Model Factors Influencing Innovation and Uptake Thereof ©NSUS**
It was recognized that water is a major priority for the Netherlands but it still is difficult to match demand and supply of innovative water technologies. The mere existence of broker institutions and personal networks is not a guarantee to create greater valorisation of scientific innovation. An approach which allows for more intensive dialogue between individuals, facilitated by intermediaries, to solve certain problems allows for problems to be dealt with in a shorter time span.

2.3.1 Discussion

The presenter asked the participants to classify the technologies presented in the draft paper (work in progress hence not included. Numbers are for reference purposes) according to cost and scale to determine the feasibility of adaptation to the Caribbean. It was thought that high technology required patent issues to be addressed and expensive technologies would make adoption difficult. The technologies which were relevant and could be adapted easily to the Caribbean were: 1.2 high efficiency boiler for heating water, 1.4 solar water heaters, 2.1 municipal energy efficiency requirements, 2.3 energy performance standards for new buildings, 4.1 energy box and energy saving consults for low income households, 4.4 training local women to be eco coaches, 6.1 green accounting, 6.5 green or vegetation roof, 6.6 Perforctor-e (emergency) portable water purification unit, 8.1 rain and storm water use in agriculture, 11.4 education game about water use, 14.2 Inflatable dam, 15.1 storm water use in agriculture, 16.4 water awareness campaign, 16.5 extendable hazard mapping system, 18.4 sustainable urban drainage system, 18.9 permeable pavement with gravel water storage.

Testing and validation (of hard technologies) is a challenge for the region (e.g. limited laboratories) however innovation in the region can occur best through adaptation of soft technologies (e.g. ideas). The EU Patent Registry (Escapenet) used in the study is accessible to the general public including persons in the Caribbean. Many Caribbean countries have local Patent Registries and there are plans to setting up one in Suriname in 2-3 years.

There was the general view that in the Caribbean there needs to be greater co-ordination between various sectors. Institutions may be collecting data but are unwilling to share (territorial issues) and there is a lot of bureaucracy in accessing information. It is instructive to note the example of Peru where there is a national network that does scenario building from different perspectives which crosses different political phases, sectors and levels. This Cities for Life Forum gives good practice for governance arrangements; a process rather than a new organization. There is interest in the region on improving green and environmental accounting and other mechanisms which improve monitoring and evaluation.
3. Technical Presentations and Study Tour

3.1 Energy Efficiency & Building Standards - Dr. Renee Heller, ECOFYS

Ecofys is a market leader in renewable energy, energy efficiency and climate change and works across 50 countries. Ecofys’ mission is a sustainable energy supply for everyone - an energy system that helps to meet the need of the present generation without compromising the ability of future generations to meet their own needs. World energy demand is growing, price increases are expected in fossil fuel and CO2 levels need to be reduced, hence there is need to produce alternative energy and improve energy efficiency. Ecofys’ approach is towards sustainable area development, stakeholder alignment, life cycle approach, and smart infrastructure (flexible). There is need to find local solutions. Sustainable development is more than energy reduction. It needs to encompass people, planet and profits.

One of the major driving forces behind energy efficiency and building standards is EU legislation on energy efficiency and its three accompanying goals. (By 2020, reduce greenhouse gases by 20%; increase shares of renewable energy by 20%; and reduce energy consumption by 20%). The ultimate aim is to have buildings with zero energy use. To achieve the heating/cooling requirements, buildings need to be retrofitted at an alarming rate. Energy performance of buildings (EPBD) adopted in 2010 requires all new buildings to be zero-energy by 2020 and all public buildings zero-energy by 2020.

Examples of solar cooling in Egypt and Lebanon, solar water heating, and sea water cooling (Curacao) were presented as some of the examples to achieve climate efficient building. Some holistic strategies include:

- Limit young people from moving out of villages by providing incentives such as affordable energy efficient starter homes. There is energy legislation for new houses in the Netherlands. Energy efficient houses attract higher rents hence the investment in energy efficiency because it can be paid off by the homeowner

- There is need for legislative and non legislative approaches and the removal of barriers to implementation

- Labeling of energy efficient homes

- Passive house concept allows for maximizing infrastructure to minimize the need for any energy input

3.1.1 Discussion

There are similarities and differences between the Netherlands and the Caribbean. There is a warm climate in the Caribbean requiring cooling technologies while in the Netherlands it is more about warming technologies. However, given the need to improve yet preserve the historic architecture in the Netherlands there is a focus on retrofitting the existing urban fabric while in the Caribbean it is about retrofitting an unplanned urban fabric.
One of the key issues in the Caribbean is how to provide a cool living environment without air-conditioning, particularly for high intensity housing. Cooling technologies must not focus only on the building, but the interventions in the environment which can result in cooling in the buildings (e.g. green spaces, ponds).

In the Caribbean, solar power options are expensive and the legislation to ‘sell back to the grid’ is not fully established. Trinidad needs to stop subsidizing energy if energy saving technologies are to take hold. There is also need to educate and enforce legislation to address unplanned settlements. There is a problem to get political support. The question of how can the private sector help address these issues was also raised.

Europe has invested in energy savings in order to reduce emissions. Emissions in the Caribbean are relatively low; hence the motivation for reducing emission is not there. The response to climate change is mainly adaptation. It is only in recent times that the region has been looking at mitigation, e.g. reducing CO2 emissions by using renewable energy such as solar and hydro power.


Brazilian cities are increasingly impacted by flooding which incur costs due to loss/ damage of property and restoration of buildings. Moisture can also damage mortar and paint. There are various techniques to retrofit buildings to minimise flood damage: elevation and wet flood proofing; relocation and dry flood proofing; and barriers. Other measures of mitigation include compensation by municipal authorities and building with more resilient materials.

3.3 HKV Consultants (Netherlands): Flood Warning Communicator- Dr. Hanneke Vreugdenhil.

The Netherlands is a highly vulnerable area to flooding. Dams, dykes, dunes and barriers are standard for flood protection as well as the training of crisis management professionals. There is a Flood Control 2015 flood protection programme which has many partners. The basic approach is to innovate before the problem arises by creating smarter and more responsive systems.

Risk communication is critical as persons need to be told that they are at risk or else they will not accept responsibility. The flood warning communicators is a dashboard which provides information on the risk in different geographical locations. The system addresses the following:

1. Who is issuing the warning?
2. What type of event is threatening?
3. Who is being threatened?
4. When is the anticipated impact expected to occur (location)?
5. How intense is the event expected to be (location)?
6. How probable is it that the event will strike (location)?
7. What specific protective actions should be taken?
8. Are there high-risk groups that require special actions?

Simple icons/diagrams are more effective than written communication as numbers/words may mean different things to different people and may corrupt the risk message. It is important to communicate a proper evacuation plan.

3.3.1 Discussion

The following questions and points were raised during the discussion.

- Who pays for Flood Control 2015? The response was that this is a private initiative which is looking for a market

- Are their synergies with the Caribbean Hurricane warning systems? It was noted that the Caribbean has a comprehensive system in place which integrates the Meteorological Offices, designated shelters and warehouses

- Damage assessment in the Caribbean is not systematically done

- In Amsterdam, the municipality is responsible for evacuation. Waterboard is responsible for risk assessment, preventative measures and risk communication

3.4 Interactive Workshop “Opportunities for Technology Transfer in Energy Efficiency in the Caribbean” – Mr. Henk Waaldijk – Agentschap, NL

A case study entitled Critical issues affecting energy use in the urban sector in Guyana (Annex 2) and Electricity in Suriname (Annex 3) were prepared in advance of the workshop. Key constraints identified in the study were: lack of regulatory framework, lack of research and critical thinking, lack of participation and high cost. The opportunities identified were: well established local government and community development organizations, existence of waste to energy projects, and the adaptation of energy efficient solutions in new buildings.

Green is a more holistic concept than Low Carbon Development. In order for any “green issue” to take hold, it must become a political issue. There needs to be support from non-governmental actors. There is a challenge between what is technically feasible and what is politically feasible. Also, implementation of the ideas is a challenge given the constraints in the current system. CARICOM needs to identify the vision of a sustainable Caribbean and have persons work towards it. There are lessons to be learnt from St. Lucia with respect to green buildings and construction.

An important question raised during this segment was how to transfer the concept of labeling to the Caribbean and can this extend beyond energy. There were questions if labeling could be
successful in the Caribbean. However one view was that it could get political support. The best approach is to focus on small projects and highlight good practices in the media.

In terms of partnerships, the University of Suriname is working with an energy company on crops for biofuel. There is also a need to examine urban profiles and structure of cities as it relates to transport and energy.

3.4.1 **Study Tour: Water Management in Amsterdam – Waternet (Watergraafsmeer)**

Waternet is the only water company in the Netherlands that is dedicated to the entire cycle. They treat waste water and produce drinking water as well as maintain water levels and keep surface water clean. This is done on behalf of the Regional Public Water Authority Amstel, Gooi and Vecht and the City of Amsterdam. Amsterdam is facing new challenges in existing residential areas, namely that of combining population growth and climate adaptation. This combination directly affects the quality of life in the city. There is a contradiction between the urban polder (Watergraafsmeer) as an attractive residential area and it being the lowest part of Amsterdam (5.5 m below sea level). This results in a residential area which is vulnerable to water nuisance and flooding. At the same time energy and water cycle issues create new opportunities for a sustainable future.

In the Watergraafsmeer, the Water-Authority is working together with designers, housing associations and citizen groups to unite ambitions of sustainability, livability and water adaptation. Waternet is working on several projects to transform this part of the city to a sustainable cluster of water innovations. Through an integrated approach it is possible to accelerate, economize and innovate. The main outcome will be a change in attitude and behaviour. The Watergraafsmeer will be the example of a successful transition within an urban area.
4. Way Forward for Consultancy Reports

The objective of the three papers (B3, C2, C3) is to establish the academic basis for informing the potential policy directions towards an improved innovation environment across the Caribbean. The collective works need to address adaptation, diffusion and use of research. The technical presentations and study tours also highlighted best practices of technologies being utilized in the Netherlands and some of the key issues which needed to be addressed to facilitate technology transfer and lessons learnt can be incorporated into the relevant reports. In particular, the concepts:

- Business, not Universities, need to be the key drivers of innovation
- Legislative and non-legislative barriers for implementation of innovation need to be removed
- Research needs to be socially relevant
- Technology can be a key boost to research communication

Based on the Dutch model for innovation and uptake thereof, the various reports should place emphasis on the following areas as shown by Figure 2:

FIGURE 2: Synergy between C2, C3, and B3

For improvement of the paper C2 Review of monitoring and evaluation tools which determines the relevancy and uptake of research involving Science, Technology and Innovation (STI) in the Caribbean the authors need to:

- Recommend a system to value research contributions beyond peer reviewed publications
- Address the issue of public information versus patenting
- In the absence of national policy, address how to get universities to develop a research agenda or guide individuals to conduct research that is priority.

- Consider how to develop the human capital which feeds into our research institutions at and before the tertiary level i.e. curriculum reform.

- Take a more in depth look at national STI policies, expand the focus beyond the University of West Indies and Trinidad and consider a regional case study.

For improvement of the paper C3 *Use, Adaptation, and management of technology for the urban sector* the authors need to:

- Provide some of the applied technologies/tools/policy instruments in the Caribbean.

- Refer to human, financial and institutional factors in the analysis of the most important barriers to the use of research (=innovation uptake) in the urban sector.

- Identify strengths and weaknesses in the Caribbean context: which of these factors are particularly problematic in the context of the Caribbean (=weakness), which ones are already supporting innovation uptake (=strengths).

- Address what needs to be done in order to facilitate further implementation of these technologies. In particular, improving communication strategy which was the common element between the three working group discussions.

For improvement of the paper B3 *Best practices in urban planning and management in urban planning and management technologies* the authors need to:

- Incorporate elements from the C3 report to address further implementation of technologies.

- Include and expand upon the discourse provided below.

The scenarios relating to level of innovation and uptake was examined in relation to the position that the policy direction of the Caribbean should take. The Netherlands is in Scenario 4: *Sand in the desert* whereby there are high levels of innovation but low levels of uptake and may strive towards Scenario 1: *Brand new world*. The Caribbean is likely to be best placed between Scenario 3: *Something went wrong* and Scenario 2: *Adaptation Wonderland*. Focus in the short to medium term should be placed more on improving capacity for uptake of technologies rather than creating new innovations so the Caribbean is more firmly entrenched in Scenario 2. The transfer of innovation from Dutch to the Caribbean and the converse transfer of experiences in stakeholder dialogue and adaptation approaches from the Caribbean to the Dutch are likely to benefit both parties in realizing the ideal scenarios.
The issue of creating an “Adaptation Agency” in the Caribbean, which focuses on showcasing relevant technologies and assisting persons in choosing if to validate and adopt or adapt the technologies originated in the discussion of the papers. Given the range of technologies, it is unlikely that this can be one agency but spread across various Ministries, Chambers of Commerce or National Patent offices.

There is also need to address who are the broker institutions and how do they contribute to the uptake of STI in the Caribbean. There should be additional research into this area as the C3 report is not geared to answer this question.
## 5. Annexes

### Annex 1: Agenda for Meeting

<table>
<thead>
<tr>
<th><strong>Sunday 23rd October 2011</strong></th>
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<tbody>
<tr>
<td>Day 1: C2 Presentation &amp; Energy Efficiency</td>
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<th><strong>Monday 24th October 2011</strong></th>
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<tr>
<td>09:00-10:30 C2 Draft Report Presentation and Q&amp;A</td>
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<tr>
<td>10:30-10:45 Break</td>
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<tr>
<td>10:45-11:45 Group work</td>
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<td>11:45-12:15 Plenary feedback from group work</td>
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<td>12:15-12:30 Way forward: C2 Final Report</td>
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<td>12:30-13:30 LUNCH</td>
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<td>13:30-14:45 Dr. Renee Heller, ECOFYS, Energy Efficiency &amp; Building Standards</td>
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<td>14:45-15:00 Break</td>
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<tr>
<td>15:00-16:00 Interactive Workshop Energy Efficiency &amp; Building Standards</td>
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<td>16:00-17:30 Project Management Team Meeting</td>
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<td>19:00-21:30 Dinner @ boat tour in Amsterdam</td>
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<tr>
<td>Day 2: Water Supply &amp; B3 Presentation</td>
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<tr>
<td>09:00-12:30 Study tour: dike reinforcement &amp; waterfront development</td>
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<td>13:30-14:45 B3 Draft Report Presentation and Q&amp;A (UvA)</td>
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<td>14:45-15:00 Break</td>
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<td>16:45-17:00 Preliminary discussions on synergies</td>
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<th><strong>Wednesday 26th October 2011</strong></th>
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<tr>
<td>Day 3: C3 Presentation &amp; Flood Response</td>
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<tr>
<td>09:00-10:30 C3 Draft Report Presentation and Q&amp;A</td>
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<td>10:30-10:45 Break</td>
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<td>10:45-11:45 Discussion on synergies</td>
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<tr>
<td>11:45-12:15 Plenary feedback from group work</td>
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<td>15:00-16:45 Scenario Workshop – Options for the Caribbean</td>
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<td>12:15-12:30 Way Forward B2, C2 and C3</td>
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<td>12:30-13:30 LUNCH</td>
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<td>13:30-15:00 Flood Response</td>
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**Parisi Jonov, Nascimento, Silva: Federal University of Minas Gerais (Brazil)/ Institute for Water Education – IHE UNESCO (Netherlands). ASSESSMENT OF DAMAGE TO BUILDINGS DUE TO FLOODING AND STUDY OF RECOVERY AND ADAPTATION ALTERNATIVES TO MAKE THEM MORE RESILIENT**

**Hanneke Vreugdenhil . HKV Consultants (Netherlands): Flood Warning Communicator**

LOCATION/SETTING: Georgetown City Population -approx. 150,000; Households - 37,500

SHORT DESCRIPTION (problem statement, what needs to be addressed)
✓ Georgetown places the greatest demand on energy use countrywide. Satisfying this demand has relied heavily on the use of fossil fuels. The consumer is also plagued by issues of reliability and cost. The urban built environment is a reflection of buildings that were not designed as energy efficient buildings. The growth of the urban informal sector has posed several challenges in terms of energy management for the service provider.

PAST EFFORTS TO SOLVE THE PROBLEM:
✓ The adoption of the pre-paid meter billing system
✓ Use of energy-saving light bulbs
✓ With reference to the issue of reliability, the following was adopted:
   ✓ More aggressive marketing of the solar energy alternative in the city
   ✓ Use of a signalised traffic control system based on solar energy use
   ✓ Use of solar energy water heaters and solar panels at the household level

CONSTRAINTS TO ALTERNATIVE ENERGY USE IN GUYANA
1. Lack of a regulatory framework to support initiatives in this area.
2. Lack of research in this subject area; research that can feed into the whole question of elaborating thinking on energy alternatives in the urban sector and that can help to re-shape the policy agenda.
3. No in-depth participatory approach in developing consensus on energy alternatives. This can have a profound effect in terms of the uptake side of project initiatives.
4. Cost

OPPORTUNITIES
1. Guyana has quite an established system of local government and community development organizations. In this context, there may be opportunity for community-based approaches to alternative energy use, such as in the area of wind energy. This is particularly significant for coastal communities where the wind factor is dominant.
2. Waste to energy projects (potential at the household and community level). Several projects within this area have been touted but none implemented since decision-makers may not have been convinced enough or projects may not have been effectively marketed both to the decision-makers and local communities.
3. Adaptation of alternative forms of energy-efficient technology in the building design process. This approach should be marketed to developers, but is best seen as being delivered in a context whereby new regulations can be effectively aligned to required practices.

CHALLENGES TO URBAN ENERGY EFFICIENCY
1. Institutional – the challenge of putting in place institutional arrangements to more effectively address the issue of energy as a cross-sectoral urban issue.
2. Legal/regulatory framework – to define standards and allow for their enforcement; to better support take-up of new practices.
3. Technical/human resources – the challenge of addressing issues of capacities of actors and levels of know-how.
Annex 3: Case study entitled Elektriciteit in Suriname - Hans Martinus and Angelika Namdar

There are two energy suppliers in Suriname: the Energie Bedrijven Suriname (EBS) and the Ministry of Natural Resources (NH). The EBS provides electricity in the coastline and the Ministry of NH in the interior (hinterland of Suriname). Most of the generation takes place by diesel generators, with outputs of several tens of kW in villages in the interior, tens MW in the district of Nickerie to 80 MW in Paramaribo. Approximately 125 MW of the energy for Paramaribo is also provided by the hydroelectric power station of Afofaka and a few MW are provided by a plant of Staatsolie Maatschappij Suriname NV. Paramaribo is a large network (with supply from three sources); all other networks are distinct networks with no interconnections.

In the hinterland there were occasional experiments with solar and micro hydro power, which so far have had no practical results. The only places were wind energy appears to be an option is the East-North village, Galibi. Several companies use backup generators to fulfill their power needs. The peak consumption in Paramaribo is currently at 180 MW, with an annual growth of about 10%. The catchment area of Greater Paramaribo includes the districts of Paramaribo, Wanica, Saramaca except for the portion west of Calcutta, the part of Commewijne on the left bank of the Commewijnerivier except Laarwijk and Para excluding the parts east of Powakka and west of Colakreek. The population in the catchment area is approximately 350,000, spread over about 70,000 households. Of these households > 95% is connected to the energy network. In recent years several improvements had been made to the energy system: a new power line had been built between Paramaribo and Paranam with a substation to Mencendam, and several new substations and underground power lines had been built and connected to each other by the substations. The diesel power plant in Paramaribo is equipped with new generators.

There are thoughts to improve the water level in the hydro power reservoir at Afofaka by directing the stream of the Tapanahony River through the Jaikreek to the Afofaka reservoir. Increasing the water level in the reservoir can lead to the continuation of a higher generation of energy. Transport of larger capacities to Paramaribo is currently not possible because the maximum capacity of the transmission lines has been reached. There were plans in preparation for a new center to focus on the former Bruynzeel yard. Right now it seems that the Jaikreek project is linked to the acquisition of the hydroelectric power station at Afofaka by the government. The preparation of a plant on the former Bruynzeel yard seems to have been put to a stop in favor of a new plant in the area of Het Vertrouwen.

As a result the investment of EBS is delayed. Thereby a shortage of electrical energy can be expected in the near future. The latter is motivated by the idea that engineering a plant to Het Vertrouwen has just started and experts (other than the board of the EBS) have indicated that the construction can last for at least three to four years, before the plant can be operational.

In the past, the shortage of energy was handled by disconnecting areas during the peak hours. Hospitals were excluded from this regulation. It is unknown if there is also a policy on this for other groups of users. At this moment several users, particularly in residential neighborhoods, feel that they are more often than others temporary disconnected from the electricity supply. Due to the lack of governmental policy on spatial planning, EBS experiences problems in formulating adequate investment programs. Most of the time private subdivision project developers are requesting for electricity connection after they have developed their projects. As anticipation on the developments was hardly possible, direct connection to the existing network is impossible. Another problem is the squatter’s issue. Because of their illegal situation, it is often impossible for residents to be connected to the electricity grid.

The government is the only shareholder of the EBS. Due to the subsidizing policy of the government, the tariffs for the households are low. Cheap available electricity is a great advantage for the households. The disadvantage of this policy is that the EBS uses high connection tariffs and still has insufficient funds available for additional investments. The problem of high connection costs is a big concern for many people. In recent years, some relief has occurred as banks made it possible to finance the connection charges.

The recent policy of the government is to supply all households with electricity, including the new households in the housing program of the government. This requires an expansion of the generation capacity in the very short term, but also an expansion of the distribution network. I do not think that the current financial, human and material capacities of the energy suppliers are sufficient for this.
Participants at the *Best Practices in Urban Planning and Management Technologies* presentation.

Hanneke Vreugdenhil presenting on flood warning systems.

Group discussion at Waternet on water management practices in Amsterdam.

Amsterdam Central Train station in Amsterdam.
Underground waste disposal technology, an example of the Science, Technology and Innovation (STI) that can be applied in the Caribbean.

Wind-turbine taking advantage of the frequent winds from the North Sea provide renewable energy resource.

Dam system in Amsterdam used to manage water levels and prevent flooding.

Bicycles are the easiest and most popular method for traveling around the city.