

Note to Cambridge Conference in Conversation Delegates:

This is intended to be a first draft of the text of the Communication to come from the Conversation. We anticipate that there will be significant changes after our discussion on September 15th but we wanted to have a starting point from which to work.

We have included some examples in the grey boxes and questions for you to consider are in red. If you have further good case studies or comments or thoughts on this document please voice them during the Conversation or email them to us. The final version, together with your recommendations, will be produced after the Conversation in the six UN languages.

Applying Geospatial Information to Climate Challenges

Call to Action

Every country on the planet has been impacted by our changing global climate. Location data provides a vital lens for understanding the impacts of climate change, targeting investment for resilience and planning critical measures to push towards net zero.

To support the UN goals at COP26, national mapping and geospatial agencies (NMGAs) can support their country's efforts, and the UN's Sustainable Development Goals, in these key areas:

- by collaborating effectively across borders, we support cross-cutting measures that enable all countries regardless of economic or political differences, to tackle common issues.
- by collecting and curating authoritative data, we help plan and deliver measures that can be trusted and relied upon by policy-makers and the international community.
- by making our foundational data accessible and reusable, we encourage others to expand on our work in order to tackle specific problems in innovative ways.
- by sponsoring and embracing agreed standards, we ensure technical solutions can tackle common problems in a consistent way.

A pledge from the NMGA community: We recognise the importance of location information in fighting climate change and we will endeavour to provide our best efforts to this cause.

Would you support a pledge similar to this?

Others can support the development of better geospatial information to tackle climate change through:

[A small number of recommendations – to be inserted after the Conversation event]

What key areas and recommendations would you like to see here?

Introduction

The impact of climate change is a geographical issue. It will touch every corner of our planet, but the impacts will not be evenly spread. Some places, people, activities will be impacted more than others and resources will need to be targeted effectively to support those communities that will be most affected, and to take efficient and effective actions to reduce our adverse impact on future climate.

Our task as national mapping and geospatial agencies (NMGAs) is to produce good, accurate, consistent data about 'where' resources, people, impacts are - to inform decision making. However,

location information¹ is not available for all parts of the globe equally and is not always easily accessible, usable or of the appropriate quality.

The critical importance of data to support decision making is acknowledged and highlighted in the UN's proposed Bern Data Compact which explicitly calls out the need for *'the geospatial community to work with other data producers to maximize the value of geocoded data and information.'*

Foundational location data can come from governments, national mapping and geospatial agencies, businesses, NGOs and the individual citizens. Much of this data comes from our measurements and observations on land and sea but about 30 out of the 54 essential climate variables being monitored today can only be measured from space. These include sea level monitoring, polar ice extent and greenhouse gas emissions².

The challenge is to stitch it all together to give a clear picture of how these complex systems work. Geography and data science allows us to look at a problem holistically. Geography is not just about seeing a point on a map, but explicitly understanding the relationships among places, people, policies and actions³.

The collective effort to address our common problems comes into sharp international focus at the annual Conference of Parties of the United Nations Framework Convention on Climate Change, known as COP26. This year, delegates to COP26 will be discussing actions and commitments to reach four common goals:

1. Secure global net zero by mid-century and keep 1.5 degrees within reach
2. Adapt to protect communities and natural habitats
3. Mobilise finance
4. Work together to deliver

The following sections provide some examples of how location data can, and is, helping to achieve the proposed COP26 Goals and the unique role that mapping and geospatial agencies can play.

Goal 1. Secure global net zero by mid-century and keep 1.5 degrees within reach

Verification of carbon emissions is a complex and difficult process. Governments will need to bring together data from industry, agriculture, the environment, and citizens in a way which can be integrated to produce an authoritative result. To support this what is known as a 'data infrastructure'⁴ is required which provides the standards and rules by which data can be brought together and compared.

NMGAs are already working to support a wide range of these policy interventions, technological developments and social changes in behaviour. Authoritative location information is key to identifying the geographies and activities that have greatest impact on global carbon emissions. At the same time, actions to mitigate or adapt will require authoritative data, with an increasing rate of currency and greater accuracy. Functional requirements will mean that national mapping and geospatial agencies must use new and varied inputs to enrich our existing data assets.

Changing our sources of energy is a top priority for most countries but to do that we need to know where the new energy resources are, where the consumers are and how to plan the distribution infrastructure. Here are some examples.

¹ This data is called 'location' data here although other terms are used such as 'geographical', 'geospatial' or 'place'.

² [What are ECVs? \(esa.int\)](https://esa.int/en/what-are-ecvs/)

³ [GIS Technology Can Back The Pledges Made At Biden's Climate Summit \(forbes.com\)](https://forbes.com/news/2021/08/03/gis-technology-can-back-the-pledges-made-at-biden-s-climate-summit/)

⁴ [Spatial data infrastructure - Wikipedia](https://en.wikipedia.org/wiki/Spatial_data_infrastructure)

The **Netherlands** has used their mapping information together with artificial intelligence to produce data on the solar potential of roofs. This provides an insight on not only where the potential lies, but also categorises it by building and owner type, which is of great benefit to the policymakers⁵.

In **Scotland**, the ParkPower initiative has drawn together data on the green and blue spaces in urban environments to identify locations for installing ground source heat pumps which can supply to energy to local residents⁶.

Curtailing deforestation is the flip side to reducing emissions. For example:

In México they are using regular updates on forest cover to identify areas under threat, plan policy incentives and regulation, support enforcement and other geospatial data to support policies to support communities in forest areas. Geospatial Forest Data is used by the Natural Resources and Environment Ministry (SEMARNAT) to assess and conduct policy, and by the Ecology and Climate Change National Institute to estimate GHG emissions from land cover and land use changes.

Are these good examples? What other ones can you suggest which would highlight the role of NMGAs and their data in tackling this Goal?

Goal 2. Adapt to protect communities and natural habitats

As the Earth's climate warms, our governments and societies are changing to adapt. This will mean complex systems, including natural and human-centred ecosystems, such as cities and agriculture, will be impacted by climate-induced changes.

Location data enables governments and policy-makers to identify and assess where the impacts of climate change will be felt most critically. Better location information will help governments target their resilience measures and efforts to protect those areas that are most at risk.

Here are some examples.

In **Chile** they have developed a tool called ARclim - Atlas of Climate Risks for Chile⁷. This brings together all the data they need from a variety of sources to show the impact chains of climate risk, exposure and sensitivity leading to an overall risk and the time horizons for a particular location. This is a critical input to the design of public policies and the implementation of adaptation measures to climate change to tackle, for example, threats to aquaculture, biodiversity and coastal communities. The ARclim Project has shown that the impacts of climate change for the country are mainly negative, especially for some cities. However, opportunities for adaptation to climate change are still detected, and this tool can contribute as a relevant input, in understanding and strengthening the challenges of climate change and, thus, facilitate the construction of adaptation strategies at a national scale, local and sectoral.

Costa Rica has created a monitoring system known as SIMOCUTE⁸. Location information from more than 40 government, academic, international, and other institutions is brought together to create one national monitoring system for land use and ecosystems. SIMOCUTE is founded on three interrelated elements – What? (classification), Where? (mapping) and How Much? (inventory and registries). It was constructed in a highly participatory fashion. Importantly, it harmonises the classification of land cover, land use and ecosystems which has enabled the government to have a

⁵ [EG annual review 2020 2021 06 14.pdf \(eurogeographics.org\)](#)

⁶ [ParkPower - green energy in urban spaces | Greenspace Scotland and Greenspaces for green energy | Success story \(ordnancesurvey.co.uk\)](#)

⁷ <https://arclim.mma.gob.cl>

⁸ <https://simocute.go.cr>

coherent view of the whole country and make informed decisions and hence implement sound land management policies.

At a more granular level the pressures and competing interests in land use are hard to manage but even harder, if not impossible, without a good information base of who owns what and the current use of the land.

Rwanda has realised this and has completed an ambitious programme to record every one of its 10.3 million land parcels⁹. This is now forming the basis for its spatial planning process as part of its National Strategy for Transformation which includes actions to address climate challenges by, for example, the creation of the first mining and forest cadastres to allow delivery of policy focused on those sector¹⁰. Similarly, **Romania** collects data on land use, building function for both urban and rural areas which supports Romanian stakeholders who are dealing with environmental monitoring and reporting, climate-related disaster preparedness and mitigation, and adaptation to the effects of climate change.

The combined effects of drought, temperature change and agricultural practices have meant that food security is threatened for many countries.

The **GEOGLAM Crop Monitor**¹¹ is a significant information resource. It integrates data from satellites together with ground-based information on crop conditions to provide a monthly crop monitor report. This provides early warning of crop failures and hence allows government to take early action to protect communities threatened by food scarcity.

Disaster management is, regrettably, becoming an increasingly important subject as climate-induced disasters become more frequent and severe¹². Whether it is forest fires, high temperatures, floods or hurricanes, the location of both people, infrastructure and resources is an indispensable element in the planning of mitigation, preparedness, response, and recovery.

One example is the use of satellite imagery after hurricane and tornado damage in the **USA** to identify rubble piles and buildings covered by tarpaulins thus identifying locations which are probably in need to target assistance¹³.

Are these good examples? What other ones can you suggest which would use to highlight the role of NMGAs and their data in tackling this Goal?

Goal 3. Mobilise finance

Mobilising finance to tackle the impacts of climate change will require better information and clear evaluation of the risks associated with mitigation and adaptation activities. Natural disasters generate significant fiscal risk and create major budget volatility for countries impacted. Even countries with robust disaster risk management programs can still be highly exposed to the economic and fiscal shocks caused by major disasters.

Financial resilience for vulnerable countries facing climate change risks is something which the World Bank has considered for several years through the Disaster **Risk Financing and Insurance** Program (DRFIP)¹⁴. Key to assessing the disaster risk and evaluating impact is location information.

⁹ [Modernising Rwanda's mapping | Success story \(ordnancesurvey.co.uk\)](https://www.ordnancesurvey.co.uk/modernising-rwanda-mapping-success-story)

¹⁰ [LTRP Project Completion Review](#)

¹¹ [GEOGLAM \(earthobservations.org\) and GEOGLAM Crop Monitor](https://earthobservations.org/geoglam-crop-monitor)

¹² [Effectively Use Geospatial Data in the Disaster Management Cycle - L3Harris Geospatial](#)

¹³ [Effectively Use Geospatial Data in the Disaster Management Cycle](#)

¹⁴ [Disaster Risk Financing and Insurance \(DRFI\) Program \(worldbank.org\)](https://www.worldbank.org/disaster-risk-financing-and-insurance-drfip)

The better the information the clearer the actual risk and the more accurately we can judge the effectiveness of climate mitigation measures and economic impact.

Is there an example of location data being used in this way to understand risk better and hence allow disaster insurance to be put in place?

Many of the actions we need to take to mitigate, or adapt to, climate change requires some change to the way we use our finite resource - land. At an individual property level it is well acknowledged that in many places occupants of land are unwilling to invest in their land due to a lack of security of tenure (de Soto, 2010, and many other subsequent studies¹⁵). This makes any investment in property risky and hence unlikely as land cannot be used as collateral for a loan. At a governmental level taxation can be raised from land, but only if there is information on who to tax for what. Underpinning both aspects is the need for a comprehensive **land administration system** – to record ownership and provide security of tenure to support investment and allow taxation. Such a system holding details of each land parcel can also form the basis for other services.

Some examples are:

In Vietnam and Romania considerable investment has gone into creating a trusted land administration system. In both countries there is evidence that this has improved land management, freed up capital and increased revenues from taxation¹⁶.

Are these good examples? What other ones can you suggest which would use to highlight the role of NMGAs and their data in tackling this Goal?

Are there other examples of location data being used to mobilise finance?

Goal 4. Work together to deliver

While the challenges of climate change are universal, the response is sometimes fractured and divided by administrative boundaries and political priorities. This can lead to differences in response to similar challenges, sometimes pushing the problem from one jurisdiction to another.

But working from a shared foundation of location information can enable national governments to take a collaborative approach to problems. This necessitates a strong peer-to-peer set of relationships to help build an agreed set of data standards and a common approach to climate data management.

Many countries have realised that geography, and the location data which describes it, can form the binding agent to bring together the sometimes disparate parts of government.

For example:

Abu Dhabi has brought together parts of government by building a single source of location data to support environmental decision making through the Emirate¹⁷. In **Singapore** it is recognised that location information is foundational and plays a vital role in supporting climate change related research studies, prediction and simulation of climate impacts, urban design and city planning, and decision making. Agencies work together in a ‘whole-of-government’ way to address coastal protection, flood risk mapping, and have developed a ground-breaking virtual 3D city model to address urban challenges such urban heat island, increased of wind speed, adoption of solar energy, and natural capital estimation.

¹⁵ [Subedi, Gandhi. \(2016\). Land Administration and Its Impact on Economic Development.](#)

¹⁶ Hoang-Anh Ho, “Land tenure and economic development: Evidence from Vietnam”, World Development Journal (2021)

¹⁷ [Geospatial policy safeguarding in Abu Dhabi | Success story \(ordnancesurvey.co.uk\)](#)

Collection of information, whether location or not, was once largely the preserve of governments and others in authority. This is no longer the case. Vast quantities of data are now being collected by businesses, communities and individuals. Privately owned satellites criss-cross our skies, our cities are covered in cameras and sensors and one mobile phone in the hands of a citizen can record data not just from the citizen's direct input but from its inbuilt sensors. To get real insight from this ever-growing mass of information will require collaboration on a huge scale. One critical aspect being tackled is standards to allow data to be brought together. Without standards GPS and other satellite positioning systems, for example, would not work.

For example:

The **Open Geospatial Consortium**¹⁸ brings together universities, research organisations, NGOs, companies and government organisations. Standards have been developed for the interchange of location data without which many information systems used by governments today would not function.

Collaboration is key tenet of the United Nations, whether at an international, national or sub-national level. This is evident in the work of the UN and World Bank to develop a framework to assist countries to develop the right location information infrastructure to support their national strategies. The Integrated Geospatial Information Framework (IGIF)¹⁹ provides a roadmap and guidebook to do this, bringing together stakeholders in government, academia, private sector, civil society and the citizen. The Framework has been successfully used by a number of countries to develop their location data infrastructure.

For example:

In **Mongolia** the IGIF structure has been used to produce an Action Plan and a change in law which now mandates a single source of location data and platform to be shared by all, no duplication of effort and coordination of stakeholders.

Are these good examples? What other ones can you suggest which would use to highlight the role of NMGAs and their data in tackling this Goal?

Looking forward

This paper illustrates how location data is critical and valuable to a country seeking to mitigate and adapt to the impacts of climate change. The technology is available. What is needed is commitment to invest in the collection, management, co-ordination and intelligent use of location data for the benefit of all. The National Mapping and Geospatial Agencies are central to this. They are the custodians of fundamental location data and have the knowledge and ability to make a strong contribution. They call on all governments to recognise this value and commit to creating appropriate data infrastructures to help propel us all to a sustainable, safer and fairer world.

Is a document in this style and format useful?

Would you use it? How?

What improvements can we make in the final document following the Conversation?

¹⁸ [The Home of Location Technology Innovation and Collaboration | OGC](#)

¹⁹ [UNSD — UN-GGIM](#)