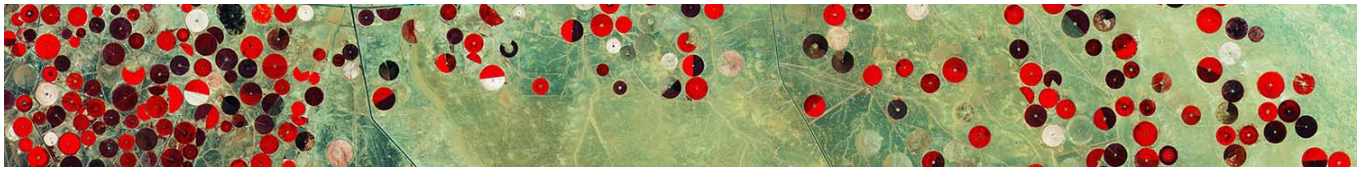
21st October 2015: Taking a global view



Aims

As the first in the series, we laid the foundations for the rest of the term by raising questions related to ways in which new technologies could be applied to look at environmental risks and resilience, data ownership, open data sources, and the need to scale data in both time and in space to provide the information that policy makers and businesses need to make decisions.

Witnesses

Professor Alan O'Niell, Emeritus Professor of Meteorology at the University of Reading and the founding Director of the NERC National Centre for Earth Observation, joined **Dr Mukesh Kumar**, a Research Associate in the International Manufacturing group at the Institute for Manufacturing and **Steve Peedell**, a Senior Scientific Officer in the Land Resource Management Unit at the Joint Research Centre.

Research gaps

In his introduction, Steve highlighted research gaps related to the **collection and processing of data to measure resilience, risk and vulnerability**. Although satellite images can provide comprehensive information on a global scale, there are many very important questions related to ground-truthing those data and bringing them together with economic, social and biological information to build up a comprehensive picture. Focusing on protected areas, he argued that there is a need to look beyond the area-based Aichi targets to concentrate on the effectiveness and vulnerability of protected areas, now and in the long term.

Mukesh focused on three areas of resilience in food chains: crop failure, product failure and supply chain failure. When discussing questions of scale during the round table, he argued that **there is an inherent danger that both assessments of resilience and risk are both used to make short term focused decisions when long term vision is needed** to increase the resilience of a system (e.g. water use in agriculture). Danny Ralph agreed that resilience in the short term and the long term requires different ways of thinking and different approaches to both asking and answering the same questions.

Alan opened by saying that the most interesting questions we can ask relate to **the new kinds of datasets that are available and the ability they give us to ask data-driven questions** and to carry out 'uncontrolled' experiments. He argued that we are in a transformative time where a constellation of satellites are generating massive, openly available datasets, very rapidly and on a global scale. There are also new datasets that can be applied to questions related to land use, resources and food. For example, phone tracking data can be used to look at congestion in cities and to track the movements of illegal loggers or hunters in tropical forests. Often commercial or privately funded, there is a risk that people will be charged to use them in the future.

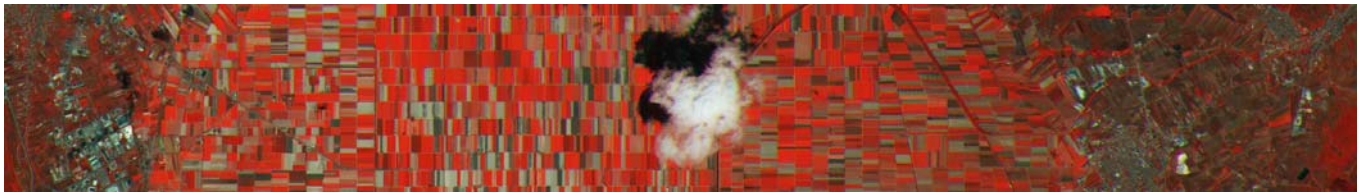
Wicked problems and questions generated by the open discussion included:

- It was agreed that ultimately, **it is not the data in itself that holds value, but the information it contains**
- Danny Ralph argued that *"As researchers, part of our job is to equip others to do their job better"*. Bearing this in mind, **what kinds of questions should we be asking?** Should questions drive our search for data or do should the data available drive the questions we ask?
- **'Big data' doesn't just refer to data volume, it is also becoming increasingly complex and heterogeneous**, and is being drawn from a wide variety of sources which presents challenges in itself.
- **How do we collect and analyze data given the pace of change?** Turning raw data into information products to feed into policy processes and create responsive policies is particularly challenging. How can we trace the signature of certain information through to policy decisions?
- **How will we meet the next generation of reporting challenges** presented by the Sustainable Development Goals and other national, regional and international level agreements?
- How can we **move from tracking historical trends into identifying emerging risks and project past information forwards into the future?**
- We touched briefly on **data security, especially when using open data**. Could trusted secure systems encourage people to allow their data to be used in ways that would otherwise not be acceptable?

The Cambridge Forum for Sustainability and the Environment

Risk, resilience and response: Food and water supplies

19th November 2015: Building up a picture



Aims

This was the second in a series of three meetings, and the aim of it was to use examples provided by the witnesses to explore ways in which overlaying big data sets and remote sensing can assess and communicate risk and resilience in food supplies and changes in biodiversity.

Witnesses

Dr Francois Kayitakire, a senior scientist at the Joint Research Center (JRC) in the Institute of Environment and Sustainability (IES) from Ispra, Italy flew over to join **Dr Matthew Smith**, an ecologist working in the Computational Science Lab at Microsoft Research and **Craig Mills**, the CEO of Vizzuality.

Research gaps

Francois outlined the food security programme at JRC and argued that resilience thinking calls for multi-disciplinary approach, not only in the qualitative analyses, but also in quantitative models. Food security is an area that needs absolutely such an approach. An emerging focus of development for both them and the EC is to **think about food security in terms of resilience by building safety nets, putting in place response mechanisms and managing risk**. He argued that putting food security in a broader context of the conflicts surrounding resources and the vulnerability of resources is essential for policy and decision makers.

Matthew's group in Microsoft Research was originally founded to apply their expertise in predictive modelling to real world problems such as water security and food security and climate change. He is now concentrating on agriculture and 'agricultural intelligence' where he is working with companies to create geotemporal models that are being used to predict food supplies, represent demand and match the two together to minimise waste in supply chains. He argued that **some of the data challenges we face are fairly basic, simple and mundane** rather than being highly intellectual. Finding ways to better train the next generation to be able to bridge disciplines will be essential. Are there opportunities for better engagement between, for example, biologists and mathematicians, if the goal was problem based rather than discipline based?

Craig introduced Vizzuality and their aim of visualising complex datasets in a way that people can understand and interact with. Recently, they have been working with the World Resources Institute (WRI) to create Global Forest Watch, based on Matt Hansen's Global Forest Change datasets. Typically, **their challenge is to take data out and to strip the information back in order to be able to communicate clear messages**. For example, the aim of a new project with the Zietz Foundation is to take live data feeds from satellites and send information to poor famers in Kenya via their mobile phones to help them to improve their crop productivity. Most of them text only, so key questions centre on ways to present big data on a small screen: How does satellite data relate to what is happening on the ground? How can that information be communicated in a way that helps people to make practical decisions?

Wicked problems and questions generated by the discussion included:

- **How do we build resilient food systems in both developing and developed countries?**
- **The politics of data are very complex and can be politically changed and politically sensitive** which will influence both how the data are collected and how it is used.
- **Bringing remote sensing data down to a human scale:** There is a disconnect between environmental information and people's understanding and use of that information. There are many new opportunities for open data and services, such as Copernicus, but as yet, there has been relatively little investment in how to communicate the information in a way that people can use to make decisions in the real world.
- **Remotely sensed data does not replace the need for on the ground sensors and information**, but instead compliments it. Finding ways to be able to support long term, ground and air based datasets will be an essential part of answering the questions we need to ask about food security in the future.
- Decisions are taken at multiple scales from local to international. **What place does satellite data have in decision-making at all of these scales** and is it feasible to use it to make local scale decisions?
- **Is there scope for a growing role for citizen science in this 'new world' of open, big data?**
- Although boring**, data collection and storage standards are going to become increasingly important** if we are going to be able to be able to cross-analyse and layer different datasets. Could lessons to be learnt from the experience of genetic open data be applied to environmental datasets?

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