

# Eye on Earth Summit

## Working Group 5 - Applications Showcase

### White Paper

DRAFT

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## 1.0 Introduction

### 1.1. Background and Purpose

The Eye On Earth Summit - Abu Dhabi 2011 (“The Summit”) is a global intergovernmental and multi-stakeholder event and exhibition to convene the thought and action leaders in the worldwide environmental and societal information networking movement, to converge consensus on key areas of mutual importance, and to collaborate towards strengthening existing initiatives and filling gaps towards more informed policy making and a sustainable future. The Summit is expected to:

- a) Identify commonalities in existing environmental information networks in an effort to strengthen, align and synergize these initiatives while collectively filling the gaps through coordinated alignment of common efforts;
- b) Strengthen, synergize, and extend global processes for bridging the environmental knowledge gap and provide data, information and tools for decision-making (transformative action);
- c) Reinforce multilateral policies and institutional arrangements to leverage investments in environmental data while ensuring the preservation of the investment in this information to improve information infrastructure in countries needed to support more coordinated, effective and sustainable development;
- d) Support technical cooperation to accelerate the building of a federated global environmental information infrastructure;
- e) Accelerate capacity building and technology support programs around the world to further close the gap between developed and developing nations.
- f) Strengthen access to resources to support developing countries

This document presents a set of topical issues that are the initial outcomes of each Working Group based on collaborative research and evaluation by its members. This Thought Paper provides Issue Statements based on an identification of issues, the current situation regarding each issue, major stakeholders engaged in addressing these issues, opportunities and constraints, and the major impacts and outcomes that can be achieved by further addressing the identified issues as part of the Summit. The identified topical issues will be submitted to the Framework Committee for review that will lead to the



selection of a subset of topics that the Working Groups will then focus on more intensively. Based on the selected topics, the Working Groups will expand each Issue Statement into a more detailed White Paper. During its second meeting, the Framework Committee will review the White Papers and use them as the basis for the development of the Summit program and special initiatives.

## 1.2. Process and Results

The planning, design and development of the Summit involves a very diverse range of issues and a large number of simultaneously moving parts. The Working Group and Framework Committee efforts, with the feedback from the Executive Advisory Board will in large part define the Summit content and special initiatives that will be the visible output of the Summit preparation process, and that will define the path forward for some years to come. In general, the process for defining the Working Group white papers includes the following:

Identification of Topical Issues. Working Groups will assess previous topical issues submitted by the stakeholder community and identify a set of topical issues they would like to address as part of their initial evaluation.

Develop Thought Papers. For the identified issues, a Thought Paper will be developed that elaborates each issue by illustrating the importance, implications, major stakeholders, potential impact and special initiatives that could be generated.

Framework Committee Review and Approval. The Thought Papers will be reviewed by the FC, which will recommend specific topical issues to be further developed into a more refined White Paper.

White Paper Development. White Paper development will treat each selected subject in more detail and will include the direct participation and buy-in of key affected stakeholders.

Final Nomination and Commitments. The Framework Committee will evaluate the White Papers and use the submitted information to develop the Summit program and to recommend if any White Papers should be featured as Special Initiatives to be announced during the Summit closing.

## 1.3. Working Group Definition and Purpose

Below is the working definition of this Working Group's scope of activity:

WG5 will be focusing on three areas:



1. Identifying the underlying issues that technology and applications seek to address for the benefit of environmental and social data networking. Through the deliberations of the WG, it became clear that the focus areas would concentrate on: 1) Open data, data access and discoverability; 2) Data visualization, analysis and storytelling; and 3) Citizen science, crowdsourcing and sensor networks. Through this evaluation, the WG will seek to identify good practice case examples and examine the major issues, opportunities and constraints in using these applications to collect information, solve problems and communicate information.
2. The EoE Exhibition will include a Technology Showcase Exhibit that will display world-class examples of technology that support the full lifecycle of environmental data and information gathering. This can include new methods for capture, analysis, visualization and dissemination and those technologies that enable collaborative environments. Some examples include information portals, sensor webs, sharing frameworks and knowledgebase, visualization interfaces, decision support, crowd sourcing, etc.
3. The EoE Exhibition will include an Innovation Forum that illustrates the unique and innovative ways technology is being applied around the world. This could include use cases within a developed and developing country context and provide showcases of today and tomorrow. Examples include the Surui Tribe in Brazil and its use of GPS and Google to preserve indigenous communities and forests in the Amazon; the Copenhagen Wheel; Map Action in Haiti, Libya and Japan; Senseable Cities, etc.

#### 1.4. References

This report includes provisions that are more fully described in other documents and that are included by reference, including:

***Eye on Earth Summit Program Design.*** Original Program Design dated 1 May, 2010. This document is being updated as part of the Summit detailed planning stage. Its provisions will have influence on the detailed activities of the GPC Team.

***Executive Advisory Board, Framework Committee and Working Groups Charter.*** This document provides the Charter for each of these Groups describing their purposes, processes, intended outputs and interdependencies.

***EoE Special Initiatives.*** A critical objective of the Eye on Earth Summit is to ensure that there are compelling, specific, achievable outcomes that translate the principles of the Summit to “on the ground” commitments and actions. A target of 4-6 EoE Special Initiatives has been set, each of which is to be defined through the Summit preparation process, and announced during the Closing Plenary.



**WG Thought Papers.** As an initial input, the Working Groups each developed a Thought Paper that identified and articulated the initial set of issues and special initiatives each WG considered to be the important issues for which content should be developed around for presentation at the Summit and/or Exhibition. The Thought Papers become the starting point for the White Papers by further articulating and expanding on the notions originally presented such that the White Paper can be used to guide and develop the Summit Program.

**FC Feedback on WG Thought Papers.** This report synthesizes the Framework Committee's feedback to the Working Groups on the submitted Thought Papers. This synthesis is based on the a review of the Thought Papers and Special Initiatives as part of the Framework Committee meeting that was held in Geneva, Switzerland on 27-18 July 2011.

## 2.0 Applications Showcase Working Group White Paper

### 2.1. Executive Summary

The Applications Showcase Working Group (WG5), as previously mentioned, focused on issues that are more application focused and sought to identify a set of interesting applications that could be featured as part of the Technology Showcase and Innovation Forum. Through the WG5 deliberations, it was identified that the focus areas were revolved around the issues of open data, access and discoverability; data visualization, analysis and storytelling; and citizen/civic science, crowdsourcing and sensor networks. The following paper describes these issues from the perspective of applications to an extent that generalized the issue areas understanding that most of the issues are covered in greater depth within the other Working Groups.

Because WG5 is cross-cutting in that it is seeking to identify solution sets that address the major issues covered within the other Working Groups, WG5, based also on feedback from the first Framework Committee meeting, will act as a more integrated function as part of the Summit Day 1 streams. In other words, rather than WG5 having its own dedicated stream like the other Working Groups, WG5 will integrate 3-5 minute flash and multimedia talks at integral points to provide the audience with an interesting application that provides a novel solution to the issues being discussed. In this way, the other four Working Group streams can be provided with more positive examples of how progress has been made in many ways that will hopefully open new perspectives and ideas within the delegations present at Day 1.

As the Summit process moves forward, and based on further feedback from AGEDI and the Framework Committee, a team will be developed to secure priority exhibitors to populate the Technology Showcase and Innovation Forum. The hope is to have very



interesting and innovative applications and stories be presented at these forums with balanced representation when considering the organization type and geographic region. Other factors such as cost, subsidy, partnership, sponsorship, availability, etc. will also have to be considered as part of this process.

## 2.2. Setting the Foundation

Every day the Earth continues to succumb to the increasing pressures of mankind's activities—from population growth, to growing demand for natural resources to mitigating risks of natural disasters. Our ability to manage our activities on Earth is directly related to our ability to process information into knowledge which must precede action. For without the correct knowledge, we are bound to make mistakes that will likely have long term effects on future generations.

However in many circumstances we have gone from a lack of information to too much information. The 21st century world is rich with information—satellites continually monitor the world, sensor networks from the air, water and ground provide real time information, and recent technological advances are allowing every citizen to be their own sensor. While it is believed that all this information will lead to better decisions about the environment, the sheer volume of information is challenging our ability to manage, process and understand what this all means. In order for society to function effectively, we need the capability of our governments, scientists, stewards, businesses, and public to share, comprehend, and act upon environmental information. Environmental management is no longer the purview of the few, but is now subject to the ever growing pressure of the masses. As all these groups become more engaged, the 21st century challenge of our future is to empower these groups through the best available information in a world that is rapidly becoming overloaded with content.

How do we deal with too much information? If the information is too complex, too vast, or too hard to access, we will often ignore or choose not to use this information. If the information takes too long to collect or analyze, it may be too late to make a difference in decision making. And if the information is not from the authoritative source, how do we understand and resolve differences with other sources of information? All of these are examples of the growing challenges that are facing any organization or person involved in understanding our world. As technology grows collecting, managing, and analyzing information, we as people, need to implement the processes and workflows to complement the technology that provides for the maximum utilization of the information. While this has been happening for decades, in the last few years, significant changes have been occurring in four areas that warrant further understanding and action:

***Open data, access, and discovery.*** information is being shared at an exponential growth rate. While in the past environmental information was often held locked away by individual

scientists, regulators, or policy makers, the world has discovered that open data access creates a more collaborative world where people are contributing together. This activity creates challenges: how to make data open and accessible and how to discover the best information for a particular need?

**Visualization, analysis and storytelling:** once information is discovered, what are the best practices for turning information and data into knowledge? This requires the right tools for analysis and visualization, but in today's world it goes far beyond. Today, we must put the information into the hands of various audiences of different skill levels, on many multiple platforms and devices. Information is no longer shared in a printed report, but is available online, on mobile smart phones, and in a multitude of media formats. As an example, we can consider how people historically received their information from books or vast publications, but now their information is in 60 second sound bites, or 140 character tweets. This has created another new challenge: how do we reach the next generation of users that have different communication styles and standards? How do we make sure the story reaches them and not just the short data bursts? Story telling approaches have been around for millennia, but they always must adapt to the changing needs of society. Telling stories about the environment is no exception.

**Sensor networks:** the trend is astounding---more information about the Earth is being collected every day than, some may argue, in our entire history. The information is real time, near real time, and historical. The information is from a vast array of sensors that are measuring just about everything from everywhere. How we choose to utilize this information and make it available is the path of our future.

**Crowdsourcing and citizen/civic science:** one of the most recent and innovative trends is the adoption of the crowd, the citizen, and the public to collect and monitor the Earth via their mobile devices. Simply put, smart phones are opening up entire new avenues of data collection, reporting, analysis, visualization, and action. Every person in the world now has the opportunity to become part of the sensor network monitoring our Earth. Every environmental organization today is facing these challenges and determining not only how to support this platform, but more importantly leverage this platform in a world of limited resources. Many people want to help—we just need the tools to empower them to help.

## 2.3. Issues, Challenges and Opportunities

### 2.3.1. Open data, data access and discoverability

Today's society is rapidly being overtaken by an abundance of data and information. According to Eric Schmidt, CEO at Google, Inc., it is estimated that every day, we generate about 2.5 exabytes of data (2.5\*10<sup>18</sup> Bytes). To further expand on this,



according to Schmidt, every two days, we create as much information as we did from the dawn of civilization up until 2003.

While there is an abundance of data and we have made strides in sharing this data, there are many hurdles to still overcome. While these include technological issues, especially within a developing country context due to access and distribution issues, the main obstacles are related to policy, privacy and access issues. Nevertheless, society continues to move towards a more open policy that suggests that data should be made available. It should be free, available instantly and formatted in well-known structures making it accessible to as many different uses as possible.

Many organizations in the public, private, academic and civil society sectors generate data. A part of the data may be either short-lived or for internal use and therefore not, by definition, fit to share. A large part, however, may be interesting to other parties as well. How can organizations promote widespread data sharing policies and how can technology mitigate the obstacles? These are just a few of the questions we must address as well as exploring other questions below.

- Are organizations willing to share data and information?
- Does prevailing politics promote data sharing?
- Do all stakeholders support the same philosophy?
- How to create incentives across different communities, such as academic, scientific, regulatory and more to share data?
- How do metadata, citations, credits and data tagging promote increased data sharing? How can you have context travel with data? Can we trace usage as approaches to determine high value data?
- While search engines are often used to locate data and information, how do portals provide curated, authoritative sources and build communities of collaboration?
- How are data kept current? The hidden cost in data is often the long term challenges to keep the data current. Can we create sustainable approaches to environmental data?
- How do we balance the need for authoritative data and volunteered data?
- How do we support the need for rapid access self-service data in the situations such as natural disasters and emergencies?
- How do we maintain adequate controls to protect sensitive environmental information?



- What exactly does open access mean? More specifically what are the best approaches to provide open access to data? “Open” can be interpreted widely including such issues as cost, source, platform, architecture, security and more. It is important to set the expectations correctly when discussing the word “open.”

For the consumers:

- Where is the data?
- Who owns it?
- What does it cover (temporal, spatial, thematic)?
- Can I use it?
- Is it reliable?

And for the producers:

- Do I want to share it?
- With whom do I want to share?
- Where do I store it?
- How do I make it available?
- How do I make sure I am credited?

Obviously technology can provide an answer to a number of the questions. However, some of the issues are of a more political or organisational nature. Furthermore, some parts of the world may not have a very advanced data or communications infrastructure and therefore need to rely on low-tech solutions. There is a need to build platforms that solve short-term project needs, but deliver information with higher value. This includes tools to decrease start-up costs for data gathering efforts, collaboration tools, data visualization, tools for publishing datasets (API, widgets, file exports, print document builders, etc.). These services can be offered at low cost, with the requirement for open licensing, good data structure and interoperability, semantic IDs, etc.

Most of all, the question: “why do we want to share our data?” needs to be addressed. There are obviously numerous reasons as to why we want to share data. The [UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters](#), known shortly as the Aarhus Convention, focuses indeed, amongst others, on the aspect of data sharing, in this case to facilitate public participation. The convention is a good example that there is a political will to collect and share data. Though the convention is geographically restricted primarily to Europe and Central Asia, the importance is evident as Acknowledged by the Secretary General of the UN at the time:

*“Although regional in scope, the significance of the Aarhus Convention is global. It is by far the most impressive elaboration of principle 10 of the Rio Declaration, which stresses the*



*need for citizens' participation in environmental issues and for access to information on the environment held by public authorities. As such it is the most ambitious venture in the area of environmental democracy so far undertaken under the auspices of the United Nations."*

In the scientific world, recognition by peers is regarded as crucial for career advancement. The Science Citation Index (SCI) is regarded as the leading worldwide tool for academic recognition. The SCI however focuses on publications only. A similar system where researchers were credited for the data they collect, and disseminate, could form an incentive for sharing data more widely and in an earlier stage. Obviously tools need to be in place to assure proper recognition like proper metadata description and possibly data tagging.

Small organizations could profit in their own way from sharing data. First of all, recognition by a wider audience may be one of the advantages. Secondly, many smaller organizations, Environmental NGO's may not always have the resources or the means to assure proper data collection and sharing. There are now many Internet-based marketplaces where their data could be made available for a small fee or even for free. Furthermore, organizations are beginning to develop websites and portals that can provide small, non-profit organizations with the space and infrastructure needed for collecting and sharing data. One example of such an effort is that of the European Environment Agency (EEA) with the development of the Eye on Earth platform. In addition, sharing infrastructures are becoming more readily available and cost-effective with the further advances and availability of cloud computing services and infrastructure.

This also brings up the notion of "curated content, i.e. the best available resources and a semi-authority or de facto authority to qualify such data. In large part, platforms can be developed to make this user driven in that data that is made available can be rated for its quality and relevance, while tagging can also enable the discovery of understanding how these data are being applied in various studies and applications.

Social networks can play a role in many different ways. They can help in collecting data through crowd sourcing or be used as a multiplier for communication efforts. Geo-referenced tweets via twitter can be used as early warning on environmental issues as well as "Google" (or other search engines) searches can help identifying environmental issues.

### 2.3.2. Data visualization, analysis and storytelling

*Aspiration: Data becomes information, which is useful to answer questions, allocate resources, and invite participation.*



It can be argued that the world has an overabundance of data, but how do we turn data into information, which leads to knowledge and which precedes decisions and action? It is through visualization and analysis that we begin to understand what all the data means. However, we often overlook the third aspect which can pull the visualization and analysis together, storytelling. Stories have an emotional effect; they can cause people to care about a subject. This emotional link then often causes action.

Visualization is how we perceive the data. Data are often bits and bytes, but we can choose to look at these in many different ways. For example, the data may be a spreadsheet, a database table, a Word document, or a field notebook. How you visualize this might be in a table, or it may be in a graph, or a map. There are many proven visualization techniques and new ones discovered ever year. However, we also need to expand beyond simple visualization and explore related subjects such as where do you visualize the data? In today's world of pervasive computing, you may be at your desk, at home on the web, or anywhere with your mobile device. Visualization encompasses having the right information at the right time on the right device. As a society, we are demanding information everywhere and anywhere. In return, it means society can act on that information in many new ways as well—e.g. collecting additional information or taking immediate action.

How we analyze information is also changing. Historically, information analysis was the job of the scientists, policy makers, etc. While these professionals are still very much engaged, analysis is happening more quickly across broader communities. The news media is analyzing information and broadcasting the story often before the professionals even hear about it. The public is forming their own analysis based upon information coming from many different sources like friends and families and their social networks. Instead of thinking about these as competition, we need to start thinking about these groups as collaborators and inviting them to participate.

Societal expectations are also changing in regards to the systems that perform analysis. As a society we often find ourselves using more and more focused applications, or single purpose applications that give us the immediate answer to the problem at hand. For example, what is the weather where I am, or what is the water quality where I am going on holiday? If we are inviting the public to participate in analysis, it will likely be through small focused solutions which are typically mobile and web based. If we are sharing our results the same concepts also apply. The world is rewarding small focused, user-friendly, agile solutions. The large complex environmental systems are often not able to keep up with the pace of rapid evolving technology.

After analysis, we must be able to share the results. In other words, share the story and not just the data. Knowledge in the hands of just one person is just limited knowledge. Knowledge in the hands of many is the potential solution to a problem. Transforming data



into a solution requires successful storytelling that often encompasses both analysis and visualization. In order to tell a compelling story there are specific aspects that need to be taken into account. Who is the audience? What is the desired outcome of the story? Should it inspire people to donate money, to recycle, or act in some other way? As we proceed in the 21st century, and with the vast amounts of data, our challenge is to make sure we can accomplish visualization, analysis, and storytelling to reach our maximum potential. If we are not careful, storytelling will become a lost art. It has been practiced for millennia in the forms of books, reports, and verbal communication. Through stories, people have understood the problems, the issues, and solutions. How do you accomplish the same in a 60 second sound bite, or a 140 character tweet? While it will be possible, we need to consider how technology is changing our story telling. In the vast grasslands of Africa, do people read books, listen to their elders tell stories, or receive the stories on mobile phones—and in what languages? Additionally do the symbology, charts and methodologies make sense in the culture the story is being delivered? Pictorial representations are not culturally universal, and meanings can be misconceived.

Indigenous knowledge also presents a unique data situation as the information is invaluable, but often in forms that makes traditional data capture a challenge. Often, this knowledge is presented in narratives that span many years. There have been many efforts to more effectively capture this information and present it in visually compelling ways so that the historical relevance can be understood. Advances multimedia and location based technologies publishing within the same portal environments, along with social networking and the internet have made many of these stories come alive.

As technology has advanced it has also empowered everyone to tell stories on the Internet and across the globe. Unfortunately, it has also allowed anyone to become a data publisher and an increasing number of publishers are omitting the story, the conclusion and the larger meaning. In the race to publish and share information we are often being overloaded by “dots on maps” that have lost the meaning/story that leads to the correct decisions and actions. “A picture may be worth a 1000 words”, but we need the story with the picture to create true understanding. We must not lose sight of the importance of storytelling—who are you communicating to and how will they understand the information?

An example for a good visualization is Kuwait official environmental portal ([www.beatona.net](http://www.beatona.net)), which is to be launched soon by Kuwait Environment Public Authority (EPA). "Beatona.net" is meant to share authentic environmental information about Kuwait with the public over the internet in an easy and transparent manner. Beatona (our environment) is the Arabic name chosen for this portal. The portal shall be a one-stop shop for all environmental data and information in Kuwait. It is also available in two languages (Arabic and English) so that it could be easily used and understood by the local population as well as foreign residents and international users from outside Kuwait



As good examples for proper visualization that matches the local taste we could pick up two major modules of Beatona.net. Explore Our Environment (EOE) is an environmental explorer that allows the user to turn on/off thematic environmental maps on GoogleMaps along with metadata and search functions. It also allows the users to compose and print individual maps of their choice. Environmental layers come from different organizations. A metadata search engine allows the user to identify available data layers and their sources.

Our Environment Now (OEN) is another platform to publish on-line, near real-time environmental quality data measured by EPA departments to the public This includes Air Quality, See Water Quality, Soil Quality, Drinking Water Quality, Beaches Quality and so on.

### 2.3.3. Crowdsourcing, Citizen/Civic Science and Sensor Networks for the Environment

*Aspiration: An increase in citizen science and crowdsourcing will empower civic society and influence decision making for positive environmental change.*

Distributed participation in professional scientific inquiry is booming today thanks to the ease of collecting, sharing, and storing data over networks. Rigorous inquiry into the coherence of ideas about the world -- science -- originated as a volunteer pursuit before the field became professionalized in the 19th century. Today both amateur investigation and professional science are complimenting each other in the pursuit of solving difficult environmental problems. This field where amateurs, either by self design or working with professional scientific institutions in the pursue scientific enquiry, is termed as “Citizen Science”. For example, the eBird application has revolutionized the way that the birding community reports and accesses information about birds. Launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society, eBird provides rich data sources for basic information on bird abundance and distribution at a variety of spatial and temporal scales. eBird's goal is to maximize the utility and accessibility of the vast numbers of bird observations made each year by recreational and professional bird watchers. It is amassing one of the largest and fastest growing biodiversity data resources in existence. For example, in January 2010, participants reported more than 1.5 million bird observations across North America.

Citizen participation in environmental data collection and processing is not limited to science. There are many examples where connected people across the internet, the ‘crowd’, are collecting and process data more quickly and accurately than traditional techniques or high powered computers. We refer to this as “Crowdsourcing”.

Rapid advances in mobile and web technologies have made the crowd more actively engaged in global environmental and social issues than ever before. They can represent



the early warning systems reporting on situations and they empower data collection at a scale that has never been possible before. Of course, it offers its challenges as well in regards to the validation of crowdsourced data and how it integrates with “official” government data. However, in today’s troubled economy, citizen science and crowdsourced data also present opportunities to access a resource pool that is engaged and willing to provide data and information that supplements other data collection activities, and potentially, provides a much richer and dispersed dataset. In addition, the future value of crowd sourcing is going to require increased awareness of geographic position and new semantic classification techniques to make sense of the massive volumes of information.

Never before in the history of the world, has our environment been so closely monitored. Sensor networks measure everything imaginable: including air and water quality, deforestation rates, to traffic patterns, energy consumption, and many more. While many of these systems are expensive and complex (e.g. satellites), others are simply “do-it-yourself” sensors built by common citizens. A simple weather balloon and an iPhone can capture photographs of the landscape. Or a mobile phone’s microphone can be used to measure noise levels and the accelerometer can measure road conditions.

Sensor networks are changing and our ability to turn these data into knowledge and action requires more information processing systems capable of fusing together disparate sources of information.

These reemerging fields present many opportunities:

1. Increased coverage and distributed cost of ‘sensors’ to sample our environment. This is typically analogous to field work .
2. Accessible DIY technologies for inquiry emerging from the DIY and maker communities. The DIY and maker community, by focusing on information output and the use of readily available materials, is making it possible to remove specialized techniques and technologies that have been barriers between a non-specialist and the information they want to know about the environment.
3. New solutions to process large scale and complex pattern recognition problems not possible with computers (i.e. remote sensing, species recognition in photos, digitizing archives)
4. New way to empower people to partake in and become aware of environmental projects.
5. Opening up monopolies on data and information. Outcome-driven inquiry can produce data that is “owned by the community” and focused on producing the change that the community wishes to create in their environment



To make the most of the opportunities crowdsourcing and citizen science yield, key questions need to be addressed.

- How do we get people to understand the opportunities and benefits?
- How can we reach a network of willing volunteers?
- How do we make people confident it works and institutions respect the quality of the information?
- People already have meaningful questions - how do we support their ability to generate information about what they want to know?
- What is the role of expertise in community-led research? support? stamp of authority? funding? Many varieties.
- How do we get adoption of the information gathered in traditional decision making circles?
- There are many skill sets required for a “full data lifecycle” from design to collection to analysis interpretation and advocacy. How does one connect with these either latent or currently existing skills within community researchers?
- How do we scale up the local effort to the national and global level?

There are many examples of successful citizen science and crowdsourcing projects which demonstrate the utility of the approach. These will be demonstrated in the innovation forum and through a series of talks at the summit. [need to decide what these will be]

It is important we highlight areas that need developing to make crowdsourcing and citizen science have as much impact as possible. We propose a series of work areas that would need expanding, resourcing and promoting:

1. Have a suite of CS solutions from the low barrier low tech through to highly advanced cyber-science.
2. Promote and demonstrate its utility in government.
3. Building frameworks (tech or otherwise), training, tools and funds to allow people to set-up their own projects.
4. Demonstrate successes and failures and learning experience from existing projects
5. Encourage competition but with rules- openness, standards where appropriate and semantically linked.
6. Increase the amount published about the field in papers, on the web, in the popular press.
7. Create local and online community with diverse expertise (engineers, hackers, anthropologists) to support community inquiry processes



## 2.4. Direction and Way Forward

The way forward navigating these challenges is the understanding that all the issues must be considered in a comprehensive system design. These are not independent issues that can be considered alone, but rather they are intertwined. Sensor networks include both traditional sensors but now must include crowdsourcing and citizen science. Data visualization, analysis, and storytelling must integrate all the various data and communicate both the results and the actions to all participants of the networks. And in order to build a more sustainable world, all this information must be shared in open discoverable systems that facilitate collaboration around the world. With the growing volumes of data being created daily, our ability to manage our environment will require a comprehensive understanding and the tools and approaches to determine the patterns and the anomalies in the data. These are the challenges we face today and in the future.



## 3.0 Appendices

### 3.1. APPENDIX 1: Technology Showcase and Innovation Forum Examples

This section of the report provides statements that describe exhibition and showcase pieces that are proposed for the Technology Showcase and Innovation Forum as part of the Eye on Earth Exhibition. While separated as part of this document due to a separate line of contributions, elements of Issue Statements described in Section 2 may also be included as part of the Exhibition. This should be evaluated as part of the Framework Committee evaluation.

#### 3.1.1. Mobile Mentor / I-Call Project

The I – CALL project seeks to address among others waste management, climate change issues and Environment Impact Assessments in the country by use of story based mobile learning and to provide a mechanism which will improve the environment. As the first step towards the project the Authority identified the existing deplorable waste management system.

The expected output shall be improved waste management at community level in Nairobi city. In Kenya the greatest issue is segregation of garbage at house hold level. Identified as the first topic to tackle, the Authority together with its partners is in the process of further developing other environmental stories for instance climate change.

The key environmental issues targeted include climate change, desertification, disasters and conflicts (floods, droughts, early warning, fires), ecosystem management, environmental governance, harmful substances and hazardous waste (waste management, community health, carbon emissions etc.) and resource sufficiency (recycling, sustainable production and consumption & water conservation).

The learning content is provided in the format of interactive stories. Learners listen to stories (similar to audio soap operas) and make decisions in place of the protagonists. The stories continue based on the decision of the learner. The learners then experience the consequences of their own decisions. The stories are provided in national and local languages, and are accessible by dialing a local (free – call) telephone number. The learner makes the decision on how to continue the story via keypad in an interactive dialogue system.

Story based learning has a rich tradition in African societies including Kenya and relates easily to local cultures. Well told stories are attractive for many people, which will help to disseminate environmental knowledge throughout society.



Nairobi is estimated to generate 2400 tons Municipal Solid Waste (MSW) per day (SOE - NEMA 2005). Only 40% of the total MSW generated is collected by the City Council of Nairobi and 20% by the private sector. The remaining 40% is uncollected. The bulk of the collected waste ends up at an open dumping ground posing an environmental and health hazard to nearby communities. The resulting environmental and social economic consequences of poorly managed waste on the community include air pollution caused by burning of waste which a common practice by low income communities in Kenya. The others include littering the environment, livestock (cattle and goats) death after ingestion of plastics and acts as mosquito breeding ground causing the spread malaria which is currently a major cause of death of children under 5 years and pregnant women. There is also very little awareness on proper waste management at the community level. Despite efforts by the City Council of Nairobi to manage waste and initiatives by the private and informal sectors to encourage reduction, recycling, reuse and refurbishing of waste, much remains to be done to improve and strengthen the current waste management system.

In line with crowd sourcing the Authority is using the i-call mobile project since to be accessed by different persons whose intention is acquire environmental messages using the their phones. Callers make calls and in the story there several branches that informs the callers to make inform decisions.

I-Call has three mobile learning levels. They include are as follows:

### **Level 1: Community–based learning through interactive storytelling via GSM/ Phone connection**

The requirements for a mobile learning solution on the community level are:

- Independency of phone models
- Must interest, captivate and motivate users
- Rather a oral/auditive than a text-based solution
- Achieving mostly effective learning objectives (change of attitude behavior, awareness raising)

#### *Mentor Mobile Solution*

The learning content is provided in the format of interactive stories. Learners listen to stories (similar to audio soap operas) and make decisions in place of the protagonists. The stories continue based on the decision of the learner. The learners experience the consequences of their own decisions. The stories are provided in national and local languages, and are accessible by dialing a local (free – call) telephone number. The learner will make the decisions on how to continue the story via keypad in an interactive dialogue system.



Story based learning has a rich tradition in African societies and relates easily to local cultures. Well told stories are attractive for many people, which will help to disseminate knowledge throughout society.

### **Level 2: Mobile Learning on the educator and multiplier level**

The requirements for a mobile learning solution at multiplier level are:

- Independent of phone models in use
- Provision of background knowledge
- Allowing interactivity and two – way communication

#### *Mentor Mobile Solution*

The learning content is accessible via mobile browser, optimized for GPRS bandwidths. There is simple text–based content, podcasts, quizzes, etc which will provide background knowledge to the interactive stories offered at the community level.

### **Level 3: Mobile Learning at the specialist level**

The requirements for a mobile learning solution at the specialist level are:

- To allow high levels of interactivity
- To support different forms of communication and data collection
- To allow animations and simulations to impart more complex knowledge and information

#### *Mentor Mobile Solution*

The learning content is accessible via mobile browser or special smartphone applications. The solution must support flash and/ or javascript to enable animations and simulations to be displayed on the phone. Use of videos will be included.

### **Main Objective:**

To mobilize communities in understanding how to use I – Call mobile technology on sustainable environmental management and conservation.

### **Stakeholders:**

This challenging project can only be realized within a strong network of partners. The following partners will develop and implement I – CALL mobile learning on a pilot level:

- **UNEP – United Nations Environment Programme**

Identifying fields of application, providing content expertise, local networks and applications

- **NEMA** – the National Environment Management Authority is the implementing agency and developer of local content. The Authority will spearhead environmental campaigns on environmental conservation.
- 
- **SAFARICOM** – they will be in charge of providing access (toll free numbers)
- 
- **Corporate Social Responsibility–Partners (CSR/Corporate Philanthropy)**

This project allows organizations to present themselves in a ‘green context, with an approach to community and learning in Africa, by using social technology. This combination of elements covers important requirements for highly visible and successful CSR projects.

**Audience Segments:**

The matrix below shows the target groups for the project.

| No. | Target Group  | Rationale  |
|-----|---|--|
| 1.  | Provincial Environment Committees (PECs) and District Environment Committees (DECs) | They coordinate and advise on issues of environment at grassroots. They will spearhead marketing of the I – CALL to the public.  |
| 2.  | Informal Businesses   | They generate a lot of waste. Understanding the I – CALL project will enhance proper waste disposal.   |
| 3.  | Households  | They produce waste and a coordinated marketing engagement with this group is important to obtain buy – in.   |
| 4.  | Community Based Organizations (CBOs) and Faith Based Organizations (FBOs)           | The leaders of these groups have major influence on waste management hence by winning their support will help persuade their followers.  |
| 5.  | Formal Businesses   | They generate waste and have a role in educating their clients the importance of waste management. A clear and tactful marketing of I – CALL to this group is important.       |
| 6.  | Councilors and Local MPs  | These are opinion leaders who can influence the views of the affected people either positively or negatively. A clear marketing strategy/ plan for this group is important.    |
| 7.  | Solid Waste Dealers: Transporters, Nairobi City Council, Recyclers and Decomposers  | Clear messages have to be designated and delivered to the waste handlers informing them of the importance of proper waste management to the success of this project.           |
| 8.  | Lobby Groups: KAM, KARA, NCBDA etc.   | These are opinion leaders who can influence the views of the affected businesses either positively or negatively. A clear marketing/advocacy plan for this group is important. |
| 9.  | Learning Institutions (primary and secondary schools, colleges, universities etc.)  | They teach environmental management courses and carry out research. They can also participate in clean-up activities.  |

### 3.1.2. Beatona.net

#### Discuss great examples of visualization and story telling

A good example for a good visualization is Kuwait official environmental portal ([www.beatona.net](http://www.beatona.net)), which is to be launched soon by Kuwait Environment Public Authority (EPA). "Beatona.net" is meant to share authentic environmental information about Kuwait with the public over the internet in an easy and transparent manner. Beatona (our environment) is the Arabic name chosen for this portal. The portal shall be a one-stop shop for all environmental data and information in Kuwait. It is expected to play a leading role in raising awareness of the value of the environment among Kuwait's citizens and residents. Beatona.net is also a network that offers information about Kuwait's environment from various national, regional and international organizations on one single platform. It also allows the public to participate and interact in the preservation and protection of the environment in Kuwait by reporting environmental phenomena and problems they may encounter to Kuwait EPA in an easy manner, supported by location, descriptive text and photos. The design of Beatona.net and its components is presented in Figure 1.



Figure 1: The Environmental Explorer Section of Beatona.net

Beatona.net is composed of two major sections: the Environmental Explorer and the Knowledge Base (Figure 2). The Environmental Explorer (Figure 1) is a GIS-based platform that allows the users to project thematic environmental layers on GoogleMaps, which were chosen because they are widely used by the Kuwaiti communities and are regularly updated. This went well in-line with the overall objective of offering simple and self-explanatory tools to the public. The Knowledge Base Section (Figure 3) is a multi-media platform that offers articles, reports, photos, videos, maps and publications about the environment in Kuwait in an impressive manner.



Figure 2: The introductory screen of Beatona.net.

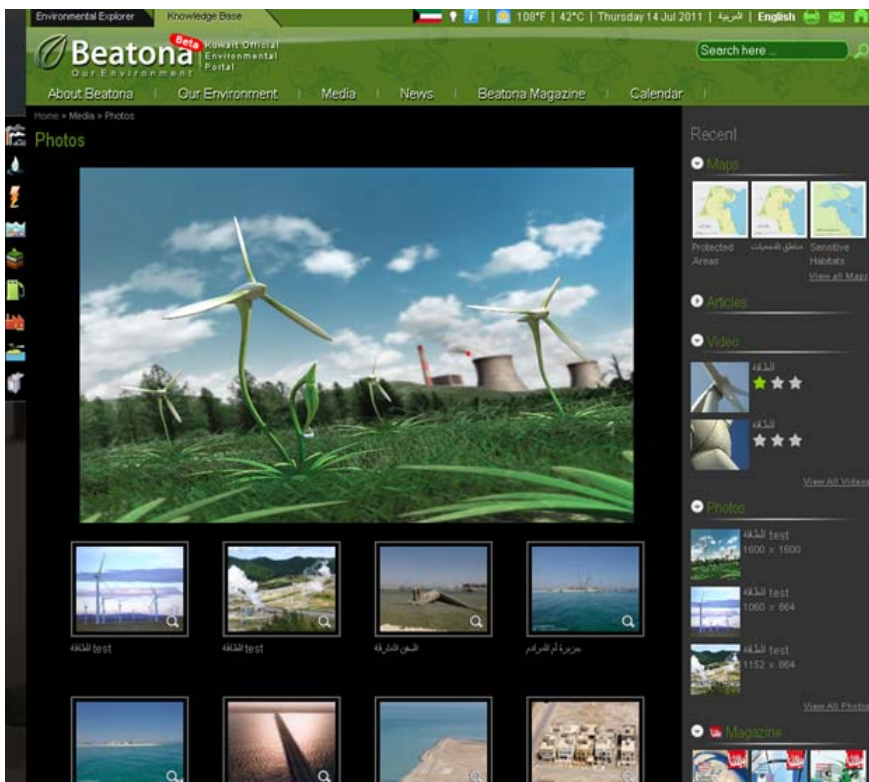


Figure 3: The Knowledge Base Section of Beatona.net

As good examples for proper visualization that matches the local taste we could pick up two major modules of Beatona.net. **Explore Our Environment (EOE)** (Figure 4) is an environmental explorer that allows the user to turn on/off thematic environmental maps on GoogleMaps along with metadata and search functions. It also allows the users to compose and print individual maps of their choice. Environmental layers come from different organizations. A metadata search engine allows the user to identify available data layers and their sources.

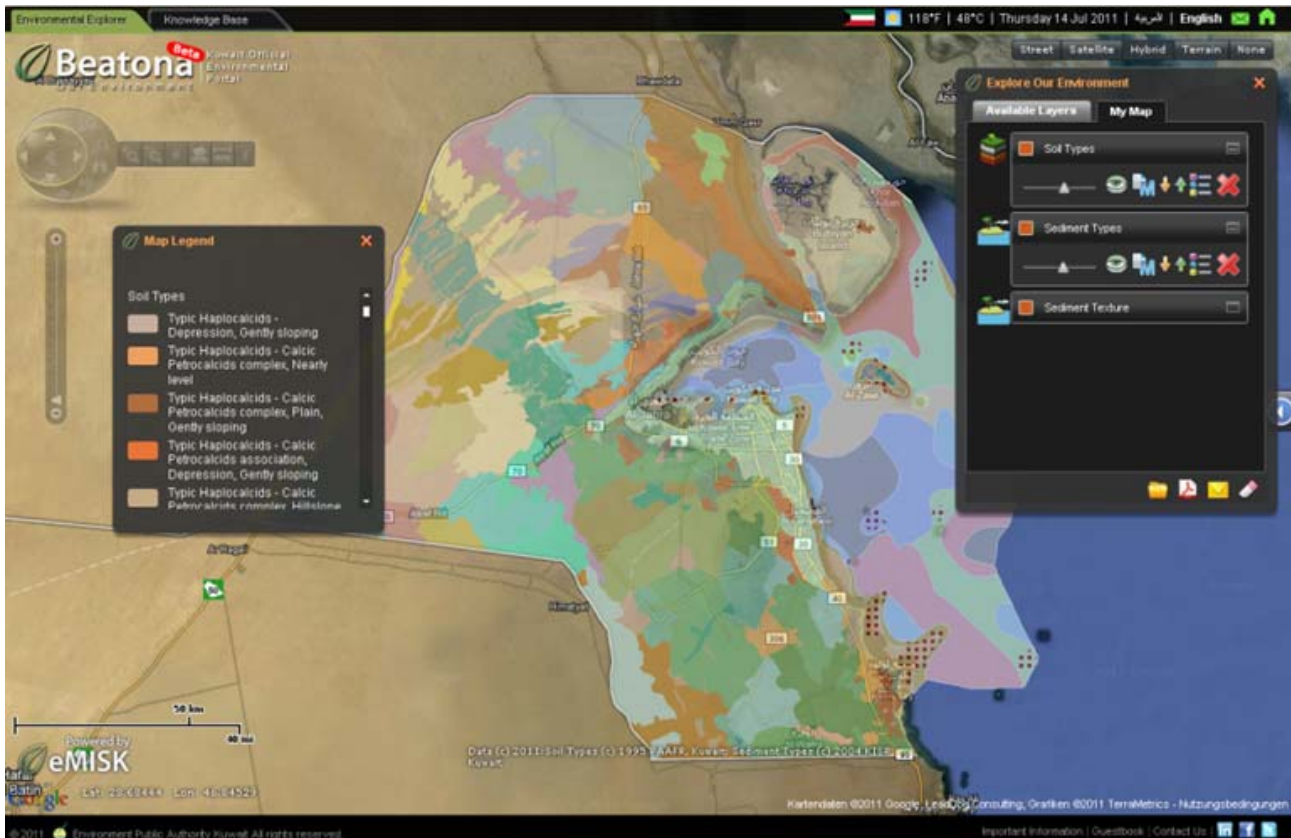


Figure 4: Explore Our Environment

**Our Environment Now (OEN)** is another platform to publish on-line, near real-time environmental quality data measured by EPA departments to the public (Figure 5). This includes Air Quality, Sea Water Quality, Soil Quality, Drinking Water Quality, Beaches quality and so on.



Figure 5: Our Environment Now

Beatona.net visual representations are made in a very simple manner addressing the simple Kuwaiti citizens and residents from all age groups and all education levels. The visualization is based on several aspects that could be highlighted as follows:

- Beatona.net is designed with colorful attractive symbols that appeal to the Kuwaiti citizens and most of the residents in Kuwait.
- It is also available in two languages (Arabic and English) so that it could be easily used and understood by the local population as well as foreign residents and international users from outside Kuwait.
- The local environment, habits and traditions are observed as much as possible. For example, symbols and icons represent local uniforms (Figure 6). When personal data are required, the user is given the option to give a nick-name only. This is especially to encourage female users to participate, as it is a common practice in Kuwait and elsewhere in the Arab world to call persons with the nicknames as the “father of” or the “mother of” rather than using the

real name.

Figure 6: The observation of local Kuwaiti traditions and uniforms in Beatona.net

- Simplicity and self-explanatory symbols are also used whenever possible. For example the button designated for turning layer on and off in the environmental explorer is made like an eye open (turn on layer) or eye shut (turn off layer) (Figure 7). Air Quality Index legend and Water Quality Index legend are also unified for simplicity. Moreover, icons representing the various environmental domains (i.e. Water, Air, Soil, Energy, etc.) are all unified across all modules and services and are used in simple words understandable to everyone rather than the original scientific domain names (e.g. the use of the term ‘Soil’ instead of ‘Terrestrial Environment’ and ‘Air’ rather than ‘Atmospheric Environment’, etc.)
- As one of the major purposes of the portal is to raise awareness among the public, each element of Beatona.net was designed to fulfill that. The choice of the overall black background for example, was especially made to raise the awareness of the anticipated energy saving of using black color screen in the internet. The user is given the chance to turn the background color into white (turn-light-on function), if this is more comfortable for some users, or to turn back into a black



Figure 7: Layers management symbols in Beatona.net



screen by switching off the light. An adequate explanation is given in a small tooltip (Figure 8).

Figure 8: The “Save Energy” button in Beatona.net

- For more simplicity and in order to ensure popularity among the public, GoogleMaps were used in the background of the portal. It was proven that the users in Kuwait, like most users elsewhere, are familiar with the use of GoogleMaps. Research has also shown that the use of GoogleMaps in the background is preferable by the potential users than for example using local base maps or satellite imagery of Kuwait, which would be soon outdated after publication. Therefore, innovative efforts were done to fully integrate GoogleMaps with ESRI ArcGIS Server engine, upon which the Environmental Monitoring Information System of Kuwait (eMISK) Geodatabase is built. In addition to its attractive look-and-feel and efficient response time, GoogleMaps are updated very frequently for Kuwait in comparison to other similar platforms, like Bing Maps for example, which is very much outdated for Kuwait.

#### Where is this going?

Further research is required to enhance the digital cartography and the used symbols and colors for Beatona.net for better performance even for slow internet connections. Moreover, certain modules are planned for IPHones and Android mobile devices for wider accessibility and ease of use among the young population.

#### Conclusion

As Arab countries in general, and GCC countries in particular, have many traditional, cultural and social aspects in common, Beatona.net is an example that could be easily replicated in other Arab and other developing countries, for disseminating and sharing their environmental data and information with the public.

#### 3.1.3. Common Sense

Community Sensing has developed numerous handheld device with custom boards that has carbon monoxide, ozone, NOx, temperature, and humidity sensors. This board is based on the EPIC mote platform. The handheld device also has a GPS/GPRS module so it can collect GPS data and upload all sensor data to our servers in real-time. Their goal is to create mobile sensing for Community Action, and facilitate diverse data collection through simple opensource hardware and software components available to the public. <http://www.communitysensing.org/technology.php>



**Exhibition Venue:** Technology Showcase

#### Stakeholders:

- Civic science participants



- Local environmental organizations
- Opensource community

**Impact:** Providing inexpensive mobile devices to track and monitor an array of environmental variables would enable data collection at a fine grained detail, while enabling citizens to participate as data collection nodes. Citizens would benefit from helping understand larger environmental trends, and more importantly better understanding the potential environmental concerns within their own living space and surroundings.

**Themes:**

- DIY Data Collection
- Innovative methods
- HyperLocal Sensing

### 3.1.4. Eye on Earth Accelerator

The Eye On Earth Accelerator is a special initiative to help generate innovative technology ideas related to key Summit Issues, and then kick-start the development of those ideas through small seed funding grants. Prior to the summit, the EoE Accelerator would post a handful of problem areas to the an EoE Accelerator website, and enable the public around the world to respond to these areas with their own ideas on technology which could help solve these problems. The public would also have the ability to indicate those ideas they find most valuable, and over time those ideas with the most appeal across the board would rise to the top. Either during the closing proceedings of the Summit, or shortly thereafter, a handful of the best ideas would be selected to receive small seed grants to prototype and/or develop their concepts. This would reflect some immediate meaningful innovative outcomes from the Summit, and provide an ongoing set of programs to keep the spirit of the Summit going. The funding of these seed grants could come from Commercial sponsors, unilateral funding agencies, NGO's, or from a dedicated fund set up for EoE innovation.

This concept is very similar to others being successfully leveraged elsewhere to engage user communities in helping to solve problems through innovation. These often take on the form of a contest, where a problem statement is released and the general public can choose to respond. The participant with the best idea (either decided by the public or a selection board) is granted seed money to help kickstart the development of their idea. Often times the sponsoring entity retains a certain percentage of the Intellectual Property (or company stock), though many times it is more effective to engage the opensource



community in helping grow and mature the development path until a mature COTS/GOTS offering can be spun off.

Some examples of similar programs include:

<http://challengepost.com/>

<http://challenge.gov/>

<http://nycbigapps.gov>

<http://www.kickstarter.com>

**Exhibition Venue:** Innovation Forum – potentially a special program to promote long term engagement and creative collaboration

**Stakeholders:**

- Entrepreneurs
- Civic Science
- Developer communities
- NGOs
- International stakeholders

**Impact:** Coming out of the EoE Summit, a small number of world class innovative concepts would receive seed funding to build their ideas. After being built, these tools would then be shared back with the Eye on Earth community, providing ongoing momentum from the summit and engaging/expanding the EoE community. There is potential for shared licensing models which could help fund additional rounds of EoE Accelerator startups, and the cycle of innovation and feedback could continue organically. Alternatively, the end products could be part of an EoE opensource community which would seek to further engage a global audience in building and refining meaningful tools to address EoE issues.

**Themes:**

- Investing in innovation
- Crowdsourcing ideas
- grassroots technology development
- Addressing issues through innovation

### 3.1.5. GateWing

Gatewing real benefit is the speed of capture, and the ability to collect data even under high cloud cover which may affect satellite/aerial collection methods. It is a small autonomous aircraft that can be used to capture extremely high resolution imagery for mid-size areas of interest. Users specify the capture zone digitally, and the device takes off, flies the course, and then lands in a designated area. The internal components are rather simple, utilizing either a standard point and shoot digital camera or an optional infrared camera to capture the images.



<http://www.gatewing.com/x100>

**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- Disaster response community
- Local environmental organizations
- Planners

**Impact:** Strong potential impact for collecting large amounts of very high resolution imagery in disaster response situations. By reducing the cost to acquire this aerial imagery, an access to data barrier would be diminished significantly. While the cost may be higher than other DIY methods (see grassrootsmapping), the technology still eliminates the reliance on costly 3rd party data which may have limitations based on weather and cloudcover.

**Themes:**

- DIY Data Collection
- Innovative methods
- Imagery

### 3.1.6. Grassroots Mapping

Opensource DIY technology for low cost creation of a balloon imagery capture system. This approach provides the public with a set of instructions and a material list for them to rapidly create their own collection tools, and then process data into multiple products. This approach has recently been used for disaster mitigation and recovery like the Gulf Oil Spill, and also grassroots environmental monitoring and change detection. This technology is currently being developed and shared through the PublicLaboratory.

<http://grassrootsmapping.org/>



**Exhibition Venue:** Innovation Forum

#### **Stakeholders:**

- Disaster response community
- Local environmental organizations
- Planners

**Impact:** By reducing the cost to acquire very high resolution aerial imagery, an access to data barrier would be diminished significantly. Through sharing of DIY instructions, nearly anyone could construct their own image collection device instead of having to rely on aerial or satellite imagery vendors.

#### **Themes:**

- DIY Data Collection
- Innovative methods
- Imagery

### 3.1.7. LifeLens

A really fascinating application which enables individuals with a cell phone to perform field tests for malaria. The Lifelens system is made up of a hardware element and a software one. The specific hardware in the system is a microscopy lens that is attached to the back of Windows 7 mobile device. The software application, which is developed in Silverlight, can visualize samples placed on the lens as if it were a microscope.



<http://thelifelensproject.com/blog/>

**Exhibition Venue:** Innovation Forum

#### **Stakeholders:**

- Developing countries
- Medical community
- Citizens in malaria prone regions
- Environmental/humanitarian organizations

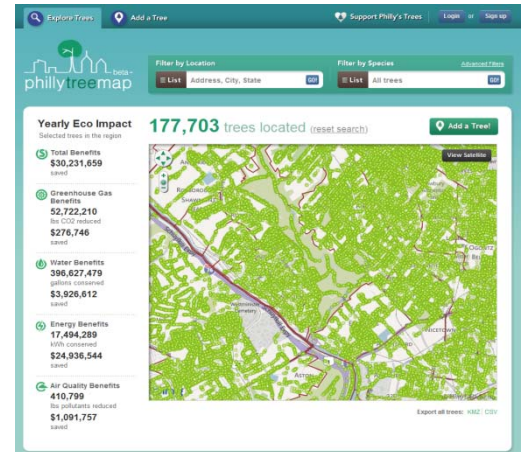
**Impact:** Based on the recent explosion of mobile phone use in Africa, this application would essentially enable anyone with a phone to test for malaria. Lifelens hopes to directly address the major problem of reducing child mortality rates throughout the world by providing a robust mobile diagnostic solution for malaria patients. The application could also help share data across the globe which could be analyzed against additional environmental datasets.

#### **Themes:**

- DIY Data Collection
- Mobile
- Innovative methods
- Environmental Health

### 3.1.8. OpenTreeMap

OpenTreeMap provides an easy-to-use public inventorying platform that enables individuals, organizations, and governments to collaboratively contribute to an interactive and dynamic map of a community's tree population. OpenTreeMap can be used in a single municipality or cover a broader geographic region with many communities. The core concept is to enable a wide range of users to create, index, and update information on the trees around them, and when combined with other opensource initiatives such as TreeKIT (a field inspection toolset for classifying and recording tree info) this system provides a really interesting platform for collective data exploration.



**Exhibition Venue:** Innovation Forum

**Stakeholders:**

- Cities
- Regional Planning Groups
- Environmental Organizations

**Impact:**

By engaging the public in collecting detailed information about trees, a powerful knowledgebase of tree types, locations, and conditions can support analysis for planning and related tasks. Since the platform is opensource, it can be shared with interested parties and then optionally linked back to the larger OpenTreeMap community. Most importantly, the web application shows the Yearly Eco Impact of the tree data by calculating Air Quality Benefits, Energy Benefits, Water Benefits, Greenhouse Gas Benefits, and then the sum of those benefits in terms of Dollars Saved. One example site for the City of Philadelphia shows an annual benefit of over \$30 million dollars saved per year.

**Themes:**

- DIY Data Collection
- Crowd Sourcing



- Environmental Observations

### 3.1.9. Pachube

Pachube provides an API infrastructure to connect sensors, environments, and databases in order to better support the real time data world. They are a commercial organization that charges for these services, though the protocols they implement are opensource.



<http://pachube.com/>

**Exhibition Venue:** Technology Showcase

#### **Stakeholders:**

- Environmental data collection community
- Researchers
- Civic Science

**Impact:** The problem space that Pachube directly addresses is that of publishing and connecting varying types of real-time sensor feeds. There are some major opportunities for better analysis and early warning detection applications when data can be shared in an automated fashion through a common exchange protocol.

#### **Themes:**

- Data exchange protocols
- Connecting sensors
- Publishing and connecting real time data feeds

### 3.1.10. ProtectedPlanet.NET

Protectedplanet.net allows you to search in any language to find information about individual protected areas. If you don't know exactly what you are looking for, you can explore the world with intuitive and beautiful maps, photo's from @Panoramio and @Flickr and text descriptions from @Wikipedia. The real value of the approach protectedplanet has developed is in simplicity of user interaction, and the depth of data that is pulled together for each protected area.

<http://protectedplanet.net/>



**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- Conservation Groups
- Local environmental organizations
- Public and civil society

**Impact:** By providing a better means to discover data related to protected places, this information can far more effectively support decision makers, planners, and the public. The ability to explore through the map interface, as well as the multiple language support, means that data discovery is much easier and effective.

**Themes:**

- Data discovery
- Compiling multiple data sources

### 3.1.11. SourceMap

SourceMap is a community collaboration tool for understanding sourcing and supply chain for everyday products. Built and maintained by the user community, this platform lets people research the parts and ingredients of everyday products, and then link the sources of these components on a global scale. The resulting map illustrates a very interesting view of how global sourcing works. Through this view, users can access the information needed to make sustainable choices and share them with the world. This free and open-source project is completely volunteer-driven.



<http://www.sourcemap.org/>

**Exhibition Venue:** Technology Showcase

#### Stakeholders:

- Disaster response community
- Local environmental organizations
- Planners

**Impact:** Displaying the complex information behind everyday items is a compelling way to look at the impact that our consumer habits have on a global scale. This approach could help build awareness of these potentially sub-optimal practices and encourage people to think about alternatives which are more environmentally friendly.

#### Themes:

- Community collaboration
- Global supply perspective
- Consumer impact

### 3.1.12. Air Quality Balloons

Out of CMU, these DIY glowing balloons that react to surrounding air quality. Inside each balloon is a tri-colored LED. This LED reacts to data from an air quality sensor, turning green, yellow or red based on low, average, and high values. This method can be utilized to provide real-time feedback on air quality for public spaces, and does so in a playful and highly visual interactive manner. This was awarded the best Instructable of 2010 by <http://www.instructables.com/id/Best-of-2010/>



<http://www.livenv.net/spectacle-computing>

**Exhibition Venue:** Innovation Forum

**Stakeholders:**

- Civic Science Participants
- Local environmental organizations
- Opensource community

**Impact:** Displaying the complex information behind everyday items is a compelling way to look at the impact that our consumer habits have on a global scale. This approach could help build awareness of these potentially sub-optimal practices and encourage people to think about alternatives which are more environmentally friendly.

**Themes:**

- Community collaboration
- Global supply perspective
- Consumer impact

### 3.1.13. OmniGlobe

ArcScience has developed a spherical media device called Omniglobe. This display device uses internal projection technology to take content and display it on a 360o globe surface, and they have a couple sizes including one that hangs from the ceiling. There are 3 size options, the largest being 60” diameter. It comes with a set of content authoring tools which are pretty easy to use, and essentially re-projects anything you want to display. This type of device is big in the museum scene, and is particularly well suited for communicating information on a global scale.



<http://www.arcscience.com/>

**Exhibition Venue:** Technology Showcase

#### **Stakeholders:**

- Information disseminators
- NGOs
- Public Outreach

**Impact:** This type of display very effective for displaying and describing environmental information on a global scale. It is particularly well suited for communicating understanding of information at multiple levels and allowing for users to explore data layers, both temporally and thematically.

#### **Themes:**

- Data dissemination
- Visualization

### 3.1.14. Citizen Sensor

Citizen Sensor is DIY, wearable, reconfigurable sensor pack and data contextualization system that allows users to collect, share, and understand data using sensors recording environmental conditions such as carbon monoxide, light, noise pollution, and methane gas exposure among others. Users choose what to sense, and then connect with others around the world to share knowledge and experience.

<http://thesis.jmsaavedra.com/>



**Exhibition Venue:** Innovation Forum

#### Stakeholders:

- Civic science participants
- Local environmental organizations
- Opensource community

**Impact:** Providing inexpensive mobile devices to track and monitor an array of environmental variables would enable data collection at a fine grained detail, while enabling citizens to participate as data collection nodes. Citizens would benefit from helping understand larger environmental trends, and more importantly better understanding the potential environmental concerns within their own living space and surroundings. Cost of individual units is minimal, and software is opensource.

#### Themes:

- DIY data collection
- Innovative methods
- HyperLocal sensing



### 3.1.15. iNaturalist.org

iNaturalist is a platform that allows users to log their observations of the natural world, explore those observations of others, and network with people interested in similar topical areas of interest. The platform began as a master's project at UC Berkeley, and is currently maintained by a non-profit team using opensource tools. The vision behind iNaturalist.org is to create is a place where you can record what you see in nature, meet other nature lovers, and learn about the natural world. If enough people recorded their observations, it would be like a living record of life on Earth that scientists and land managers could use to monitor changes in biodiversity, and that anyone could use to learn more about nature.



<http://www.inaturalist.org/>

**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- Civic science participants
- Local environmental organizations
- Opensource community

**Impact:** This is a platform which can lead to discovery and connection of individuals with similar environmental interests. Because it covers all types of environmental observations, the site pertains to a very broad audience of nature lovers, civic scientists, NGOs, and the general public.

**Themes:**

- Data discovery
- Collaboration platforms
- Data sharing

### 3.1.16. Leafsnap

Leafsnap is an iPhone application which allows users to take photos of flora they encounter in the field, and quickly determine what species the sample is. This digital field guide also has high resolution imagery samples of flora in the catalog, and allows users to match species by leaves, flowers, sees, bark, and petiole. The initiative is a joint effort from Columbia University, the University of Maryland, and the Smithsonian Institution, and they continue to work on visual recognition software to help identify species from photographs. Leafsnap is the first in a series of electronic field guides being developed to demonstrate this new technology.



<http://leafsnap.com/>

**Exhibition Venue:** Innovation Forum

#### Stakeholders

- Civic science participants
- Local environmental organizations
- Opensource community
- General public

**Impact:** By deploying simple tools that can be utilized on consumer mobile devices, users will have access to large databases of environmental knowledge in the field. This means that they can more accurately identify invasive species, sensitive or endangered species, and unknown species with the simple click of a phone camera. As more people use this to identify samples, more data is geospatially indexed and added to a growing database of flora on the backend of Leafsnap.

#### Themes:

- Mobile data collection
- Innovative methods

- HyperLocal Sensing

### 3.1.17. NYC Wireless Water Meters

As part of a major infrastructure optimization program, New York City DEP has invested in creating a world class Automated Meter Reading (AMR) and water quality control system for the largest urban concentration in the US. These wireless water meters transmit water consumption data at least four times per day and will end the use of estimated water bills and give water customers more accurate and timely records of water usage. 417,000 installed to date. This real-time infrastructure also helps DEP and the public detect and fix leaks before they become a costly billing problem, or damage infrastructure or nearby homes and businesses.



[http://home2.nyc.gov/html/dep/html/press\\_releases/10-78pr.shtml](http://home2.nyc.gov/html/dep/html/press_releases/10-78pr.shtml)

**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- Local government
- Regional government
- Water control boards

**Impact:** This approach has shown quantitative benefit and cost savings across the City of New York and DEP Operations Divisions. The cost saving related to manual meter reading in the field saves at least \$3.6 million dollars a year, not to mention eliminating the costly disputes that often end up in court. This has also had a positive impact on early detection of infrastructure failure, saving lost product as well as eliminating cost of unplanned repairs.

**Themes:**

- Sensors
- Smart infrastructure
- Visualization

### 3.1.18. Ocean Gliders

As our environmental data harvesting needs become more acute, technology is moving to provide better methods of automated collection from a number of platforms. For oceanic research, gliders are an important sensing platform for understanding trends in temperature, salinity, and currents. As these platforms evolve, they are now able to provide data in a number of different ways from different sample depths and coverage swaths. These remote sensing devices are important contributors to global data capture and monitoring, and while there are many types of gliders we are still assessing which one would be best to feature at the Summit.



[http://en.wikipedia.org/wiki/Underwater\\_glider](http://en.wikipedia.org/wiki/Underwater_glider)

**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- Marine scientists
- Global climate researchers
- Technology sector

**Impact:** As a class of remote data collection devices, these units are providing extremely valuable data from the world's oceans. Their design and mission planning is thought provoking, as well as the ways they use technology to communicate data back from the field. By making these types of sensing platforms available to others there may be opportunities to better understand the vast data gaps that exist in our oceanic knowledge and analysis.

**Themes:**

- Sensor platforms
- Marine data
- Visualization

### 3.1.19. OldWeather

Over the course of history maritime observations have been recorded in great detail as ships made course of their travels. By indexing and extrapolating this observation data, scientists can better model projections of sea levels, climate model projections, and weather extreme trends. OldWeather is a tool which engages the public in helping to sift through this vast database of maritime observations and help turn them into actionable data for use by scientists. Using a crowd source model, this application asks users to ‘Help scientists recover worldwide weather observations made by Royal Navy ships around the time of World War I’.



<http://www.oldweather.org/>

**Exhibition Venue:** Technology Showcase

#### **Stakeholders:**

- Civic science
- Maritime/climate researchers

**Impact:** This type of crowdsourcing platform can be very powerful for parsing through large amounts of non-normalized data which requires some level of human observation. This platform provides a great example of what’s possible with this type of approach, and what some of the ways to engage users using game mechanics or incentives.

#### **Themes:**

- Crowd source
- Civic science
- Public engagement strategy

### 3.1.20. Copenhagen Wheel

The project transforms ordinary bicycles quickly into hybrid e-bikes that also function as mobile sensing units. The Copenhagen Wheel allows you to capture the energy dissipated while cycling and braking and save it for when you need a bit of a boost. It also maps pollution levels, traffic congestion, and road conditions in real-time. Controlled through your smart phone, the Copenhagen Wheel becomes a natural extension of your everyday life. You can use your phone to unlock and lock your bike, change gears and select



how much the motor assists you. As you cycle, the wheels sensing unit is also capturing your effort level and information about your surroundings, including road conditions, carbon monoxide, NOx, noise, ambient temperature and relative humidity.

<http://www.digitalurban.org/2010/04/crowd-sourced-data-copenhagen-wheel-for.html>

**Exhibition Venue:** Innovation Forum

**Stakeholders:**

- Cities
- Public
- Planners
- Researchers

**Impact:** This is a great example of how crowd sourced data can provide a wealth of environmental information using activities the public is already engaged in. The wealth of information and contribution to linking environment and society under this model will far surpass the amount of information that can be captured using traditional monitoring methods.

**Themes:**

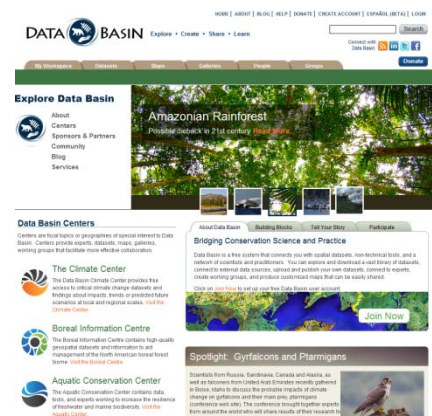
- Civic Science
- Crowd Sourcing

- Sensors
- Data Collection
- Innovation

### 3.1.21. Data Basin

Data Basin is a free, online system that connects users with spatial datasets, tools, and expertise. Individuals and organization can explore and download a vast library of datasets, upload their own data, create and publish analysis, utilize working groups, and produce customized maps that can be easily shared.

To address the need to connect science, policy, and the people making change on the ground, the Conservation Biology Institute (CBI) worked with partners to design and construct Data Basin ([www.databasin.org](http://www.databasin.org)). Data Basin is a web-based, mapping and collaboration platform that provides access to thousands of well-documented spatial datasets, non-technical visualization and analysis tools, functionality to assist collaborations, and networks of scientists, practitioners, and interested citizens.



Data Basin is supported by cloud computing making the system fully scalable, more affordable, and easily accessible. All users need is a reasonably fast Internet connection and a web browser (Firefox, Chrome, Safari, or Internet Explorer) and Data Basin can be used from anywhere, anytime. To put it in mapping terms, Data Basin is GIS for the non-technical user fully supported on the web – no downloads necessary. Also, Data Basin is built to support multiple languages with one of our Gateways (see below) available in both English and Spanish. Support for additional languages is planned.

**Core Functionality:** Data Basin is not a typical website or data portal – its application integrates science, mapping, and people. It is as much about the sociology of data use and sharing by a wide audience as it is about the data itself. Providing guidance on how to use spatial data to address conservation and related issues and links to a growing community of experts is a major strength of Data Basin. A short, guided tour of Data Basin can be seen here: [http://www.youtube.com/watch?v=KTcSuyr\\_oW4](http://www.youtube.com/watch?v=KTcSuyr_oW4)

The core functionality of Data Basin is free and provides:

- Direct downloads of thousands of spatial datasets (currently ~5,000 and steadily growing)



- Non-technical mapping tools so users can to create custom maps (integration of multiple layers, styling, etc.)
- Ability to create or join group workspaces for collaboration, negotiation, and/or review
- Basic drawing and analysis tools
- Data and map service uploading with options for privacy (e.g., sensitive species localities, work-in-progress, etc.)
- Searchable directory of user profiles
- Scientific experts leading content development (e.g., climate impacts, ecological modeling, protected areas, connectivity, etc)

Data Basin also has a growing number of **'Gateways'** that provide customized management and highly focused map-based analytical tools for specific content in the system. For example, the "Inter-American Biodiversity Information Network Data Integration and Analysis Gateway IABIN-DIAG ([www.databasin.org/iabin](http://www.databasin.org/iabin)) supports the spatial datasets and tools generated by five thematic networks throughout Latin America. For corporations and investment banks, customized Data Basin solutions are being built and supported to help improve finance decision making, drive costs down, improve ability to compete in a 'green market', and improve corporate citizenship.

Data Basin was launched in mid-2010 to serve the core needs of individuals and organizations that make decisions about environmental management, education, and policy. To date, more than 2,500 users have created accounts and started creating maps, galleries, and participated in working groups. Many more users have visited Data Basin to view data and information without creating an account, which is only required for those who want to take full advantage of Data Basin's capabilities. Users come from a diversity of entities, including non-government organizations, academic/research institutions, local/state/regional governments, federal government, corporations, and citizens.

<http://databasin.org/>

**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- Researchers
- Planners
- NGOs
- Public

**Impact:** By creating a better set of tools for intuitive data discovery, DataBasin is enabling a wide range of users in accessing spatial datasets for use in analysis, map making, and decision support. The DataBasin interface also organizes environmental interests into thematic communities, where users can share, contribute, and discuss the datasets they work with. This framework is an important bridge to better online data consumption and sharing.

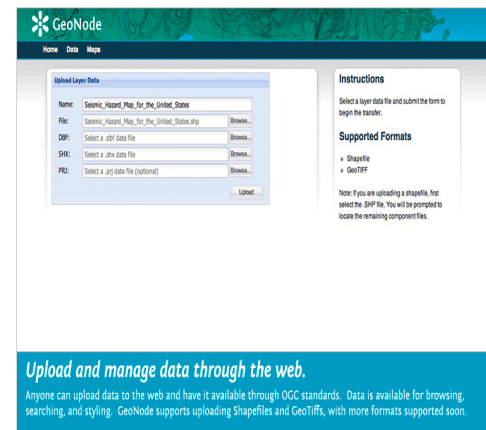
Themes:

- Data Discovery
- Data Sharing
- Community Building

### 3.1.22. GeoNode

GeoNode is an open source platform that facilitates the creation, sharing, and collaborative use of geospatial data. The project aims to surpass existing spatial data infrastructure solutions by integrating robust social and cartographic tools.

At its core, the GeoNode has a stack based on GeoServer, Django, and GeoExt that provides a platform for sophisticated web browser spatial visualization and analysis. Atop this stack, the project has built a map composer and viewer, tools for analysis, and reporting tools. As part of the Open Risk Data Initiative, the Global Facility for Disaster Reduction and Recovery collaborates with partners to



deploy GeoNode in a number of

<http://geonode.org/>

**Exhibition Venue:** Technology Showcase

**Stakeholders:**



- Disaster response community
- Local government organizations
- Planners

**Impact:** This opensource set of tools can enable users to create, share, and collaborate using geospatial data. There is an opportunity around global disaster reduction and recovery data creation to support the Open Risk Data Initiative.

#### Themes:

- Community collaboration
- Data creation
- Data sharing

#### 3.1.23. GeoSur

A geospatial resource network for South America and the Caribbean. Ensuring geographic information is readily available is the mission of the GeoSUR Program, a regional initiative to integrate and disseminate spatial data in Latin America and the Caribbean. GeoSUR was originally developed under the direction of the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), which promotes the development of transportation, energy and telecommunications infrastructure from a regional viewpoint. Since the Program's inception in 2007, GeoSUR has grown to serve a large audience interested in development objectives, both regionally and within individual countries.



GeoSUR has three main components:

- Geoportal
- Network of map services
- Regional topographic processing service.
- 

All these geoservices are available from the GeoSUR South American Portal at

<http://www.geosur.info/geosur/>

**Exhibition Venue:** Innovation Forum

**Stakeholders:**

- South America
- Government
- Planners

**Impact:** Enabling geospatial data discovery, sharing, and regional data processing means a more cohesive set of collective efforts are possible. By sharing map services, organizations can benefit from previous work which has been compiled, as well as share back their data and analysis with the community.

**Themes:**

- Community collaboration
- Geospatial
- Data discovery
- Data sharing

**3.1.24. Indaba**

The Indaba platform is a browser-based platform that allows geographically distributed teams to create, edit, review and publish original content, such as policy scorecards or citizen audits. This content can include text, quantitative data, and uploaded files of any type. It was launched in September 2010, and currently has 14 organizations with projects in the pipeline. Based on currently interest there is anticipation that this suite of tools will expand that rapidly. Indaba is a tool to get locals submitting data on social issues, quickly and cheaply, then do quality control, editing and publishing from the same database. When it's done, all these orgs have their data in a common, sharing-friendly format.



<http://getindaba.org/>



**Exhibition Venue:** Innovation Forum

### Stakeholders

- NGOs
- Public
- Planners

**Impact:** This platform enables groups of people to design projects, collect data, write reports, edit documents, clean datasets, conduct quality control and peer review, and then publish or export the results, all from a web browser. By providing these opensource capabilities through simple tools, the platform increases the likelihood and ability of communities trying to perform data collection.

### Themes

- Community collaboration
- Data collection
- Data discovery
- Data protocols

### 3.1.25. OCEANIDS

New areas of the seabed and deep sea are facing management challenges related to the potential impacts of various human activities. The global community, with developing states and small island developing states in particular, requires credible, science-based marine data and information for purposes that include support to: 1) scientific investigation, 2) environmental and natural resource management and 3) reporting on the state of the marine environment in an overall effort to promote the sustainable use of the oceans. OCEANIDS seeks to make relevant interdisciplinary and multithematic public marine data searchable, accessible and meaningful to users by combining the development of a ease-of-use web platform with UNEP/GRID-Arendal's marine capacity building activities and initiatives.

OCEANIDS shall build upon the successful development and implementation of the UNEP Shelf Programme's One Stop Data Shop ([www.continentalshelf.org](http://www.continentalshelf.org)), which gathered together public marine geophysical and geological geospatial information and metadata for use by developing states and small island developing states working to delineate the outer limits of the continental shelf. OCEANIDS will primarily function as a searchable catalogue of publicly available datasets needed to support scientific, management and policy decisions. OCEANIDS' secondary function will involve accessing relevant public data for uses that include:



- Assessing the state of the deep sea environment inside and outside areas of national jurisdiction
- Providing developing states with qualitative evaluations of non-renewable marine resources
- Prospectively mapping for deployment of marine renewable energy systems with jurisdictions of developing states
- Mapping of benthic habitats and marine and coastal ecosystems to support marine spatial planning
- Using data compilations to support proper valuation of deep sea ecosystems facing the impacts of human activities

The technical development of OCEANIDS will be designed with the non-GIS expert end-user in mind. The capacity to visualize, examine and perform basic comparative analyses of datasets will be provided through a public web-based service that focuses on ease of searchability and accessibility. When possible, access to the data inventories of partners will be accomplished using Open Geospatial Consortium protocols.

<http://oceanids.geoiq.com/home>

<http://geoiq.grida.no/home>

GRID-Arendal is hereby seeking to inform current data partners and potential new partners of the development plans for OCEANIDS and invites all holders of relevant data to contribute their basic inventories and metadata. OCEANIDS also seeks to ensure that no duplication of effort occurs and as such we greatly welcome all feedback, suggestions and proposals for collaborations. All queries can be directed to **Yannick Beaudoin**,

Yannick Beaudoin  
 Head of Marine Programme  
 UNEP/GRID-Arendal  
 Tel: +47 9542 9247  
 Email: [yannick.beaudoin@grida.no](mailto:yannick.beaudoin@grida.no)

**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- NGOs
- Researchers
- Planners

**Impact**



Please see above.

### Themes:

- Community collaboration
- Data collection
- Data discovery
- Data protocols

### 3.1.26. Rethinking the Climate Network Paradigm: Creating a “Collaboratory for Adaptation to Climate Change”

Notre Dame University

Climate change is a pressing focus of scientific research, social concern, economic worry, and political attention. Adaptation to climate change is a critical component of the climate crisis, motivating an unprecedented coordination of data, networks and knowledge. The question is not only how to slow or stop climate change, but how to adapt and live with the consequences. Such adaptation requires an unprecedented mobilization of knowledge about impacts, vulnerabilities, and potential strategies for effective action. Climate change and adaptation discussions go beyond research labs and classrooms, and impact citizens and communities. It thus imposes a need to network people together of different expertise – from computer science to ecology to climate science to policy – dispersed over a wide geography in order to share data, information, and knowledge. The University of Notre Dame is leading such an initiative to develop a novel online networking paradigm to bring together scientists, policymakers, regulators, agencies, and citizens. It’s called the “Adaptation Collaboratory.” This initiative is supported by a grant from the National Science Foundation under the Cyber-enabled Discovery and Innovation Program. The Collaboratory builds on cyber infrastructure, data and knowledge management, modeling, scenario analysis, citizen participation, as well as regulatory and legal expertise in order to pursue pioneering scientific inter-disciplinary integration and sound policy development. Our goal is to create a networking paradigm that connects dots of data to enhance the understanding of complexities in the natural system, and chart the path from data to knowledge to insight to action.



The Collaboratory's initial function is to enable projections and vulnerability assessments for natural resources under climate change; collect and deliver expert opinion about adaptation to climate change; provide a clearinghouse of legal and regulatory data to inform adaptation strategies; enable a platform for the adaptation community to develop, and deploy novel computational modeling tools; and conduct scenario analysis. The Collaboratory will enable anyone interested in climate change, such as policymakers, resource managers, scientists—to make better decisions about climate change adaptation and deliberate those decisions with peers and experts. Citizens of the world, irrespective of the location, will be able to participate in the discussion, learn from the experts, and participate in online educational opportunities. Notre Dame will show how this new networking paradigm is being used to jump-start the global conversation on climate adaptation in the 21<sup>st</sup> Century. We also will present our complex networks-driven approach for modeling the multi-variate spatial relationships, long-range teleconnections, and dependence structures in climate variables, leading to descriptive understanding and predictive modeling in climate data.

<http://crc.nd.edu/index.php/cyberinfrastructure/ice/111>

### **3.1.27. Networks for Transportation and Invasions by Harmful Species: Reducing Future Harm in Terrestrial, Freshwater and Marine Ecosystems**

Invasive species are a major global driver of environmental damage and economic harm. A government report in the U.K. last year estimated the cost of invasive species in Britain to be 1.7 billion pounds per year. Similar studies in the United States estimate that the annual cost of invasives in that country is nearly 120 billion dollars. Global transportation networks—ships, planes, trains or automobiles—have long served as vectors for invasive species introductions. One of the key limitations to improved management of these harmful introductions has been the lack of reliable invasive species forecasting that could help guide successful management intervention. There are knowledge gaps regarding (1) the extent of harmful species populations around the globe (2) whether those potentially harmful populations are prone to being moved via human transportation networks (3) what regions/areas are most likely to be colonized by these species (4) and the lack of environmental information networks that can help coordinate research and management intervention across international boundaries. The University of Notre Dame is pioneering new computational thinking and network science methods to locate, quantify, map and track the convergence between global transportation networks and invasive species populations and provide technical information, analysis and visualizations to facilitate improved management and forecasting. The key research challenge is how to identify the



risk and contain the spread of invasive species? An accompanying key question is: how will climate change affect the global shipping network and the potential transfer of nonnative species? Answers to these questions lie in the understanding and modeling of the composite or “inter-genre” network – the global shipping network, climate network, and economic network. The global shipping network represents the carriers and routes of the invasive species; the economic network represents the trade dependencies across organizations and countries, as well as how to create effective incentive and/or intervention strategies for such organizations; and the climate network classifies different ports in the world on the basis of climactic similarity and the scenarios of new shipping routes becoming available due to climate change (in the Arctic, for example).

The research at Notre Dame focuses on the fundamental science of descriptive understanding and predictive modeling of time-varying inter-genre networks to effectively contain the impact of invasive species while not impacting the global trade and economies. The University of Notre Dame, along with partners in the global conservation community such as The Nature Conservancy, has begun the process of organizing and providing detailed invasive species forecasting information to management agencies across the globe.

### 3.1.28. Lale’enok Resource Center

#### ***TITLE: Lale’enok Resource Centre***

One of the richest wildlife areas and biodiversity hotspots in all Africa straddles Kenya’s Great Rift Valley connecting Amboseli and Maasai Mara. Here, the Shompole and Olkiramatian communities have set aside wildlife conservancies with the help of the African Conservation Centre. The conservancies have attracted ecotourism enterprises and researchers. The South Rift Association of Landowners was formed to promote conservancies across the rift and develop a new tourism hub linking Amboseli and Maasai Mara. Managing wildlife, tourism and livestock calls for good information and sound planning. The African Conservation Centre (ACC) working with the South Rift Association of Landowners (SORALO) has set up the ***Lale’enok Resource Centre*** with conservation research and planning in mind. The centre is named after the traditional Maasai scouts who gather information vital to the welfare of their families and herds. The community resource assessors also gather indigenous knowledge of their environment and livelihoods and integrate this knowledge with the gathered scientific environmental information. Lale’enok brings together community scouts, local resource assessors, scientists, students and conservationists to collate information crucial to wildlife conservation and community development in the South Rift.

The ***Lale’enok Resource Centre*** symbolizes the unveiling of a new approach to conservation, one that is evidence-based and community-driven. The Lale’enok centre in the South Rift Valley forms the hub



where communities, scientists and conservationists come together to gather and share information pertaining to natural resource management. It provides the physical location for the coordination of information gathering and dissemination, and makes collaboration easy.

Lale'enok provides the local communities with the tools for information generation and exchange and allows for innovative and valuable forms of local income generation, through research-based tourism activities. The centre also serves as an educational resource for local school children.

Run by the Olkiramatian Women's Group Community and rooted in the traditional coexistence between Maasai and wildlife, the centre epitomises the value of the growing number of conservancies that have enabled the increase and conservation of biodiversity. The conservancies also double as traditional grass banks that cut livestock losses in drought, promote rotational grazing and ease competition between wildlife and livestock.

### ***Connection to themes of the Summit***

The Lale'enok Resource Centre relates to the Eye on Earth's Summit's WG4 Sub-theme on the aspects relating to Citizen Science as it seeks to promote the involvement of local communities in the collection, exchange and use of environmental information. The centre also promotes the access to Environmental Information for public participation to enable civil society to engage in environmental decision making and build capacity for the same.

### ***Stakeholders***

The grass root institution SORALO which represents local communities spanning 15 group ranches in the South Rift and spanning an areas of over 750,000 sq.km is the custodian of the project and over the last 2 years the centre developed partnerships with local and international institutions that are keen to develop this form of research that is driven with communities and other researchers. Some of the other partners on board are: National Museums of Kenya, University of Nairobi, Montana State University, Earth Expeditions with Miami University & Cincinnati Zoo, Botanical Gardens, The Angel Fund, McGill University, Swedish University of Agricultural Sciences and EarthWatch Institute.

### ***Outcomes***

The targeted outcomes of this initiative are that the local community will grow in their appreciation of the importance of environmental information and that through a doing-by-learning approach, the community resource assessors will gain skills on gathering and integrating information and dissemination of the same back to their communities. This community learning and resource centre also provides the interface for integration of scientific and indigenous knowledge.

### 3.1.29. Placeholder: Innovative Queensland Crisis Response Recognized in Top IT Awards

### 3.1.30. Woods Hole Research Centre

Potential WHRC contributions to the Eye on Earth Summit:

- (1) Summit Working Group Sessions (the individuals referenced below could serve as speakers and/or participants in panel discussions).
  - a. Technical Infrastructure:

Dr. Josef Kelldorfer has been involved for several years with the Group on Earth Observation's Forest Carbon Tracking (GEO-FCT). Among a variety of activities, he has served as a co-lead in developing standards for satellite data processing workflows, including the potential for interoperability between the various radar and optical satellite sensors being used as part of the GEO-FCT approach. At WHRC, Dr. Kelldorfer has spearheaded efforts to deploy cutting edge satellite image processing software and hardware to provide a research environment in which global scale radar, optical, and lidar data can be mined for multi-scale mapping and monitoring of terrestrial ecosystems. Kelldorfer has been an invited keynote speaker at various NASA and international meetings on the topics of forest and biomass mapping, data fusion, image-to-information processing, e.g. for the Kuwait Foundation for the Advancement of Science, the First Latin American Remote Sensing Symposium, and recently NASA's upcoming Joint Science Meeting on the topic of Carbon Monitoring Systems.
  - b. Capacity Building, Education, and Awareness Building:

Drs. Alessandro Baccini and Wayne Walker have been involved in technical capacity building in forest measurement and monitoring with stakeholder groups ranging from indigenous peoples to government ministries. This effort, which has been undertaken throughout tropical America, Africa, and Asia, emphasizes the tools and techniques used to measure and monitor forests on the ground as well as from space. Google.org is a co-funder of these activities and we have contributed to the development of the forest monitoring applications of their Android/Open Data Kit and Google Earth Engine platforms.
- (2) Stakeholder Showcase (we could potentially have a Woods Hole Research Center booth as part of the Showcase).
  - a. Booth Display:

Center staff combine remote sensing with field research to study, model, map and monitor Earth's land surface. The Center puts a lot of effort into making



attractive map products that promote the utility of our data to decision makers. These map products intrigue crowds of all backgrounds and professions and make an attractive booth display. Moreover, as a key part of the Center's mission statement, it is in our best interest to interact with potential data users and help them see the true value and utility of our research.

### 3.1.31. eLEAF

To give you some background on this. Ad Bastiaansen is the director of the eLEAF organization, who has met with Cathrine, Jane & Marije in July this year to introduce eLEAF to AGEDI. See the eLEAF website for details of what the organization's background is <http://www.eleaf.com/#about> My understanding is that Cathrine was very enthusiastic continue the relationship between AGEDI & eLEAF long term, but short term for eLEAF to have some role to play in the EoE summit. Of course Ad has a commercial interest in attending the Summit, but the themes that his new technology present would be interesting to our captured audience at the Summit. What do you think?

In addition to Ad, he has also put forward a colleague Prof. Wim Bastiaanssen of his who could possibly facilitate/chair themes around the water security/environmental systems. See link for more information re: his experience.

<http://www.citg.tudelft.nl/en/about-the-faculty/departments/watermanagement/sections/water-resources/leerstoelen/hydrology/people/bastiaanssen-wgm/bastiaanssen-wgm/>

In discussions with Jane, Marije & myself we think he would be suitable to contribute in the following ways:

- present a 'technology/innovation session' – with a non-commercial focus,
- have interest in being an exhibitor with some 'pitch time' in the Technology/Innovation showcase?

If you could please advise whether either or both of these would add value to the Summit's content and in what capacity/role we can offer for them to attend.

I will be the contact person for him initially, then direct them accordingly.

Thanks

Kind regards

**Larissa Owen**

### 3.1.32. Vizzuality

Vizzuality is an innovative application development group that focuses on creating tools for the conservation world. Having worked with some of the biggest conservation organizations worldwide, they focus on developing web applications that engage users around issues that matter. They have developed a number of applications previously mentioned in this Whitepaper focused on citizen/civic science and crowdsourcing. These examples include:

- Old Weather
- Imazon
- ProtectedPlanet.net
- .GeoCAT
- Planet Hunters



<http://www.vizzuality.com/company>

Javier de la Torre would make a great speaker on the topic of Crowdsourcing and tools to engage users in collectively solving problems around global environmental data...

<http://vimeo.com/15999689>

### 3.1.33. Encyclopedia of Life

The Encyclopedia of Life (EOL) began in 2007 with the bold idea to provide “a webpage for every species.” Now, EOL brings together trusted information from resources across the world such as museums, learned societies, expert scientists, and others into one massive database and a single, easy-to-use online portal at [EOL.org](http://EOL.org).

EOL is expanding to become a global community of collaborators and contributors serving the general





public, enthusiastic amateurs, educators, students, and even professional scientists from around the world. Learn about [The People of EOL](#) and [EOL Governance](#).

<http://eol.org>

**Exhibition Venue:** Technology Showcase

**Stakeholders:**

- Species based Communities of Interest
- Scientists
- Public / Enthusiasts

**Impact:** A platform that bridges communities of interest around species and environment.

**Themes:**

- Visualization
- Story Telling

### 3.1.34. GeoCAT

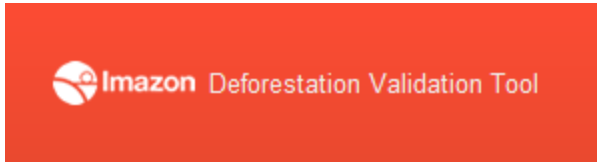
The Geospatial Conservation Assessment Tool is a powerful platform developed to support analysis and reporting of species information around the globe. It allows users to import data via web services from sources like GBIF and Flickr, and then add/remove information in performing analysis. It also offers the possibility of performing AOO and EOO analysis. The workflow and reports are Red List Assessment compliant, providing easy access to existing data and allowing users to filter and report from there.

<http://rlatstage.ipq.co/>



### 3.1.35. IMAZON

Imazon is a web application focused on using crowd-sourcing as a means for Deforestation Validation. This tool uses a number of remote sensing datasets and spatial analysis techniques to determine areas where deforestation may be occurring. The web application then allows users to visualize these many different variables and refine the modeling to fit the specific area of interest. Finally, the application lets distributed teams validate the output of the analysis and refine the deforestation data through a map interface. The overall workflow and user interface are seamless, and the user experience is very elegant.



### 3.1.36. Eye on Earth Platform

Eye on Earth is a two-way communication platform on the environment which brings together scientific information with feedback and observations of millions of ordinary people. It is the result of a partnership between Microsoft and the European Environment Agency (EEA). Currently it includes information on the water quality for more than 22,000 bathing sites throughout Europe. EyeOnEarth also includes information on air quality for more than 1000 air quality monitoring stations throughout Europe. Additionally, an air quality model enables viewing of the air pollution situation in between the air quality monitoring stations. For water sites, the portal presents historical data over several years and for some, the latest 2009 data is also available.



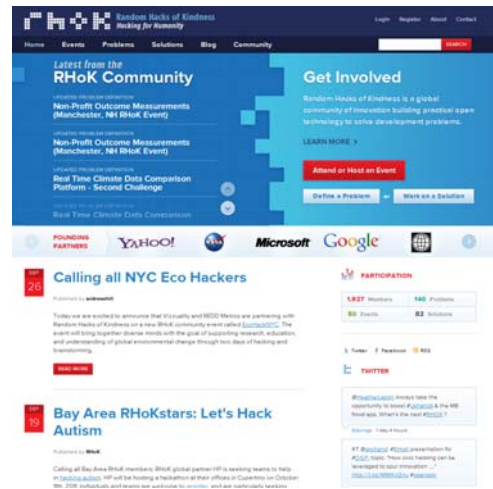
Over the five years of the planned Microsoft-EEA partnership, Eye on Earth will gradually grow to include information on many other environmental topics and turn into a global observatory for environmental change. It will broaden the thematic spectrum of

environmental information by integrating the most prominent environmental challenges of our times, such as ground level ozone and other forms of air pollution, oil spills, biodiversity, and coastal erosion. At a later stage, it will also include additional information providers and link out to other automated environmental monitoring services.

### 3.1.37. RHOK

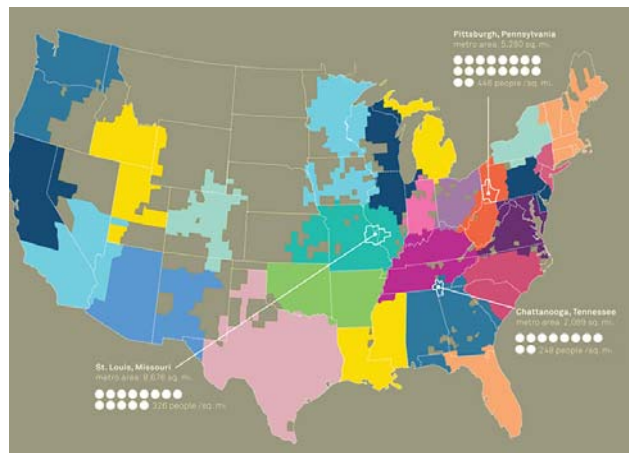
Random Hacks of Kindness is a community of innovation focused on developing practical open source solutions to disaster risk management and climate change adaptation challenges. Random Hacks of Kindness was founded in 2009 in partnership between Google, Microsoft, Yahoo!, NASA and the World Bank.

<http://www.rhok.org/>



### 3.1.38. MIT Senseable City Lab

**The Connected States of America:** The Connected States of America illustrates the emerging communities based on the social interactions through the use of anonymized mobile phone data. Investigating the interaction network of people reveals interesting facets on how people utilize space. Cities attract their citizens from all walks of life, from nearby and from distant areas across the country. This constant flux of people commuting, migrating, and travelling across the country establishes connections which are dominated by large cities.





**CO2GO:** CO2GO, a new type of smartphone application, is an effective tool that assists in making smarter individual transportation choices to collectively reduce carbon emissions in cities. Making sophisticated use of the sensors contained in a standard smartphone (accelerometer, GPS) carried in your pocket, CO2GO deploys an unprecedented algorithm to calculate in real-time the carbon emissions while on the move. It does so by automatically detecting your mode of transportation (walking, biking, train, car, bus, subway) while tracking the distance covered.

**Trash Track:** TrashTrack focuses on how pervasive technologies can expose the challenges of waste management and sustainability. Can these same pervasive technologies make 100% recycling a reality?

TrashTrack uses hundreds of small, smart, location aware tags: a first step towards the deployment of smart-dust - networks of tiny locatable and addressable microelectromechanical systems. These tags are attached to different types of trash so that these items can be followed through the city's waste management system, revealing the final journey of our everyday objects in a series of real time visualizations.

### 3.1.39. One laptop per child

OLPC has an aim to provide each child with a rugged, low-cost, low-power, connected laptop. To this end, they have designed hardware, content and software for collaborative, joyful, and self-empowered learning. With access to this type of tool, children are engaged in their own education, and learn, share, and create together. They become connected to each other, to the world and to a brighter future.



<http://one.laptop.org/>

**Exhibition Venue:** Technology Showcase



### 3.1.40. PLACEHOLDER: Water Pump Technology

Submitted via the Submit a Project Site. Email sent back on 9.17.11 requesting further information.

I translated for you the subject of the email , and Mr. Majed Rajab yaden wants to participate and attend the conference and they have new inventory for pumping water

Full Name: Maged Ragab Yadin

E-mail: [mrny\\_2006@yahoo.com](mailto:mrny_2006@yahoo.com)

Institution: experts Center to protect the earth environment

Partnership: private partnership

The subject : We would like to inform you that we (experts Center to protect the earth environment )want to participate in the summit and we would like to attend and be active and partners and we would like to introduce you to a new invention to pump water from wells without pumps and fuel, by capillarity in which this invention has importance in reducing the carbons emitted from pumps and low cost . hope to accept our request

\*Regards,\*

\*Rahaf Al Sheikh \*

\*Senior Administrative Assistant\*

\*Environment Information Sector\*

\*phone :02-6934 783\*

\* Fax :02-499 7263 \*

### 3.1.41. SunSaluter

This young woman (19) just won the 2011 Startups for Good Challenge with a new approach to low-cost solar technology, panels which are 40% more effective and much cheaper as well.

<http://mashable.com/2011/09/22/startups-for-good-winner/>

**Exhibition Venue:** Innovation Forum

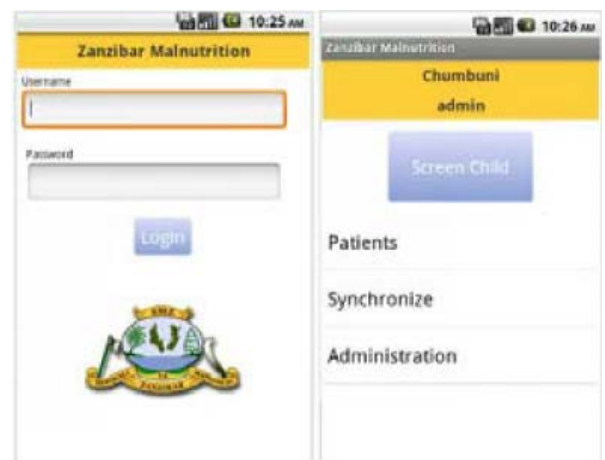


### 3.1.42. D-Tree - Android/OpenMRS

A set of mobile applications which support remote healthcare workers in collecting information about patients and their environment. Field tested in numerous developing countries.

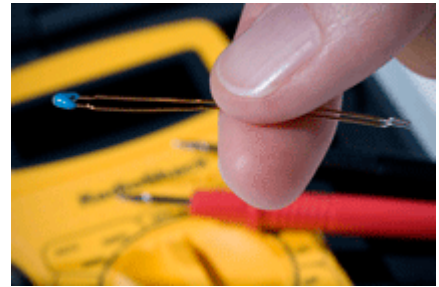
<http://d-tree.org/wp-content/uploads/2011/06/Med-e-Tel-Routen.pdf>

**Exhibition Venue:** Technology Showcase



### 3.1.43. **SENSE IT**

The Student Enabled Network of Sensors for the Environment using Innovative Technology (SENSE IT) project will integrate science, technology, pre-engineering and mathematics (STEM) skills into a robust interdisciplinary curricula and teacher development effort by teaching high school students to design, build, test, deploy and interpret their own environmental sensors.



<http://www.bire.org/approach/senseit.php>

**Exhibition Venue:** Technology Showcase

### 3.1.44. **One Day on Earth**

On November 11th, 11.11.11, across the planet, documentary filmmakers, students, and other inspired citizens will record the human experience over a 24-hour period and contribute their voice to the second annual global day of media creation called ONE DAY ON EARTH. Together, we will create a shared archive and a film.

Founded in 2008, ONE DAY ON EARTH's first media creation event occurred on 10.10.10. The collaboration was the first ever simultaneous filming event occurring in every country of the world. It and created a unique geo-tagged video archive as well as an upcoming feature film.



<http://www.onedayonearth.org/>

**Exhibition Venue:** Innovation Forum

### 3.1.45. **Awaaz De**

Awaaz De provides hosted, open source voice solutions that help organizations engage communities in any language, leveraging the power of voice and mobile phones to make social media accessible for everyone. Their goal is empower communities to become informed producers and consumers of knowledge. work closely with organizations that are already working as change agents, helping them increase their reach and more effectively manage communications and knowledge.



<http://awaaz.de/>

**Exhibition Venue:** Innovation Forum

### 3.1.46. **Esoko**

Using mobile phones, Esoko gives people and businesses the opportunity to share information quickly and affordably. Esoko provides a range of applications that both push updates out to the field, and, more importantly, pull data in from the field. Being better-informed helps everyone along the value chain and can play a vital role in how markets operate.



<http://www.esoko.com/about/>

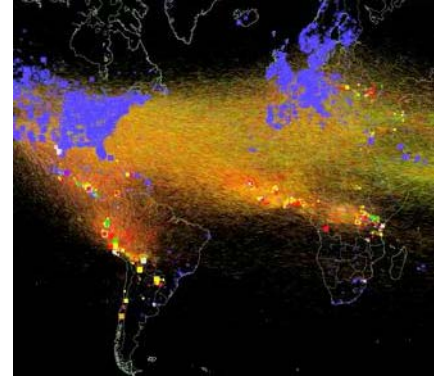
**Exhibition Venue:** Innovation Forum

### 3.1.47. Kiva

Amazing visualization of the history of microfinance loans and returns through Kiva's history.

<http://vimeo.com/28413747>

**Exhibition Venue:** Innovation Forum



### 3.1.48. Trash Tycoon

Guerillapps, a Manhattan-based social gaming startup, has launched Trash Tycoon, its first green-themed social game for Facebook, along with partners TerraCycle, Carbonfund.org, and Treehugger. The game is now available for play and takes a unique approach to social gaming by incorporating awareness for environmental issues and sustainability. The first game to ever highlight the concept of upcycling, Trash Tycoon is an immersive game that presents opportunities for real-world impact.

<http://www.guerillapps.com/>

**Exhibition Venue:** Innovation Forum

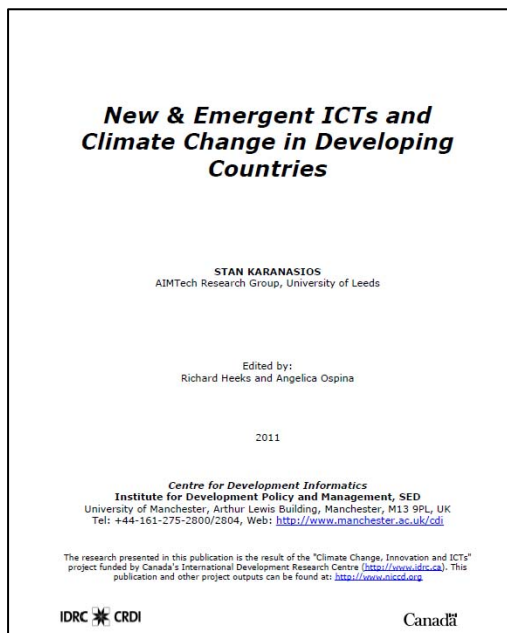


### 3.1.49. New & Emergent ICT's and Climate Change in Developing Countries

A timely paper describing: Over the last decade advances in ICT have emerged as a critical ingredient in the development process and can equally play a role in the climate change challenge. Based on a comprehensive review of the extant literature this paper outlines the range of new and emergent ICTs (e.g. wireless broadband and wireless sensor networks, geographic information systems and Webbased tools) being applied to climate change issues and investigates their use in developing countries.

<http://www.niccd.org/KaranasiosClimateChangeEmergentICTs.pdf>

**Exhibition Venue:** Technology Showcase

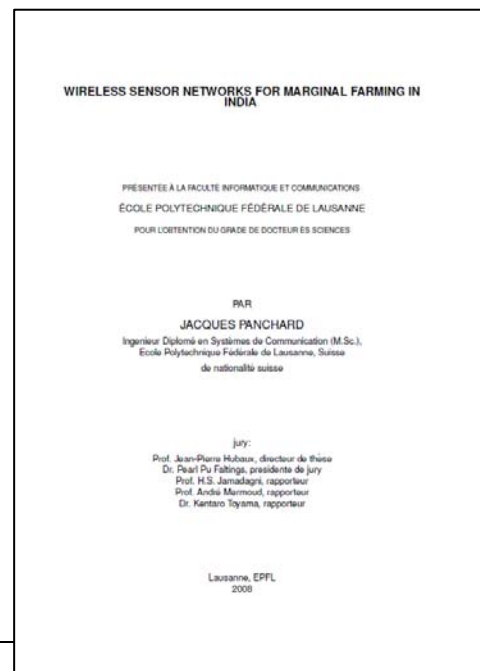


### 3.1.50. Wireless Sensor Networks for Marginal Farming in India

PAPER: In the first part, we present the environmental challenges faced by the developing world and identify relevant applications of environmental monitoring in this context. Then, we proceed with a review of the technology of environmental monitoring in the broad context of agriculture and formally present the opportunity represented by WSNs. Finally we show how this can be applied to addressing a crucial problem of DCs, namely rural poverty.

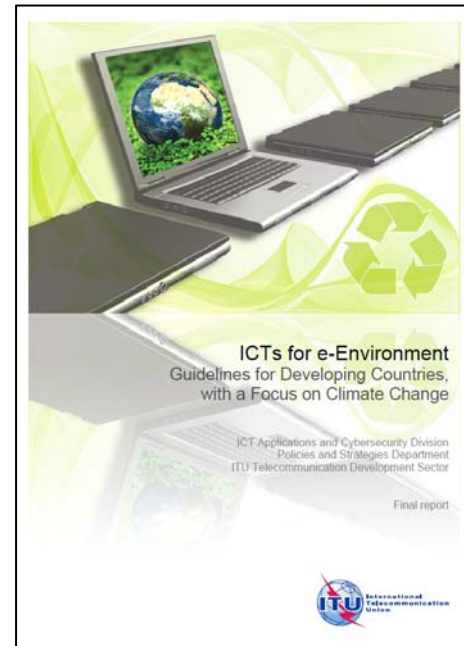
<http://commonsense.epfl.ch/Resources/thesis.pdf>

**Exhibition Venue:** Technology Showcase



### 3.1.51. ICTs for E-Government Guidelines for Developing Countries, with a Focus on Climate Change

PAPER: The impact of human activities on the environment – and on climate change in particular – are issues of growing concern confronting life on Earth. At the same time, information and communication technologies (ICTs) are being rapidly deployed around the world. Although ICTs require energy resources, they also offer a number of opportunities to advance global environmental research, planning and action. This includes monitoring and protecting the environment as well as mitigation of and adaptation to climate change.



<http://www.itu.int/ITU-D/cyb/app/docs/itu-icts-for-e-environment.pdf>

**Exhibition Venue:** Technology Showcase