# A SUSTAINABLE FUTURE FOR THE EXUMAS

Environmental Management, Design, and Planning Conference Report


Compiled by Harvard University Graduate School of Design

The world is currently facing many ecological challenges relating to questions of scarcity of resources, pollution, climate change, and risk. Such issues are amplified on island communities. In this context, how should society and governments anticipate the future good of citizens? What plans should be made?

The Exumas, the chain of islands in The Bahamas including the Exuma Cays Land and Sea Park, face a particular set of challenges, but also distinct opportunities. These challenges relate not just to issues of environmental management and protection, but of development, employment, education, public health, and tourism. How best to focus on preservation and sustaining the natural resources, beauty, and culture of the Exumas while planning carefully for the islands' future well-being, and that of the residents?

This is a report of a conference, held on 8 July 2011 in Nassau, The Bahamas, which brought together a group of national and international experts to address both current strategies and future possibilities for the Exumas. The intention for this introductory event was to prepare the ground for a possible multiyear research initiative that will consider the Exumas from environmental, social, economic, and design and planning perspectives. The ultimate goal is to achieve a better understanding of alternative modes of developing and planning a more resilient future for the Exumas.

Ministry of The Environment
The Bahamas
www.bahamas.gov.bs

Bahamas National Trust
www.bnt.bs

Harvard University
Graduate School of Design
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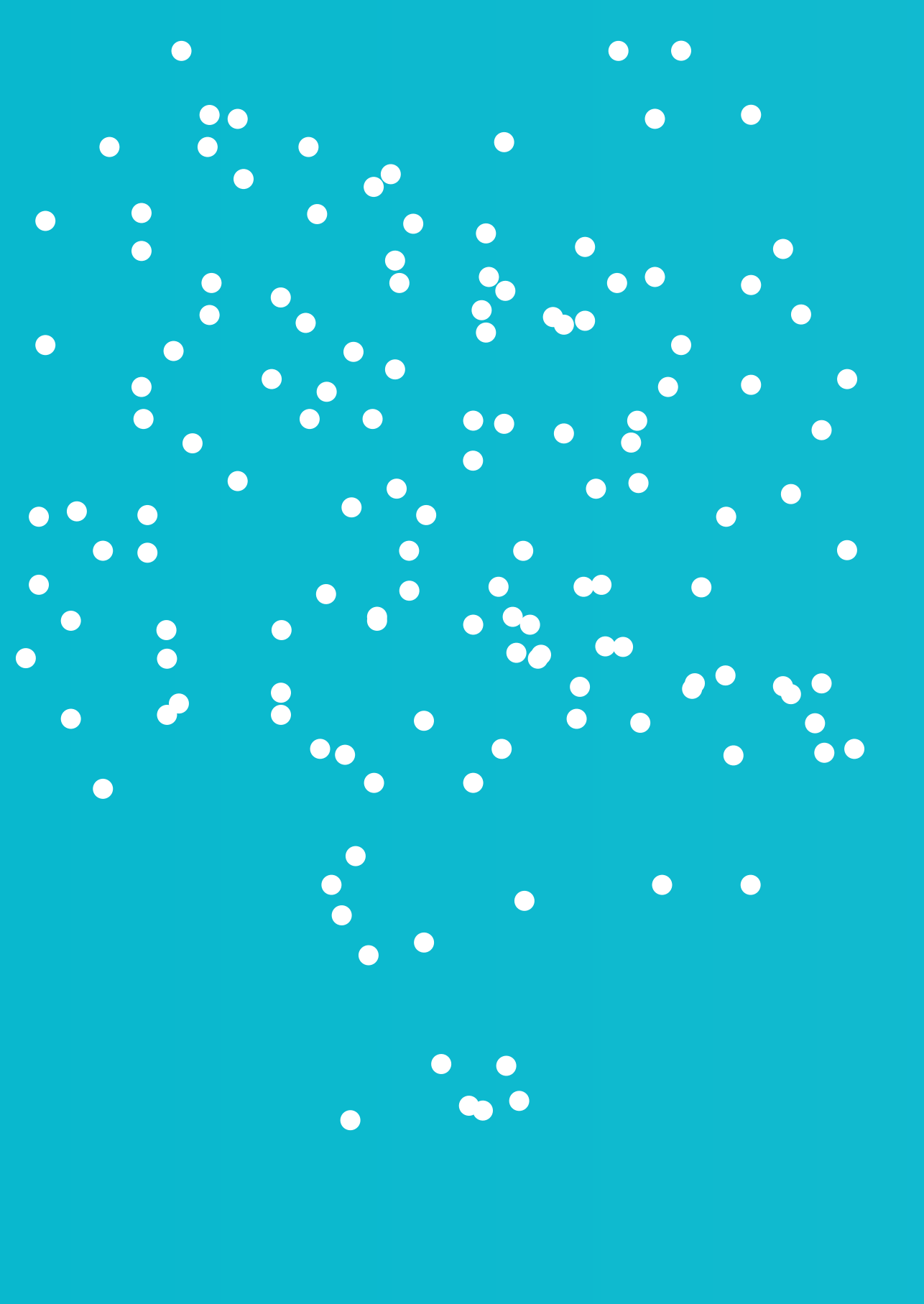
Environmental Management, Design, and Planning Conference Report




A SUSTAINABLE FUTURE
FOR THE EXUMAS
Environmental Management,
Design, and Planning
Conference
2011
EXUMAS
JULY

# I Biographies

The Rt. Hon. Hubert Alexander Ingraham M.P., The Prime Minister and Minister of Finance was first elected to the House of Assembly in 1977 as the representative for his hometown constituency of Cooper's Town, North Abaco. He has been re-elected on six consecutive occasions as the representative for that constituency. A child of working-class parents, Prime Minister Ingraham has a strong social conscience, which influenced the policies of his party and government. In 1993, he was made a member of Her Majesty's Most Honourable Privy Council.

The Hon. Earl D. Deveaux, is the Member of Parliament for the Marathon Constituency and Minister of The Environment. He has previously served as Minister in several other government agencies. He recently led the process to modernise developmental protocols and encourage land management and conservation through legislation including the Planning and Subdivisions Act, the Forestry Act, and The Bahamas National Trust (Amendment) Act. The former public officer, agricultural consultant and commercial farmer believes that healthy environments and sustainable development are inextricably linked.

Neil McKinney is President of the Bahamas National Trust, and has assisted and supported the BNT for many years. He previously served as a director and president of the Bahamas Chamber of Commerce, and has also served on the National Advisory Council for Education, the BEST National Climate Change Committee, and the Montreal Protocol Steering Committee. McKinney has worked for many years in real estate in The Bahamas.

Mohsen Mostafavi, an architect and educator, is Dean of the Harvard Graduate School of Design and the Alexander and Victoria Wiley Professor of Design. He was formerly the Gale and Ira Drukier Dean of the College of Archtecture, Art and Planning at Cornell University. Previously, he was the Chairman of the Architectural Association School of Architecture in London. He is author and editor of many books, including *Structure as Space* (2006); *Ecological Urbanism* (2010); and *Implicate and Explicate* (2011).

Eric Carey is Executive Director of The Bahamas National Trust, and formerly the BNT Director of Parks and Science, and Government Wildlife Conservation Officer. Carey served on the BNT Wildlife, Ornithology, and Gamebirds Committees, is a member of the Bahamas National Wetlands Committee, former Board Member of the Cape Eleuthera Foundation, and served two terms as President of the Society for the Conservation and Study of Caribbean Birds. His international awards include the Partners-In-Flight International Conservation Award and the Wings Across The Americas Research and Management Partnership Award.

Gareth Doherty teaches at the Harvard Graduate School of Design. He is a founding editor of *New Geographies* journal and editor-in-chief of Volume 3 "Urbanisms of Color" (2011). He edited *Ecological Urbanism* (2010) with Mohsen Mostafavi. Dr. Doherty received the Doctor of Design degree from Harvard University and Master of Landscape Architecture and Certificate in Urban Design from the University of Pennsylvania. His current research focuses on the anthropology of design.

Herbert Dreiseitl is an internationally renowned sculptor, artist, landscape architect, and interdisciplinary planner. He is the founder of Atelier Dreiseitl, a globally integrated design studio with a 30-year history of excellence in landscape architecture and urban planning. Dreiseitl currently directs the organisation's strategic design and planning efforts, demonstrating a portfolio of site-responsive interventions of urban hydrology and environmental engineering. A hallmark of Dreiseitl's work is the inspiring and innovative use of water to solve environmental challenges.

Leonard N. Enriquez has over 20 years of experience in the solid waste management industry. He founded Cambridge Project Development Inc. ("Cambridge") in 2001, and has successfully developed a number of solid waste projects in The Bahamas/ Caribbean region, including the 1,000 tons/day Sustainable Barbados Recycling Centre. Enriquez holds both Master of Science (1976) and Bachelor of Science (1975) degrees from the Massachusetts Institute of Technology in Cambridge.

Padraic Kelly trained as an engineering scientist at Trinity College Dublin and is a Chartered Engineer with more than 30 years designing and delivering infrastructure and buildings for the public and private sectors. He joined Buro Happold in 1978, becoming a director in 1992 and Managing Director in 1996.

In 2006, Kelly established Happold Consulting which advises cities on its strategic planning, economic development, and urban regeneration. Kelly lectures widely on city issues, is President of Europengineers, and co-founded the Working Group on Sustainable Cities at Harvard University.

Orjan Lindroth was born in Sweden and moved to The Bahamas with his family at an early age. After studies at London School of Economics, he worked in the U.K., France, and Canada before returning to The Bahamas in 1993. He is President of Lindroth Development Company, a Nassau-based community builder whose projects emphasize sustainable architectural patterns as a means of addressing modern ecological challenges and preserving local cultural identities.

Erich Mueller has been studying corals and reefs for over 30 years. In addition to research and education at a variety of levels, Dr. Mueller developed two laboratories for Mote Marine Laboratory in the Florida Keys. He has been working in the Exumas since 1995, has been a Senior Research Scientist with the Perry Institute for Marine Science since 2004, and is currently Director of the PIMS facility on Lee Stocking Island.

Spiro Pollalis is Professor of Design, Technology, and Management at the Harvard Graduate School of Design. Professor Pollalis is the Principal Investigator of the Gulf Encyclopaedia for Sustainable Urbanism project and of the Zofnass Program for the Sustainability of Infrastructure at the GSD. He has taught as a visiting professor in Greece; Uni-Stuttgart; TU-Delft; and ETH-Zurich; and has offered joint courses with the Harvard Business School on planning and development. He is the chief planner of DHA City Karachi, a new town of 500,000 people, and a consultant to the General Services Administration.

Chris Reed is Adjunct Associate Professor of Landscape Architecture at the Harvard Graduate School of Design, and principal and founder of Stoss Landscape Urbanism, a Boston-based strategic design and planning practice. Stoss has distinguished itself internationally for a hybridized approach to public works projects rooted in infrastructure, functionality, and ecology. Stoss was the recipient of the 2010 Topos International Landscape Award, in recognition of the "theoretical and practical impulses the firm provides to the advancement of landscape architecture and urbanism as dynamic and open-ended systems."

C. Robert Reiss is the President of Reiss Engineering Ltd., a civil and environmental consulting firm. He holds a Ph.D. in Environmental Engineering from the University of Central Florida and is a licensed professional engineer in The Bahamas as well as nine U.S. states. Dr. Reiss is the President of the Bahamas Society of Engineers and was appointed a member of the Accreditation Committee of the Bahamas Professional Engineers Board in October 2010.

Joyce Klein Rosenthal is an Assistant Professor of Urban Planning at the Harvard Graduate School of Design. She received her Ph.D., with distinction (in 2010), M.S. in Urban Planning, and M.P.H. in Environmental Health Sciences from Columbia University. Professor Rosenthal's research interests are in the nexus between urban climate, public health, and the built environment, with a focus on developing social capacity in planning ecologically resilient and adaptive communities.

Elizabeth Thomas-Hope was Chair of Environmental Management at the University of the West Indies from 1993 to 2010. Professor Thomas-Hope's current research includes: agro-biodiversity and land management in the Caribbean; poverty and urban environmental management, environment and health; environmental perception and its implications for environmental management; and, international migration and migration policy in regard to the Caribbean. Professor Thomas-Hope has a doctorate from Oxford University and has authored many books including *Freedom and Constraint in Caribbean Migration and Diaspora*, (2009).

# II Conference Programme, 8 July 2011

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| 9:00 am | National Anthem<br>Prayer |
| 9:10 am | Neil McKinney, President, Bahamas National Trust |
| 9:20 am | Mohsen Mostafavi, Dean, Harvard Graduate School of Design |
| 9:30 am | The Rt. Hon. Hubert Alexander Ingraham, Prime Minister of the Commonwealth of The Bahamas |
| 9:40 am | Break |
| 9:50 am | The Hon. Earl D. Deveaux, Minister of The Environment |
| 10:10 am | C. Robert Reiss, President, Bahamas Society of Engineers |
| 10:30 am | Erich Mueller, Director, Perry Institute for Marine Science |
| 10:50 am | Break |
| 11:00 am | Elizabeth Thomas-Hope, Professor, University of the West Indies |
| 11:20 am | Joyce Klein Rosenthal, Assistant Professor, Harvard Graduate School of Design |
| 11:40 am | Herbert Dreiseitl, Founder, Atelier Dreiseitl |
| 12:00 pm | Respondents:<br>Gareth Doherty, Leonard N. Enriquez, Padraic Kelly, Spiro Pollalis, and Chris Reed |

Morning proceedings chaired by Eric Carey, Executive Director, Bahamas National Trust

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| 1:00 pm | Lunch |
| 2:00 pm | Spiro Pollalis, Professor of Design, Technology, and Management, Harvard Graduate School of Design |
| 2:20 pm | Padraic Kelly, Managing Director, Happold Consulting |
| 2:40 pm | Mohsen Mostafavi, Dean, Harvard Graduate School of Design |
| 3:00 pm | Respondents:<br>Eric Carey, Orjan Lindroth, Erich Mueller, C. Robert Reiss, Joyce Klein Rosenthal, and Elizabeth Thomas-Hope |

Afternoon proceedings chaired by Chris Reed, Adjunct Associate Professor, Harvard Graduate School of Design

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| 4:15 pm | Remarks by The Hon. Earl D. Deveaux, Minister of The Environment |
| 4:20 pm | Remarks by Mohsen Mostafavi and Neil McKinney |

# III Introductions

## Eric Carey, Neil McKinney, Mohsen Mostafavi, The Hon. Earl D. Deveaux and The Rt. Hon. Hubert Alexander Ingraham

Eric Carey

The Right Honourable Hubert Ingraham, our Prime Minister. The Honourable Dr. Earl D. Deveaux, Minister of the Environment. The Honourable Phenton Neymour, Minister of State for the Environment. Mohsen Mostafavi, Dean of Harvard University Graduate School of Design. Mr. Neil McKinney, President of the Bahamas National Trust. Mr. Colin Higgs, Permanent Secretary. Ms. Diana Lightbourne, Permanent Secretary. Other senior government officials, ladies and gentlemen, good morning.

We're all here to talk about a fragile chain of islands that in the 1950s Howard Hughes thought would be a wonderful place to buy and purchase as a playground. The government of the day entertained a proposal by a group of concerned citizens, and we were fortunate enough to have set aside a part of that chain, which is now the Exuma Cays Land and Sea Park. Outside of the Exuma Cays Land and Sea Park, however, a lot happens. And as you can read in the aims of the conference, the area presents many challenges and opportunities. I had the pleasure of going to the Exumas with the Minister of the Environment last year. Discussions started about how much stuff happening outside the park is impacting what happens inside the park. We also started looking at how much development was actually happening in the Cays. As we flew over, it was, wow, that's happening here, that's happening there. When you fly over and see how close it all is, you realize how interrelated it all is, and then you realize that it really is not properly planned. There is no clear commitment to the sustainability of the development that's taking place. Governments have to make terribly hard decisions sometimes, about balancing protecting the environment with providing jobs—finding somewhere in between. And it's not possible to do it properly without planning. Many of you will be aware that the government of The Bahamas passed a very progressive piece of legislation called the Planning and Subdivisions Act. That Act allows for the development of land-use plans. So for a particular space defined in the act, we have the ability to plan for what happens there. Those of us that protect the environment and sometimes get accused of being a little bit too green-freaky have to also sit in the same room with a developer who is interested in providing jobs. So a balance must be struck. We have the ability to sit down and chart how that balance happens by developing land-use plans. We believe the dialogue that we start with this conference will take the Exuma Cays far along the path of getting that much-needed land-use plan.

I welcome you on behalf of the Ministry of the Environment and the government, and of the Bahamas National Trust. We're really pleased to have the Harvard Graduate School of Design, and the dean who represents that wonderful institution, and so many wonderful speakers. Today we're going to have a

discussion about what's important to our country and how we look at this incredibly fragile but great space called the Exuma Cays, and its opportunities, and balance those against the challenges. And at the end of the day a process will have started. Our first speaker for this morning's opening session, who will speak briefly, is Neil McKinney, who has been associated with the Bahamas National Trust longer than he really knows. His grandfather was a founding member of the Bahamas National Trust, his father was the president of the Bahamas National Trust, and Neil follows in that role.

Neil McKinney

I can't possibly go over all of the matters that affect sustainability in the entire Exumas, and so I'm going to deal with a portion of it, because there are also other people here who are far better able and more knowledgeable about other areas. One of my main concerns for the Exumas and for The Bahamas is actually to do with our marine reserves, and that's just as important within the Exumas as it is for the rest of The Bahamas. I'm going to open my remarks with a passage, strangely— nothing that Harvard should be too upset about—from Cornell's Laboratory of Ornithology, from a home study course by J.W. Fitzpatrick with the title of "Bird Conservation."

> "The passenger pigeon is almost certainly the most abundant bird ever to have existed on earth. Explorers' accounts of its numbers across the eastern United States between 1630 and 1880 read to us like science fiction (Schorger 1955). Audubon wrote of a flock passing for three successive days near Louisville, Kentucky in 1813, stating that "the light of the noonday sun was obscured as by an eclipse." He estimated that this mile-wide flock contained a minimum of 1.1 billion birds. [...] How many pigeons existed across the entire range of the species? Nobody knows for sure, but the number may have been five billion or more. ... One thing we do know, as of 1914, just 100 years after Audubon saw his massive flock, the passenger pigeon was extinct." [1]

I chose to start with this passage to illustrate that sustainability is not about the abundance or the scarcity of a particular resource, but about its proper management. And you may ask, how does

1—S. A. Temple, "Individuals, populations, and communities: The Ecology of Birds," Home Study Course in Bird Biology, S. Podulka, R. Rohrbaugh, and R. Bonney, eds. (Ithaca, NY: The Cornell Lab of Ornithology, 2001).

Neil McKinney

the demise of the passenger pigeon relate to sustainability in the Exumas? There are parallels. There were several factors that led to the demise of the passenger pigeon, but it was the unrestrained hunting that was the dominant factor in its extinction. We have a similar situation here in The Bahamas today, whereby once a fishing or hunting season is opened, whether it be for grouper or crawfish, there are no limits. For conch, there is no closed season, and there are no limits. Is this sustainable? We still commercially fish spawning aggregations. Scientifically, we know this is not sustainable, and these aggregations will eventually disappear. The challenges we face in the Exumas today are systemic. We have arrived where we are today as a result of our historical use of our marine resources. Traditionally, we have looked at the seas and its bounty as an open and unlimited resource for the taking. As long as we had a small Bahamian population, and demand was low, and the methods employed to harvest these marine resources were relatively inefficient, the system worked, and it was sustainable.

Today, the pressure on our marine resources is far greater, as the methods employed to harvest them are far more efficient than those of earlier days. We also have both a growing population and ever more visitors to our shores. We already know that many of our resources are in severe decline, and it would be foolish to expect a reversal of that trend without a change in management and policy. A first step might be a full assessment of the resources that are available. Without that knowledge, it is hard to see how it is possible to claim that what is harvested is sustainable. Indeed, in other regimes, quotas are set, and once they are achieved, seasons are closed. Our government, as Eric already mentioned, has committed to having 20 percent of our marine areas as parks or reserves by the year 2020. This is an impressive commitment, and just as the Exuma Land and Sea Park replenishes areas outside of its boundaries, so, too, can other reserves function in a similar manner. At the same time as we seek to protect these resources for future generations, we also need to provide meaningful opportunities for the people who live within the Exumas so that they can use these same resources to support themselves. Opportunities in tourism, marinas, diving, mariculture, etc., needed to be blended in with conservation so that the inhabitants of these areas value the resources, and are both proponents and guardians.

As we talk of sustainability, there are many more questions than we have answers. Inevitably, because so much of our country is water, the questions revolve around the marine environment. Some of you may feel that my talk is too general, and that I have not focused on the Exumas. My response is that

an oil spill does not respect artificial boundaries. Lionfish do not care which island is close by. Climate change is not a local issue. The acidification of the oceans, which destroys limestone and therefore many of the animals that live in it are unable to build their shells—these are all national as well as local issues. Ideas or policies that are formulated from this conference are likely to be used for other areas in The Bahamas. The future of the Exumas is inextricably bound up with the rest of the nation. If we are to maintain our resources, at some time, there must be a plan that is national in scope. This is not in any way to take away or detract from the work or ideas that are put forward here today. There must be a starting point, and lessons can be learned, and policy and management refined as we find the methods that work here in Exuma and discard others. How will we know if the measures we take are successful? How do we define success? I would suggest to you that good science can help us measure our progress. Once we establish goals or objectives and start with good baseline information, with proper programmes in place, we can measure the success or otherwise of policies. Ironically, if we do a good job, the pressure on our resources will increase. That may sound counterintuitive, but if you think about it, there will be more visitors who wish to visit and come and see the pristine environment that we have here in The Bahamas.

Properly managed, this can help us support a growing local population as fishing grounds outside of our country are further depleted or degraded, there will be greater demands for access to our resources. This will come both in formal requests and also in the form of illegal intrusions that we now suffer in the form of poaching. We will need sound policies to manage requests for commercial fishing, and strong enforcement to ensure that legal fishing operations are within required parameters, and that those that poach are caught and severely discouraged from returning. There are many factors that I haven't mentioned or talked about, like health and education, which I will leave to others who are far more competent than I to talk about. But I would like to say that this is a wonderful opportunity to plan and help guide the future sustainable development of the Exumas, and I look forward to hearing the comments and ideas that will be put forward.

Eric Carey

Thank you very much, Mr. McKinney. In the mid-1600s, a struggling colony in The Bahamas was sent supplies by people in New England, and as a showing of their gratitude, the people sent a ship laden with tons of braziletto wood. And that, at that time, was the largest gift that the fledgling Harvard College had received; it was a major gift to Harvard. So it is not by coincidence that Harvard is giving back something to The

Bahamas. I would like to call at this time Dean Mohsen Mostafavi, who is the Dean of the Harvard Graduate School of Design.

Mohsen Mostafavi

Good morning, and welcome. It's a real pleasure to be here with you this morning. I think what Eric doesn't maybe know, and certainly Neil didn't know, is that before going to the Graduate School of Design at Harvard, I was actually at Cornell University. So it's wonderful to hear about the whole work in ornithology that they do. I did have the pleasure of working with a number of people and actually spending time in their building, and very much hope that some of the things that they do, in a way, is also very much aligned with things that we do and we think about it. I want to thank the Right Honourable Prime Minister for your presence here today, and the Honourable Minister. It's been incredible, over the past many months, as we have been preparing this event, to have the opportunity to spend time with the Minister and to find out how the Minister and Neil and Eric and so many other people have been so incredibly committed to the Exumas, to the future of The Bahamas, and to really thinking about innovative ways in which we should be caring and really dealing with the custodianship of these islands. And for us, it's also a real privilege to have been introduced to this project through the Aga Khan programmes at Harvard University, and I'm really grateful to everyone who has been involved with this particular project.

We certainly hope that we are able to return something of a gift back to the Exumas, but we also feel that we are getting still more of a gift by being part of this project, and by being here today. You may well ask, what is the relationship between a design school and Exuma. Some people may not be familiar with the fact that we at the Graduate School of Design deal with a broad range of topics and issues in architecture, in landscape architecture, in urban planning, in urban design. It's very important to recognize that today, when we're dealing with large-scale environmental issues, as has already been mentioned, we both deal with questions of preservation and conservation, and actually think in terms of the future possibilities. That means imagining. That means questions of creativity. As Neil was suggesting you can't simply deal with the future through a process of preservation. Preservation is also deeply intermingled with ideas for the well-being of society and for the good of mankind. In that sense, the questions of what one does, how one imagines things, what are the kinds of possibilities and projects, become a very important part of what we have to discuss.

Very briefly, I want to also explain something of the logic of the meeting that we have today. Those of you who've had the opportunity to look at the programme for the day would have

noticed that we are starting the morning session with the specifics, and in the afternoon we will be dealing more with general issues, and then returning to the specific. In other words, in the morning we will hear from people who are deeply involved with the particularities of the Exumas, The Bahamas, and then in the afternoon we will have some presentations, including my own presentation that will deal much more with comparative models: what can we learn from other places, what are other examples of things, what are the kinds of issues that are important? I think that we should not end up focusing so much on the Exumas that we actually miss the relationship between the Exumas and the other things. That's something about the structure of the conference.

One of the key issues today is the relationship between, if you like, bottom-up forms of organization and top-down forms of organization. What are the kinds of things that can happen at the grassroots level, and what are the kinds of things that need to happen in terms of planning and anticipating how we are thinking about future possibilities? I would argue that we need both of these. We can't have a focus solely on top-down forms of planning, nor should we solely rely on bottom-up forms of organization. Therefore, how we balance these things, what is the relationship between these things, is absolutely critical. The other thing that I think is important is that in the future there will be so much emphasis on how we're dealing with questions of water urbanization. The relationship between water and urbanization will be a key feature of global planning, policies, and issues. We have a number of people here who are focusing their research and expertise on questions related to water. The other side of this is the relationship between larger environmental topics and issues of health. I think this touches on many of the themes that we have tried to bring together in this conference. Clearly, the relationship between small-scale buildings and large-scale planning is the overall sort of theme that's at stake behind the technical, the scientific focus on the Exumas.

I, for one, am hopeful that this conference will not be a one-off event—that in fact, with the support of the Prime Minister, with the support of the Minister, and all of you, that there will be genuine opportunities for us to continue this collaboration and to see this conference as the first of a number of events that will look at a variety of themes and issues that will be pertinent to the future of Exumas and the relationship of the Exumas to larger issues of planning in The Bahamas. Thank you very much, and like everyone else, I'm very excited about what we're going to hear today.

Eric Carey

The Honourable Earl Deveaux will now come and introduce the Prime Minister.

Earl D. Deveaux

Thank you very much, Eric. It is indeed a distinct pleasure for me to introduce the person I believe is the architect of much of our conservation, protection, and sustainability. I have great difficulty trying to confine my message to a short introduction, Prime Minister. So I'll just use two examples. Once, on a small plane flying over Abaco with Eleanor Phillips, the Prime Minister leaned out the window as we approached the wetlands in the marsh of Abaco and said to Eleanor, all of this should be protected, and it should be under your charge, if you could but manage it. Just this week, the Prime Minister reflected, with his Minister of Agriculture and Marine Resources, about the turtles that he saw on Long Island, that by his hand, he protected last year. The Prime Minister loves to eat turtle soup. He's an Abaco man, but yet, by his hand, he protected and prohibited the harvesting of turtles, and was marvelling at the bounty of turtles coming out of a pond. When the Minister remarked at how many eggs they found on the beach, I could see his reflection change, and the delight increase in his face, to hear that the turtles were coming back. I use these two illustrations to make the point that, in protecting the hills, the wetlands, and passing the Planning and Subdivision Act, and the Forestry Act, and making the endowment to the Bahamas National Trust that made it ten times bigger than it ever was, and in protecting sharks, and finally in ensuring that close to a million acres of The Bahamas' land and marine area are under permanent protection, the Prime Minister has demonstrated far greater than any other world leader, his commitment to sustainability. As I indicated to the gathering earlier this week, when we announced the protection of sharks, the environmental community in The Bahamas has no better friend than Hubert Ingraham. And so I would invite you to stand as we invite him to the podium to give his remarks.

Hubert A. Ingraham

Thank you Minister Deveaux. The reality is that people like Lynn Holowesko and yourself and Teresa Butler and others drilled in my head 20 years ago how I ought to become very concerned with the environment. I'm pleased to say a few words on the launch of this environmental management design and planning conference, and to acknowledge formally the collaboration of The Bahamas government with the Bahamas National Trust, and the Harvard University Graduate School of Design in the realization of this meeting, and to express my appreciation to His Highness the Aga Khan Foundation for the part which he played

in causing this conference to come about. This conference will provide us with the opportunity to undertake activities to assist in educating and informing citizens on important matters related to environmental protection and conservation. It is supportive of the planning and management initiatives underway at the Ministry of the Environment, and fulfilment of the standards and requirements of the Planning and Subdivisions Act, 2010.

The natural environment, inclusive of its conservation and enhancement, has long been of importance to the government of The Bahamas, as evidenced by the fact that the establishment of the Exuma Land and Sea Park, the oldest park of its kind, dates back to 1959. Additionally, the park has been managed since 1959 by the Bahamas National Trust, which itself was established by an act of Parliament. In 1986, new by-laws for the Exuma Land and Sea Park declared the park as a "no-take zone," or "marine fisheries reserve."

The Sea Park is unparalleled in beauty, with pristine biodiversity—a true treasure. Indeed, it is truly a bountiful treasure of marine resources and a replenishment area continually providing young conchs, groupers, and crawfish to the waters surrounding this national treasure. It is therefore appropriate that the Exumas, the home of the Exuma Land and Sea Park, has been selected to benefit from the knowledge, expertise, experience, and advice of all of you gathered here today. Effective planning and responsible environmental management will be critical to the future development of the Exumas, and indeed, to all our islands. Planning for the future development of The Bahamas presents the challenge of fostering the well-being of the people, while at the same time preserving the natural beauty and unique ecology of our archipelago. Notwithstanding this challenge, much has been accomplished, and of course there is much more to be done. When my government first came to office in 1992, we began a dialogue with concerned and interested environmentalists with a view to enhancing the conservation of our natural environment, an extremely vital component of our tourism product. During our three non-consecutive terms in office, we have maintained our commitment to ensure, to the best we can, responsible environmental stewardship. We have sought to advance a national dialogue to embrace many facets of environmental protection and conservation, and to adopt initiatives that would best serve the interests of the Bahamian people.

We developed policies to promote sustainable development of our resources, and we have enacted legislation necessary for the implementation of our policy for environmental sustainability. Specifically, some of the initiatives included the following:

Hubert A. Ingraham

- The establishment of The Bahamas Environment, Science and Technology (BEST) Commission whose mandate was to coordinate the government's response to important international environmental initiatives, and to develop a protocol requiring Environmental Impact Assessments on all proposals for major new developments in The Bahamas. Originally required for foreign direct investments only, the EIA protocol was subsequently expanded to include all significant developments.

- The enactment of laws and regulations which: created a protected tree list and put a set of rules in place for dealing with protected trees; outlawed long-line fishing; and prohibited the fishing for Nassau grouper during spawning aggregations.

- In 1999 we caused an inventory to be undertaken of the 40 creek systems in The Bahamas that had become badly degraded and in desperate need of rehabilitation and management, and thereafter spearheaded the study of degraded creeks, and established the National Creek and Wetlands Restoration Initiative.

- In early 2002, we doubled the size of the national parks managed by the Bahamas National Trust, and in 2009, to mark the 50th anniversary of the National Trust, we further expanded the National Park System to include additional important marine areas in Andros and around the Conception Island Land Park and created a new national park at Fowl Cay in the Abacos.

- Since May, 2007, we have increased our direct budgetary contribution to the Bahamas National Trust ten-fold to one million dollars annually, in recognition of its expanded responsibility as a non-profit NGO, for the management of an enlarged national park system.
- We enacted the Planning and Subdivisions Act, 2010, which calls for development of land-use plans for each island in the country.

- Our new Forestry Act, 2010 is designed to assist the sustainable development and management of our forestry resources.

- We have also amended the Bahamas National Trust Act.

- Earlier this year, we banned turtle fishing and, just this week we approved new regulations prohibiting commercial exploitation of any shark species in our waters in recognition of the importance of top predators, like sharks, in sustaining healthy ecosystems and fish populations. The extensive international media coverage of this major accomplishment attests to the fact that what we did domestically is of global significance.

Outside of The Bahamas, we have expanded funding to the regional protected area system markedly through sponsorship with other regional governments, The Nature Conservatory, and other donor countries and international organizations in the Caribbean Challenge. We are cognizant that communities exist adjacent to national parks and other sensitive ecosystems and, consequently, those communities impact these systems. Therefore, to effectively plan for those impacts, we need to produce planning principles for development to guide present and future decisions as we seek to foster sustainable communities. The Exuma Land and Sea Park is home to a number of private islands whose private ownership predates the creation of the park, and is bordered by a number of other small communities. Oftentimes that is forgotten in The Bahamas. The existence of private property in and adjoining the park are perfect examples of why we need to ensure sustainable development and land planning for the Exumas, and by extension, for all our islands. Privately owned islands and Cays in the park have been the cause, over the years of expressed concern by, first, other owners in the park; second, the Bahamas National Trust, which is responsible for the management of the Park and enforcement of its by-laws; and third, the wider Bahamian community, and finally by other environmentally conscious citizens.

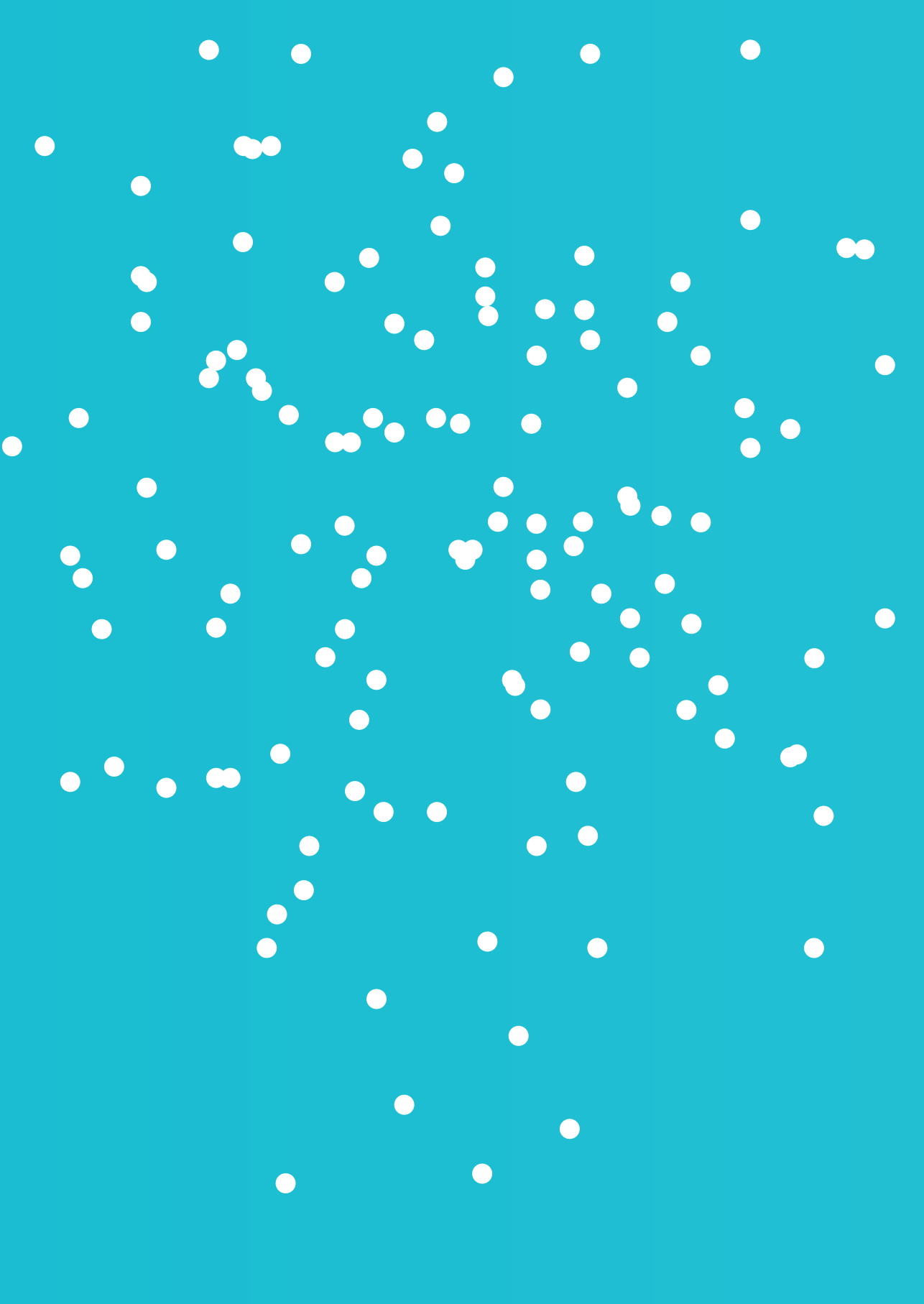
Concerns have ranged from fear of damage to the seabed as a result of dredging, the size and scope of proposed development within or near the park's boundaries, the introduction of commercial activity in the park, the capacity to enforce the by-laws of the park, and the need to develop and enforce new rules. These concerns indicate the need for clear, easily understood and enforceable user protocols, which identify and define sustainable practices, and for required sound planning principles inclusive of density rules, building standards, and maintenance. Similar concerns have also been expressed about developments on other islands such as at Clifton and the Albany Resort in southwestern New Providence; Bimini Bay in the Biminis; and Baker's Bay, Abaco; and at Emerald Bay, Exuma; just

Hubert A. Ingraham

to name a few. It is certainly not the government's policy to impede development, but it has become necessary to require the development in our country, particularly in communities proximate to National Parks and protected areas, be harmonious with the environment, and for them to be governed by the highest standards and best practices, so as to accommodate desired and appropriate use. Today, with the help of the Harvard Graduate School of Design, we begin the process for the Exumas. This multiyear initiative, I hope, will analyze the Exumas from environmental, social, economic, and planning perspectives, and will provide a model for land-use plans in The Bahamas. We have made significant strides as a corporate community, along with our international partners to ensure the conservation and preservation of the stunning beauty and natural environment of the archipelagic jewels of the Bahama islands. It is therefore my hope that this undertaking and the ongoing collaboration will enable us to accomplish even more. I wish you the best, and thank you for your participation. I look forward to the fruits of your collaboration.

Eric Carey

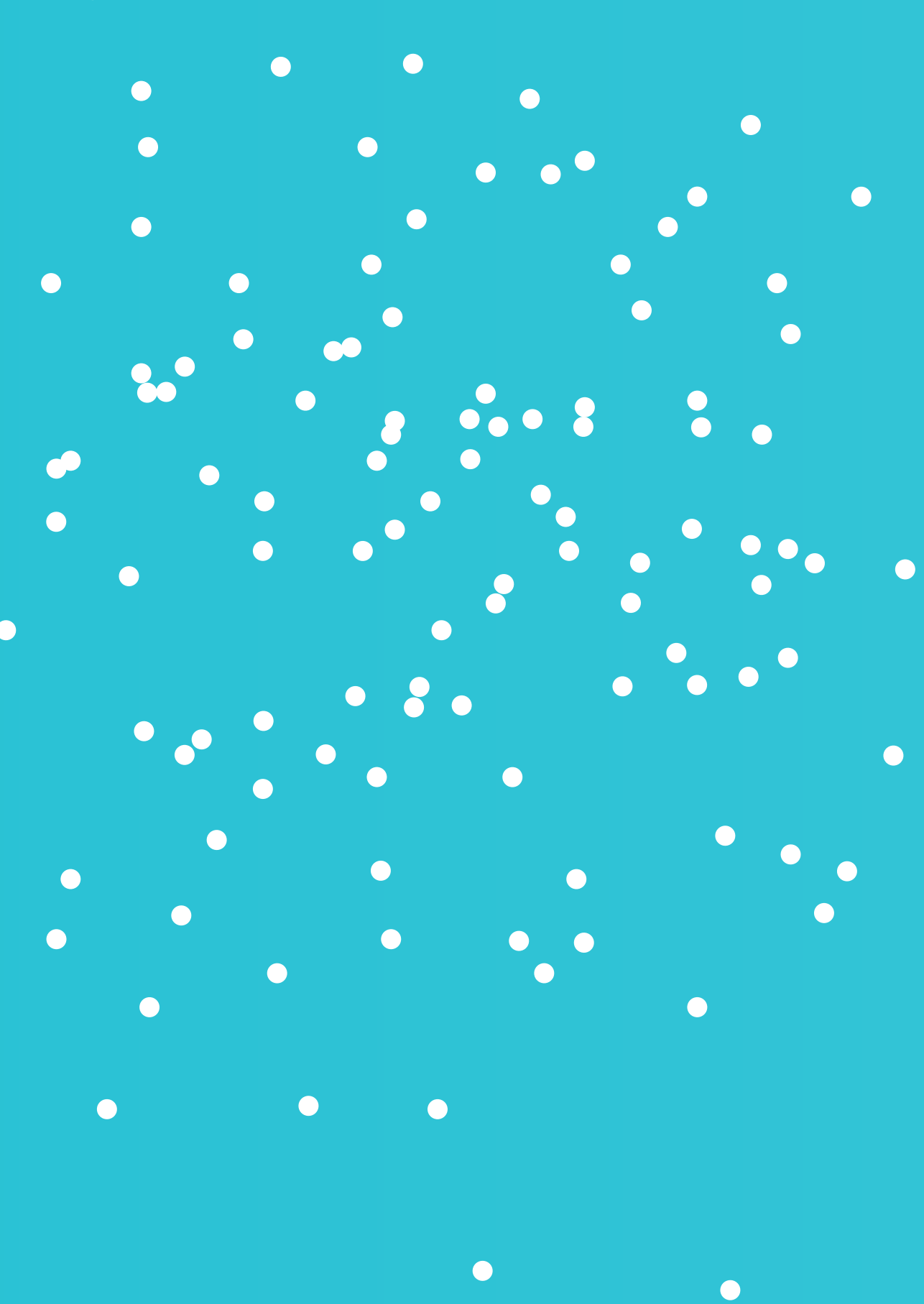
Thank you very much, Prime Minister. I wish to assure you that the National Trust never forgets, and that it is deeply appreciative of your efforts. I think this government, as history is written, will certainly go down as one of the most environmentally friendly governments that this region has seen. I think we've shown great leadership regionally, and will be noted globally for our efforts. That brings us to the end of this first morning session.




WALKER'S CAY
TREASURE CAY
MARSH HARBOUR
ABACO ISLAND
WEST END
GRAND BAHAMA ISLAND
PALM BEACH
FREEPORT
GREAT HARBOUR CAY
BERRY ISLANDS
BIMINI ISLANDS
PARADISE ISLAND
NORTH BIMINI
CHUB CAY
NASSAU
MIAMI
ALICE TOWN
SOUTH BIMINI
NEW PROVIDENCE
SAN ANDROS
ANDROS TOWN
FRESH CREEK
MANGROVE CAY
CONGO TOWN
ANDROS ISLAND
LEGEND

# IV Exumas from Above: The Sea


THE ISLANDS of The BAHAMAS
ELEUTHERA ISLAND
ROCK SOUND
ARTHUR'S TOWN
CAT ISLAND
SMITH'S BAY
BANNERMAN TOWN
NEW BIGHT
COCKBURN TOWN
SAN SALVADOR
EXUMA CAYS
CONCEPTION ISLAND
RUM CAY
PORT NELSON
SAMANA CAYS
GREAT EXUMA ISLAND
STELLA MARIS
LONG ISLAND
STOCKING ISLAND
GEORGE TOWN
DEADMAN'S CAY
LITTLE EXUMA ISLAND
CROOKED ISLAND
COLONEL HILL
PLANA CAYS
MAYAGUANA ISLAND
ABRAHAM'S BAY
LONG CAY
ACKLINS ISLAND
SPRING POINT
RAGGED ISLAND




Preserving our best-loved traditions

# V Creating a Culture of Land Planning in The Bahamas

## The Hon. Earl D. Deveaux, Minister of The Environment

In 2010, the Bahamas Government sought to advance land-use planning in the nation. Planning the built environment of The Bahamas needs a new approach that will honour our traditions in building communities while protecting our natural resources. Three pieces of progressive legislation were passed in 2010 to modernize land-use planning—The Planning and Subdivisions Act, The Forestry Act, and The Bahamas National Trust Act. Together these acts strengthen the BNT's ability to manage national parks and update its organizational structure.

These Acts are critical for The Bahamas' continued growth and development and reflect the government's desire for successful and sustainable development of our islands. This symposium is intended to launch a process for developing land-use plans to support the Planning and Subdivisions Act. Once this first land-use plans is completed, it will be used as a model to create other land-use plans throughout the archipelago. This will create a new culture of planning in The Bahamas, and will ensure that while development is important and essential to the welfare of our people, development itself will not destroy the country's continued need to succeed in the future.

I wanted to show you all a few pictures to put in perspective and to share in the most effective way why we believe sustainable planning is important. We have produced a series of slides, and the first you see is Warderick Wells, the heart of the Bahamas National Trust Park headquarters in Exuma Cays Land and Sea Park. I wanted to specifically point you to the very open marine environment.

The next picture is a trip back in memory. This is what The Bahamas used to look like, and how our people carried things, maintained their yards, built their walls. There are a few more shots of fishing boats. That's the way we carried mutton to the slaughterhouse back then. And this is the way we caught and maintained our fish. That's Prince George Wharf.

We commuted between the islands like this, and many of us lived like that. Notice the treescape surrounding this house to keep it cool and shaded.

That's the way the forest looked at the time. We started to learn about the value of forests in the 1920s, the '30s, up to the '50s, and did things like that to our forests in Andros, Abaco, and Grand Bahama.

And that's the example of a logging operation. At the time, when we did it, we intended that five trees per acre would be left. We didn't have foresters at the time, and so the trees that were intended to be left were intended to reseed the forest and to make it sustainable. We had, in essence, a high grading of the forest and pillaging of the forest estate. So today we are now at a point where we're trying to resurrect it.

And this is the challenge of what we are dealing with. We took this picture last Saturday (2 July 2011). This is essentially from Pinewood Gardens, looking across to Kerzner, to see how development and urbanization have overtaken New Providence, and the pattern that it has

taken. Believe it or not, that was taken last Saturday, too. From the air, that's what The Bahamas is beginning to look like. That is the road that will come over from Gladstone, and this is the roundabout that will go there. And these are some of the issues that we want to address as a result of this conference.

People have issues regarding development. They get very emotional about land. Inagua Cay. I'm not quite sure whether this is Bimini, Pinewood Gardens, Exuma, Andros, or where: it could be anywhere in The Bahamas — people are concerned about land and development in the country.

This is what we used to do: a typical subdivision is designed and intended to maximize lots to be at the minimum compliant with the Town Planning Act. And so all the trees are taken out. We ensure that the road is the minimum width. The alleyways too. And that's the way we used to plan subdivisions, without regard to the surrounding communities.

I wanted to show you this to illustrate why we must plan. This is a cay in the Exuma Park called Over Yonder Cay: windmills to capture the wind and create energy, solar panels to capture the sun's energy, and there is a diesel generator. This particular cay can supply itself with electricity from the generators from the wind turbines, from the solar panels, or from the diesel generators. If you want to see extravagance in the name of renewable energy and sustainability, look at Over Yonder Cay. Now, we believe that renewable energies are the keys to the future, and we think of them as benign. But this, more than any other slide I will show you, should illustrate the need for planning and appropriateness. When you go into the Exuma Cays, you are confronted with this development, and it is somewhat jarring. But yet, it is trapping the energy of the wind and the waves, and it is intended to be sustainable. They are also doing dredging here.

This is Elizabeth Harbor in the Exumas, a very beautiful picture. Most people won't believe that it was only last year that we put a wastewater treatment in the Exumas, in Elizabeth Harbor. So all those regattas that you went to, and all those boats that go to Elizabeth Harbor, it was only last year that they were able to treat the effluent from the boats. And I use that to make a point, that from Stocking Island to Great Exuma to Over Yonder Cay to Warderick Wells (our first slide), the ocean knows no borders.

This is Abaco. This is my absolutely favorite subdivision in the whole Bahamas. This is Schooner Bay. These pictures are intended to show how Schooner Bay harmonizes development with the land, the sea, and the trees to create an environment that is sustainable. Narrow roads, tree preservation, lot sizes are defined. Access to the beach is defined. And there is a farming community. It embodies the principles of sound planning that we want to inculcate and nurture in our society.

I know you all don't like wooden houses, because you believe they catch fire and burn easily, but more people want a dormer window today, and everybody wants a picket fence and a garden. This is the way it used to be. Is that Spanish Wells, Harbour Island, Bimini? Somewhere in New Providence? Everywhere Bahamas? That's the way we designed homes and houses. We left trees in place. We had wonderful, beautiful colours that blended in with our community. We knew how to build. We knew how to design. And we used our natural products to build and design.

This next series of slides shows what we're seeking to protect— conch, grouper, birds. Some people love lizards. And-man-of war fish eats all the crabs. I would have preferred that picture to be a land crab. But I think you get the point that in planning for a development, we must leave space and opportunity for these creatures that we enjoy.


What would The Bahamas be like if you couldn't get a conch salad? What would it be like if you went into the forest and couldn't hear birds sing? What would it be like on New Year's Day, or any Saturday, if you couldn't have boiled fish? And that's why we must plan for the preservation of ecosystems that keep these things. Now, I have never seen a Bahamian with a pet osprey, but imagine going to the Exuma Cays or any island in The Bahamas, and not being able to see this beautiful site.

And so there's an overhead shot of Exumas. You can imagine New Providence to the left, Long Island to the right, and this interconnected series of cays and islands. Between Ship Channel Cay and Barraterre is Black Point, Farmer's Cay, Staniel Cay and a number of other developments. The memory I want to leave you with is the continuity of that ocean. There's deep water. There's shallow water. The complete integrated nature of this system of water is why we must plan for its development.

Photography courtesy of Bahamas National Trust, Bahamas Information Services and Collection of Capt. Paul Arahna

VI

# Seawater and Brackish Water Treatment: Challenges and Design Considerations


## C. Robert Reiss



Freshwater is not readily available in The Bahamas, and therefore, the primary source of drinking water is either seawater or brackish groundwater. The treatment of such sources requires careful evaluation and design in order to provide reliable and safe drinking water to consumers and in the meantime minimize the capital and operating costs of such complex treatment systems.

Typically, a reverse osmosis membrane system is used to treat salt water, and the challenges encountered by the designer are mainly related to source water withdrawal, pre-treatment prior to reverse osmosis, and post-treatment. For example, beach wells or open intake for seawater withdrawal should be technically and economically evaluated prior to making a decision, and both present infrastructure design challenges. The design of such seawater withdrawal infrastructure directly impacts the costs and operations of the plant. This paper presents the challenges of designing the infrastructure for seawater and brackish groundwater plants in The Bahamas.

Two days ago, do you remember we had what seemed like a monsoon sweeping through? I was in a very small aircraft diverting to the left, to the right, every which way to get around that storm, down into Rock Sound, and then transported off the coast to a small island to meet with a developer. He shared some of the tremendous passion that you heard in Minister Deveaux's speech preceding mine. "How can I develop and be sustainable and protect this beautiful, beautiful environment that is a part of my property?" We talked about some of the different options relative to having sustainable energy sources, reducing the carbon footprint, and protecting the environment. When we were done, I told him, "I understand your vision for a sustainable environment to provide stewardship and leadership relative to the environment, and I will commit to do anything I can in return for getting me back inside and out of the bush before the mosquitoes eat my last little bit of blood." So I now owe him, because he did that for me.

I was asked to speak about water supplies for the Exumas, and in particular, sustainable practices. I'd like to talk first about sources of supply, and the historical practices for water supply in the Exumas. I will speak about what other alternatives there are for sustainability. And then I'd like to touch momentarily on wastewater treatment, because certainly there are environmental impacts on the water supply side, but equally, if not more so, potential environmental impacts from wastewater.

In the Exumas, as is typical, one likes to look at all of one's options, freshwater—whether that be from rainfall or fresh groundwater that can be pumped. The freshwater lens underneath the Exuma island chains is similar to any other, in that the interface from the freshwater lens to the fully saline lens happens very, very quickly. Unlike with larger landmasses, brackish groundwater is very limited.

Looking at historical practices in the Exumas, in 1970, the Bahamas Land Resources Survey did, in fact, identify a freshwater lens in Great Exuma that could be utilized. A total of 13 well fields were developed, primarily on private lands. The water was fresh, but did have some treatment issues, in particular hydrogen sulfide gas, which creates the rotten egg smell and which requires air stripping and volatilization of hydrogen sulfide. Unfortunately that capacity is very limited. Over time, the Water and Sewerage Corporation has gradually phased out those well fields and moved on to what we're all quite familiar with in terms of reverse osmosis and desalination treatment.

In 2004, the reverse osmosis system was initiated in Georgetown. It has since been expanded. There are further expansions potentially in the future. And then there is a whole range of small reverse osmosis

systems throughout the Exumas. Currently there are desalinated water supplies at Black Point, Farmer's Cay, Staniel Cay, and plans for a facility with six storage tanks in Williams Town.

Moving forward, the use of desalination is going to continue. It is the method of providing a reliable source of drinking water supply. But the question is, what are the other choices, and how, if reverse osmosis will continue, do we do that from an environmentally reasonable standpoint?

Clearly, and even in Great Exuma, fresh groundwater supplies have been far outstripped. The classic use of cisterns will always remain, but the issue of cisterns and rainfall is in fact unreliable supply. It's great when it has rained, and you have that supply, for irrigation or drinking water use, but there must be a constant available supply. As I mentioned, brackish groundwater is not really an option. So seawater really is the most reliable environmental resource to use for water supply. The question is, how to use that seawater in a reasonable fashion?

In terms of obtaining it, deep wells are the most common method of obtaining seawater in the Exumas and throughout The Bahamas. There are some facilities that have used beach wells—a French drain-type system underneath the sand to protect the marine organisms. There are significant technical challenges with keeping those operational and not having them foul. Open intake is very uncommon, but unfortunately I have seen it. It does exist. There is an industrial facility here in New Providence that has done that for many, many years. And obviously that is a grave environmental concern regarding entrainment, and entrapment of marine organisms.

So, from an environmental standpoint, we support the use of deep wells relative to reduced if not eliminated impact on sea life. And it provides a better quality of water to feed into a reverse osmosis system, so it, in fact, doesn't plug or foul. It meets both those objectives.

Reverse osmosis systems themselves are the way that coastal communities and island communities receive their water. There are other options, such as multistage flash distillation and other thermal processes. Those are used in larger communities around the world. They are extremely environmentally insensitive. They use a very high carbon footprint, and are usually collocated with a power plant. So the logical technology that is portable and that can easily handle smaller capacities is reverse osmosis. But there is

still a challenge from an environmental standpoint. The feed pressure to a seawater reverse osmosis system is typically 1,000 pounds per square inch (psi). There is a huge amount of energy required to pressurize water to 1,000 psi. And so, how do we get that quantity of energy in a way that we don't have diesel generators belching out air that impacts the quality of the surrounding environment, or any other issue that relates to the carbon footprint?

As the Minister mentioned, there are several technologies, and I very much appreciate his comments regarding any technology that you use needs to be well thought out and planned, because it can also impact the environment. When we look at the Exumas, many of the cays are not able to tie into the grid, even if they wish to. It really does become a choice of a diesel-driven generator or some other alternative. One of the things regarding small-scale reverse osmosis systems is that there is not yet really a commercially available system with a proven track record which integrates solar technology, but the solar technology itself exists as a standalone right now, today, and can easily be mated with a water maker or other reverse osmosis system.

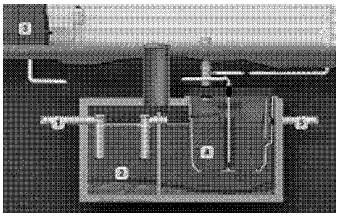
Wind power has the same type of considerations, and in Jamaica right now there is a 75,000 gallon per day seawater system that is solely wind driven. So the mating of the various technologies is coming together to integrate with water supply needs.

There is the issue of higher capital costs, but in the long term it means lower operating costs and certainly reliable supply.

Reverse osmosis systems generate brine. They generate a concentrate. Typically for every gallon of water you put in, you get a half a gallon of freshwater and a half a gallon of saltier water than what you started with. So the question is, where does that go? The Water and Sewerage Corporation has only one authorized method, and that is "deep well". This is not to say that there aren't other ways of disposing of the brine, such as that we have seen in the Family Islands. It is clear that deep well discharge is in fact a tremendous method to take what is a saltier water down into the saltwater aquifer and dispose of it.

But when you look at surface water disposal, taking brine directly to the immediate offshore environment, where there may be spawning beds or coral, you can have some impact. It is not inherently toxic water, but it is of a different nature and constituency due to its salinity than the receiving water, the surrounding water bodies. It is clear that there is a cost consideration that drive projects to sometimes consider surface water disposal. But it is something to be very, very cautious about and very cognizant of where that brine is being discharged to—preferably to get it out into an area where there is a flow of water along the coast and move it off sensitive areas. That's it relative to water supply. I think the future is what we see today relative to reverse osmosis. But the question will be—it goes back to the planning aspect being discussed here today—is how do you plan reasonably for meeting the needs of communities while also considering the environment?

Let us talk about the wastewater treatment, which doesn't get discussed as much in The Bahamas, partly because of the small flows from smaller communities. A larger portion of water supply in many cases is needed for irrigation, and the actual amount of water that comes back as wastewater from a home or a development is actually fairly small. Nevertheless, it has a very significant impact on the environment, depending on how it is addressed. In smaller communities in the cays, septic tanks are the norm. But you end up with a drip field that is near the surface, in adjacent areas that could leak into the freshwater lens or other aspects of the surrounding community. And certainly very high levels of nutrients are not desirable in the environment.



One of the things that the Water and Sewerage Corporation and private developers and other communities have been looking at in the past five or six or eight years that is becoming quite common is the "advanced" septic tank, which use aeration blowers to allow aerobic bacteria to degrade the waste. In fact, I've heard the term "septic tank on steroids." It is actually no longer a septic tank, but an aerated tank with biological activity. It is a phenomenal way to reduce the environmental impact and improve the quality of the effluent that is discharged from that facility. At least to try to have a technology that will provide some benefit, I think, is very important. The other alternative for that effluent is, if it is available, to discharge it down deep wells. And again, certainly in larger-capacity communities, that is the norm as well here in The Bahamas—and very much an environmentally sound practice.

The Minister mentioned the marine waste in Elizabeth Harbor, which has up to 500 boats during the regatta. The facility that he referenced is a GEF (Global Environment Facility)-funded wastewater treatment plant initiated last year and

commissioned this year in Georgetown. This is a very, very interesting technological challenge trying to address an environmental matter, because the boat wastes are saline.

Utilizing a wastewater treatment facility that will actually degrade the waste to an environmentally acceptable level is extremely challenging, versus a traditional wastewater plant that receives a freshwater waste and freshwater bacteria to degrade that waste. We were involved in the front end of some of the technology analysis, and this facility does require advanced treatment technology that can handle marine waste and utilize marine bacteria to degrade it and then subsequently send it down a deep well. But a wonderful facility to see built.

# VII The Perry Institute for Marine Science: A Venue for Sustainable Research, Technology, and Education in the Exuma Cays

## Erich Mueller

John H. Perry, Jr. recognized the need for sustainable development of marine resources and energy long before the notion became mainstream. Numerous aquaculture projects were undertaken in the 1970s and 1980s at Lee Stocking Island, just north of Great Exuma. Work on tilapia aquaculture led to the successful development of this current technology. Mr. Perry also used a large solar array and wind turbine to provide power for the research centre established on the island. In the 1980s he was recognized as a pioneer in the development of fuel cells and the use of seawater to generate methane. After 40 years, the research centre continues to facilitate world-class marine research and education. The location and infrastructure of Lee Stocking Island is superb for the development of new technology, and is responsible for training a new generation of Bahamians to construct and maintain sustainable systems.

I love The Bahamas, and nowhere more so than the Exumas, and I want to tell you a little about someone else who also had a great love for the Exumas and started sustainable practices before most of us knew what sustainability was. That's the history of the Perry Institute for Marine Science, which I want to talk about for a little bit, and then I will talk about where we're going. The vision that I have been gelling in my mind for some time is so in line with this conference, that I think the timing is perfect.


John Perry was a newspaperman originally, but he fell in love with the sea, and he pioneered a lot of undersea research technology in the 1960s, building a number of submersibles. He was key in the founding of the National Oceanic and Atmospheric Administration (NOAA). He created all kinds of equipment, in addition to submersibles, remotely operated vehicles, even undersea habitats. This was a time of great excitement. Jacques Cousteau was becoming known to the world and inspiring people to live and work undersea.

Hydrolab I was deployed off Grand Bahama for close to two decades. A lot of research was done there. And then it was moved to St. Croix. Hydrolab II, which is much smaller, is located right off Lee Stocking Island. Mr. Perry had a commitment to not just the undersea, but using Lee Stocking Island as a test bed for sustainability. Again, he didn't call it that at the time.

The Exuma Cays run down along the side of Exuma Sound, and Lee Stocking is located just north of Great Exuma Island. There's nothing on the island but the laboratory and its facilities and an

airstrip. This all started to be developed in the 1970s as a research centre and also as a test bed for energy systems. As a research centre for marine studies, it was ideal, because of the deep oceanic waters of Exuma Sound, the shallow waters of the banks, and virtually every habitat in between. So it has attracted scientists from around the world to work on these habitats.

A brief history. We have some Loyalist Era ruins on the island, and they may be related to the salt works, which was over here on Norman's Pond Cay back in the Loyalist time. There are some ruins on the island that may relate to that but really, nothing was built until Mr. Perry purchased the island in the late '50s, and then really started getting going in the 1970s with the founding of the Perry Foundation. Today we call it the Perry Institute for Marine Science. As that lab grew, it became established as the Caribbean Marine Research Center in 1984. Many scientists still know us as the CMRC, and so you may hear that term out there. Several years later, we were designated by NOAA, the agency that Mr. Perry helped found as one of six national undersea research centres. We were the only one not in the United States. All the others were scattered around the USA, and their purpose was to bring technology to marine scientists, submersibles, deep diving technology, and remotely operated vehicles, and to make them available to scientists. It also supported basic science in the area.

Over the 40 years that the Perry Foundation has been in existence, we have had a pretty impressive track record. Hundreds of institutions have brought thousands and thousands of scientists and students here. Many graduate degrees in part or in whole have been finished here, as well as numerous publications. This number climbs every day. We have people that are spending almost all day underwater as we speak right now—working on lionfish, working on other issues, diving and spending a lot of time underwater. I'll show you the submersibles that we did have on the island. We don't anymore, but many dives were conducted on the wall that drops right off into Exuma Sound, so we learned a lot about that deep-water habitat. A lot of money has been brought in for research, and of course, some of that's trickled into the local economy as well.

I just want to briefly capture some of the projects and you'll begin to see the scope of some of the sustainability items that Mr. Perry was focused on. Tilapia aquaculture is one of the success stories in aquaculture. You can find tilapia in just about any supermarket or restaurant these days in the United States.

Alan Stoner conducted a lot of the very seminal work on conch biology and

principles of aquaculture as well here. He's recently come back and spent a little time here cruising this year, but he's also helped inspire a project called Community Conch, which just finished up on the island repeating surveys of conch that Alan Stoner did 20 years ago. That group is now in the Exuma Cays Land and Sea Park, again following up on this historical data. One of the values of Lee Stocking Island is we've been there long enough now, we're starting to develop historical data sets.

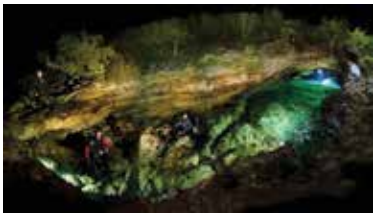
The aquaculture of lobsters is a little difficult, but stock enhancement, both with conch and lobster, has a future, which we can talk about another time.

Carbonate geology is not of particular economic significance, but giant stromatolites are a living example of one of the oldest forms of life known. The discovery of these in the 1980s brought geologists from throughout the world to come back to Lee Stocking Island, and they continue to do so.

We had a two-person sub that operated out of the lab during the 1990s. Today we're doing a lot more using technical diving, rather than submersibles. It allows you to get right to things hands-on. Of course, you can't go quite as deep, but you can get hands-on, and it's much less expensive. We just had a group working down at about 450 feet. And we have another group coming in a few weeks that will be doing 300-foot dives in Exuma Sound.

For many years, we had a dive safety officer who some of you may well know of, Brian Caycook, he's now on Abaco. Last August, *National Geographic* featured the blue holes of The Bahamas, and Brian was the dive team leader for that. He spent many years at Lee Stocking, and he opened my eyes to the habitats around there. I didn't go in the caves with him. Brian does crazy things in caves, and he's really good at it.

There is one on Norman's Pond Cay next door that he helped pioneer. It doesn't look like much. The opening is just a little opening in the rock, but it goes in over 300 feet deep and over a quarter mile back. There are many such



caves, and Brian has pioneered many of them. We've had scientists such as Dr. Craig Dolgren, who is on our staff, do a lot of work on fish and fisheries ecology, as well as Mark Hickson, who with his team has been coming every year for 20 years from Oregon State University. Mark Hickson is considered one of the leading fisheries ecologists in the world. Right now they're focused on the invasive lionfish, which we've heard mention of before, and they've been doing some of the seminal work on the effects of this fish in The Bahamas.

Some of the deep diving work involves looking at potential biomedical products as well as ecology. I, as well as Craig Dolgren and others, working out of the lab, have done a lot of work on the Exuma Cays Land and Sea Park in helping to design marine-protected areas and evaluate their effectiveness. I'm basically

a coral biologist, and there are many people other than myself that have been doing a lot of really good work in coral biology, including on the effects of global climate change, which are affecting coral reefs throughout the world.

Unfortunately we lost NOAA funding in 2006, because of economic and political realities in the United States. We still have this monitoring stick out there in the sea, but there are no instruments on it. So there's an opportunity for someone

that wants to help us get back into monitoring global climate change.

Education has always been a part of our mission, but it's taken a back seat and that's something I've been trying to change the last few years—not just traditional education with college groups such as the College of The Bahamas and the University of Wyoming who came out two years ago looking at ocean acidification—but also to get into our local schools much more than we have in the past, and to do it on a consistent basis. We have come out to the island, sometimes with schools, sometimes with the Boys Club or Girl Guides; when we can't get them out, we go in to the classroom as well. We've had a number of teacher workshops—again, something I'm looking at increasing over time to help spread the information that we generate, and distribute it to the schools.

A particular community that we have in Exuma, and as well on Abaco and other parts of The Bahamas, is the cruising community. In Elizabeth Harbour, we have several hundred boats congregating at the peak of the season, and until we had the pump-out system last year, most of them were discharging waste directly into Elizabeth Harbour. In prepping for the pump-out system to come, I tried to get people to realize why they needed to do it. It's going to cost them some money. It's going to cost them some trouble. But they need to understand why they can't be discharging their waste into the virtually pristine waters of The Bahamas.

We have interns from around the world coming constantly. There are always one or two interns there. So that's another aspect of our education programme that has influenced many careers and continues to. Then there's educational material. Some of you may have seen our poster series. The first one was the conch, and there's Nassau grouper and lobster. The posters distributed not just in The Bahamas, but through much of the Caribbean and throughout Florida, and we'll continue to add new species of interest as funding allows.

So where we go from here? Certainly some of the things that we've been doing we're going to continue. Our visiting scientists programme brings fame to The Bahamas around the world. People know Lee Stocking Island, because they know this is one of the best labs in the world. It can be better, but it's still one of the best out there, so we'll continue that. I want to get in-house research re-invigorated. Since we lost the NOAA funding, we've not had as much ongoing 365 days a year kinds of programmes. As I mentioned, with education, I think it's important to expand our reach into the classrooms, as well as host field programmes on the island. We have a great facility to do that, which has been highly underutilized.

We're looking at a establishing a scholarship fund that will support Bahamian interns and grad students. We've already had some students who have been very notable. Nikita Shiel-Rolle, whose book (with John A. Thompson) you may have seen on the Exumas, was an intern, and we want to increase this — where we're reaching more Bahamians and giving them more opportunities to learn about the sea directly. And it's a great place for doing conferences and workshops.

The real thing that I'd like to bring out today is my vision for recapturing what Mr. Perry did. I talked about his submersibles, and I talked about the aquaculture that he supported, but there was more going on.

Back in the 1980s, the research site had a wind turbine and a solar array with 100 panels, which were a little bit before their time, and they worked. The batteries were cumbersome. Batteries are still a problem. Mr. Perry was trying to develop alternative energy, alternative food, alternative sources for water. We're still using reverse osmosis (RO) that was also pretty new technology then. He was working with hydrogen, trying to get fuel from the sea. He developed fuel cells that you can still purchase today. He sold the technology to Teledyne. We've lost that kind of thing along the way, partly due to funding reasons. I'd like to recapture that spirit and use the islands as a test bed.

What I'm proposing is something I call the assist programmes. They're dealing with four of the five most important things to humans: water, food, shelter and energy. Air is missing—intentionally—because at least in the Exuma Cays, our air quality is excellent. We really don't have a problem with that. In Nassau, it may be a different issue. These systems will all deal with these critical things, and I'm going to lay out a little design challenge at the end that integrates them all. First of all, start out with some real workshops, not "talk shops," but workshops where you come away with tangible products for design and engineering specifically for these island environments. And have an island where you actually test these. We get products from the United States all the time and bring them out to the island. They disappear into a pile of oxidation within a period of months or a year; certain rubber compounds, even not being out in the sun, turn into mush. This is a real environment, and we can tell you that the rates of entropy on Lee Stocking are higher than most places in the world. So that means things tend to degrade. We can test them in a real-world environment, and then actually pass on this technology to Bahamians first in the form of training workshops, where they're learning how to operate systems, and then bringing that knowledge to their communities. That technology transfer could go beyond The Bahamas, to other island groups. We're not talking about training just Exumians. We might start with that, but there's no reason why we couldn't bring in students for training sessions for a week or two, and have them go back out and bring sustainable technology throughout the Caribbean.

This is my design challenge for those who are architects and thinking about a systems approach. My approach tends to be more distributed than centralised, and I think that's more appropriate for the Exuma Cays, where we don't have an urban environment. Some centralisation on Great Exuma may have its scale-dependent benefits. The idea of the Exuma House is not really a single house, it's a modular concept that can be used for small buildings. If I were designing it, it would be a structurally integrated panel construction, and I would train people and set up local facilities to create these panels. It's relatively low tech. You can use standardised materials, and you can

make them relatively inexpensively. So you can get people working the whole product cycle of the building, from constructing the panels, to building the structure, and then operating it. The realities of the Exumas mean that you've got to be hurricane resistant, because we do get hurricanes once in a while. So the building has got to be sustainable from weather, and also from rot, insects, corrosion. There are so many parts that we put into a house, windows, etc., that are not designed for these high-salt environments, and you end up replacing them. You need to have something that is cheap and easy to maintain, like no-paint systems. Have your SIPP panels made with integrated colours in them so you don't have to paint them. A lot of these things can increase sustainability over time. Designing and siting to optimise passive cooling. We've gotten within two generations addicted to air-conditioning, yet in the Exumas, we have almost every day beautiful breezes. If you site and design houses appropriately, they're very comfortable to live in. There will be places where sites aren't amenable to that, but then you can have an efficiently designed building with a lot of insulation to optimise air-conditioning efficiency. Of course, you want all the sustainable systems. With respect to water, again, in a distributed system, I like cisterns. I think the problem with them is, they're too small. We have plenty of rain in The Bahamas, but it only comes at certain times. So you need to be able to store it for the dry times. So an investment in a larger cistern can provide all the water you really need. And of course, electricity. I don't have wind in there. I think wind has got its place for certain things. We certainly have pretty good breezes, but when you have moving parts, and a high-salt environment, and then also aesthetic considerations, wind energy is not always so attractive. Minister Deveaux mentioned Over Yonder Cay. I knew the former owners of Over Yonder who had a very nice low-key home on it. Now it looks like a porcupine bristling with very cool, but unfortunately ugly alternative energy.

I'd like to think of my talk as a catalytic element—starting small and working up to the bigger community. We'll certainly be focusing with our research on marine sustainability, but I think it's important for all of us to think about the human element as well, and as scientists we have to address that.

# VIII Pearls in Aquamarine: Environmental Value and Management Strategies for the Bahamian Exumas

## Elizabeth Thomas-Hope

**The concept of "pearls in aquamarine" used here to introduce a discussion of this sub-archipaelago of coral atolls, creates a context for assessing strategies for their employment and management that emphasises aesthetic and authentic value. Both aesthetics and authenticity can be translated into monetary value as a proxy variable for the purpose of allowing comparisons to be made with other utility values that may be placed on the islands. The presentation explores conflicts of interest and issues of sustainability in potential management strategies, and demonstrates the costs and benefits of possible options through referencing experiences of similar types of islands elsewhere. These experiences are viewed in light of what may be assessed as good practice and bad practice. It is argued that a clear notion of the various dimensions of environmental value must undergird all strategies that are developed for the holistic and sustainable management of the Exumas.**

The title of my paper is "Pearls in Aquamarine," not just because I wanted to sound exotic, but because I wanted to consider in a more explicit and purposeful way the issue of value and worth that we place on the environment as we think about planning. In planning, we're very concerned obviously with pragmatic issues—many of them have been discussed already. These are critical. But behind those pragmatic issues is implicitly the sense of value or worth that we ascribe to the environment, generally, and to a particular ecosystem as we plan for it.

So that is behind the selection of my title. We need then to pause and consider the issue of value and worth. The notion of value has both qualitative and quantitative dimensions. The qualitative value often exceeds the quantitative to an extent that cannot be measured, or even imagined. In other words, the quality of the asset is seen to be so great it can be considered priceless. I begin, then, with this thought because we need to include this value that we attribute to the environment in our planning and considerations. The types of value or worth that I'm considering are, first of all, the utility value—or use value, whereby the ecosystem is regarded primarily as a resource to be used so that we maximize the monetary profit that is derived from it.

Secondly, we need to consider the service value—the service of the ecosystem, or the ecosystem services performed. These allow the continual cleansing of air, water, and land, and are carried out through the sequestration of carbon dioxide and the absorption of degradable waste matter. There is, of course, a cost when one has to employ technology in order to provide these services, as we have already seen in the case of water and in many other respects.

Thirdly, the aesthetic value, especially to be enjoyed by those persons who have access to a particular ecosystem, appreciating its atmosphere and beauty while disturbing it so little that the impact upon it is negligible.

Fourthly, the heritage value. In this, I'm including the scientific value, as we have seen in the preceding presentation, referring to the environment valued for its authenticity, and also this plays a role in defining the place and contributing to the sense of education, not in a formal way, but an informal way, to the sense of belonging and identity of a people. So it goes beyond the tangible pragmatic to that of the intangible, the sense of identity and belonging to this place, and the value that this has not only for the place, but for the global community.

Fifthly, the intrinsic value of the ecosystem, which is a value based on its very existence as part of the diversity of the global environment that is part of our shared world, whether or not any human being ever visits it.

It's a balance between the sustainability and vulnerability of the Exumas that we should stop to consider before we proceed. There are two major issues to be considered in the discourse on sustainability of the Exumas and strategies for their management. One, their vulnerability to degradation and loss. The extent to which an industry or other activity depends upon an ecosystem service, or ecosystem services, for its survival is an indication of the vulnerability of the environment of the activity performed. Two, the capacity of the resource use to compensate for, and therefore sustain, the ecosystem in a healthy state. For example, whether the activity can pay for the replacement and the technology required to replace the cost of goods and services provided by

the environment. In the case of the Exumas, I believe, and similar ecosystems, vulnerability is largely associated with the risk of deterioration of coral reefs, loss of sea grasses, the removal of trees, mangroves, vegetation cover generally, and the unavailability or the problem of availability of fresh water of potable quality.

Just briefly turning to coral reefs, to reduce the impact of storm surge by dissipating wave energy, it is essential that our coral reefs be in good quality, quite apart from the other reasons that we need to protect that ecosystem. The trees and bushes on land also serve as natural barriers, or protective barriers, reducing coastal erosion. For example, Barrier Cay to the east, protecting the Exuma Islands from the Atlantic. Therefore, the state of the coral reef, not only of the Exumas, but also Barrier Cay, and in fact all the cays, is critical to the protection of the Exumas, especially in terms of storm surge associated with cyclonic activity. In addition, the reduction as an issue of vulnerability is the reduction in the availability and quality of freshwater resources.

Added to the gradual deterioration of the environment due to stresses of human use and exploitation of resources are the effects now that we must take into consideration of climate change, which are likely to greatly exacerbate the environmental management problems in the future. A word on climate change. The International Panel on Climate Change (IPCC) report identified the indicators of climate change for the Caribbean region based on its monitoring that took place is Eleuthera Island, here in The Bahamas. The report noted that small islands are particularly vulnerable to the effects of climate change, and it highlights the impact on tourism and fisheries as a particular case. Adaptation to climate change now has to be part of our planning for management of the environment in the future.

Climate change is projected to also reduce our water resources in the Caribbean, including The Bahamas, to a point where these become insufficient to meet demand. Planning has to take into account the fact that our climate change predictions for this region are for extended drought periods and increased drying of the climate.

In summary, current indicators of climate change include the increased possibility of volatile weather conditions involving increased severity of catastrophic events such as hurricanes and associated storm surge, and also sea-level rise. Thus climate change will increase the risk of ecosystem degradation and the availability of fresh water, and affect the underlying drivers of more general social and economic vulnerability, such as declining ecosystem services and new patterns of migration.

The combination of sea-level rise, due to global warming, together with any degradation of the ecosystem due to land-based factors such as solid and liquid waste and loss of vegetation cover, could jeopardize significantly—not only the sustainability of activity on the islands, but even jeopardize the actual existence of some of those islands in the future. We only have to look at the case of what's happening in the Pacific and the Indian Ocean to see that small coral atolls are now seriously under threat of inundation. And this is partly due to sea-level rise, and partly due to mismanagement of such factors as water resources.

Despite the tremendous economic successes of the tourist industry, it is

important to note that promoting tourism as the way forward brings to the fore the challenge of balancing the increased use of natural resources, and the resulting environmental degradation with the goal of sustainability. Tourism expansion has major implications for marine water quality and freshwater supply and quality, as well as for air quality. These are dependent upon such ecological services as solid waste and sewerage assimilation, and neutralization, and carbon dioxide sequestration, which have already been mentioned.

It is known that the tourist industry makes heavy demands on all of these resources. Studies have shown that a tourist, on average, uses three times as much water, fresh water, as a local person residing in a place. It has also been calculated that tourists, on average, generate more than three times the solid waste than is generated by local populations. So there will be, undoubtedly, a substantial increase in the volume of sewerage and waste produced by any increase in tourism.

A point I should make is that despite the secondary treatment plants, the additional sewerage and wastewater that will be generated will bring the necessity for a vast increase in the amount of sewerage that will have to be treated in the environment—the secondary treated level as well as much that will not have been treated at all prior to being deposited into the surrounding terrestrial and marine environments.

To give an example from Jamaica: despite the regulations governing the disposal of hotel waste, there have been sewerage problems at one of the recently built properties that was supposed to dispose only of gray water, and so forth, into the deep wells. But in fact, it was found that all sorts of sewerage and wastewater were being deposited in that way. So if the required level of treatment of effluence is not met, the probable outcome would be an increased nutrient loading, leading to utrification in the surrounding marine environment, and this would certainly result in coral reef degradation.

We remember the whole role of coral reef importance, not just directly to tourism through diving, snorkelling, and so forth, and not only directly to the preservation of the ecosystem for its own intrinsic value, but also in terms of the exposure to greater vulnerability of risk of storm surge and loss of land, as well as of investments.

The value in terms of ecosystem services has been shown to be not covered by industries such as the tourism industry. In a study that I did in Jamaica, it was evident that the contribution of the tourist industry to gross domestic product fell far short of the economic value of the environmental services that the tourism industry received—vastly less. In other words, a cost was displayed for utilities, but not for the technological and scientific need for replacement of ecosystem services and goods once they're destroyed.

Going to our other options, which I feel we need to strategically consider as part of the sustainability planning approach, these include the aesthetic, heritage, and intrinsic values of this terrestrial and marine ecosystem.

The aesthetic value. The aesthetic quality of a location plays an important role in visitor satisfaction and preferences for one place over another, obviously. A study that I conducted, again in Jamaica, in the Ocho Rios Marine Park showed the extent to which visitors would be prepared or not prepared to pay to protect the aesthetic qualities of

the area. The indications are, of course, that protection would greatly restrict the numbers and types of visitors to an exclusive few. This would be the price paid to effectively keep mass tourism out. So there is a cost, obviously.

Then, there is the heritage value. By this, I am also including the scientific value, the study of systems, and educational spinoffs. The heritage value of the area is particularly important for Bahamian nationals. Schoolchildren and young persons, especially, can benefit greatly from coming to an appreciation of the physical heritage of their country. This not only has an educational value in a formal sense, but contributes to a positive relationship with the environment, and a realization of the full worth of the environment. Young people will carry this forward into later life, and into various aspects of their work and their activities with respect to the environment in other parts of the country. The impact of the environment, then, is important not only in a physical or material sense, but it is also in a metaphysical sense, affecting the psyche and the way people look at the world. The level of environmental experience and consciousness helps in building up a positive sense of personal identity, especially in the young, and by extension, a more positive sense of group and community identity. Visits to field stations encourage students to learn about the various elements of their ecosystem, and in particular, to appreciating it—the importance of experiencing and respecting everything in their surroundings. This can be encouraged in various creative ways, including the maintaining of quiet and listening as part of developing a healthy relationship with nature, and building responsible environmental behavior that could continue in later life.

Finally, the intrinsic value. The maximization of the heritage value of the Exumas would also raise awareness of the intrinsic value of those ecosystems. It is important to take into consideration in environmental management that all the elements and diversity of the physical and biotic environment are, of themselves, of worth. Therefore, they can be viewed as having an existence value, whether or not humans appear to derive direct value from them. This awareness, nevertheless, especially of a national population, helps to encourage a precautionary approach to use of the environment, and constrains behaviour and activities that in the first place may seem benign and have no negative impact, but later could have a very negative one.

In conclusion, it is suggested here that in the development of strategies for the sustainable future of the Exumas, the following be considered. First, the carrying capacity of the terrestrial and marine environment of the Exumas could help to guide the use of the area, especially as it relates to current tourism and the expansion of tourism. Such an assessment would take into account the direct and indirect economic, social, and ecological implications of all activities associated with a human presence in the area, however good those activities are, nevertheless, they make an impact.

Secondly, the establishment of appropriate sustainability indicators is also important. These indicators need to be of both a qualitative and quantitative nature, and require the calculation of monetary valuation of environmental resources and services used even after those intangible aspects of the environment by various activities and industries. Many of the resources of the Exumas are not replaceable. It is vital

that the monetary cost of such environmental resources and ecosystem services that maintain the good condition of the environment serve as an indication of the vulnerability of those islands, if any of those systems are lost.

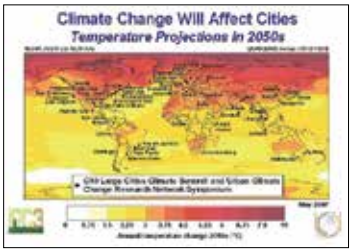
Finally, I emphasize that fundamental and long-term benefits would be derived from a strategy that includes, as central and not marginal, the value of the Exumas for their aesthetic, heritage and scientific, and intrinsic worth. Not only would such an integrated approach to the management of the area enhance its sustainability, but also it would insert essential elements into the public image and understanding of this environment that would have a lasting impact on The Bahamas and its people, and their level of responsible environmental behaviour. This will have a number of direct and indirect effects on developing a national community that is aware of shared roles and responsibilities in the enhancement of sustainability so that such approaches, such involvements, such support for the planning that will take place comes from the community—you could say from the bottom to the top, and all that comes between. This, then, will make people realize that it is not only of personal, community, and national importance, but also an area of global significance.

# IX Creating Resilient Communities: Reconnecting Planning, Design, and Public Health in Climate Adaption

## Joyce Klein Rosenthal

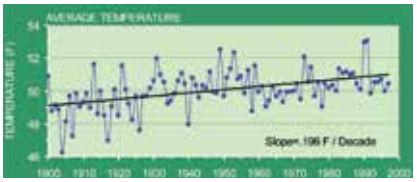
There is now an active planning process across many levels of government to prevent or mitigate damage from climate-related disasters such as heat waves. Higher average summertime temperatures in temperate zone cities are associated with environmental and public health liabilities, such as decreased air quality, increased mortality and morbidity, and peak electrical demand. Municipal climate adaptation in American cities has focused on approaches based on technological innovation (e.g., new materials and infrastructure upgrades); changes in behaviour and public education (e.g., neighbourhood watch programmes and heat-alert programmes); and improvements in urban design (e.g., zoning for mixed land-use; the use of water, vegetation, and plazas to reduce the urban heat island effect), while generally not incorporating social policies, such as supportive housing, that may address key vulnerabilities. Recent initiatives to spur climate adaptation and research on the public health impacts of urban design are discussed to illustrate these concerns and to address the effectiveness of strategies for developing “climate resilient” communities.

I've been asked to speak about my research, which is involved in two areas: looking at urban heat island mitigation in New York City—that's a project that uses urban design to try to ameliorate the health impacts of urban climate; and also, because it's so relevant for the Exumas, the planning activity that is going on now in the Mississippi Gulf Coast region to adapt to sea-level rise.

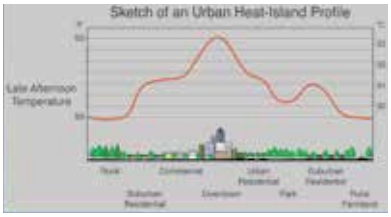



NASA-CCSR, 2009

We all know that The Bahamas are quite heavily endangered by climate change. This is a map showing projections for the 2050s relative to the mid-1980s, and showing why Arctic sea ice is melting in the northerly latitudes, which are warming up quicker. In the absence of international action on climate change, and binding greenhouse gas targets, many cities around the world have joined campaigns such as ICLEI Local Governments for Sustainability, a non-governmental organization that works with and advises local governments. ICLEI has organized large transnational networks of municipalities to develop and implement local climate protection policies through their Cities for Climate Protection initiative, the Mayors Council on Climate Change, the carbonn Cities Climate Registry, and other strategies. There are many other initiatives such as the Sierra Club's Cool Cities programme. Hundreds of cities are now actively planning for climate adaptation and carbon mitigation.




MEC Report, 2000



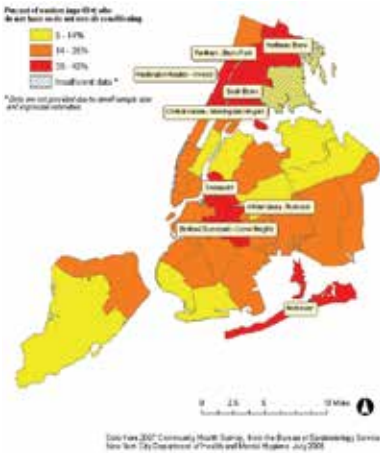

Rosenthal, Pena et al., 2003

My research has focused on New York City, where we're experiencing two types of climate change, as many cities around the world are. There is the type caused by the global warming of the atmosphere due to greenhouse gases. New York City warmed about two degrees Fahrenheit in the last century, and it's expected to go much quicker in the next century due to changes in the global atmosphere. Whereas the urban heat island effect is a localized environmental effect of urbanization. The change in land use and land cover from vegetation to urban uses causes a warmer near-surface and surface temperature in New York and other cities around the world. This has significant consequences for public health. The urban heat island is often described as that dome of elevated air temperatures over a city. Cities also create their own weather in terms of precipitation. But planners are largely concerned with the temperature effect, because it involves adverse impacts on energy use, air quality, and public health.

This (below) is a picture of the surface urban heat island in New York during a heat wave in 2002. And you can see the thermal imprint of the airports there on the lower right, that's Kennedy Airport and La Guardia Airport, and the

northern part of Queens. The elevated surface temperatures due to the heat island effect is very amenable to urban design strategies. Vegetation and water cool the urban environment, the configuration of buildings in urban design and block design matter for the retention of heat, and this matters because of health impacts, which can be severe during periods of hot weather, heat waves.

This is some imagery from Moscow's heat wave last year, where over 10,000 people died, and of course in Europe in 2003, during the first half of August, a heat wave caused increased mortality patterns, especially in senior citizens. So the urban heat island is of concern to health scientists and urban planners because it interacts with air quality, it speeds up the formation of ozone and smog, it creates demand for peak electricity, and the need for building new facilities, and it also is a significant urban health stressor, leading to increased mortality and morbidity rates in cities.



2007 Community Health Survey, Bureau of Epidemiology Services New York City Department of Health and Mental Hygiene, July 2008

So one of the first things that cities such as New York do, in planning to adapt to climate change, is to map vulnerabilities. And I would add to that, mapping assets. We discussed that a bit this morning—Minister Deveaux talked about mapping vulnerabilities. This is a map of access to and use of air-conditioning in New York City. Now, air-conditioning is a protective factor against heat-related mortality, but at the same time, as we've heard, it increases peak electrical demand, and dumps waste heat into the environment. So the question for urban designers and planners is, how can we find a better way to cool the urban environment than relying on mechanical cooling systems, and yet recognize that lack of access to air-conditioning can be life-threatening. As you just heard from Professor Thomas-Hope, the summer days are projected to warm very significantly in The Bahamas in the coming decades.

Some of the programmes that cities have undertaken include this one by a not-for-profit organization in Philadelphia—the Energy Coordinating Agency—to install, using federal funds, highly reflective roofs and rooftop insulation to cool down the indoor environment and help preserve senior citizens from health impacts on very hot days. That's been very

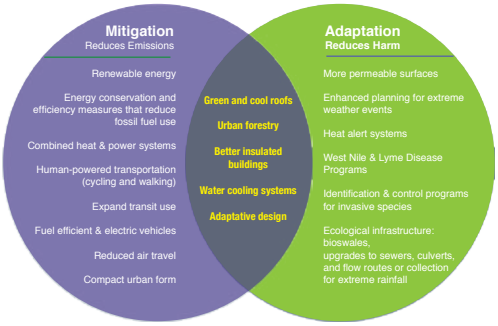
successful, and a good model also for creating jobs in high unemployment neighborhoods in New York.


Philadelphia Energy Coordinating Agency

[14—include image credits]

Another model that I like is that of Sustainable South Bronx, an environmental justice organization in the Hunts Point region of the South Bronx that has started a cool roof and green roof project. One of their projects is the Bronx Environmental Stewardship project, which trains people in these communities where unemployment reaches about 24 percent, to get jobs helping to green and use ecological infrastructure in the urban environment. That's been a very successful project, and about 82 percent of the graduates of the environmental stewardship-training programme have jobs now doing similar things.

In addition, New York City has adopted a strategy of planting one million trees to provide a cooler and healthier environment. It's become a point of competition between cities. Chicago said it would plant half a million trees, so New York came back and said it would plant a million trees. Los Angeles now, I think, wants to plant a million and a half trees. That not only adds filtering of air quality, but cools the urban environment. I was very interested in the deforestation that Minister Deveaux was speaking about earlier, which seems like it's needed in The Bahamas as well.





So we have a framework for two strategies that cities use to try to protect the climate in their environment that might be useful in The Bahamas as well. Carbon mitigation, of course, reduces emissions. Adaption, of course, reduces the harm from extreme summertime heat. What environmental planners really look for is that spot in the middle that uses both strategies at the same time: those that are carbon mitigative, and at the same time adaptive to a warmer and changing environment. Some of those we've discussed, such as urban forestry and other ecological infrastructure forms.

What we've found in research—and this finding has informed the city

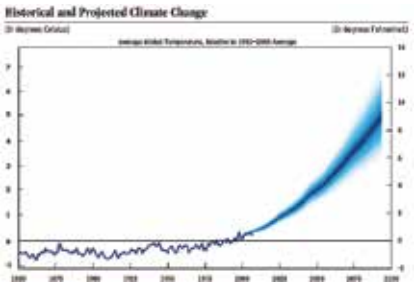
planning effort in New York—is that these strategies of ecological infrastructure, whether urban canopy and shade trees, or green roofs, or highly reflective surfaces serve multiple purposes. It serves not only to lower ambient and indoor temperatures but also preserve air quality and reduce energy demands. That's the type of things planners always look for.

In the future, we definitely need more research on the health benefits of site-design strategies. I would say this is a very new field in urban planning and design, and we're just learning how to create climate adaptive cities and resilient cities. But it is a very popular one now, and many cities have developed social strategies such as heat-health alert systems and neighbourhood watch systems—and those need to be evaluated as well in terms of health impacts.

I was asked to add a section on sea-level rise. It's so relevant and important for The Bahamas and the Exumas. The Caribbean Community Climate Centre is the regional clearinghouse for information on climate change, and I was struck by its appeal that future climate change should be limited to a 1.5 degree centigrade increase in average temperature. I think that is a laudable goal, and the Centre wrote that if we warm above that point, there will be serious impacts for the marine environment and human health and environmental degradation, which is what we just heard earlier this morning as well.

We know this is a pivotal time. I recently turned to the UK paper, *The Guardian*, and saw an article that the 2010 carbon emissions were the highest ever, that we're virtually on a business-as-usual track. That's a projection of emissions by the Intergovernmental Panel on Climate Change (IPCC) scientists, and that business-as-usual track leads to a projected 50 percent possibility of increase of four degrees centigrade or higher over the next 80 to 90 years. It's a very serious situation, and I was struck by the contrast between these divergent projections for temperature increase during the 21st century; that is, on the one hand, the urgent social and ecological necessity expressed by the Caribbean Community Climate Centre of trying to limit warming to less than a two degrees centigrade rise in global average temperatures, when in actuality, on the other hand, the world might be on the path towards a much high increase of four degrees centigrade or higher.

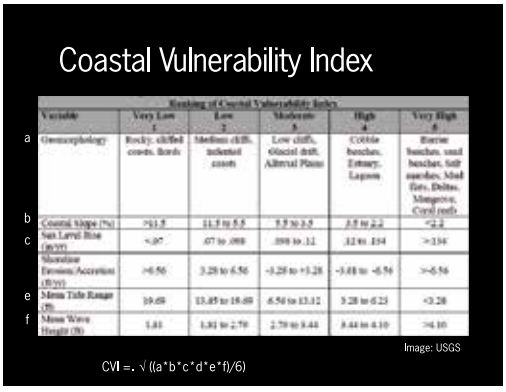
Sea-level rise has always been with us. The seas have risen and fallen from time immemorial, but what's different now is that we have development beside the coast. I'd like to quickly discuss that, and some strategies that are in place on the U.S. Gulf Coast now in terms of planning stages. I hope they might be relevant and useful for you. We know that the sea-level is rising because of the thermal expansion, increasing the volume of the oceans. In addition, the IPCC projections for sea-level rise did not include rapid ice melt—scientists are now noting that Greenland and Antarctic ice sheets are losing mass at an accelerating pace, are melting faster, and may be significant contributors during the 21st century to global sea-level rise.




Congressional Budget Office

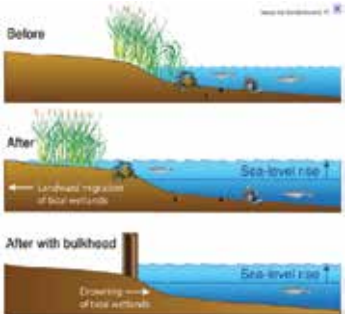
Sea-level rise is variable globally, because in some counties along the U.S. Gulf Coast, the land is actually subsiding a bit, so sea-level rise is projected to be higher than the global average. There's a lot of uncertainty in climate science. The projections vary. The IPCC scenarios tend to be criticized these days as being very conservative, because they don't include the melting of land-based ice sheets. But these sea-level rise estimates might range from a foot to two feet of sea-level rise by 2100, to one meter and over within the next century. Other scenarios go much higher. The median one that's used on average in the United States is three feet of sea-level rise by 2100. Some areas in Florida are actually planning for four to six feet of sea-level rise by 2100.

So we see with coastal development in the Gulf Coast and other regions, there are a lot of highways, transportation infrastructure, right on the coast. That is why this issue matters so much in terms of vulnerabilities and needs to be planned for now.




Mississippi used a coastal vulnerability index created by the US Geological Survey. The USGS model looks at the entire country; this was used by the State of Mississippi to try to determine the vulnerability of different regions. Barrier beaches, sand beaches, mud flats, deltas, mangroves, and coral reefs are among the most vulnerable, in the category five of very high vulnerability. This type of useful model can be used to look at different islands, perhaps, and it factors in coastal slope and shoreline accretion and erosion into determining vulnerability of particular places.

We know the ecological impacts of sea-level rise can be substantial, ranging from coastal erosion to wetland destruction and saltwater intrusion. In the Gulf Coast planning process they are looking at all these impacts, increased storm frequency and increased flood frequency are among the most costly of the impacts from sea-level rise there.




Wetlands can migrate if there's not an inland barrier in place. This issue has become important for the U.S. Gulf Coast, which was affected by Hurricane Katrina. If you have a barrier such as a bulkhead in place and the sea-level rises, the wetlands will drown. But if the soil is accreting, the sediment is accreting as the sea-level rises, then the wetlands will migrate upward. And since the wetlands are the repository of most of the fishery species at some stage in their lifecycle, this is a very important ecological issue to consider, and a problem with erecting barriers against sea-level rise.

Increased flooding, of course, can occur because the higher the sea-level,

the more likely a small storm surge will go further inland, and flooding from intense rainfalls won't drain as quickly as it would with lower sea-level rises. So the shore erosion eliminates that barrier to increase flooding and storm surges. In the Mississippi Gulf, there is definite concern about impacts for agriculture and freshwater drinking supplies as well.

James Titus, US EPA

globalsecurity.org

Now to the planning part. Mississippi engaged a consultant team to develop a sea-level rise plan. In addition, the federal agency, the National Oceanic and Atmospheric Administration (NOAA), provided Sea Grants to communities to organize community meetings on this topic. And what I think was really smart was that the grantees first developed "communities of practice" meetings. That is, they gathered engineers and architects to develop ideas and to discuss these issues, all with state and federal funding.

The plan put out by the consultant team focused on three major strategies: armouring, retreating, and adapting to sea-level rise. We've discussed armouring a little bit with the bulkheads and sea walls. It's basically putting a barrier between the land and the sea. The problem there is, of course, that as the sea-level rises, you lose that intertidal zone, which is so important for ecology and recreation, and you lose access to the beach. Armouring, of course, has been very popular with private landowners on the Gulf Coast, but it's considered the most costly of these three strategies. You can lose wetlands and future beaches this way, and lose access.

MT Audubon

Retreating is a strategy of using policy and land-use planning measures to say there might be no-build zones, or no-re-build zones. This area was heavily affected by Katrina and many casinos are being rebuilt right where Katrina's storm surge came through. Retreating can use rolling easements or deed restrictions and land acquisition programmes to try to step back from the shore and allow the sea-level to rise unimpeded. This is considered the most ecologically sensitive, but perhaps the least politically feasible strategy in that area.

For example, a rolling easement is a strategy that allows for having private landowners build right on the shore, but then accede over time to sea-level rise. As the sea-level rises, the property boundary moves back, and over time, the private property becomes public land and eventually goes to the sea entirely. So this is one way to allow some private development on privately owned land on the shore, and yet plan for sea-level rise at the same time.

Adaptation uses different forms of soft engineering techniques, such as beach nourishment and adaptive storm water management to try to adapt to current levels while integrating coastal zone management into land-use

planning, and using vegetative strategies to try to ameliorate and block the encroaching sea.

In terms of the different options available to Mississippi and to any coastal area, considering the advent of sea-level rise, we see that armouring —again, because it places a physical barrier—is, in the Mississippi Gulf Coast region, the most popular politically, especially with economic interests, and yet the least environmentally sensitive; whereas adaptation is the most fiscally sound, and really falls about in the middle of political acceptability and environmental sensitivity. Retreating is the most environmentally sensitive, but least politically feasible as yet. This type of thinking process may be very useful for the Exumas and The Bahamas to consider.

In terms of the planning process, adaptive techniques might require land-use planning based on risk of facilities. In the long run, some armouring of important economic interests and places might be necessary, but armouring should be held off. It's not necessary, perhaps, yet. Instead, retreating allows the wetlands to migrate inward, removing barriers to wetland migration, and allowing the sea to rise, designating areas where the sea might be allowed inland. But the bottom line is, it's important to start planning for sea-level rise now, because reacting down the road will be far more costly than being proactive.

If we put the two issues of urban heat island mitigation and sea-level rise together, there are several principles and planning frameworks that might be of interest for the Exumas and The Bahamas. As discussed by many speakers today, one of the first things you need to do is consider the climate projections, use the sound science, identify vulnerabilities and assets using techniques of spatial analysis, and map those out.

Equally important is the social engagement, and the building of social capacity on environment and development issues. An inclusive planning process, and efforts to engage stakeholders, can help best implement any policy ideas that come up, because after all, they know their local community best. So that's a critical part to do initially. There's got to be surveillance and tracking of threats as well. It's important for designers and architects to plan with climate in mind, because it costs less to do it right in the first place than to try to correct problems in the future.

To conclude, I've been trying to think about what adaptation might look here in The Bahamas. I'm familiar with it in the context of, say, New York City and other localities. But only The Bahamas can decide what adaptive planning looks like here. It's certainly needed. I think we all agree it's time to take the future into our own hands in a way that we haven't to date, or we'll be facing greater challenges down the road. How do we build the social capacity to adapt when residents are stressed with just basic day-to-day economic and health concerns? How can we engage people in the long-term environmental planning of a community? There are solutions, techniques, tools and models there to use. What information not only informs, but actually changes people's behaviour, and what are the costs, and the cost of not adapting?

Note: I want to acknowledge the support of the Harvard University Graduate School of Design, the U.S. Centers for Disease Control and Prevention, and the NYC Department of Health and Mental Hygiene, and also Tammy Wisco, a student (MPA 2011, Harvard Kennedy School), who provided research on Mississippi's planning for sea-level rise.

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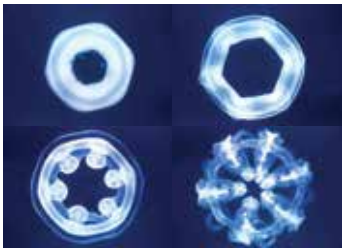
# Ecological Waterscapes: Site-responsive Interventions of Urban Hydrology

## Herbert Dreiseitl

**Water is a beautiful resource for all life forms and for pleasure and enjoyment, especially in places like the Exumas. But water also currently presents a frightening challenge, that will only increase in the future. With the reality of critical water shortages and sometimes poor water quality management, the wasting of water resources is a luxury that few can afford. One option is to integrate, store, and recycle water that can then be upgraded and reused on the islands. Bringing water into the public realm requires multifunctional arrangements and provides an opportunity to raise public awareness of water issues. This may hopefully lead to more ecological waterscapes in the future. Waterscapes provide powerful narratives and realistic solutions that contribute to a better future.**

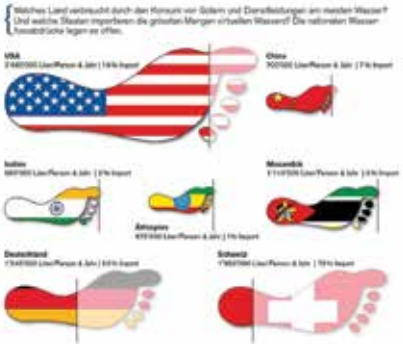
This is a beautiful place, and beauty is one of the topics I want to focus on, besides technology. When we talk about water in such a region—I'm just back from the International Water Week in Singapore—it's a question of how do we protect this nature, but it's also a question of how do we build developments in a way that protects but also makes our places beautiful. I would like to focus on that a little bit more.



Ringvortex Source: Institut für Strömungswissenschaft, Herrischried, Germany

I would like to start with some images of the beauty of water. One drop of water with a little bit of colour: if you look at this form, what you can see when you add a little bit of ink or colour, you see that one drop, even, is rich and full of design, of beauty, of engagement. We can never describe water just by chemical formulae. If we look at the dance of light on water, which is basically what tourists love so much when they come here, we see the morning and the sunset, and when we look at the inner structure of water, when water is flowing, and we just put a little bit of structure to it, we see this enormous potential that water tells us about—stories of how we could build. When we look at the beauty and the emotions that people have in relation to water, when kids play on the beach, we have to ask why can't we bring that quality to our urban areas, to our housing, to our cities? Why do we have to go always to the beach? Why can't we make the areas we live and work in more sustainable, but also beautiful and liveable? I would like to focus very much on that topic.

We find structures and forms related, which are full of life, and they always combine function and aesthetics.
And we can learn so much about nature and species, like animals in the desert who take the morning dew, as ways to be sustainable with water. There are many ways.



How do we treat water today on our planet? We waste a lot of water. We are not very careful with water. I don't want to blame America. I'm just focusing on the countries where I come from—Switzerland and Germany—how much water we use,

not only the water we have directly, but indirectly. The water we use just to produce our food. Seventy percent of the water consumption on this planet is for food production, and that's also something we have to consider. What do we eat, and how do we produce our food? And that is a water question, which finally comes back to every place.

We can learn from other places, and I would like not to give an answer here. This would be absolutely arrogant, because I want to learn also how this place looks, and what can we do. I would like to share with you some experience on different projects and different approaches. I think we can learn a lot about urbanism in different regions, how cities came up, or how housing areas came up, and how they have been very sensitive to the physical form, to the social component, and also to connect somehow to what we have in religion or in spirituality—what is our inner outreach? How do we feel connected to the environment? And what is our motivation for the next generations? When we look everywhere on the planet, at urban fabrics and urban settlements—they have ignored this. There's no time and no space. We get rid of water. When we look at the difference between a forest and a city, there's a dramatic change. It's the same for islands. We lose a lot of water. When we look to nature as opposed to cities, there is a different impact on the environment. Evaporation is much less in cities. Infiltration and groundwater renewal in our urban areas is much less. Just from the aesthetic side, we only see the water out there in the environment, and we don't recognize what we do to the water is very poor and very limited.

We have to change our way of thinking. This thinking really needs to start by looking at infrastructure. We need to think differently about how we use our infrastructure. How can we make it better? How does it relate to our culture, to the way that people behave, or how people maintain it? And how do we manage energy? And with that, I would like to focus on a very important thing.

When we have money and technology, we build infrastructure in a certain way. Here are the decisions we have to make. What will be the infrastructure, and what will be the built environment, the urban patterns, the built form, and finally, what is the process after that? That is very important. I would like to show to you two scenarios.

One is, we have capital, and we build everything based on one technology, such as reverse osmosis. If we only focus on one resource, we arrive at forms that are very much centralized, and if anything fails, then we have big problems.
There are many cities who depend very much on only one technology. I don't want to say that's not the way to go, but it's a dangerous way. We should discuss this.

We should also discuss different and more dynamic, more decentralized systems. Maybe there should be less investment or more differentiated investments; maybe we should find ways of using different sources of water, and also harvest and recycle water on larger scales, maybe also using grey water. We have to build differently. We have to build a different form, and the outcome of architecture has to look different. We also have to build in a way that we recycle, and we reuse the water, and also that means a different way of architecture. So that's a very important point.

I don't have the answer for The Bahamas, but I would like to go through some examples worldwide of a more sensitive approach to water. Finding ways to protect water means also when you compare these two models, that you come to a different way of working with the environment. We have to deal with pollution. We have to deal with energy. When it comes to a different, more dynamic and more localized system, we have to consider the regional level. It is based on the rain patterns that we have and makes more use of recycling systems. And finally, it is also a system which is probably more secure in the long term, because we don't know what will happen with all our energy questions, for instance. So these are the two basic scenarios. I don't want to make it like black and white, but it is a question of deciding in what direction we want to go.

Here are some examples of what my team worked on. Why not, for example, harvest water in a bigger cistern tank? We did this in Berlin Potsdamer Platz, to collect the stormwater from the entire region, using rooftop areas where we filtered the water before collecting it in the larger cisterns.

We also stored the water in lagoons, building up cleansing systems for treating the water to get rid of nitrates and phosphorous, bringing it up to a very good water quality.

And also embedding that in an architecture which is focused on lifestyle, which looks beautiful, which brings in art, and which celebrates the water in the city, where it can also sit and have tourists and enjoy. It's not just the ocean. It's also your built environment which should look beautiful.

Singapore very much faces this challenge. Singapore has growing industries but also a growing population—five million people now live on the island. It's a tropical island. Forty percent of the water comes from Malaysia by pipeline. Now it is starting to harvest its own water and to recycle the water. Singapore uses desalination as well. We also are working on a strategic plan for the island of Singapore for the next 25 years—how to bring together architecture and infrastructure, which involves not only technology but also beauty and the celebration of water. We call this ABC water guidelines—A for active, B for beautiful, and C for clean. We also recycle wastewater on the island, and we call it new water, because it's hard to sell a population its own sewer water. So we call it something different, and we educate differently—through television programmes, and on up to the prime minister. Everyone, even every taxi driver on the island, knows about the ABC water guidelines. Active, beautiful, and clean catchments, waterways, and reservoirs to store water in large quantities. This means the built environment has to change. This wasn't the situation in the old paradigm, which was to get rid of the water in big canals and dump it out in the ocean. We just lost the fresh water—it just disappeared. We started to change the structure completely, to collect the water and to integrate it into the open space. This means a different way of political organization, of management, and

maintenance of finances and resources. We have to bring it together. We bring daylight to the infrastructure. We bring biodiversity back by working with bioengineering technology. We also have a very strong educational component that is not only from the top down, but also from the bottom up, to teach people about the environment and to accept larger changes in the infrastructure.

You can do this in many places. Tianjin, which was a very polluted area, is now completely clean. Why? Because the water runoff in the built environment was cleaned. We collect the water, treat it, and then bring that water into this open system, and then people can get close to it. So the aesthetic and the functional come together, and you suddenly have culture coming back, and people really celebrate it. I think it is very important that engineering is involved. I don't want to go deeper into that. But the main message is, the aesthetics of architecture and technology have to come together, close to the emotions of people, so that people celebrate it. This has many benefits.

You can even collect and treat water in industry. The new car centre for Formula One racing cars even uses rainwater for an air-conditioning system. So the entire built environment should be a way to treat, to collect, to slow down, to recycle, to reuse. And in the same way, you can make it beautiful. It can be a place for performance and art. It can be a place for tourists and local people. It can be a place to cultivate water on the island and to bring it all together.

I've opened the envelope, or the curtain, to a lot of opportunities to bring that environmental question into architecture and into the built environment. I would like to open that up for discussion later on. Finally, we need to come to a more integrated approach, decentralized structures, multifunctional systems, more synergies of design and function. We need a different process of planning. We have to be much more sensitive to the local culture. We have to bring a holistic perspective for smarter solutions. We have to think in a long-term perspective about service and maintenance, including people taking care of their own home, or their front door, and such things. We need to take nature as an example and find a paradigm shift. Finally—I know this is the hardest—we need political leadership and courage to take a step.

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Mohsen Mostafavi
Why Ecological Urbanism?
Why Now?
An Introduction
Design
Publishers

# XI Panel Discussion I

## Respondents: Gareth Doherty, Leonard N. Enriquez, Padraic Kelly, Spiro Pollalis, and Chris Reed

Chaired by Eric Carey

Gareth Doherty

In some ways it's really difficult to find the common thread running through the morning's presentations, but that's also their strength. The point I would like to make is that this project challenges us as designers and planners to look at the nuances of the islands. We tend to generalize. We tend to research, to gather information and to synthesize and then to make proposals, and to generalize. But what this project forces us to do, in looking at so many islands, is to look at the nuances of the particular islands. So from a professional point of view I find it both very challenging, and also very exciting. Then, of course, I think we need to understand what it is that makes island life so distinct and appealing. Why is it that I, as an Irish person (and there are two of us here on the panel), feel a certain affinity for The Bahamas? Partly from being an islander. But what is it about being an islander that's distinct? Sometimes, coming from an island, you see it as a disadvantage. But what are the advantages of island life? I think that is something that we really need to keep in mind as we move forward. Herbert Dreiseitl's presentation made me think about this, because we often think about water as a problem, but Herbert challenges us to see water as an opportunity. I think that's really a fundamental change of perception. The other point I would like to make is, at what point do islands disappear? At what point is it not relevant anymore that we're looking at islands? In terms of the social relationships, in terms of the relationships of islands to each other, it's something that we really need to think about. So what to do about that? I think that anthropological fieldwork is going to be really important. But anthropologists are not very good at anticipating the future and that's where designers and planners come in, and I think that's what we offer.

Eric Carey

Thank you, Gareth. And I think we'll move right to Leonard Enriquez.

Leonard N. Enriquez

Just a little bit on our company. We're developers—we finance, design, build, own, operate solid-waste infrastructure projects. By that we mean landfills, transfer stations, recycling plants, and waste-energy plants. I'm going to start out with something fairly specific, and then work up to the general. As developers of solid-waste projects, our region of focus is the Caribbean. Our experience includes building the landfill and recycling centre in Freeport, and our flagship facility is in Barbados, which is a 1,000-ton-per-day recycling facility that's been able to divert about 50 percent of the tonnage that used to go into the landfill next door. Solid waste is probably one of the aspects of development that may impact a small island context, like the Exumas, most quickly. Anyone who's been to Grand Cayman will know that the first thing you see when you come into the harbour is a 150-foot-tall mountain of garbage. Each one of us produces the equivalent of an SUV or a van in volume of solid waste, every year. The good news is that there are lots of technologies and lots of approaches to address this. What we're thrilled about in this conference is that there is a holistic approach being taken to development. I think Dr. Thomas-Hope talked about values and so on. We find ourselves as developers building these projects and operating them in a bit of a vacuum. It would be great if we could do it in a context where the community's values have been integrated into the development, and we're fitting within that. Just as an example, in terms of land use, how much land do you want to dedicate to a landfill? How much do you want to encourage people not to use PET bottles, and just use reusable glass bottles? There are all sorts of micro issues. We're very excited about the approach that we see taking place here, because it is such a holistic approach. So we have a very narrow focus on a very broad effort.

Padraic Kelly

It's been a really interesting discussion so far. I'd like to focus on a simple idea. If we are doing a project, my view is that the answers are within. I think the important point is asking the right question. I was particularly struck by this on my visit to Schooner Bay yesterday and seeing how the particular characteristics of the site informed the design, and hearing the story about the original workshop that took place and about discarding the master plan, when the evidence on site actually demonstrated that it wasn't a viable solution. I thought that it was really sensitive. It was very interesting. These issues are extremely complex, and whether it be the Exumas or any other project, I think that we can see it, on

the one hand, as a genome problem, because it has a very high level of complexity with many variables. On the other hand, probably not all those variables are of equal value or of equal merit. So what we like to try and do is focus on a smaller number of variables, the ones where you have knowledge, where you have information available that can significantly help to inform a process. These are almost certainly multidisciplinary. And I think that is an interesting point. You need to involve many different disciplines, professions. I think they need to be able to help to bring their piece, their information. One of the problems that I think we've got, as both academics and professionals is, we spend our time developing very strong individual levels of technical specialisation. Combining them together to address these complex issues is extremely difficult, because they do not have enough common understanding to be able to address the issues. So I think what we need to address is more "T people," people who have a very strong element of technical knowledge, but a broad spectrum of knowledge as well, because only then are we able to address those levels of complexity.

Spiro Pollalis

I have some good news and bad news. The good news is what we were discussing this morning is very common all over the world. The same questions that were asked here today, the same questions that were posed by the government, are very similar to what we hear everywhere in much more populated places, on islands and non-islands. The bad news is that nobody has the answers, because basically there is a fundamental problem here that we have to face. This fundamental problem is that the human population rises every year, and the resources on the planet are not enough. We're not talking about sustainability. We're talking about our own survival. We have to face it like this. It was never more telling, when in one of the research seminars we had at Harvard, someone mentioned that we have to kill the mosquitoes, because the mosquitoes carry a particular disease, and our way of thinking about sustainability is to kill the mosquitoes, because this is bad for the population of humans. So having said that, I don't believe I am adding anything more to solving the problem, just making it more difficult. I would simply say that we have to look at an integrated approach. We have to use technology up to the point that technology can allow us to do things. The presentations this morning were very telling. Climate change, yes, it's a very serious problem, both in terms of how we handle it for adaptation and what we're doing that we cause climate change. Unfortunately, climate change is not seen the same way all over the world. Everybody blames others for causing climate change. Nevertheless, we have to deal with how to handle it,

Spiro Pollalis

especially in places of low rise above the sea-level, like here. Water is a major issue. We throw away the water that we're using. We don't see that water is like blood. It carries nutrients, but can be reused, and in our own bodies it's being reused all the time. We have to use water the same way. We have to reuse it. We have to drink it very many times. We have to make sure it is recycled the proper way, and yes, we need energy, and we have to harvest more energy from the natural resources on the planet, renewable energy. The other thing is that what was presented this morning about the Perry Institute is really fundamental. We have to understand the past. We have to study from the past. I'm going to talk more this afternoon about these things and about some specific research we do at Harvard on similar issues. They may appear a little different, but they are very similar.

Chris Reed

I want to make three points. The first is really about the multidimensionality of sustainability initiatives. This is something that really comes out of the full range of talks that we heard this morning—you cannot talk about environmental sustainability without talking about issues that are socio-political, economic, cultural. I think it's fundamental that, as we begin to think about moving forward and the kinds of plans and structures we might begin to imagine, that we address issues of the social and of community and of education and of public health. I think this is something that we saw in Joyce's presentation. We need to address issues that are about cultural sustainability, that are about cultural issues, that are about function, and—as Herbert was talking about—beauty. This afternoon we'll hear a little bit more about the importance of culture and design as we move forward. And we need to talk about economic sustainability as well, that you cannot just purely preserve and environment to talk about environmental issues without talking about the economic mechanisms that are going to be in place to support those initiatives moving forward. So that's my first point.

My second point is a challenge. We need to find or figure out ways to marry up the management structures that will be carrying forward the plans that are put in place with our new understandings of the science of the environment and ecology. Many of you know that in the last 20 years there's been a radical shift in terms of how ecological systems are considered. Fifty years ago, scientists thought of environmental systems as static or trying to achieve a steady state condition, whereas now we know that the science says that ecosystems are always in a state of change or fluctuation. Right now most of our management structures are set up to control natural processes, and we really need to find management structures that can talk about adaptive

management strategies that can deal with these conditions of dynamic change over time. So I think that's a challenge, and as Spiro says, this is a challenge not just for The Bahamas, but a challenge for communities and governments and nations everywhere.

The third point I want to make is that as we think about the planning and research process itself, maybe there are more creative and innovative vehicles for research and planning we may begin to use. I was struck this morning with Erich's talk in particular about how the Perry Institute not only is thinking about how to bring people to the institute to educate them and to participate in workshops on site, but how some of those research initiatives can now move out into communities. I think this is very important. How can we have a very participatory planning process, where people really get involved in workshops over a period of time, so that we're getting as much information and participation from the ground up as we are expertise being brought in from other places? How can we also think about bringing research out into the public environment? How can research and testing and demonstration projects become tools for training people to begin to take over, to build up skills, but also take on some of these new sustainable technologies that we're going to be thinking about putting in place? I think there's some great opportunity there in thinking about new innovative vehicles.

Eric Carey

Thank you very much, Chris. We've heard thoughts people have tried to put together based on what has been discussed this morning, and now we're going to invite anyone else who has a question or comment to come forward. As we look at what's happening in other islands in The Bahamas, we realize quickly at the Bahamas National Trust how important the initiative that's being advanced by the Minister is—i.e., making sure that development outside of protected areas, and especially those on the borders of protected areas, is done sensibly and sustainably. Schooner Bay (and example we keep coming back to) is a development on the border of Abaco National Park with respect to Bahama parrots, which live in the park. When I saw the proposal, I thought either Keith (Bishop) or Orjan (Lindroth) had lost their minds, because they left prime real estate in its natural, green state with trees as a flyway for Bahama parrots. So what happens outside of these protected areas is extremely important, and as we develop our country, we have to keep that in mind.

Spiro Pollalis

Although the problems are common, the answers to those questions raised are specific to each area. This is what makes

Spiro Pollalis

things more complicated. Following this wonderful presentation about water, recapturing water and so on, I just want to bring in as a light note here, that when I was working in Denver, Colorado, you're not allowed by law to do that, because if you capture the water, then the water does not go down the river and deprives Arizona and the areas downstream. And that is very serious, even to the point that the green roof on a building was challenged at the legislation, that you should not do a green roof, because the green roof deprives the water from going downstream. I want to use this as an example, that although The Bahamas are facing very common problems, the answers to what you face here may be different than for other places. And this is where you really need a more researched approach—you have to be open-minded and think out of the box.

Audience Member 1

I'm Gayle Charles. My question has to do with population. How does sustainability connect with population growth? And is population growth a major problem for sustainability? Can the planet and our resources sustain the level of population growth?

Audience Member 2

First of all I also share the view that we had some very interesting presentations this morning. What I think I heard, or what I think I didn't hear clearly enough, however is, what are the opportunities in our own environment to innovate? I haven't heard anybody talk about innovation. In particular, we've had a couple of points made about water resources, and the issues addressing the water challenges in our region, the issues related to how do we harvest water and whether we go back to rainwater harvesting, which is something that was encouraged previously, but that is no longer government policy. But I haven't heard enough about innovation. How do we innovate? Or how do we make those best practices that already exist in the Exumas and across The Bahamas? Schooner Bay has been used as an example. Minister Deveaux spoke about the design that we traditionally used. How do we use those things and improve them in the modern context? But more particularly, I want to hear about, what do we do to innovate and to make sure that we do have sustainable communities run into the future? And I think that when we talk about the Exumas, it's a very good case in point to look at what is primarily an urban environment, but has potential to expand quite rapidly. We have also in the scope of the Exumas changes from very small islands to much larger communities, and also from what are individual homeowners on an island, to what is ocean back or the Sandals property. So how do we innovate?

Eric Carey

Thanks, Phil (Weech). We're going to have Len (Leonard N.

Enriquez) finish discussing Gayle's point about population and its interface with sustainability.

Leonard N. Enriquez

I think Gayle's is an excellent question, and I think it's an area that's not discussed sufficiently. I can't think of a variable that drives environmental problems more directly than population. I like people. You know, I like myself. I like my family. But the truth is that each of us has an environmental impact, a significant environmental impact in any context that we live in. And so the level of sophistication and the way you deal with the environmental issues, solid waste, wastewater, etc., has to go way up as the population density increases. That's been our experience, especially in an island context, where it's critical, where you don't have a million acres of hinterland to play with. You've got to take care of it right there in most cases. This is my perspective.

Padraic Kelly

I think as planners and designers we can only cope with it at the scale that we ourselves have power to influence. When we work at a city scale or at a community level, you need to plan for population growth. You need to look at the different spectrums of population, employment, social aspects, economy. So I would suggest, if you can solve that at the individual level, I think it will largely look after itself. I think we're not in a position to address something on a global scale, and I couldn't for a moment see political consensus at that level. But I think if you address population growth at the level that we can control, that we deal with, then I think we will be able to bring a certain level of equilibrium, however unstable it may be from time to time.

Spiro Pollalis

Let me say that there is no answer to your question about population. Definitely you cannot control populations, at least with measures that are democratically acceptable. So the answer is going to be only in the short term or medium term, which is going to be enough for our lifetime. Basically there are some answers, and one is that you have to increase density. You have to reduce the use of energy, and at the same time, you should not look at the American model. What happens is that as I travel all over the world, and I propose different solutions, people tell me, we want to live like Los Angeles. We want to have more cars. And when I say, no, I become quite unpopular, because they want to be like us. This is wrong. So you have to learn from what we have learned from countries like the U. S., to be in the short term a little more constrained, and at the same time remember that the most environmentally friendly city in the U. S. is New York City. Why? Because of the density. Because people don't have cars.

Spiro Pollalis

Because they use less energy, although they have quite a good life. So we have to start thinking like this. Of course, this is going to create problems. It was suggested that we should exclude tourists from going to certain areas, or we should we control more. Actually, this is a long, slippery slope if we start segregating population, and we start segregating among those who have the right to go somewhere and those who do not, which is the right of every country to impose, of course. But what we see as part of urban planning is that the issue of security and segregation starts becoming very much in centre play, although governments do not want to acknowledge that. But they ask us more and more to create gated communities for the haves to separate them from the have-nots. So these are really serious sociological issues. And I would say that urban planning and planning of the Exumas as well has to be considered together with social anthropology, and the economy, and environment at the same time. You cannot separate those things anymore.

Chris Reed

I also think relative to this question of innovation that we very much need to look at a broader spectrum of the systems that are in play here. We need to look beyond just the element or the system that we are dealing with. In this morning's presentation on waste and septic systems, we saw examples of emerging systems that were becoming more efficient, and yet still had waste products that weren't really being dealt with. I think of the reverse osmosis system where you have an output of some very salty brine. I think of the septic system where there still is effluent that passes out. My question is, how can those discharges, outputs from the system, be thought of as inputs to other systems? Or how can we create systems that are more circular. I'll give you one very simple example, which may not be too unfamiliar to some of the folks here. This is in Milwaukee where an aquaponics installation was set up within an old warehouse, and it's both aquaculture, where fish—tilapia—are being raised, but also fruit and vegetables, specifically, lettuce. The system that's being set up there is that the fish produce waste, which is then used to fertilize the plants within the system and allow plants to grow. The plants then filter out the waste from the system and actually cleanse the water to support the tilapia. And so you have a nice system that's set up, where loops are being closed, where there isn't as much discharge being put out. And so I think there are some creative and clever ways that we can begin to redirect resources to more productive ends. I also think more generally, we need to find ways to support a culture of experimentation and research, and of course, part of this involves outreach and education.

Eric Carey — Do you want to comment on that?

Gareth Doherty — I want to make a quick remark on the question of population and sustainability. I think it's a problem insofar as there's a cultural problem with sustainability, because the carbon footprint of population is not consistent throughout the world. So if we think about the average American or the average city in the Persian Gulf, for instance, their carbon footprint is much, much higher than, for example, a tribe living in the Amazon. So these are relative questions. I think the solution is a cultural solution and one of how we behave. So I think that is something to keep in mind. In terms of the question on innovation, I don't want to put too much pressure on the afternoon speakers, but the emphasis in the afternoon is on innovation and research.

Padraic Kelly — On innovation, there is a view—and it's been conveyed by many professionals—that there are some universal solutions that we can take from around the world and apply everywhere. And to some extent our key performance indicator (KPI) systems of LEED, of green, encourage that view—that you can take those systems, you can apply a common standard, and they will be equally applicable in Chicago and Barbados or The Bahamas. It doesn't work like that. It can drive you to make what I think are disturbing decisions regarding system selection. I mentioned earlier that the answers, and I think that also goes for the innovations, are likely to be here (in The Bahamas). And that's why the research proposed by the Harvard Graduate School of Design—to assess some of the issues associated with Exumas or The Bahamas in general—I think are likely to inform solutions which will be very appropriate to here. They may not be appropriate to elsewhere, unless the conditions—environmental, social, technological, etc.—are similar. So I would suggest that almost certainly those will be found here. And that's where the local population can really engage. I don't think putting some of the solutions that we have tried and sometimes succeeded in elsewhere will be appropriate.

Eric Carey — Thank you. Stacey, do you have a question or comments?

Audience Member 3 — Yes. My name is Stacey Moultrie, and I've been working in the Bahamian environment for the past 16 years. How is this project going to integrate Bahamian architects, planners, engineers, scientists, who have put forward some of the very same ideas that have been discussed in the presentations this morning, but have not been able to get much traction in seeing those ideas actually implemented on the ground? The reason I think it's

Audience Member 3 important to have those people engaged is to have transfer of knowledge both ways, from you to them, as well as from them to you, so that this isn't purely an academic exercise.

Eric Carey One of the things that we, when we started looking at this process, realized quickly was that we had to make sure that there was a component that involved interaction with Bahamians. And also, it was also immediately recognized, when we were discussing this with some of the government officials and others involved in funding this process, that it was not going to be a quick process that brought in a few experts to do a presentation or two, and then we'd evolve a plan. The first thing was, we were going to have interns. I'm really glad to see some of the Bahamian students who are in universities, registered, and are here today. We're also going to involve students from the College of The Bahamas as interns in this process. And there will be forums organized as we go forward with this planning process, to make sure that there is an opportunity for Bahamian professionals to inform, guide, participate, and benefit from the process. So the discussion that starts today leads toward a lot of the things that you've pointed out, because certainly one of the things that Lynne Gape and I put forward as we started discussing this and writing a project proposal is that we were to make sure that it was an effective way to involve Bahamians in all aspects of this process. After all, this is a process that is designed to develop a model for developing land-use plans to support Bahamian legislation, and as such, we have to have the benefit of Bahamians who have been involved in this process. And that will be written into and guaranteed as part of what we do going forward.

Audience Member 4 My name is Michael Major from the Department of Physical Planning. I was quite happy with the fifth panellist who indicated that when we look at the issue of sustainability, we must look also at the social, economic, political, and cultural issues as well, and then also we must look at them in terms of the management system that we have set up here in The Bahamas, and in some other places, where these systems are basically to control rather than to manage change. My experience with the Family Islands, and also extending to Exuma, is that one of the critical issues that we will have to face is the implementation of the strategy, and managing or realizing the expectations of the local population, as compared to those of tourists and foreign investors. There are many issues, especially in terms of economic development, for which we must consider the benefits to, or the expectations of, local persons, as opposed to foreign investors. Exuma is just one of those areas. Just this week, we have dealt with issues in the

Barrier Islands, in terms of economic development, in terms of what the local populations expect, in a tourism economy. The local population does not feel that it is actually benefiting from the opportunities of a tourism economy. It's dominated by, say, the cruise ship lines. So they (locals) are not really benefiting in that sense. They cannot afford housing. So we have to, as planners, and the planning department, then provide ways that they can access housing—much denser housing, cheaper housing, and so forth. So I'm just wondering or commenting that I hope that enough focus is placed on the management of change in Exumas, as well as the Family Islands, and to make sure that we account for the system that we now have in place with our local government. It has been in place, from 1996—it's fairly new and always changing. And the process we have now, which is basically top-down, doesn't work. Bottoms-up, or local government, I think, is not working as it should. So we're going to have a real problem with how we implement any strategies we have.

Spiro Pollalis — I would like to ask you (Audience Member 4), before you go, are you convinced that this change is good for the local population?

Audience Member 4 — In most cases, no.

Spiro Pollalis — Are the stakeholders only the local population? Or is it a greater area of The Bahamas?

Audience Member 4 — The broader.

Spiro Pollalis — So I think these are the two things that you have to address. First, you have to be convinced and make it so that the local population also benefit. And second, bring all the stakeholders and make sure that the entire population benefits. If the entire population does not benefit, probably it's not a good project. And of course, I don't know anything about the project. They just judge from other projects. People want it to be explained. So management here is not only for communication. It needs to go to the real issues and make sure that you deliver what you promised to deliver. Otherwise things are going to go off track. And again, I know nothing about your project. Probably it's a wonderful project, and I should not judge by that. I just judge by other cases. And this is, again, a very common concern, that the immediate beneficiaries are not the ones bordering the project. They may be the losers in the short term. So what are you going to do in order to bring them up?

Audience Member 5 — I'm Henry Hepburn, a local architect and planner. I would just like

to piggyback on what the young lady stated just before I came up (Audience Member 3). I do want to thank everyone for putting together this conference. I think it's very important and timely, because we here in The Bahamas are going to be impacted quite severely with regard to climate change and what's happening in terms of the global environment. I heard the Prime Minister comment in terms of capacity in this area. We do have some local planners, and we do have architects. We have quite a number of architects. And I am rather disappointed, while I hear Mr. Carey say that, yes, he's going to have some interns come in, and then he will have some professionals involved. Where are the professionals this morning? Where are our people this morning? Where is the College of The Bahamas? The College of The Bahamas is presently embarking upon a small island sustainability institute. And we're looking at trying to do the same thing that you're talking about here. Now, I'm wondering, yes, I heard that you have some funding for this. Why isn't some of that funding being passed on? Or why aren't the college and professionals immediately involved, not at the tail end, because that's what's normally happening here in The Bahamas. We get involved at the tail end—the foreign investor comes in. He or she has his or her plans. It's all set. We come in at the tail end. And they want us to rubber stamp, which we (some of us) do not do. We need to be involved at the beginning, not at the end. So I'm disappointed that—with the exception of Eric (Carey)—I don't see any Bahamians.

Eric Carey

You've raised a complex question. The first thing, today, is just to start a discussion. The Bahamas National Trust interacts very regularly and effectively with the College of The Bahamas, and in fact, we were quite pleased when the small island sustainability programme got well-funded. In fact, it is one of the most well-funded programmes in the history of The Bahamas. So we're really pleased that you have been able to attract that type of funding, and you've been able to start a programme. What we're doing here doesn't have any major funding. We're talking about seed funding to start a discussion. Government is committed to this process by virtue of the fact that it passed the Planning and Subdivisions Act (2010). There was a similar planning exercise in Abaco, which Orjan (Lindroth) was involved with, and there they were able to raise private funding to start that discussion, and there was involvement of a number of Bahamians in that and in fact a lot of Bahamian architects say that they reference some of the products that came out of that process. Today a process started for getting Bahamians involved: we had a discussion, and we have a conference, and we invited people to register. It's an open discussion that everybody was invited to, to come and

make a presentation. There was a press release that went out about the conference, and people were invited to register. It's a very open and transparent process. There's no end product envisioned that will exclude anybody.

When I went to the Bahamas National Trust, and we started developing management plans for our national parks, we didn't even have a template. We had to start the process from scratch. That process said that we had to make sure that we are aware of and take into consideration what happens outside of a protected area if we are going to ensure long-term sustainability of that protected area. The government's legislation fortunately incorporates that same type of thinking. But again, this is the first of any number of discussions, forums, and workshops that will take place under this legislation. Christopher Russell, who is here, is charged with responsibility for developing forestry management plans. So I think there are going to be any number of opportunities. In fact, there are going to be challenges in trying to get the feedback that we need for these plans. I'm pleased that people have come to this conference, pleasantly pleased that we have so many Bahamians in the room, that we do have professionals, as well, and we do have students. And certainly we will be working with the Bahamas National Trust, any institution, and any architect who has something to lend to the process—anyone who has planning expertise to benefit and enrich this process.

Audience Member 6 My name is Toni Lloyd. I come from a background in sustainable tourism. As Dr. Thomas-Hope shared earlier, tourists contribute to a lot of the waste that we get here, a lot of our resources that the locals won't be using while they're at work, and I think that in the past, many countries have made decisions where the masses, the local people, have not been involved, have not given their consent to a certain plan or a certain project, and I'm very happy today to get this opportunity. One of the things that I really hope that we do at this is involve the public. Today is the beginning, but involving the public in more evening sessions, while people are off from work, to get their views, to get their stamp, to get their approval on what we should build in the Exumas and in the rest of The Bahamas. One thing I wanted to just mention as well, or to highlight, is that we have to think about the carrying capacity for any project that we do. I think it will mean that, like Dr. Thomas-Hope shared as well, we have a higher price. You may even have to limit the number of tourists that can come there, of course, not excluding Bahamians. So I think that carrying capacity is something that we need to consider for this.

Eric Carey

You're exactly right. There was a report years ago, and I think Mike Major would have been involved in that, that made recommendations for what types of development should take place on certain-sized islands and islands in the Exumas. And he made a recommendation that on this particular island, a couple of acres should really only be for a small weekend home, because at the time, there wasn't the legislation. There wasn't a consultation. That recommendation was approved by local government, without any consultation, without any plan to guide it for a type of development that is fully out of scale with that island. You see this island, and you go, why didn't someone think about it? Well, people thought about it. Michael Major, who was the chairman of the town planning committee at the time, made a recommendation. But it fell through the cracks. So what we're trying to achieve through this process is to make sure that going forward, there is a plan, there is a process to guide a decision made, either by a local government, to guide an architect who would want to do the right thing, or one who wouldn't want to do the right thing, but through the fact that you would have guidance and guidelines, can reference and see that for this island, this is what is appropriate. This is what is approved. And this is what we are trying to achieve. And you're very right—we need to involve many people in this process. But you know, Rome wasn't built in a day. And even though they took a lot of time to build it, because it probably wasn't planned for sustainability, the Roman Empire fell apart. So you have to ensure that you do proper and effective planning. And that is what we're trying to start today. And everyone is definitely going to be invited to be involved.

Audience Member 7

My name is Deon Stewart. My question is a little bit different. I would like to know, how do you see the public education and awareness component being involved in this type of project or this type of planning? When we talk about the future, we're talking about planning for the next generation. So how will this type of planning, from your experience, involve, say, the education at the lower-level schools, the middle-level schools, the general community, the children, the next generation in education and awareness, to help integrate or to help implement a sustainable management plan for, in this case, Exuma?

Padraic Kelly

I'm quite happy to take that question. I'm involved in Detroit. In fact, two of us are involved in Detroit. There's a very interesting consultation process there. As professionals, we produce a level of documentation generally as part of our work, which is extremely good for other professionals, for city planners, etc. It's not appropriate generally as a medium to communicate with the

wider public. There needs to be a parallel process that runs side by side with the planning process where there is consultation and engagement, a different form of language, a different form of communication. And I think the same thing should apply here. Otherwise you will get a mismatch between the professionals and the wider public. And we definitely experience that in Detroit. I don't know if you want to say anything about it, Chris?

Chris Reed

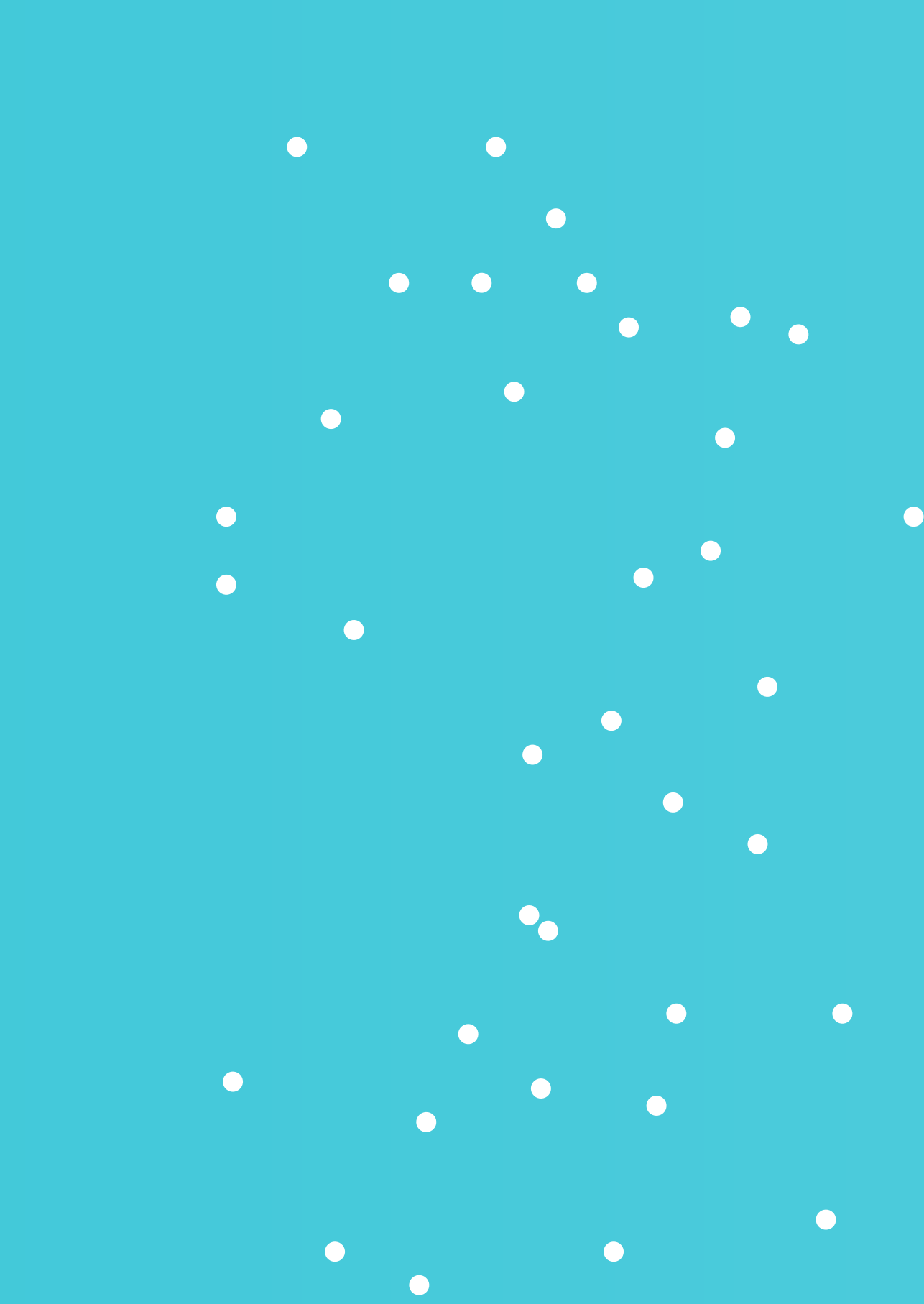
Sure. In fact, I think there are ways that the planning process can really engage people on the ground, not just to get them excited about the proposals that are being made, but to really inform the proposals that are being made. Joyce was showing examples from New York City where communities were participating in rooftop garden installation, those sorts of things. She was also talking about these, not just as a one-off—we're going to fix the roof to make it more environmentally sensitive—but as part of a programme that would train people within the community for this kind of occupation or employment. I think that's critical. In Detroit, what we're doing is trying to look at what organizations are at work on the ground? How can we learn from their efforts? And how can we really build on their efforts and support their efforts? And so I think in his project moving forward, there's a lot of groundwork to be done. There's a lot of listening. I have a feeling that there are a number of very innovative solutions to how to live on islands that are already at work here. And it's discovering what works from those, and then beginning to study how to scale those up. So I think part of the answer is in engagement. Part of the answer is in learning from local expertise and experience, and then really bringing that to inform some of the longer-range plans that are made.

Leonard N. Enriquez

Just to footnote that—again echoing Dr. Thomas-Hope's comments—this is one of the primary vehicles, it seems to us, for incorporating the values of the community in the plan. So it's a must.

Eric Carey

Thank you. I'd like to thank the respondents. I'd like to thank all of you for coming. This is really an important process. The Planning and Subdivisions Act (2010) is really an important piece of legislation, which, properly implemented, could give very good guidance to people, to existing and developing businesses, to our people having wonderful lifestyles and having jobs. But it also provides the opportunity to sustain the environment while still supporting all of the things that we need to do as human beings. So I encourage you all to continue to support this process and to provide your guidance, your input, and we will certainly make sure that it is incorporated into this process.



# XII Exumas from Above: The Land


The Zofnass Rating System for Sustainable Infrastructure
Harvard University Graduate School of Design

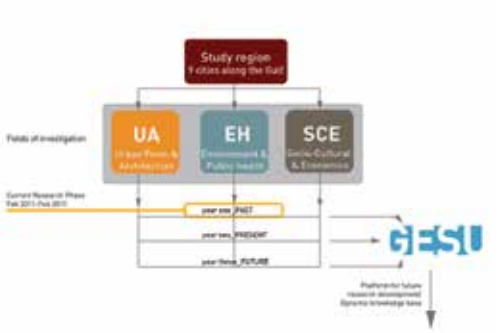
# XIII Sustainable Urbanism in Affluent Societies

## Spiro Pollalis

**A multiyear research study, under the leadership of the Harvard Graduate School of Design, will address sustainable avenues for the future of nine coastal cities in eight Persian Gulf countries. The first year of the research focuses on understanding and documenting the past, the period before oil and gas revenues had an impact on the local economy. Subsequent phases will include the present and the future. The main focus of the research is on analyzing architectural typologies and urban forms as they relate to socio-economic and environmental sustainability. This is accomplished taking into account the local climate, the economy, the people, and public health issues. Anthropologists, urban economists, environmentalists, and public health specialists complement the architects and urban planners and urban designers. The research is in its first year and two cities, Doha and Kuwait, have been analysed and are presented. Researchers are currently collecting data for the remaining seven cities.**

Today, I'm not going to refer to The Bahamas directly, and I'm not going to refer to innovation. I'm going to talk about a project and, through it, I am going to address several of the issues that were discussed this morning. This is a large research project at the Harvard Graduate School of Design, sponsored and jointly conducted with the Qatar Foundation. It's going to last four years, and we are in the first six months of the initiative.

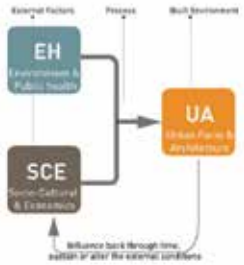
I'm going to present a few thoughts about what we're doing in this project. The Qatar Foundation is interested not only in Qatari cities but in the entire area of the Gulf, and we see the sea as a connecting element. I have to say that I always see the sea as the opportunity to reach the other end, as opposed to when I see mountains. I see mountains as barriers. I assume that this is the way you look at things in The Bahamas as well. We are studying nine coastal cities in the Gulf, and we research what is similar and what is different looking though the lens of sustainability. It's a large research team. I direct the project and the sponsor has several local advisors. I would like to specifically point out to you the local delegates and consultants, people from the area or with knowledge of the area who are active in this research. Referring to some of the questions that were asked this morning, I want to emphasize that as outsiders we cannot successfully go to Qatar and do the research by ourselves. We need a very good local foundation. However, we are equally demanding of the people there, they have to contribute. At the same time, the research team has Harvard faculty advisors. Harvard is not only the Graduate School of Design. We work together with the other schools, and that makes us rich in our research, with experts in sociology, anthropology, public health, government, and so on.



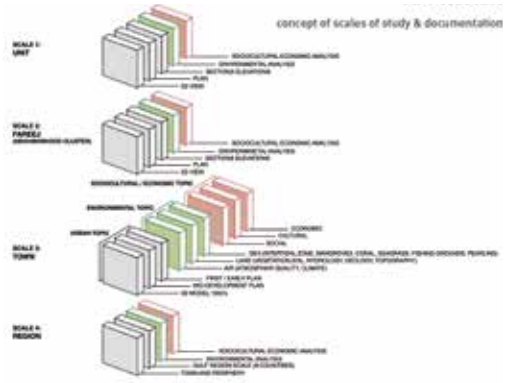

Our main objective is to develop sustainable cities in the future. We study the region from three different perspectives: urban form and architecture; environment and public health; and sociocultural and economics. The first year we are focusing on the past. So we started understanding what happened there before oil changed the economy in a big way. The second year of the research will be about the present, and years three and four are going to be about the future. This is something I want to emphasize in this conference as well. If you're going to do systematic research, it's always good to look at the past in a similar manner, like what we showed with the Perry Institute earlier, and understand the built environment and how people lived for a long time, instead of jumping directly to answers with a short-sighted view of the present.


We started in February 2011, with a very systematic process. In very many ways, it's like professional work.

Let me speak for the people in the Gulf. They are concerned that the ways cities are being built today with the plentiful funds from oil and gas are not sustainable. Today, they have a lot of money and cheap energy, but they're concerned about what is going to happen later. So the real question we're asking is, how cities should be developed and be sustainable? We look at the past in order to understand what was sustainable at that time, and what we can learn from the past. Cities used to develop in a different way. They were totally different scales of associations and socioeconomic issues. We look at sustainability. I said earlier that sustainability is about survival. Sustainability at that time was how people could survive in a very harsh environment, survive the economic and environmental problems they faced at that time. I think we come back to the same issue. This is how we look at survival. There was the oil economy, economic prosperity, the new economy, and now we're looking at the new survival. The hypothesis here is that we start from external factors and through various processes we look at the built environment. Our specialty is the built environment, but we want to understand how this built environment was developed through those processes.



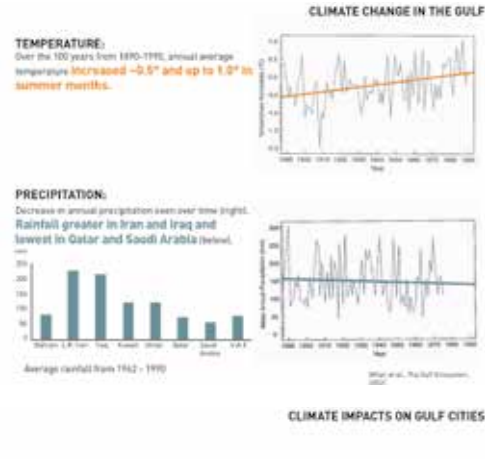

Here we look at the environment, public health, sociocultural issues, economics, how they influence the built environment. By built environment, I don't mean only buildings. A built environment is constructed landscape as well. And then how the built environment feeds back and influences the economy and the local society, and culture and religion are very important issues here too. So what is our methodology?





We are going to develop a series of books addressing each city and comparing cities at multiple levels: at the unit level (which is the house or the single open space), all the way to the neighbourhood cluster, all the way to the town, all the way to the region. Eventually we will develop a portal on the net, an electronic version with keywords, and here we show how this electronic version is going to be available on the Web.

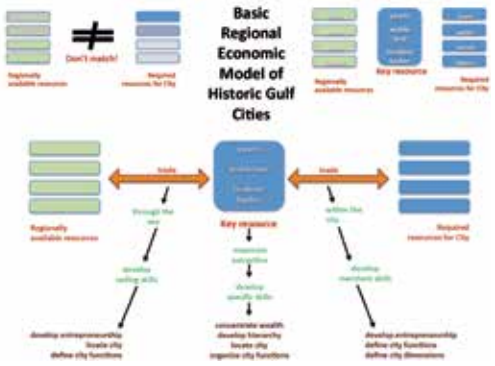
How do we organize the research? The fields of study are, as we said, urban form and architecture, environmental study, sociocultural and urban economics. The individual, then the unit, then the smaller neighbourhood, then the city, the region and the mega-region, and eventually out of all these things, we look at sustainability in historic and traditional terms. And sustainability for us is not only environmental. Environmental sustainability was a minor concern in the past, concerns then were mostly socioeconomic.





Our first findings. We look at the overall area, the environment, and then we notice that the temperature is rising. We notice that precipitation is getting less. The ecosystems, changes in sea-level, temperature, and salinity increased the desertification, and then how this affects the built infrastructure. We have to deal with temperature rise, with extreme heat, with changes in sea-level and salinity.

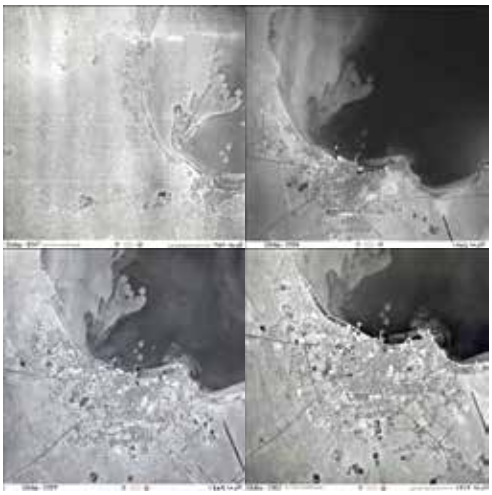
In the past, we were constrained by nature. In the present, we design without nature. Actually, this is the major criticism. In the future, we expect to design sustainability with nature, understanding nature.

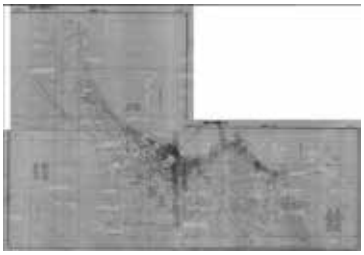



We look at archaeology, historiography, trade routes, during the 1500s, and then we go back and look why the cities were developed where they developed. It was primarily for trade. Then we come to the point that the regionally developed resources do not match the required resources for a city. In other words, these cities were developed for specific purposes, like pearl diving. Now it is for oil. Padraic was saying earlier (on the panel discussion) that you cannot apply LEED directly there. You cannot apply the existing norms that were developed for North America in this culture and environment.

And eventually, we look at the key resources, and we start looking at how regionally available resources relate to the required resources for the city. And eventually we'll develop a whole model of how the economy works and how houses were developed. Then we start putting down for every city what are the main issues. But trade, sailing, and

exchange were fundamental in the development of that economy.





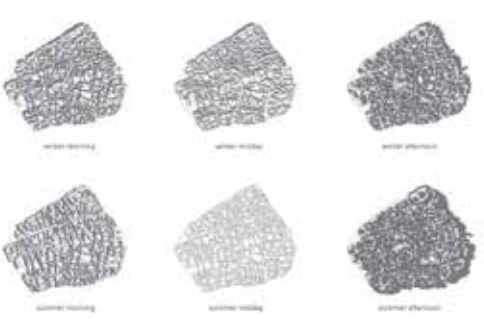
And we look at the environment, and we work with aerial photos, and topographic maps. Very little information is available. And based on that, we start developing maps of how each city was developed. We do the urban economic analysis, and then, using GIS, we start looking at how cities have grown. Eventually we start looking at the old network of cities, looking at the old aerial photographs, and the new developments, and we start recording the neighbourhoods according to the Islamic way of neighbourhoods. Then we look at the plots, one by one, by just using the aerial photographs. This is a lot of work there, tracing and understanding what's going on. And eventually we look at the mosques and where the mosques are, the historic houses, and recorded wealth.



Again, water is a major issue. In Doha, they were getting it from wells. We continue our research with cemeteries, where the cemeteries were—and all these are placed on GIS maps. We calculated that the population in Doha in 1952 was 20,660 people. We did that by simply measuring the number of houses. When we presented this to the local experts, they said, "It's so accurate, we can't believe you got it." And I have to say this, not so much that it was accurate, but you can see, in 1952, that was a very small village, because this is what could be afforded and feasible in the desert climate. What we see today is a result of overgrowth of the economy driven by oil and gas.

We study some neighbourhoods, and then we continue trying to understand distances among points of


interest and houses, how many people lived there and so on. We see the density of how much has been built. Then we start looking at other neighbourhoods. There is an infill. We have to learn from the infill, instead of the sprawl. We found that the sizes of the different plots ranges from 57 square metres to 1,300 square metres. We continue with studying clusters of houses. And then we continue with the size of building entities, and we continue analysing the neighbourhoods, and then the streets in 3D.



Then we start looking at the shading in the winter, in the summer. We start dating individual houses, tracing individual houses, first on paper. Then we make models, followed by assigning an ID for every house.

Next, the houses are built in 3D models. We study how sunlight goes into the rooms. The problem there is that the sunlight is too strong. We start looking at the different spaces with courtyards and how the houses are expanded through the years. So a particular house starts small, and then the residents build more as the family increases in size, is divided among members of the family, and then sold to a new owner who can afford the entire house.

We see how during the day, the shading, what is the effect of the courtyard. Continuing to look at the buildings—we do an analysis of the

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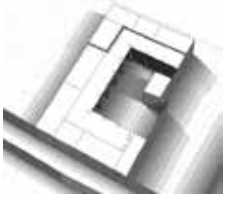
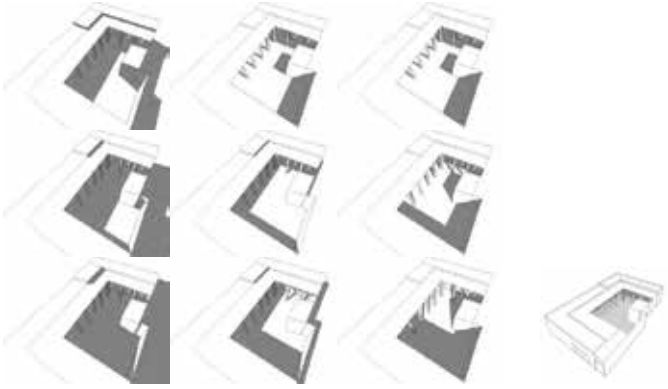
21 March Shadow Range 8.00-16.00

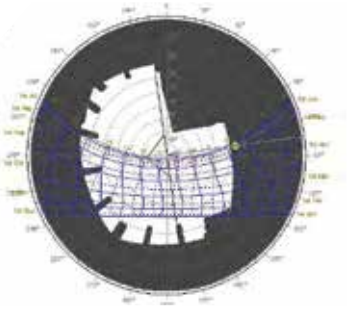


21 June Shadow Range 8.00-16.00

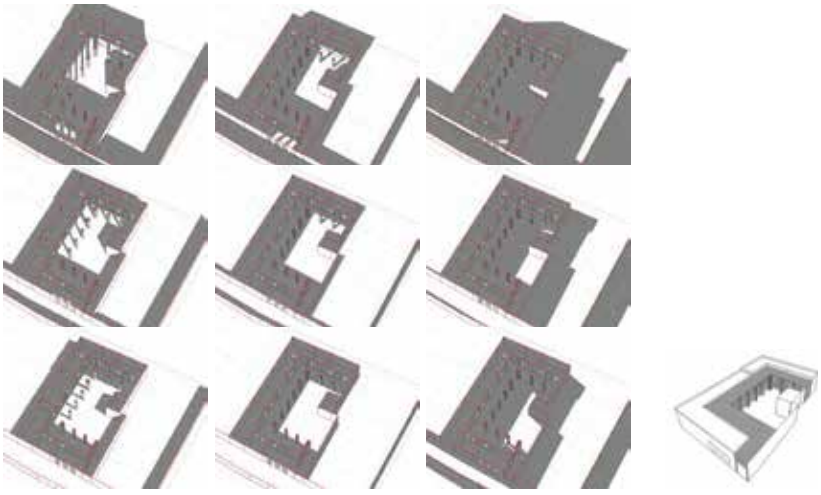
Early 50's Mid 50's Late 50's



Shading in courtyard



Courtyard shading mask



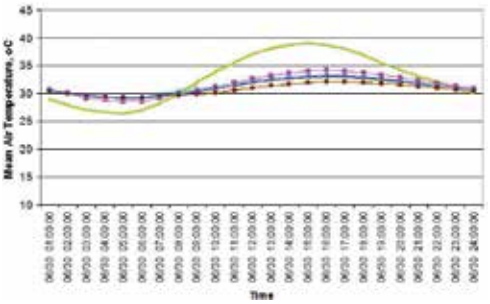
Shading in rooms

Existing courtyard

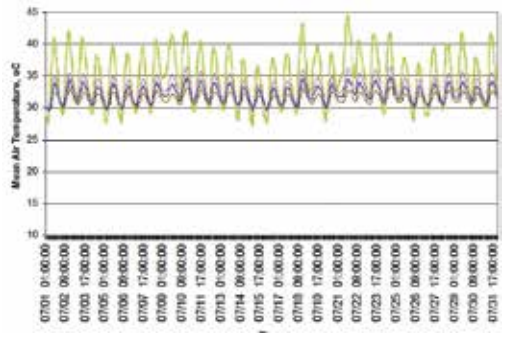
The effect of gallery on the courtyard

The effect of gallery on the rooms

openings, depending on the direction of the wall, taking into account the environmental behaviour, using simulation programmes for environmental analysis. We start studying what is the effect of the gallery and the courtyard on the different rooms.




And this is the temperature, the outside temperature is the green line. And this is the temperature of every room being simulated. We find out that they were doing an excellent job in designing their houses, given the very difficult climate.




Here is the mean air temperature in July, and then we start seeing how it is on a cool day. And you see how the cool day goes, with about 12 degrees, ten degrees, and you see how the rooms keep the temperature, that they pick it up during the day, and they keep it during the night as well.

Then we start doing some very interesting experiments. We start saying, what happens with the existing situation. What amount of energy is needed for heating? What amount of energy is needed for cooling? And then we start making modifications in the computer model, like removing the gallery, adding insulation, removing insulation, and we find out that the very best is what they were doing. In other words, if you were putting more insulation on the roof, that would trap the heat in and would require more cooling capacity. As can be demonstrated, they were doing the right things, they were building the proper way! So I want to emphasize that no matter what you do for the Exumas, make sure you appreciate and you study very carefully what people have done throughout the centuries. They knew more than sometimes we want to accept. We found the indigenous situation to be by far the best.

We started doing some parametric analysis to categorize the different houses. Our computer models are not just beautiful architectural models. Our models are intended to understand the different components that make the houses. Then we start looking at what are the windows as a percentage of the surface in the different walls and the different orientations. What is the daylight factor? The windows, over the wall surface. The windows over floor area. All kinds of ways to understand the way they were designing their houses.

Then, we started creating a database into which goes all the information from a single house, and the collection of the houses gives us aggregate results. Eventually, this is how we process the parametric analysis.

And at the same time, we start looking at some architectural models. And we start making a very detailed analysis as part of the research for documentation.

# CITY- UNIT: Doha, Qatar

## General metrics

Habib Al Hassan House

| | |
|---|---|
| Plot Area | 381.56 m² |
| Built Area | 295.62 m² |
| Un-built Area | 85.69 m² |
| Closed spaces | 192.09 m² |
| Semi-open spaces | 103.53 m² |
| Open spaces | 85.69 m² |

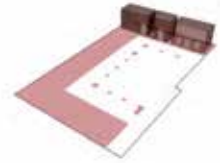
plan



total plot area

built-unbuilt area

closed/semi-open/open spaces



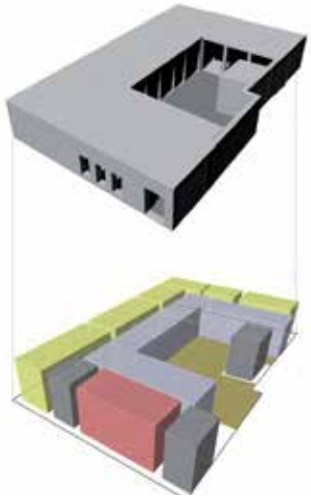
| | |
|---|---|
| UNITS | Side C |
| Orientation Exterior | North |
| Exterior Wall | 57.55 m² |
| Exterior Openings | 6.00 m² |
| Openings per Wall ratio | 0 |
| Aver. Wall Thickness Ext | 0.55 |
| Orientation Interior | South |
| Interior Wall | 34.22 m² |
| Interior Openings | 10.03 m² |
| Openings per Wall ratio | 27.68% |
| Aver. Wall Thickness Int | 0.55 |

| Room | Orientation | Wall Srf Area | Openings Area | Floor Area | Ceiling Dimensions | Windows/Wall surface | Windows/Floor area | Average Day-light Factor |
|---|---|---|---|---|---|---|---|---|
| C1 | North/South | 47.41 m² | 4.89 m² | 14.40 m² | 5.32 x 2.94 | 9.35% | 0.34 | 1.86% |
| C2 | North/South | 37.19 m² | 3.61 m² | 9.35 m² | 3.65 x 2.85 | 8.60% | 0.34 | 1.14% |
| C3 | North/South | 47.86 m² | 1.73 m² | 13.96 m² | 5.12 x 2.79 | 3.48% | 0.13 | 0.53% |

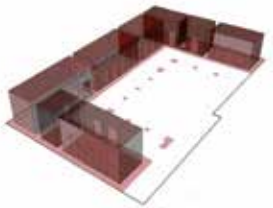
## Space uses

Habib Al Hassan House

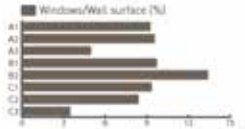
| UNITS | Areas | per total room area |
|---|---|---|
| Main Rooms | 86.80 m² | 73.81% |
| Supportive Spaces | 18.00 m² | 14.89% |
| Majlis | 17.28 m² | 13.72% |
| Gallery | 89.64 m² | 48.30% |
| Courtyard | 85.69 m² | 46.07% |



Courtyard
Gallery
Majlis
Supportive Spaces
Main Rooms



Through parametric model a table of parameters is produced. Tables of data are converted to figures in order to read and complete results. A system of analysis can be formed.



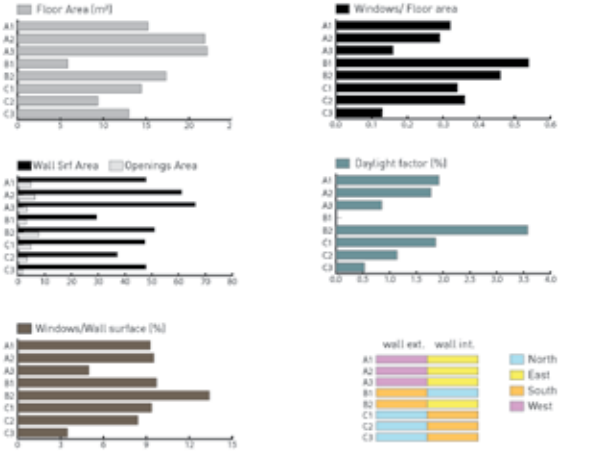

| Room | Orientation | Wall Srf Area | Openings Area | Floor Area | Ceiling Dimensions | Windows/Wall surface | Windows/Floor area | Average Day-light Factor |
|---|---|---|---|---|---|---|---|---|
| A1 | West/East | 47.86 m² | 4.89 m² | 15.35 m² | 3.50 x 4.93 | 9.27% | 0.32 | 1.92% |
| A2 | West/East | 61.88 m² | 6.43 m² | 21.84 m² | 3.50 x 7.03 | 9.50% | 0.29 | 1.77% |
| A3 | West/East | 66.14 m² | 3.45 m² | 22.11 m² | 3.38 x 7.86 | 4.94% | 0.16 | 0.85% |
| B1 | South/North | 29.36 m² | 3.14 m² | 9.86 m² | 3.17 x 2.87 | 9.70% | 0.34 | - |
| B2 | South/North | 50.97 m² | 7.88 m² | 17.28 m² | 4.42 x 3.95 | 13.39% | 0.46 | 3.08% |
| C1 | North/South | 47.41 m² | 4.89 m² | 14.40 m² | 5.32 x 2.94 | 9.35% | 0.34 | 1.86% |
| C2 | North/South | 37.19 m² | 3.61 m² | 9.35 m² | 3.65 x 2.85 | 8.60% | 0.34 | 1.14% |
| C3 | North/South | 47.86 m² | 1.73 m² | 13.96 m² | 5.12 x 2.79 | 3.48% | 0.13 | 0.53% |

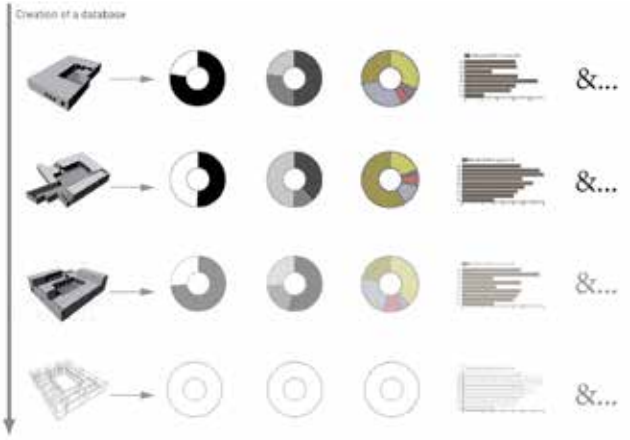
| Room | Orientation | Wall Srf Area | Openings Area | Floor Area | Ceiling Dimensions | Windows/Wall surface | Windows/ Floor area | Average Daylight Factor |
|---|---|---|---|---|---|---|---|---|
| A1 | West/East | 47.84 m² | 4.89 m² | 10.25 m² | 3.50 x 4.92 | 9.27% | 0.32 | 1.92% |
| A2 | West/East | 61.38 m² | 6.63 m² | 21.56 m² | 3.50 x 7.33 | 9.53% | 0.29 | 1.77% |
| A3 | West/East | 44.16 m² | 3.48 m² | 22.11 m² | 3.38 x 7.94 | 4.96% | 0.14 | 0.85% |

| Unit15 | Side A |
|---|---|
| Orientation Exterior | West |
| Exterior Wall | 83.48 m² |
| Exterior Openings | 3.30 m² |
| Openings per Wall ratio | 5 |
| Aver. Wall Thickness Ext | 0.4 |
| Orientation Interior | East |
| Interior Wall | 51.34 m² |
| Interior Openings | 14.77 m² |
| Openings per Wall ratio | 28.75% |
| Aver. Wall Thickness Int | 0.3 |

| Room | Orientation | Wall Srf Area | Openings Area | Floor Area | Ceiling Dimensions | Windows/Wall surface | Windows/ Floor area | Average Daylight Factor |
|---|---|---|---|---|---|---|---|---|
| B1 | South/North | 29.16 m² | 3.14 m² | 8.84 m² | 3.17 x 2.57 | 9.70% | 0.54 | - |
| B2 | South/North | 50.97 m² | 7.88 m² | 17.28 m² | 4.42 x 2.95 | 13.39% | 0.66 | 3.58% |

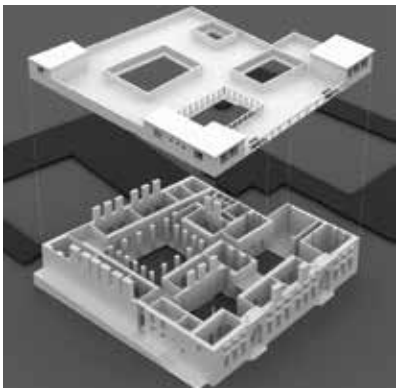
| Unit15 | Side B |
|---|---|
| Orientation Exterior | South |
| Exterior Wall | 53.04 m² |
| Exterior Openings | 7.99 m² |
| Openings per Wall ratio | 15.07% |
| Aver. Wall Thickness Ext | 0.5 |
| Orientation Interior | North |
| Interior Wall | 46.71 m² |
| Interior Openings | 10.07 m² |
| Openings per Wall ratio | 34.75% |
| Aver. Wall Thickness Int | 0.4 |




A systematic parametric analysis of units (or fareyes in case of neighborhood scale) can facilitate the creation of a database of information that could lead to qualitative results. It is about a continuous open process to decode the "genes" of Gulf traditional architecture.

And we see the house in more detail, exploded so we can see the different areas. We use the computer models for additional analysis. As I told you, we are looking at nine cities. It's important to see that not all of them were developed at the same time, in the same way. Oil was explored in Kuwait earlier than in Qatar, for example. So the impact of the economy changed there earlier rather than later.



We are all very excited with this research. We learn a lot. The most difficult thing is for us to keep our focus on the past and not be driven by analysing what is happening right now. Because we must study the past in the first phase of the research. But it's not a historic research. We study the past to build the foundation to understand the present and project the future as practitioners. I want to emphasize that. We are not historians. Not a single person in our research team is a historian, other than the local people in the region who help us. And we have timelines. This is run very professionally, like a project for which you assume the design and construction, or the development in order to make things happen seamlessly.

Things are changing, and we have to be open-minded. Very often, when I lead the team, and I say, we are changing the course of action, we're going to do something different, it creates some unease.

Let me tell you about another project, which is the rating system for sustainable infrastructure. This morning, it was mentioned by Professor Thomas-Hope that we need to have a system to measure sustainability. Three years ago at the Graduate School of Design, we were the pioneers to be contracted to do a rating system, which is now going to be adopted by the Institute of Sustainable Infrastructure in the USA, in order to be applied to measure sustainable infrastructure. The key here is that it's not enough to look at buildings. We have to look at the infrastructure systems. And this is where infrastructure sustainability counts much more, because the stakes are so much bigger than for buildings. So again, this is the goal of our programme. Our mission is to promote the development and distribution and the adaptation of sustainable methods and tools that define and quantify sustainability in the context of infrastructure in large-scale developments. I lead this programme as well, named the Zofnass Program for Infrastructure Sustainability and, following a similar structure as the Gulf Sustainable Urbanism programme, we also have advisory board members. We also have the active advisory participation of the largest engineering firms in the United States who represent 75 percent of the building of all engineering in the world. I have only the best things to say about our faculty, our students, our advisors.

What are we doing in the Zofnass Program? Infrastructure has six different components: energy, water, waste, transportation, landscape, and

information technology. We look at these six categories and how we can make them more sustainable. In order to do that, we have identified four areas of measuring sustainability.


This is our framework. We look at the resources, and especially materials, energy, and water. We look at climate change, and especially emissions, how to reduce climate change, and at the same time, how to adapt the projects for expected future climate change. We look at the natural world. That has to do with the site selection and the habitat and the mitigation as we do the site selection. Finally, we look quality of life, which is health, education, and community values. The reason we break this into four parts is because many of these may contradict one another. We believe the whole process of sustainability is political, and eventually someone has to pay attention. Do we pay more attention to the natural world or to quality of life for people? Sometimes they go together, but sometimes they are not compatible.

Do we pay more attention to resources or to quality of life?


We have 50 credits in our system. The rating system is ready to be used. We have not tested it yet at a large scale, but we have started. This rating system for infrastructure sustainability would be good material to base what you are doing here in The Bahamas, although we have not applied it in such a beautiful natural environment yet.

# XIV Touching the Ground Lightly

## Padraic Kelly

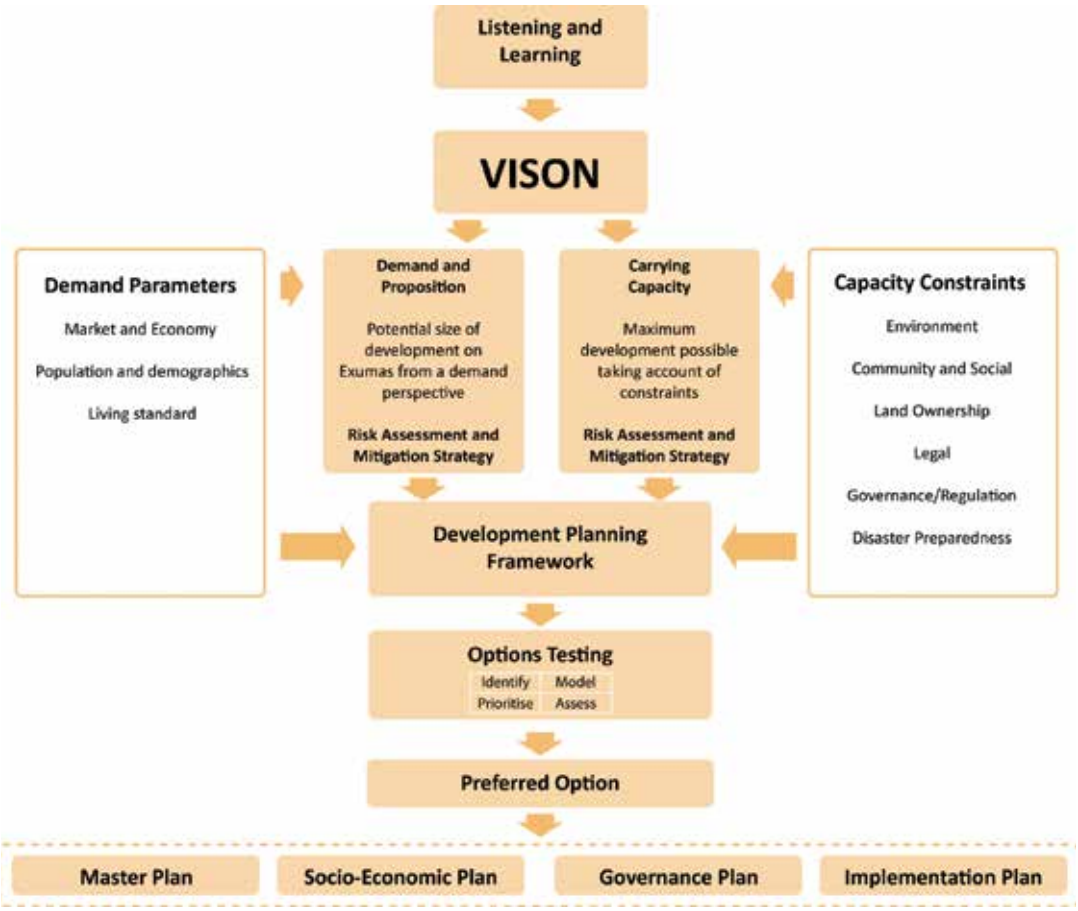
Long before sustainability joined the essential lexicon of every built environment professional, Ted Happold, the founder of Buro Happold, used to say that it was our duty as consultants to ensure that whatever interventions we make on the planet should "touch the ground lightly." Growing pressure on resources—natural, social, and financial—has led to the increased importance of integrated master planning in developments the world over. Consistent with our founder's philosophy, Happold Consulting, the management consulting arm of Buro Happold, has developed a powerful evidence-based Integrated Development Planning methodology. This methodology brings its understanding of the fundamentals of market economics, finance, sustainability, environment, low-carbon infrastructure, planning and design, organisational capability and implementation to finding the most appropriate planning solutions. Happold Consulting works at a range of scales from new urban quarters in largely natural environments to regeneration of existing cities, or the planning of new cities/regions. This presentation highlights a range of projects that demonstrate this philosophy in action.

Ted Happold, the founder of Buro Happold, was a professor of architectural engineering at the University of Bath. He took on the role in 1976. Before the term "sustainability" was ever coined, Ted's view was that we as professionals had a duty to minimize the impact that we made on the Earth's surface. Happold Consulting works around the world. We're part of a larger organization, Buro Happold. Buro Happold employs about 2,000 people, and it has about 25 offices in about 70 countries. Happold Consulting was founded in 2006, and its footprint is not quite so large, but we do work in a very large number of places, and we operate from offices in London, New York, and Riyadh. Because we deal with very complex issues that require an understanding of very many different areas, we employ people like economists, business consultants, people in strategy, environment, climate change, social sciences, planning, design, etc. We believe that to address these complex issues you need a complex set of skills.


The question I had when I set up the business in 2006 was, why do so many projects fail? Non-scientific research by me would indicate something on the order of 95 percent of all urban interventions fail. That doesn't mean they don't achieve anything. But they fail to achieve what they set out to achieve. I started to investigate why that was. I found three areas of significant deficit. One was in relation to planning. There's a failure to take into account the economic, social, political, environmental, and spatial infrastructure factors necessary to shape an overall project. On the organizational side, again going back, I found that of the 95 percent that failed, about 50 percent failed because the wrong solutions were being put in place. The other 50 percent failed because the delivery organizations didn't have the skill sets, the resources, so they didn't have the structure, the staff, the skills, capabilities, etc., to support the development. And last, oftentimes, the client organization or the key delivery partners didn't have the business planning skills, the access to funding, or the ability to raise financing. Those of you who are familiar with what happened in Dubai and Las Vegas and many other places will see that too many projects started with a drawn spatial vision before there was a clear understanding of the key issues. Much of that was driven by ramping up the market, and that sort of approach is unsustainable. I think for those of us who are concerned about sustainable development, the faster that bubble bursts the better.

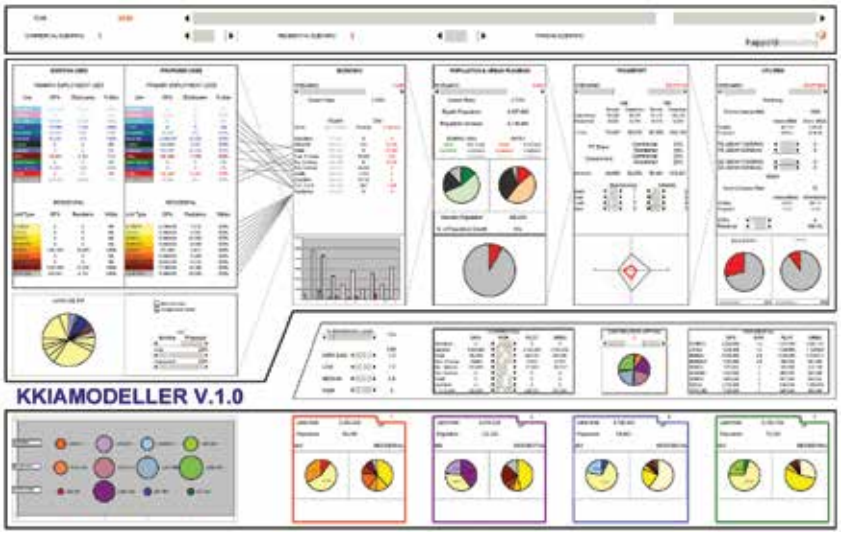
So how can we relate that back to the Exumas? Nobody has defined exactly the problem. I've tried to define it by defining the quantum scale and type of development that meets the development objectives while safeguarding the natural environment and socioeconomic balance it supports. That's a long-winded statement. I'm sure we can all do better than that if this project goes forward. But essentially what I'm trying to say is that you need to have a balance.

One of the key questions for the Exumas is, is there a shared vision? Because if there's not, there needs to be one. What type of scale of development is demanded? Demanded, and I suppose



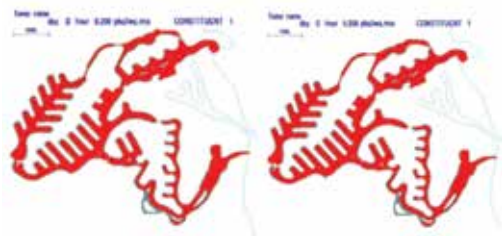

you could say, demanded by whom? What type and scale of development can be supported? What development in the Exumas will be synergetic with the rest of The Bahamas? What value will development bring? We heard some interesting comments on that earlier. What is needed to ensure that sustainable development happens? Understanding all this requires an integrated, logical, and we would say, evidence-based approach.

We call this our angel diagram. This is the structure that we follow when we do this scale of projects. The first—and this comes back to comments made by our local architect— is that you need to listen and learn from what exists here (Spiro Pollalis also talked about that). You need to get a vision in place very early, even though that vision will be amended. Then you need to look at the demand side (Elizabeth Thomas-Hope talked about this). You need to look at demand parameters. This is about market and economy, about population and demographics, living standards. On the capacity constraint side, it's about environment, community, social, land ownership, legal, governance, etc. Bringing those two things together, you're getting a demand led proposition, which is the potential development that the market could support over a range of potential timescales. There's a maximum development that a particular project




can sustain. You bring everything discussed above together into a development planning framework, and then you use that to test options. There's a series of different sorts of tests that one would apply, and then from that, you determine the preferred option. Then there are four components that, in my opinion, you need. One of them is a master plan, the spatial plan. There's a socioeconomic plan that's necessary, a governance plan, because of the points I mentioned earlier, and then an implementation plan, because so many projects fail through lack of implementation.

We've all come across the standard approach to planning. You've got option A, B, and C. The preferred option might be option C, but A and B are done. Option C always looks much better, and the client generally chooses option C. But option C isn't necessarily better. It generally is not rigorously tested. So the idea is to prepare a parametric model to look at the perhaps 10 or 15 most important variables or parameters, and model those parameters to truly understand potentially hundreds of variants that you could possibly do—modern technologies allow you to do that. You can prepare parametric models that will help you understand the complex and simplify the complicated. You can embrace complexity, because the problems are very complex. The modelling can identify patterns, which are not easy for the eye to see. And it allows you to visualize and share that information to enable a robust decision-making process.



Now I'm going to look at a series of projects. The first one is Sabah Al Ahmad's Sea City in Kuwait. Kuwaitis are a nomadic people in many ways, but they love to have a place by the sea—even people of modest means. The coastline is therefore very valuable. There's not enough of it around. You can see in the image how people have actually built along the coastline. This area for the new city is 70 kilometres south of Kuwait City. It is quite a nice but unremarkable area inland of the coast. The client asked us to try to find a site of the lowest possible environmental value, because he was looking to enhance the environmental value through the development process—not to mitigate impacts, but to increase its environmental value. The reason that this particular site was chosen was that the land here was within about one to two meters above sea level, and it was composed of sabkha, which is salt and sand. Virtually no life can live there. So it's a very poor environment. Through a rigorous planning process, hydraulic modelling, etc., we brought the sea in, rather than building out—we were able to take that dredged material and raise land levels. We were able to create navigable waterways, because people want to live by the sea and use their boats. We added value by maximizing the length of waterfront. So we didn't follow the Dubai Palm style—that has done incredible damage to the environment. We employed a leading environmental scientist to guide and advise the team, and we performed environmental modelling all the way through the project. It's quite interesting that we attracted species, both flora and fauna, to this particular project that had been dying out elsewhere in the region. Over 80 kinds of fish have been attracted to the development, and the waterways act as the spawning grounds, so this is a site that I think has been significantly enhanced by development. Very importantly, there is a management plan and operation plan in place.

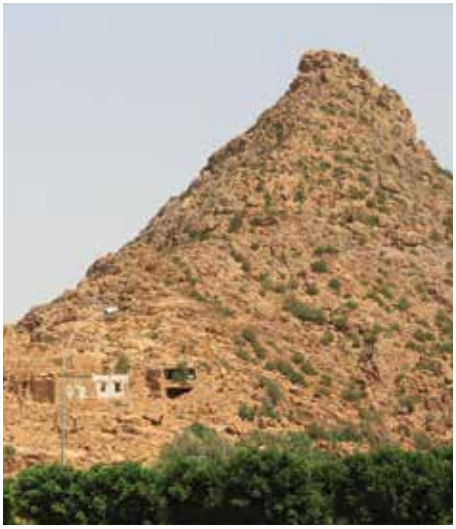
Another project about the environment — and you'll see there's a theme of environmental restoration to many of our projects. This project is a 140-kilometer wadi running to the west of Riyadh City, the capital city of Saudi Arabia, and for more than 30 years, sewerage was discharged into the wadi. You had gravel extraction. You had garbage dumping and construction waste. The natural flood channel, which is essentially a river valley—or a wadi, as they call it in the Middle East—was interrupted, and you got a lot of flooding, and many people were killed over the years. So the natural environment was seriously damaged and compromised.

This is an example of environmental degradation with serious consequences. In the top image, (page 160) you'll see growth of Phragmites. Phragmites is what happens when you get an over-enrichment of organic material in the environment, and gravel extraction

that you see on the right-hand side, and you can see construction and plant equipment. This was back in 2002. Over the next eight years or so, the environment was restored, and we prepared an environmental master plan, implementation plan, and management plan. This won the Aga Khan Award as a project of outstanding rehabilitation of a damaged environment. It's incredibly popular. This project has attracted one million visitors in its first six months of opening in a city of approximately 4.5 million.

Another project, in Latvia, that is just starting, in some respects has parallels with the Exumas. It is theoretically an eco-city or eco-town. The client had titled it an ecocity, but in reality, it's much more about society than it is about environment. The Latvian economy suffered really badly in the recession of 2008, and many people emigrated. Our client wants to develop an ecocity that can help to revive the economy and boost the social and human capital in the country. So it's a project driven by a social dimension, as opposed to an environmental one. Perhaps when we look at the Exumas, there are elements of some of these things. The developer would need to address that, the triple bottom line of social, environmental and economic, probably in that order. The first stage is to identify what a viable economy could be. (The Bahamas are highly dependent on tourism. Perhaps you need to think about diversification.) For us, thinking about what a viable

economy was the starting point. We're about two months into the project. We have identified a series of businesses based upon the environment, using its natural assets. Then we will prepare a master plan, a business plan, an implementation plan, etc. But a fundamental part of what we're doing is about communication. We have had many meetings with everybody from the prime minister responsible to the local people in the community. They've all been participating, not through a formal consultation mechanism (as this is often hijacked by narrow vested interests), but an informal one.



This is Taif, the summer capital of Saudi Arabia. Taif is a lot cooler than the country as a whole. It is at a higher altitude, and it's got some beautiful landscapes. It's a magnet for both internal tourism within Saudi Arabia and the wider region. However, as often happens in places like this, regulation and governance have been poor, and the environment is under real pressure. The challenge is how to maximize the tourism industry without damaging the area's main asset.

And this is what happens when it goes wrong. This is a road that was built across the other side of the hill that I showed you earlier. You can see the damage, the construction spoil. That is the sort of thing that can happen. What we've been asked to do is to try and prepare a plan that will help to ensure that that sort of thing never happens again. This was built some years ago, and you can see that the environment has been completely destroyed.

Another project is in Jeddah. Jeddah is located on the Red Sea coast of Saudi Arabia. It has a population of 3.4 million, and 40 percent of the population lives in informal settlements, sometimes called slums. These may not be the slums of India, but they are certainly informal settlements. Less than 50 percent of the city is served with a sewage network and

direct discharges to the Red Sea of sewage has been common, similar to what happened, I believe, here in The Bahamas. (But your populations are much smaller and perhaps is less.) A lot of damage has been done to the coral. The Red Sea has got fantastic coral, both on the Egyptian side and the Saudi side. The near-shore environment is under real pressure. Our work was primarily urban, but because the coastal area is so significant for the whole city, it became a significant part of our work. So we prepared a 20-year strategic plan to guide the development. It focused mainly, as I say, on the urban area, and again, the important thing is not to prepare plans that sit on shelves. The plan should be action oriented. There should be a series of initiatives. Any plan needs to have both a long-term time frame, and a short-term one, because politicians need to demonstrate success. We as professionals need to understand that if we can't deliver the short-term successes for the politicians, the longer-term ones will also elude us.

This is another project in Croatia. Much of the southern part of Croatia has become depopulated over the last 20 or 30 years, and that depopulation accelerated during the Balkans War of the 1990s. But tourism is one of the main attractions for Croatia, one of the main earners. It's got the wonderful city of Dubrovnik, with a fantastic landscape. In fact, there are many parallels between Croatia and The Bahamas, because of the fantastic islands. The elevation is a bit higher in Croatia, but it's beautiful too. So our client, with government support, wanted to explore building a semi-urban area to both further attract tourism and create other industries. And the question we asked is, can tourism co-exist in a fragile environment?

The client, a developer, needed a master plan, to attract the support of government, and to engage with the wider development community who would fund and build the development. And of course potential purchasers. This was a classic development project, actually. Many famous architects came into this project, worked for six months and produced a master plan. The plans failed because they were misconceived and unviable. We advised the client very

strongly that he had to understand what the land was telling him. But he didn't do that. We resigned from the project, because we believed that it was impossible to deliver a project, in these circumstances and unsurprisingly, the project failed in 2008.


Another interesting project is in Jamaica Bay, New York—a great example of urban wetlands. Jamaica Bay is a very damaged environment, partly through the construction of JFK Airport, partly the result of discharge of sewerage into the bay.

The total marsh area has been reduced from 950 acres in 1951 down to 355 acres in 2003. The U.S. Army Corps of Engineers is at this point in time involved in a massive exercise in environmental rehabilitation, very similar to what needs to be done, on the southern coast of the United States in the Gulf of Mexico. But unlike Central Park, Jamaica Bay is unloved. Nobody really knows about it because it's a wasteland. The New York police use it for target training. They use it to dump cars that are unclaimed. It's a total and utter mess. One also needs to understand that the governance is divided between the National Park Service and the city. So nobody really owns it, and that's a big issue.

Even if you get a damaged environment, it is possible—but very expensive—to restore. This restoration work is going on right now. But some crucial bits have not been thought about. The physical environment is under restoration, but even though substantial areas have been restored, the governance issue has not been addressed, and therefore the project is continuing to suffer. Another issue is, that around the Jamaica Bay area many neighbourhoods are quite a poor, and there was no relationship between the bay or park—they don't "own" it. They don't feel they own it. They don't value it. We talked about consultation earlier and how you have to engage. So in a way we are doing a retrofit on the issues that haven't been addressed. The environmental aspects have been addressed, but crucial aspects have not been, and that's what we're doing right now.

We talked earlier about codes and standards, and I'm slightly sceptical of rating systems and what they do. I think LEED (Leadership in Energy and Environmental Design), and BREEAM (the UK's Building Research Establishment Environmental Assessment Method), which we've used for more than ten years, have done an enormous amount of good, because they help to raise awareness. We also see the limitations of

these rating systems, and we see the fact that they cannot be applied across the world. The circumstances in The Bahamas are very different from the circumstances of the United States, and if you use the standards slavishly, you can quite easily do completely unsustainable things.

We've been involved in developing an interesting project for Abu Dhabi. It's tied to the Urban Planning Council's Vision 2030. It's tied very much into the culture of the city, into its institutions. It attempts to address environmental, economic, and sociocultural issues, but also the process and how projects are delivered. So it's much more expansive than usual methods of environmental assessment, and this could never be applied anywhere else, it is totally place-focused.

What are the clear lessons from such a diverse range of projects? While sustainability is decided in context, it is location- and time-dependent. Time is important, because what is sustainable today will not be sustainable five years from now. We'll have inevitably raised the bar. And if the past ten years are anything to go by, that's what's going to happen. Social and economic factors are as important as environmental ones. There needs to be a shared vision. We need to rank the priorities. We can't give everything equal priority, because we can't deliver. Ecosystems and environments are dynamic. Somebody mentioned that this morning. There are very few truly natural environments that exist. I think the Exumas is probably one of those, but landscapes are continually evolving, and we need a process to manage evolving landscapes. What pays for sustainable development? We talked about Schooner Bay, and how the developer recognized that some undiscovered aspects were part of the value in the development. But more often than not, sustainability is seen as a liability, and that's why a lot of the time it gets thrown out in the early stages of the planning of a project. If the environmental aspect is properly valued, sustainable development can have a chance to go forward. The vision can only be put in place if the institutional capacity for implementation is there.

# XV Visible and Invisible Aspects of Architecture and Urbanism

## Mohsen Mostafavi

**Architecture and urbanism are both visual practices. They involve the construction of artefacts—buildings, infrastructure, etc.—that visibly transform the environment. The beauty of architecture affects our apprehension of the built environment and improves our quality of life. But architecture and urbanism possess a nonvisual or invisible dimension as well. The aim of this talk is to explore the relationship between these two aspects of architecture and urbanism. How do buildings as physical objects contribute to constructing our lives? How can designers, planners, and government agencies create the appropriate frameworks for the most productive articulation of the relationship between visible and invisible dimensions of our environments?**

We've heard this afternoon about the role of research, and we've also seen wonderful examples of implementation. I think it's very clear that the Exumas have been the focus of our attention. I want now to argue for the relationship between processes of urbanization more broadly, and the Exumas, and to suggest that it's impossible to focus solely on the Exumas. It's imperative for us to look at the processes of urbanization, for example, within Nassau as part of a certain set of sensibilities that also relate to the Exumas. Therefore there is the need for a broader regional conceptualization of development and of thinking about the area, which then makes the research programme much more integrated as an overall set of practices, rather than one kind of practice here and another kind of practice there. I'm arguing for, in a sense, consistencies. The other thing that I'd like to focus on is the quality of things. Part of what I hope has been emphasized throughout the day is that we need to be producing the conditions, the circumstances that help us think in a different way. So, in a way, the field of design needs to construct its own discipline and its own discourses. It has to provide the appropriate circumstances, and therefore what are the ways in which we can create conditions for imagining in different ways. Finally, I want to emphasize the relationship between the idea of focus on the Exumas or any other part of the world and on the interrelationship between ethical practices and aesthetic practices. That is an important issue in the sense that we heard this morning. One of the things that comes up in relation to planning is that there are certain codes within which architectural or design projects can be approved. But in a way we could also discuss and speak of ways in which through the planning process we can create and demand more possibilities for new forms of innovation and new forms of creativity for contemporary projects. So instead of the approval process being based on a template of yeses and nos, how can the planning process become the basis for encouraging new forms of creativity? These are some of the things that hopefully will be clear.

This image is by an English engraver from the 18th century, William Holgarth. It's a very well-known engraving called Gin Lane, which was used in the 18th century to demonstrate the ill effects of drinking gin, as opposed to drinking beer. And you see that this is what happens to you if you have too much hard liquor. Basically, people start behaving badly, and there is an implied relationship between the kind of codes of behaviour within urban environments, and the health of the citizens, and the quality of life of the city. Often we think about medieval cities, or we think about old cities, there is the notion that the city is seen as a place that corrupts individuals, that is not the place of health. This

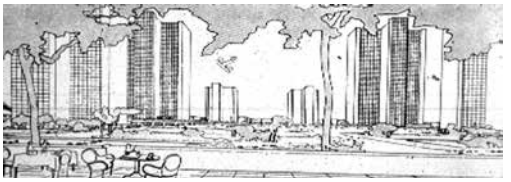
association between immoralities and the city as a site of these kinds of practices has had a deep impact on the way in which architecture and urbanization have responded to the way in which planning and design have then developed as a set of practices.


In response to this notion of the city, we get toward the very end of the 19th century and the beginning of the 20th century a whole set of ideas and movements toward the formation of what was called the Garden City. One of the examples of the Garden City movement is the work of Ebenezer Howard. What he tried to do was create cities that were very close to the notion of gardens, to the mixture of urbanization and landscape, or urbanization and nature. Nature was seen from the period of the Enlightenment onward specifically to have a cleansing power, as something that had a good effect. So if the city was the site of corruption, the Garden City was the site of purification, and its proximity to nature was something that brought about extremely redeeming kinds of features.

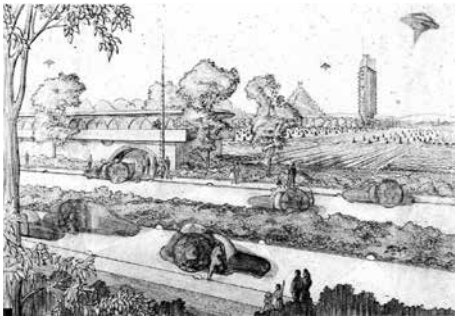
During the earlier part of the 19th century a series of buildings were constructed around London's Regent's Park. A number of architects, such as Decimus Burton, were involved in these buildings, which look like mansions, but actually they were individual houses or apartment buildings—now condominiums—that are masked, in a sense, behind a facade that looks like a mansion in the country. What is important about this is that the people who were living in the city desired the life of the country and wanted to have the association with the notion of country life, because again, and this is deeply rooted in Protestant ethics, of the association with nature and naturalism. Therefore we have a kind of lie that's going on, which is a building that's not really a mansion, but pretending to be a mansion. And what is important about this kind of project is that it represents certain desires. It represents the desire of the people who are living in these houses to say what kind of life they want to have. My point is therefore that there has been always a very direct relationship between our desires and the kind of environments that we construct.

Today the Minister made a brief reference to China. We could say that the way that urbanization and the quality of life are evolving in China is deeply rooted in the desires of the Chinese. And it's those desires that are driving those societies to do the kinds of things that

they're doing, to build the kinds of cities that they're building, and that's not always good. It has good and bad side effects. So what we have to be really focused on is also what are the kinds of desires that we have, and what is the correlation between our desires and the kind of environments that we construct.



To demonstrate that what you saw at the end of the 19th century and beginning of the 20th century has become a kind of continuous project, in 1925, a very, very well-known architect, Le Corbusier, also developed, for example, many plans. This one, Plan Voisin from 1925, shows the notion of high-rise structures in the middle of parks, in the middle of landscapes. This is very similar to what I showed before, with the idea of the mansions in relation to nature, because what is it doing? It's saying we don't want the medieval city anymore. The notion of the radical modernist city is the city where high-rise apartments exist in the midst of nature, and nature, therefore, has the capacity for cleansing and purification, and this, of course, is also seen in the work of other architects, like Frank Lloyd Wright.



Frank Lloyd Wright developed a project called Broadacre City, based on the role of the automobile and the notion that his city was a kind of antithesis of a city. It was an anti-city, and it was in many ways based on the desire for suburbia and wanting to live in the suburbs.

Today we have a situation where we are also the inheritors of this tradition, and I want to argue that the continuity of this desire for suburbia is something that is still very present in projects like Celebration in Florida. There are many others like it, which continue to represent a preference for a suburban lifestyle.

But the fact of the matter is that today, we need to think about alterative models of urbanization rather than the suburban model of urbanization, because partly with suburban models of urbanization, you also inherit many problems connected to sprawl, one of which is problems related to many of the things that were discussed this morning about resources, about energy, but also around questions of health, including obesity, and many other things.

What are the relationships between urbanization and suburbia, and what does that mean in terms of the Exumas? I feel that in the context of places like The Bahamas, we have to focus more on housing and less on models of urbanization. Therefore, it would be interesting to discuss the interrelationship between models of urbanization, which incorporate and include housing, as well as those that may perhaps not. And there are certain repercussions from that that are worth discussing.

Alex MacLean from the book "Las Vegas | Venice"

Alex MacLean from the book "Las Vegas | Venice"

The other thing is the question of water urbanization, and what it means to be designing things that are close to water. This slide of Venice is basically a marker. It's not that I'm going to say anything terribly profound about this, but I think that we have to discuss the possibilities for water urbanization, that it's not only in relation to the sustainability conversation, but about the conceptualization, the ideas for the kinds of things that are possible. Precisely, this is the kind of question that the Qataris are concerned with. We had this tradition before. We're now building high-rises. What could be the possibilities for a different kind of urbanization that is neither replication of the old nor is simply a high-rise? When we start doing things that might have a connection with water, it becomes much more a horizontal project. It becomes much more a sprawl-type of project. And therefore the question of how density is reflected in the way in which we think about our process of urbanization becomes a key part of this. We are not imagining this amazing landscape for the Exumas. But the reality is, in other parts of the world, people are living in this kind of building.

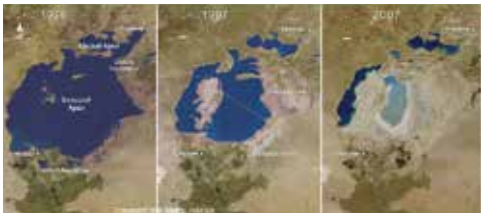
This is Kowloon Wall City (in Hong Kong), and one can imagine the condition of densification that exists in a place like

this (not that I am suggesting that The Bahamas must deal with the level of density of Kowloon). It's important in terms of the future to have a sense of the reality of the issue of density and what that could mean as a way of preventing sprawl. That is an interesting conversation, because in many parts of the world, sprawl is precisely what is happening.

Charlie Koolhaas

In the foreground you see the old city. In the background you see the new city. You have to deal with the dilemma of how to transform the old city and how to build the new city. The old city, in many instances, has to deal with problems of environmental pollution, of the quality of life for the inhabitants, and all these things not only are part of the question of resources but also relate to the whole range of the amazing growth that we have in many parts of the world.

Here you see a city that developed from 1973 to the year 2000, from the image on the left, to the one on the right.



Or the way that you see in parts of the world the disappearance in a way of the natural lakes from the image on the left to the image on the right, from 1976 to the year 2007.

All of these issues related to the question of resources in many instances may seem like that they are very far way, but they're actually very close. I mentioned this morning—and a number of other people have discussed this—the question of the issue of distance and proximity of globality and locality.

A few years ago, there were three short articles in the English newspaper, *The Guardian*, all on the same day. The first one was by a Canadian, Naomi Klein, who wrote about tar sands in Canada and the relationship between the war in Iraq and the development of tar sands in Alberta, Canada. She was trying to demonstrate that it was the war in Iraq that made the tar sands in Canada profitable. Something that was happening thousands of miles away was having a deep physical impact on the landscape of Canada in terms of how it was devastating the landscape.

Another story in the paper was about a 60-plus-storey house that was being built (it's now finished) by the Ambani family in Mumbai. This was for a very small family of about six or seven people. If the first article was about distance and proximity, this one is about the limits and ethics of what is enough and what constitutes a house, and what should be the limits of what we use as resources.

Naomi Klein

# Iraq's oil boom isn't delayed, it's relocated to Canada

As Baghdad burns, destabilising the entire region and sending the price of oil soaring, Calgary booms

The invasion of Iraq has set off what could be the largest oil boom in history. All the signs are there: multinationals free to gobble up national firms at will, ship-unlimited profits home, enjoy leisurely "tax holidays", and pay a laughable 1% in royalties to the government.

This isn't the boom in Iraq sparked by the proposed new oil law – that will come later. This boom is already in full swing, and it is happening about as far away from the carnage in Baghdad as you can get, in the wilds of northern Alberta. For four years now, Alberta and Iraq have been connected to each other through a kind of invisible umbrella: as Baghdad burns, destabilising the entire region and sending oil prices soaring, Calgary booms.

Here is how chaos in Iraq unleashed what the Financial Times recently called "North America's biggest resources boom since the Klondike gold rush". Albertans have always known that in the northern part of their province there are vast deposits of bitumen – black, sticky goo that is mixed up with sand, clay, water and oil. There are approximately 2.5 trillion barrels of the stuff, the largest hydrocarbon deposits in the world.

It is possible to burn Alberta's crud and turn crude, but it's awfully hard. One method is to mine it in vast open pits: first, forests are clear-cut, then topsoil scraped away. Next, huge machines dig out the black goop and load it into the largest dump trucks in the world (two stories high, a single wheel costs $500,000). The tar is diluted with water and solvents in giant vats, which are stewed until the oil rises to the top, while the massive tailings are dumped in ponds larger than the region's natural lakes. Another method is to separate the oil where it is: large drill-pipes push steam deep underground, which melts the tar, while another pipe sucks it out and transports it through several more stages of refining, much of it powered by natural gas.

Both techniques are costly: between $18 and $23 per barrel, just in expenses. Until quite recently, that made no economic sense. In the mid-80s, oil sold for $70 a barrel; in 1998-99, it was down to $12 a barrel. The major international players had no intention of paying more to get the oil than they could sell it for, which is why, when global oil reserves were calculated, the tar sands weren't even factored in. Everyone but a few heavily subsidised Canadian companies knew that the tar was staying put.

Then came the US invasion of Iraq. In March 2003, the price of oil reached $35 a barrel, raising the prospect of making a profit from the tar sands (the industry calls them "oil sands"). That year, the US Energy Information Administration "discovered" oil in the tar sands. It announced that Alberta – previously thought to have only 180 billion barrels of oil – was actually sitting on at least 174bn "economically recoverable" barrels. The next year, Canada overtook Saudi Arabia as the leading provider of foreign oil to the US.

All this has meant that Iraq's oil boom has not been delayed; it has been relocated. All the majors, save BP, have rushed to northern Alberta: Exxon-Mobil, Chevron and Total, which alone plans to spend $10bn ($12bn). In April, Shell paid $8bn to take full control of its Canadian subsidiary. The town of Fort McMurray, ground zero of the boom, has nowhere to house the tens of thousands of new workers, and one company has built its own airstrip so it can fly in the people it needs.

Seventy-five percent of the oil from the tar sands flows directly to the US, prompting Brian Hall, an energy consultant with Colorado-based IHS, to call the tar sands "America's energy security blanket". There is a certain irony there: the US invaded Iraq at least in part to secure access to its oil. Now, thanks partly to economic blowback from that disastrous decision, it has found the "security" it was looking for right next door.

It has become fashionable to predict that high oil prices will spark a free-market response to climate change, setting off an "explosion of innovation in alternatives", as New York Times columnist Thomas Friedman wrote recently. Alberta puts the lie to that claim. High prices have indeed led to an R&D extravaganza, but it is squarely focused on figuring out how to get the dirtiest possible oil out of the hardest-to-reach places. Shell, for instance, is working on a "novel thermal recovery process" – embedding huge electric heaters in the deposits and literally cooking the earth.

And that's the Alberta tar sands for you: the industry already contributing to climate change more than any other is frantically turning up the heat. The process of refining bitumen emits three to four times the greenhouse gases produced by extracting oil from traditional wells, making the tar sands the largest single contributor to Canada's growth in greenhouse gas emissions. The 100bn in projected investments from the tar sands have also turned Canada into a global climate renegade.

That money is the primary reason why, at next week's G8 summit in Heiligendamm, my country's oil-friendly prime minister, Stephen Harper, will join George Bush in opposing all serious attempts to cap or reduce greenhouse gases. Back at home, his government fully supports the oil industry's plans to more than triple tar sands production by 2020, with no end in sight. If prices stay high, it will soon become profitable to extract an additional 141bn barrels from the tar sands, which would place the largest oil reserves in the world in Alberta.

Developing the sands is devouring trees and wildlife – the Pembina Institute, the leading authority on the tar sands' environmental impact, warns that boreal forests covering "an area as large as the state of Florida" risk being levelled. Now it turns out that the main river feeding the industry the massive quantities of water it needs is in jeopardy. Climate scientists say that dropping water levels are the result – bringing enough – of climate warming.

Contemplating the collective madness in Alberta – a scene even the Financial Times has labelled "some dystopian fantasy" – it strikes me that Canada has ended up with more than Iraq's displaced oil boom. We have its elusive weapons of mass destruction, too. They are out near Fort McMurray, in the jet-black goo beneath the earth's crust. And with the help of trucks, pipes, steam and gas, these weapons are being detonated.

*A version of this article appears in the Nation*
www.nsfgn.org

**About 75% of the supply from the tar sands flows directly to the US – making it America's energy security blanket**

## International

# India's richest man builds 60-storey home

**£500m Mumbai tower for family of six and 600 staff**

**High-rise era attacked as dawn of 'new vulgarity'**

**Randeep Ramesh** New Delhi

In the most conspicuous sign yet of India's unprecedented prosperity, the country's richest man, Mukesh Ambani, is building a new home in the financial hub of Mumbai: a 60-storey palace with helipad, health club and six floors of car parking.

The building, named Antilla after a mythical island, will have a total floor area greater than Versailles and be home for Mr Ambani, his mother, wife, three children and 600 full-time staff.

Draped in hanging gardens, the building will have a floor for a home theatre, a glass-fronted apartment for guests, and a two-storey health club. As the ceilings are three times as high as a normal building's, the 173m (570ft) tower will only have 27 floors.

With property prices rocketing, the building is already worth more than £500m. It is expected to be ready for the Ambanis to move in next year. The family currently live in a 14-storey building, Sea Wind.

Mukesh Ambani's Reliance Group is India's largest private company, with interests in oil, retail and biotechnology. The 50-year-old became the country's first rupee trillionaire this week, taking his net worth to £14bn.

The Indian economy is soaring; yesterday it posted annual growth of 9.4%. Friends of the Ambanis told the Guardian that the billionaire's new home was "comparable to those owned by friends such as Lakshmi Mittal". The UK-based steel tycoon bought the most expensive house in London last year, paying £60m for a place in Kensington Palace Gardens.

Urban planners say Mr Mukesh's home is part of a global rush for tall buildings that has seen skyscrapers spring up in Dubai, Shanghai and Seoul.

In India, planning rules and a historic antipathy to unrestrained materialism has meant that this race to touch the sky has largely bypassed the cities, which are more notable for their shantytowns and dilapidated housing. But experts say the next wave of skyscraper proposals could come in India.

"Our wealthiest citizens used to hide their money," said Hafeez Contractor, a Mumbai-based architect. "They would not drive their Mercedes, they lived in small apartments. Even Mr Ambani's father lived in a small block of flats. They were afraid of the taxman. But that attitude has gone; Mukesh has made his money, and good for him if he wants to flaunt it."

Mr Contractor said it is only a matter of time before Mumbai was littered with high-rises. "We have to find homes for people, and in a small area that means building skyscrapers."

While some idolise the riches and glamour of India's "Jazz Age", others are uncomfortable with the "new vulgarity". Only last week India's prime minister, Manmohan Singh, called on business leaders to "eschew conspicuous consumption" and "be role models of moderation".

Fuad Bidwai, a newspaper columnist, said the divide between rich and poor was becoming obscene. "Mr Ambani is building an edifice to his own ego," he said.

"It will not go down well with the public and there is a growing tide of anger about such absurd spending."

guardian.co.uk/india ⊕

An artist's impression of Mukesh Ambani's new home Picture: Mumbai Mirror

# China admits death in wild of 'pioneer' panda

**Jonathan Watts** Beijing

The only captive-bred giant panda to be released into the wild has been found dead, it emerged yesterday after a three-month cover-up by scientists running China's breeding programme.

The five-year-old male, Xiang Xiang, was found lying in the snow-covered forests of south-western Sichuan province on February 19. A postmortem revealed he had broken ribs and damaged organs.

No information was made public until yesterday, when the country's biggest panda research centre, at Wolong, announced that Xiang Xiang had probably been killed in a fight with a wild panda.

The reason for the delay is a mystery. The Xinhua news agency said the news was withheld as scientists investigated the death. Such was the secrecy that even by March reporters were being told the panda was only "missing".

Xiang Xiang was a pioneer. Before his freedom, starting in April 2006, the 80kg (176lb) male had been trained for three years in foraging and building dens. In December he was injured in a fight with wild rivals only to be patched up and taken back to the forest. He probably died on January 7, when his satellite tracking device disappeared.

Critics say the breeding at Wolong is commercial, aimed at supplying foreign zoos which pay up to $1m (£500,000) a year to "rent" a panda. But Zhang Hemin, director at Wolong, said his goal was to replenish the wild population by releasing the reared pandas. Next time a female would be selected, who would be less likely to fight over territory.

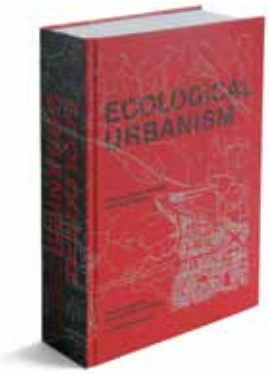
The setback confirms the fears of critics who warn a captive-bred animal is bound to struggle to survive in a rugged habitat, competing for both food and mates.

# The plot thickens

Traumatised asylum seekers are sent to a Liverpool allotment to heal through gardening – how's that for a feelgood film? Kevin Sampson reports

'Once the therapist gave them each a little plot of land, they were able to open up to her'

The third article was a story about an allotment in the city of Liverpool in England where a psychotherapist is using the allotment to bring together immigrants from various parts of the world, many of them from war-torn parts of the world, together with local community members, who are cultivating these allotments. So each one of them would have a piece of the allotment. I think the point of this allotment, and a movie was made about this experience, demonstrated that the allotment was a kind of catalyst for establishing a relationship between these people from various parts of the world. The reason I mention this is because of the fact that when we are talking about collaboration —collaboration among ourselves and collaboration among the community— it actually helps to have some specific catalyst, to have some very specific elements, physical things, that can be the devices for sharing. It makes it a lot easier to share through something, rather than to have, for example, a philosophical discussion in abstraction, as opposed to discussing something concretely about this site or this house or this landscape. This kind of allotment idea was very useful for constructing a certain set of relationships between the immigrant community and the local community.




When we think about the future of any part of the Exumas, the notion of the catalyst is very important. This is the background for the discussion around ecological urbanism and the idea of trying to bring ecology and urbanization together. If we are going to think about making new kinds of projects, we also need to design the framework through which we design these projects. It's not like we as designers feel that we're the kinds of doctors who know everything there is about any kind of conceivable disease, but that we need to also be prepared to design and orchestrate the mechanisms for production of work as much as we are thinking about the actual work itself. The relationship between the circumstances for doing the work and the outcome is important.


So for example, if we're discussing a research project related to the Exumas, the concept of designing the framework for the research, for that thinking, is something that is being shown on this slide, in the sense that you have to anticipate, you have to imagine certain things. You have to collaborate in specific ways. You have to deal with new forms of sensibility. The role of curation becomes important. How you produce things. Concepts of mobility and transportation are important. This is not trying to suggest that this is the end of it. This is proposing that whoever is working on issues needs to suggest the framework for the development of ideas, and this set of words are trying to put that forward.

Terreform ONE

One of the themes that runs through the whole conversation about ecological urbanism, about sustainability and the urban, is the attitude or the relationship to garbage. Most of our cities produce phenomenal amounts of garbage, and my point—and that of a lot of people I've talked about—is, we're not just dealing with a physical problem of how do we deal with this garbage, but that dealing with this garbage is also dealing with a cultural issue, the understanding of the kind of garbage we produce, because we see a lot of data about the quantity of garbage that is produced within different cultures. We have to deal with garbage as anthropologists who look at this garbage and decide or discuss, what does this garbage say about us. New York City every hour produces something on the equivalent of the Statue of Liberty in terms of garbage. And so I'm just going to run through some examples to suggest that we actually need to imagine different ways of doing that are normally thought of as functional problems, and see those as new kinds of opportunities, to actually be able to think about this point of the question that was asked this morning about innovation, about creativity, about the role of design, about what I was saying before about the mechanisms for evaluating work.

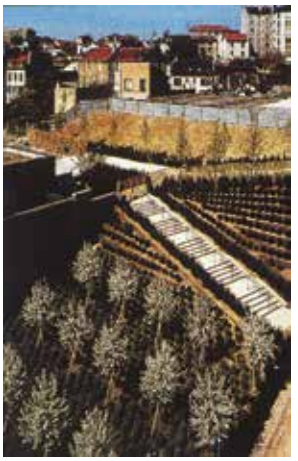
BIG

This is the work of someone who has been teaching at the school, a Danish architect, Bjarke Ingels, together with one of the engineers at the GSD, recently won a competition for an incinerator in Denmark, where basically it's a functional building for an incinerator, but it's also a ski slope on the outside. You take an absolutely mundane, totally functional building, and you turn it also into something pleasurable. So things that are often thought to be ugly, that are thought to be purely functional, might have a by-product that would be interesting.

Ecosistema Urbano

This is a project, built in Spain, which is like an air filter in the middle of the city, but it's also a kind of sculptural piece that has plants growing in the middle of it. So this is the idea of thinking about urban monuments, or thinking about places in the city might serve different kinds of functions.

Close to home here, many of you maybe have seen recently the completion of this garage building in Miami. The developer took an existing building and asked the Swiss practice of Herzog & de Meuron to turn it into a kind of multifunctional building that has an apartment. You can still park cars in it. It has a gallery. Again, the functional use of the garage is now turned into something more like a public building. So this idea of how we are able to imagine things in a different way is really one of the big challenges.



In France, for example, many years ago, instead of thinking about a public park as being something that's just designed as a landscape, they used the idea of agricultural landscape, or the notion of an agricultural territory as the basis of designing the park. The idea is that productive landscapes, things that produce things, can also have an aesthetic value. We shouldn't just think about things that are being designed as having aesthetic value.

Here, for example, are salt marshes, salt pools that are also very beautiful landscapes. They have aesthetic qualities as landscapes. But, they were never designed as a landscape. So my point is, what can we learn from things that were not intended to be visually pleasing, but nevertheless, they have a visual dimension. The responsibility of public and private partnership projects

becomes quite interesting in terms of how one can take infrastructural projects and turn them into potentially aesthetic projects—projects that have benefit for the social good.

An Italian architect, Andrea Branzi, has done a lot of work on agricultural territory.

We're going back to the point about senses. There is an artist called Sissel Tolaas who documents the smells of different cities. This happens to be scents of Mexico City.

Other ideas show that everyday places and everyday projects could be much more visually enticing. There is an artist, Luke Jerram, who leaves pianos around various cities, and people play the piano, and the playing of the piano becomes a device for people gathering around the player, and then having conversations. This is kind of a reiteration of my point about how one needs catalysts for interaction, for participation.

So these are all about ways in which you create innovations and new frameworks for urbanization. Another example is of an old railway line in Paris called Promenade Plantée, which was taken by the city and turned into an amazing landscape.

I would like to make the point about the relevance of the idea of the aesthetics of productive landscapes and how when we are thinking about our cities—whether we are thinking about The Bahamas, or whether we are thinking about the Exumas—these projects are constantly bound up in a set of aesthetic projects that are very close to our ethical attitudes toward these kinds of places. Therefore, whenever we think about these projects, we have to constantly bear in mind these possibilities and the kind of projects that we can create in the future.


C. ROBERT REISS
ELIZABETH THOMAS-HOPE
ERICH MUELLER

# XVI Panel Discussion II

## Respondents: Eric Carey, Orjan Lindroth, Erich Mueller, C. Robert Reiss, Joyce Klein Rosenthal, and Elizabeth Thomas-Hope

Chaired by Chris Reed

**Chris Reed** I would ask for responses from each of the panellists. We have four or five people here who are repeat performers. The one new person is Orjan Lindroth, president of Lindroth Development Company, a Nassau-based community builder whose projects emphasize sustainable architectural patterns as a means of addressing modern ecological challenges. So welcome, Orjan. But let's start with Eric here.

**Eric Carey** Just to be very brief, clearly what we want as an organization and as a country, is to look at all of the examples and ideas that have been presented, and as Henry (Hepburn, Audience Member 5) said earlier, to make sure that they get linked to a local concept. So I will end with finding a way to link what we're doing with the Small Island Sustainability Programme with the College of The Bahamas, and also to challenge local architects and planners to be a part of this process, and to invite them to challenge us—those of us who work in this field—to make sure that we do bring the experiences of the Bahamian context to enrich this process.

**Chris Reed** Great, thanks Eric. Next, Joyce Klein Rosenthal.

**Joyce Klein Rosenthal** Very briefly, two main points. I thought it was a very rich set of afternoon talks, and very interesting. I loved when Professor Spiro Pollalis said the main thing we can learn from looking at these experiments is that the local vernacular architecture worked best. Using the type of roofing and construction materials actually had a better thermal performance than

Joyce Klein Rosenthal

highly engineered materials. So that was very interesting. I think the speakers also reminded us of the organic growth of cities, a history of unintended consequences. And Dean Mostafavi looked at how cities grew organically originally, but then moved in the 20th century to low-density sprawl. And that question of density as a major parameter of sustainability is a very important one for many types of planners, and I think very much linked today to the challenges The Bahamas face. When I was preparing for this conference, I noted that The Bahamas is facing what the United States is facing now, too, an epidemic in obesity. I was very surprised to learn that 70 percent of Bahamians are overweight or obese, and that's very similar to the enormous growth rate we've had in that very serious health stressor in the United States as well. A lot of the American planners have linked that overweight and obesity crisis with land development and urbanization patterns. So it's something to consider moving forward.

Chris Reed

Great, thanks, Joyce. Orjan.

Orjan Lindroth

Any good land development plan is based on seeing the environment as an asset, not a liability. I think the fundamental problem that we've experienced in The Bahamas over the last 40 years is that land development is driven by financial markets. I think Professor Thomas-Hope talked about qualitative analysis. You cannot do a land development without qualitative analysis, and that should come first. And that, in fact, gives you the financial plan. That's what we've done at Schooner Bay. We didn't know what the project would look like until we studied the place, and what we could use of the place, and so on. So in fact, this view that environmental responsibility is expensive is completely unfounded. I can demonstrate that we found more value in what we kept than what we're building and selling, which is not understood. That's one of the problems with how we approach development. What we're trying to do here is get some ideas and directions of how to fix this. We had a lot of help from the Minister in doing what we did, because we broke every rule. It's not a gated community. It has beach access. We have a 40-to-one range of house price, which is unheard of. We don't build on the beach. We preserve that for everybody. So in theory, this didn't work, but in fact it's the only thing that's working. So I think that we need to understand that anything that is approved in The Bahamas should have a high environmental component attached to the planning process. We need to look at our zoning and so on, and our building codes, which have been imported from outside and don't really apply here 100 percent. I think we

should also understand that the urbanization model of The Bahamas is going to be different, because we have a lot of land and water and very few people—unlike the Chinese, who have to live vertically, I don't think, for example in Nassau, we could look at a five storey building like in Paris. I think this is a great start. I think that we're coming into a new era of development. The crisis has taught us that. The old model is clearly dead—and it's dead for a good reason.

Chris Reed

Great, thank you. Erich Mueller.

Erich Mueller

I'd like to go back to the morning panel as well as draw some common threads. One that I heard in a number of talks is building from the base—in other words, getting the local population educated as to the needs of the area and having its consensus as you go forth with development. A brief example: I was involved in a project developing what, at the time, was the largest marine reserve in the United States, the Tortugas Ecological Reserve. The U. S. government made a huge blunder going in and putting up lines on a mountain, saying this is the way it's going to be. It promptly got shot down. The government came back a number of years later with a process that worked very well, which was to engage every single stakeholder. We ended up with 26 representatives on a committee that worked for almost two years to design this marine reserve. In the end, we had 25 people, ranging from fishermen to international NGOs, all coming to one agreement. This was possible through enlightened facilitation—we had an excellent facilitator. We also took the time to bring everyone around. I think this is going to be necessary for any development plan, whether it be a Neighbourhood Plan Amendment (NPA) or whether it be zoning, to get people to come along with you, because ultimately enforcement—especially in an NPA, but it can go on with other types of planning as well—is going to come from the people. You can't pay to have things enforced all the time. You want self-enforcement.

I also want to touch on something that I don't think we've talked about here. We've all used the word sustainability many times today, but we really haven't quite defined it. I think it gets defined simplistically in two ways. One is at the level of sustainability you want. In other words, some people are very happy with their life in an urban town now, and they'd like it to stay at that level, whereas some of us who tend to live in the country think there's already too much urbanization. And so that's the point of going back to the local community, and asking what level of service, of quality of life do they want to sustain? And then you also have to look at the time factor, which relates

Erich Mueller

back to the cost. So we've had a relatively, in the U. S., short term look at getting cost returns. But as you take in the longer view, the concepts we've been talking about today start to make more economic sense as well.

Chris Reed

Great, thank you. Dr. Thomas-Hope.

Elizabeth Thomas-Hope

I'd like to reinforce a couple of points. One of the striking things is the range of approaches and disciplines that have to be brought to bear on anything like this topic—everything from psychology and social psychology to engineering and technology. This is true in the thinking, as well as in the implementation—one has to think of not only the place, but the place in terms of the people that comprise that place, as well as the natural ecosystems. This is a huge challenge, but it made today's discussions very exciting, because so many of these angles were coming out in different presentations. One of the talks this afternoon, from Padraic Kelly, hit this particularly on the head. Another point that struck me that has been mentioned, is that people in the past knew how to construct their dwellings to be pleasing to themselves within the context of the environment. To put a Bahamian angle to this, or perspective, and an Exuma perspective, the flow of air and of light through the appropriateness of the wooden buildings, and the way in which those wooden buildings were just part of the environment and much less imposed in terms of the materials and so on. But the other thing about The Bahamas now, and the Caribbean generally, is that because we are developing our urban problems later on, we can also benefit from the mistakes of the past, the past urban processes. So we needn't repeat them, although we do have a problem—usually in the Caribbean we repeat all the negative factors that we see, as long as it happened in North America or in Europe. We think it must be good, and we repeat. I think this really is a call, not only for looking back to the past for what is good and appropriate, and that's usually the most simple forms, but also to not just repeat and implant the models from outside. This has come up in many different ways throughout today. We need to be innovative, to think outside the box, but from inside the Exuma box, the Bahamas box, the Caribbean box, and so on, to learn from the past.

In closing, the point is that the matter of sustainability was referred to today as a matter of survival. I think it's important to realize that the whole concept of sustainability it itself dynamic, as the last commentator also made mention. There's nothing static about sustainability and so it's important that we don't assume that it is a thing we use as a goal, because that thing will

be totally elusive, and it will mean something very different to the next generation than what it means to our current generation. It's important that we think in terms of sustainability as a process—a dynamic set of factors that are relevant to the age, to ethical perspectives of the society and the culture involved. I think that's how The Bahamas and the Exuma planning can capture much from the global experiences that have been mentioned today to see within them the threads of relativity to the Caribbean and to The Bahamas.

Chris Reed

Thank you for talking about how we might learn from the past without imitating the past, and how some of those ideas resonate with the Dean's call to project forward, to understand not only the successes of how people built in the past, but how we can use our new technologies, our new understanding of the sciences, and the community's collective desires to project images that are as forward-thinking as the sustainable practices. And our last panellist, Robert Reiss.

Robert Reiss

In listening to the other talks today, coming back around to water supply and having sustainable resources, certainly as Minister Deveaux said, there's an impact on the environment when infrastructure goes in, including the ancillary infrastructure that might be associated with a home or with a water supply system, such a solar panels or wind turbines. It's important to make sure that we have good planning as we go through continued growth and development throughout the Exumas and the entire Bahamas. We need to recognize that in fact the more rural you get, the more you lose the economy of scale that would minimize the impact of development on the environment in contrast to when you have discrete settlements, where each location have to have their own generator, or each have their own PV panels, etc. So it's an interesting dynamic to balance smaller population densities. Also, with switching to wastewater treatment, as I've mentioned, there's so much emphasis on providing supply to communities—and I think it's a bit disproportionate—and the environmental impacts of wastewater treatment get left behind many times. The other thing that struck me about the event today is that we're evolving as a community. The government in 2004 passed the Professional Engineers Act, and put in place legislation that allows for the orderly management of engineering practices within the country—a tremendous piece of legislation that helps make the great things happen that we want to have happen in our community in an organized fashion with appropriate standards. When we talk about the ideas of how we build our community, when those ideas are formalized, then

Robert Reiss

whether it's engineers or contractors, they need to in fact subsequently implement the ideas. And when we get to that point, it's tremendous that we have such great Bahamian engineering talent. But it's also wonderful to see that the Professional Engineers Act (2004) does accommodate that integration with international partners, so that we truly can achieve the type of wonderful ideas that have been presented, in many cases from international participants, here today.

Chris Reed

Great, thank you, Robert. I want to immediately throw the floor open to members of the audience to give us your input, ask questions—either of the panellists or of anyone who was involved today.

Audience Member 8

Good afternoon. My name is Bruce Stewart. I'm a local architect, and I'd like to first of all thank you all for coming down here for this interesting presentation. It's very nice to see the input from various design professionals around the world from their studies abroad and what they've recommended for those locales. Going forward, I am curious to see how this progresses. And as a Bahamian, it's very important for our architectural community here to realize the impact of what we do for a living has on the environment. As you know, the buildings have a tremendous impact on the whole ecosystem, and the built environment affects everything. When we sit down with a client at the very beginning, whether you're in the United States or a small place like The Bahamas, you basically are left with a task of having to educate your clients, if they perhaps don't know everything that you know, which is why they've hired you. One of the things that I wanted to comment on is that going forward we would welcome your involvement with our local institute of Bahamian architects, and the engineers here, and everybody working in professional engineering for the built environment.

The other point that I would like to make is that I believe Professor Spiro Pollalis mentioned another rating system that you were working on that you found is more appropriate for other locales, and I think that that's something I'd be curious to see develop here. The LEED building credit system in the United States is fantastic because you're very close to a lot of resources and building products, but here, once everything's had to be shipped in, it blows your points out of the water. I think that going forward we would welcome different rating systems as they apply in the overall wider scheme of things. One of the other comments that I would like to make is that I appreciated Erich Mueller's input on how building materials in our environment are subject to some of the harshest of what nature has to deliver. And as a

result, it actually goes back to the LEED points, is that we end up having to bring in materials that are a lot more durable, so that they'll last longer, so that they don't end up falling apart, and having to go into the landfill—and we don't have that many acres of landfill available. So I think that when we approach building in The Bahamas, whether it's a small cottage in Exuma, or whether it's downtown Nassau, as Orjan said, maybe we go to a five-storey, medium density, which may very well be appropriate. And on that level, we're looking at some downtown redevelopment plans as a country. So there are a lot of things we are already doing here. And having the Graduate School of Design and the Bahamas National Trust involved is going to—we hope—put a lot more attention on our plight here as Bahamian architects and engineers and the design profession. So we appreciate that, and welcome your input, and hopefully we can be a part of it as well going forward. Another thing that I wanted to mention is that the client education is probably the biggest part of this. And so after we go forth with perhaps a design charrette in the future, we could then go out to the wider public with common goals determined and broadcast that. I think that that may help, because people want to know what they can do to affect change. And sometimes what happens is, you're able to affect it one building at a time, and in a small community, once one person does it, then other neighbours will see it, and they will try it. Hats off to Orjan Lindroth on his development at Schooner Bay. He's obviously broken the mould of the development there, and I think that that's going to be an interesting model at the larger planning scale. So far as what we're dealing with on smaller projects, again, it's really down to the individuals being educated to know that these systems are available to be used, and I think the government's now coming forth with plans for the duty-free importation of solar panels and things like that. So that's really helping us move forward as a greener country.

Chris Reed

Great. Thank you for those comments. It's nice to hear the enthusiasm in the room that we've heard over the course of the day, the desire for individual and organizational participation in the process going forward. I think that's going to be critical. Other comments, thoughts or questions?

Audience Member 9

Good afternoon. My name's John Canton. And some of you may know me as the Director of Public Works. But I'd like to speak in a personal capacity, actually as a lifelong supporter of sustainability and conservation, and express my appreciation to the organizers today with what I see as being a wonderful

Audience Member 9 conference and a wonderful bringing together of many talents. I think the question that I'd like to put to the panel, though, is how do you develop a natural wilderness, because the thing that strikes me about the presentations today is that what's in Exumas is unique and wonderful. I previously worked on development plans for the east of England, which was nothing in comparison to what you're looking at here. But even in that already highly developed environment, we were talking about environmental limits, and I had a real job working against the development powers, explaining that limits were limits, and that if you exceeded them, then you actually destroyed what you were attempting to protect. So I'd put that forward as one observation. The other great value I got from today was an extension of that idea of environmental capacity to a much broader carrying capacity, which is the social, environmental, economic, financial, in other words, every aspect of that context. There were a number of very valuable observations today, one of which was that the Exumas shouldn't be viewed in isolation, but in the context of the whole of The Bahamas. And if I may say so, I think at a very crude level, The Bahamas has pretty well got it right, because we've focused all the, if you like, bad development on New Providence, and it attracts a particular type of tourist. But it has allowed the rest of The Bahamas to retain its pristine beauty. There are three examples I'd like to cite of where I think pristine wildernesses have been maintained, and work as tourist attractions and still develop a lot of economic value. The first is Uluru, or Ayr's Rock, in Central Australia, where in fact there's no development at all within about five miles of those rocks, because the very essence of those rocks is their isolation. The second is the Barrier Reef, where if you want to go to the Barrier Reef, you have to take a 20-mile boat trip. And I think the third would be Antarctica, where, partly because of the environment, no one wants to build anywhere. So the model that I'd suggest, perhaps, is that it's an extension of what we've currently got, and I'm in no means talking against development. What I'm talking against is bad development that kills the goose that lays the golden egg. And my daughter is much luckier than I. She is a student studying medicine. She's had two opportunities to go to the Exumas on extended day trips, and indeed, my son's done the same thing. So you can parachute people in to witness the beauty and witness that pristine wilderness. You don't necessarily have to be able to ride on the spot. It seems to me, that on Great Exuma, we do have the opportunity to bring those tourists much closer to that beauty, and Georgetown could be developed, and that's perhaps where some of the lessons of urban development could be applied to what we're doing in The

Bahamas. But I'd repeat my question to the panel. How do you develop a wilderness?

Audience Member 2 I would like to apologize to Mr. Reed for taking the floor a second time. I (Philip S. Weech) happen to be responsible for the Bahamas Environmental Science and Technology Commission (BEST), and one of my responsibilities, is the issue of climate change. And I think in terms of looking at what we are talking about, the issue of the vulnerability and the opportunities to adopt in The Bahamas have to also be considered. And I'm not quite certain if that message came out clear enough or loud enough. We are one of the most vulnerable countries globally—not in the region, globally. 80 percent of The Bahamas is within one meter of sea level. When we build, and when we think of Exuma, we have to think in terms of the entire Bahamas. So resiliency has to be built into all buildings, including the public buildings, to allow for the inevitable. We will have storms. We will need to protect people. And we will need to house people in safe structures. We also have to move away from the distinction that everything is available for construction, because what climate change teaches us is that we have to allow for a scope to retreat, or to designate lands that are vulnerable, and not to use them in a manner that's unsustainable. So the big elephant in the room is not only talking about sustainability in this context, but sustainability into the future. And what will survivability mean in the future if we do not now start taking into consideration that fact that we will have corroded beaches, as Erich Mueller has demonstrated. We will have issues dealing with water resources and water stresses. And how do we define vulnerability and sustainability into the future as unique to this particular environment?

Joyce Klein Rosenthal I couldn't agree with you more. Sustainability and adaptation are definitely local and contextual, and it reminds me that the Dutch have a planning model based on consensus. They would get together for months, for years, a lot of evenings, a lot of days. It takes a lot of time, but they would get together and discuss what areas you would set aside to let the sea move forward, and what areas would you retreat from development. I'll be very interested to hear what Bahamians decide over the coming months and years, because we definitely agree that the situation is one that needs to be considered and dealt with.

I wanted to answer the other question, too. How do you develop a wilderness? We had a short discussion on the panel. We decided you don't develop a wilderness. I would also like to add that the national parks have a model where they use a lottery

Joyce Klein Rosenthal

system for allocating use of certain areas, and I don't know if that's something that other panellists and Bahamians think could be considered for different aspects of the Exumas—a lottery or a first come, first served basis.

Audience Member 9

I think this conference is very revolutionary. My name is Danielle Haneck Williamson and I'm from the Ministry of the Environment. In this room, you have a lot of Bahamians and also international persons who are experts in the area. I had the opportunity of working with Mr. Martini who tried to develop a draft master plan for Exuma. The fault with that was it only focused on Great Exuma, and it did not incorporate the surrounding cays. I think the challenge that we have now, which I find great hope in, is that we are looking at it as an integrated system, but not just the Exumas. The whole Bahamas is integrated, and that was highlighted not only in the presentations, but also in the examples we have seen of what happened in other parts of the world. We're all integrated.
And so my question is in reference to research opportunities for urban design. You try hard to find examples that are in the Caribbean region of any urban studies, specifically in reference to climate change and the heat island effect that you focused on. I think this is a great opportunity for looking at the Exumas, and also New Providence. I'm sure you might hear people complaining how hot it is (in The Bahamas). But in New Providence it's because of various factors related to how it's been developed and the lack of planning. Moving forward, I see that this initiative is a great way of trying to get everyone involved. In The Bahamas, we like to talk a lot, but we don't like to really implement. It's a challenge to get the right stakeholders to talk at the right time and to identify what they really want. So in the process of working with Mr. Martini when he did the draft plan for Exuma, there were stakeholder meetings held, but the way they were done rubbed people the wrong way. And so when we actually did go to them, they didn't know how to share what they really wanted. I know there is no right or wrong. But I'm sure that with the other examples in other countries, we could take our culture and the way we are and try to learn from past experiences. Everyone in this room gets what sustainability is, how important the environment is, why it all matters. The average Bahamians don't get it, really. They realize it's important. They realize that sea-level might be making a difference. There is an issue with beaches, but in the grand scheme, they don't see how it affects them. So if we could break it down where the average person really gets it, this will really make a plan that will make a difference.

Chris Reed

I think these comments reinforce a couple of calls we've heard this afternoon for how important it is to design the process moving forward, that the task ahead isn't simply to make design proposals and planning proposals, although in part it is. The task is also to figure out what is the best process or set of processes that will engage the largest set of voices and publics in this conversation moving forward.

I'd like to thank the panellists for your participation and comments this afternoon. We have three sets of closing comments. I'd like to ask the panellists to just remain in place for a few moments. The first set of closing comments will be given by Neil McKinney, president of the Bahamas National Trust.


Danielle Hanna
Williamson

# XVII Closing Comments

## Neil McKinney, Mohsen Mostafavi, and The Hon. Earl D. Deveaux

**Neil McKinney** One of the things that stood out for me this afternoon in the presentations, among many things, was when the Dean showed the picture of the house in London near Regent's Park and how it looked as if it were meant to be in the country, that was from centuries ago. Even today, if you go to London on the weekend, it empties out, and the people don't go to the suburbs. They still go to the country. This weekend is our independence weekend, and if you tried to get a seat on one of the planes right now, you couldn't. All the flights would be full as people go back to the islands. It's an interesting thing that people do connect and seem to go back to the islands. And that raises an interesting prospect, because as our population ages, as our demographics change, are more people going to leave this island and go back to the islands of their birth or of their parents'? And how will that affect the sustainability of what is being done and what is being planned? And will the infrastructure be there? So that was something that stood out to me this afternoon, which I hadn't considered this morning. The only other real comment to make about it is that so many facts and figures have been put out today that it's a little overwhelming to try to take them all in. But looking at those facts and figures, what will be important as we move forwards is, how can we take those experiences from other countries and other places and then try and slate that into a Bahamian experience, because clearly we didn't come here to hear about how other cities grew or why they grew. It's for us to take that and to translate it into Bahamian experience.

**Chris Reed** Thank you, Neil. I'd like to invite Dean Mohsen Mostafavi to the podium.

**Mohsen Mostafavi** Just a couple of very brief comments. The incredible goodwill that has been in the room all day and throughout the whole evolution of this particular project have been really noticeable and also extremely inspiring. I can assure you that it's been an

incredible honour for us to be here, and we are also very excited and genuinely believe in the importance and value of this project. So I would like to receive your thoughts and your feedback in terms of what would be the most beneficial and productive ways in which we can move forward. I do want to assure you that whenever we are engaged with a research project, or a conference like this, it's impossible to try and do everything at once in one go. We plan a sense of the totality of a range of things. And then at any one point, we're dealing with a specific set of issues. So we're not just dealing with a kind of Band Aid solution of bits, but we are dealing with specific fragments of a larger body. That's a very important thing to bear in mind because it requires a certain level of patience on the part of the participants, because every different stakeholder has a different sense of the priorities. And I think we need to establish together what may be the critical steps to address those priorities. We have some idea in terms of the way we, for example, run studios at Harvard, which are very speculative. That might be a very interesting model to use to collaborate. The fact that we have the Minister, and then we have Orjan, and we have people who are working on marine biology—what if we were able to bring all these people together to do speculative projects, as opposed to a specific development by a particular developer? I could imagine that being a very productive way to use the amazing knowledge that is here in the room, a lot of ideas and possibilities of looking at things in more detail. But it would be very exciting to receive your feedback.

Chris Reed

Thank you, Mohsen. Finally, I'd like to bring back to the podium the Honourable Earl D. Deveaux, Minister of the Environment.

The Hon.
Earl D. Deveaux

The idea of this conference was to try and inspire the audience to understand the need and the importance of planning—to bring contractors, architects, engineers, and planners together to take a look at the planning and subdivision act, using the Exuma Cays as an example to illustrate the importance of informing clients' desires and decisions with some sound planning principles in this first seminar. And the idea was to ensure that we brought together the level of expertise and broad knowledge to inform how we go about making development decisions in our country in very fragile, sensitive ecosystems. I very much believe that we accomplished that. We had in the room some bankers, some architects, people who approve applications for development, people who make applications for development, but more importantly, people who work with clients. The decisions on building designs, environmental

impact assessments, mitigation, access, and appropriate use and density are not things that could be mandated by a government or entirely by law. There has to be a culture nurtured in a series of processes, and a sense of belonging to the process.

This is the first of a number of such sessions that we hope to do, and it is my hope that the people who build, the people who design, will not lose sight of the importance of their role. You notice, most of the academicians talk about research. They never lose sight of their role. They are in a constant pursuit of more knowledge. And whenever you get an academician in a room, you hear about the need for more research. Very important. If somebody wants to build a house and develop a subdivision, or build a hotel, or create a national park, they need to make decisions based on an appropriate level of understanding and knowledge at that time. So decisions will always be before us. My role in this process is to ensure that we protect and preserve what's important to us.

I want to respond just very briefly to something that resonates deeply with me. It was a question raised by Mrs. Lockhart Charles regarding the capacity of the world as I understand it to sustain itself going forward. I'll just use one illustration to help inform how I approach that problem. There was a recent article in *The Economist* magazine, roughly about a month ago, and it spoke about a plot of land in Great Britain that was the host of a research facility—the longest sustained research facility in the world—where research was done on wheat. On this particular 14-hectare tract of land, a range of agricultural practices was researched. And you had yields of up to ten tons per hectare and as low as one. So you had all of the variables that help you determine whether the world will have food, with nine billion people or 20 billion people. The message in the article was that if you adapt and apply knowledge in a local environment, even the African farmer who is getting the one ton per hectare is able to get ten tons, through appropriate fertilizer, appropriate seed, appropriate variety, and appropriate management. And I use the word "appropriate" advisedly. But the point is, in making decisions about development, we must use the knowledge of the world in an appropriate way in a local environment. And nothing compels me more than food and the science of growing food. How to use irrigation, how to use fertilizer, how to use the weather, and how to manage the biology of a plant to get the yield that you want. Man has been able to do that in ways that push the boundaries of any thought of starvation in the world. The challenges come with distribution, pricing, marketing, and the availability of the

technology. The same principles apply across the board in many other things. We're not looking for a one cap fits all solution. What we're looking for is a population that is able to respond, that has tradable skills, and that is able to cope with the demands and the challenges of a changing world. If we can build that in our communities, in our decision makers, in our professionals as we go forward, I think we'll achieve the objective of this kind of endeavour.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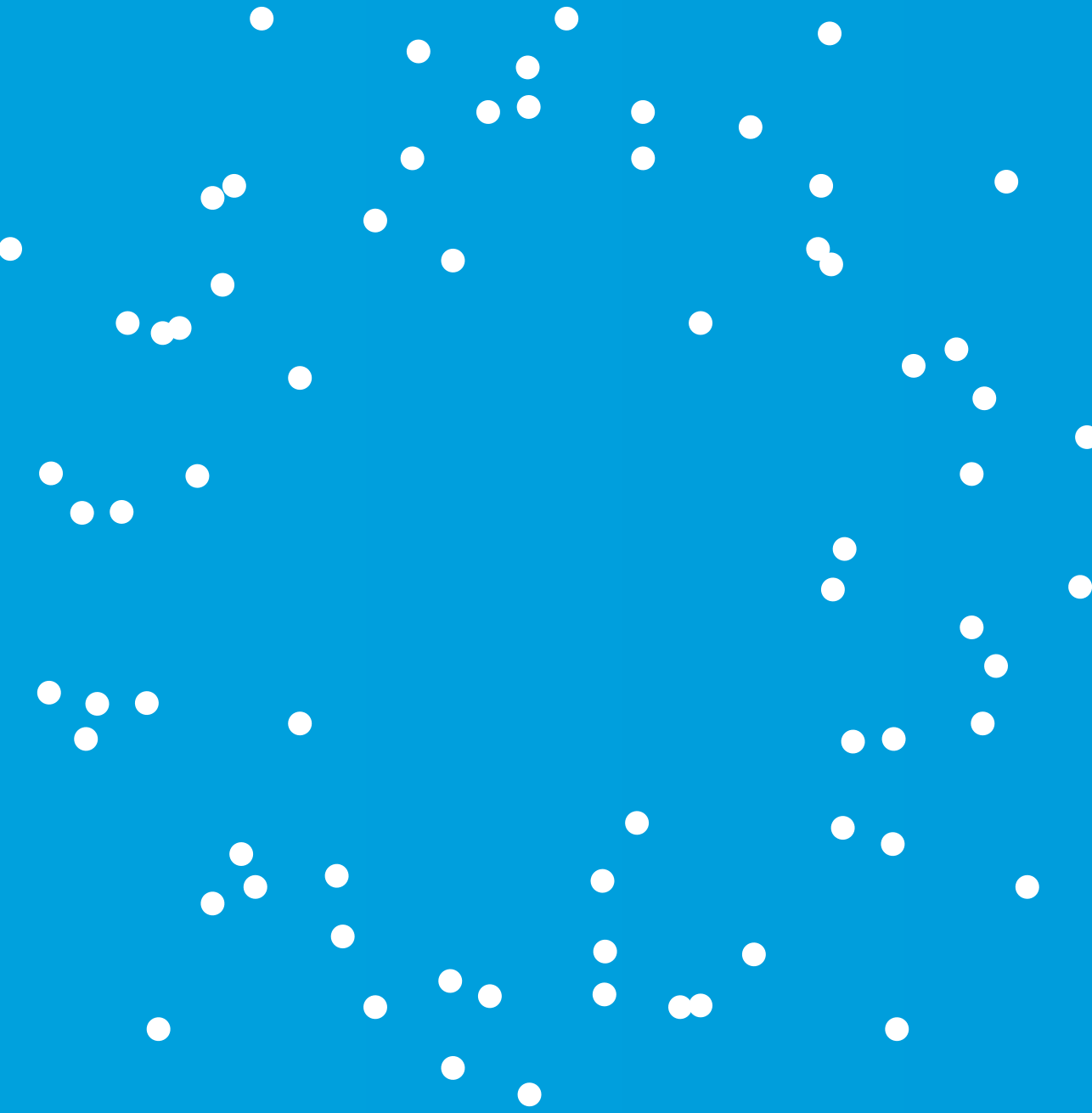

# XVIII Lee Stocking Island, 9 July 2011


Welcome To
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Bahamas
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Lee Stocking Island, 9 July 2011

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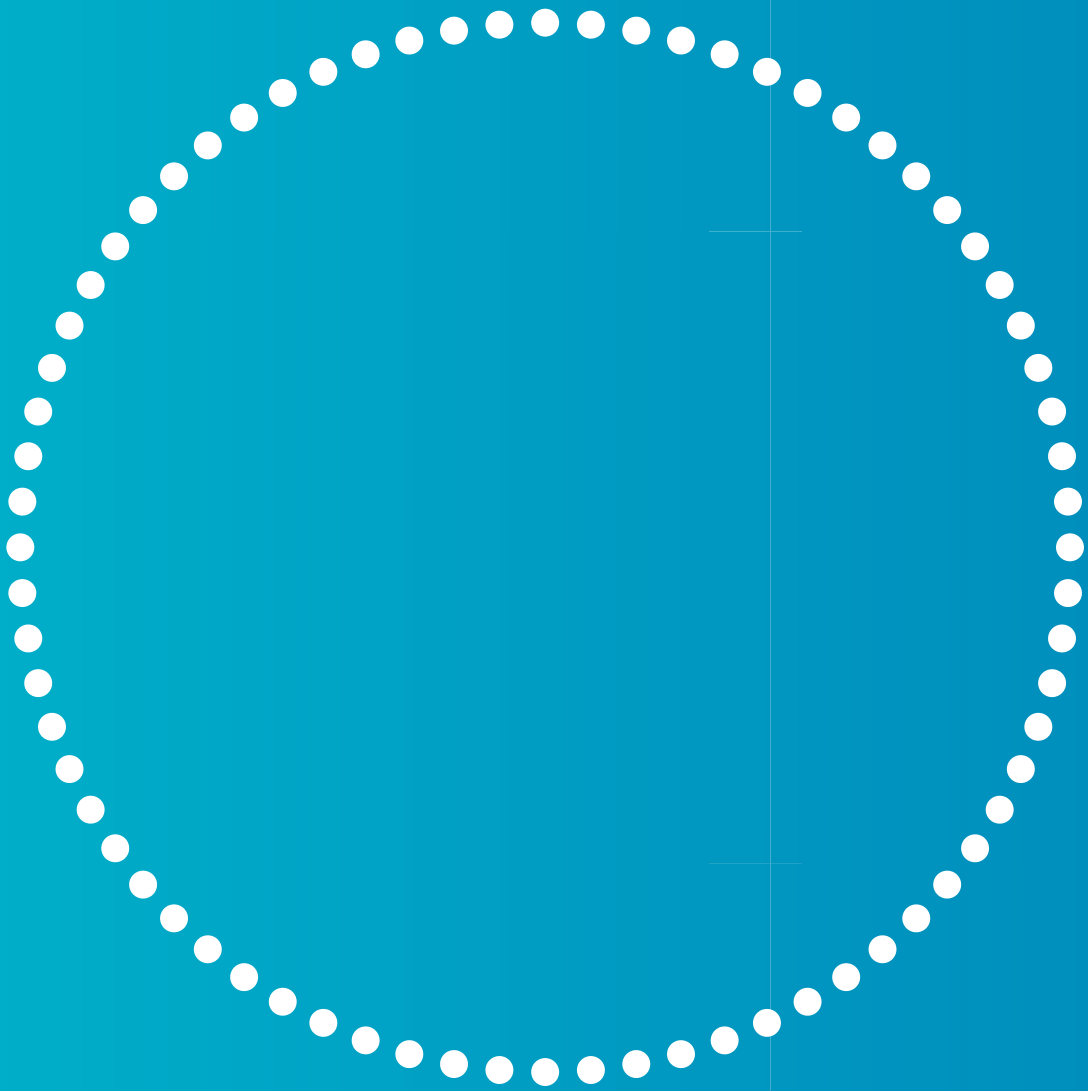

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