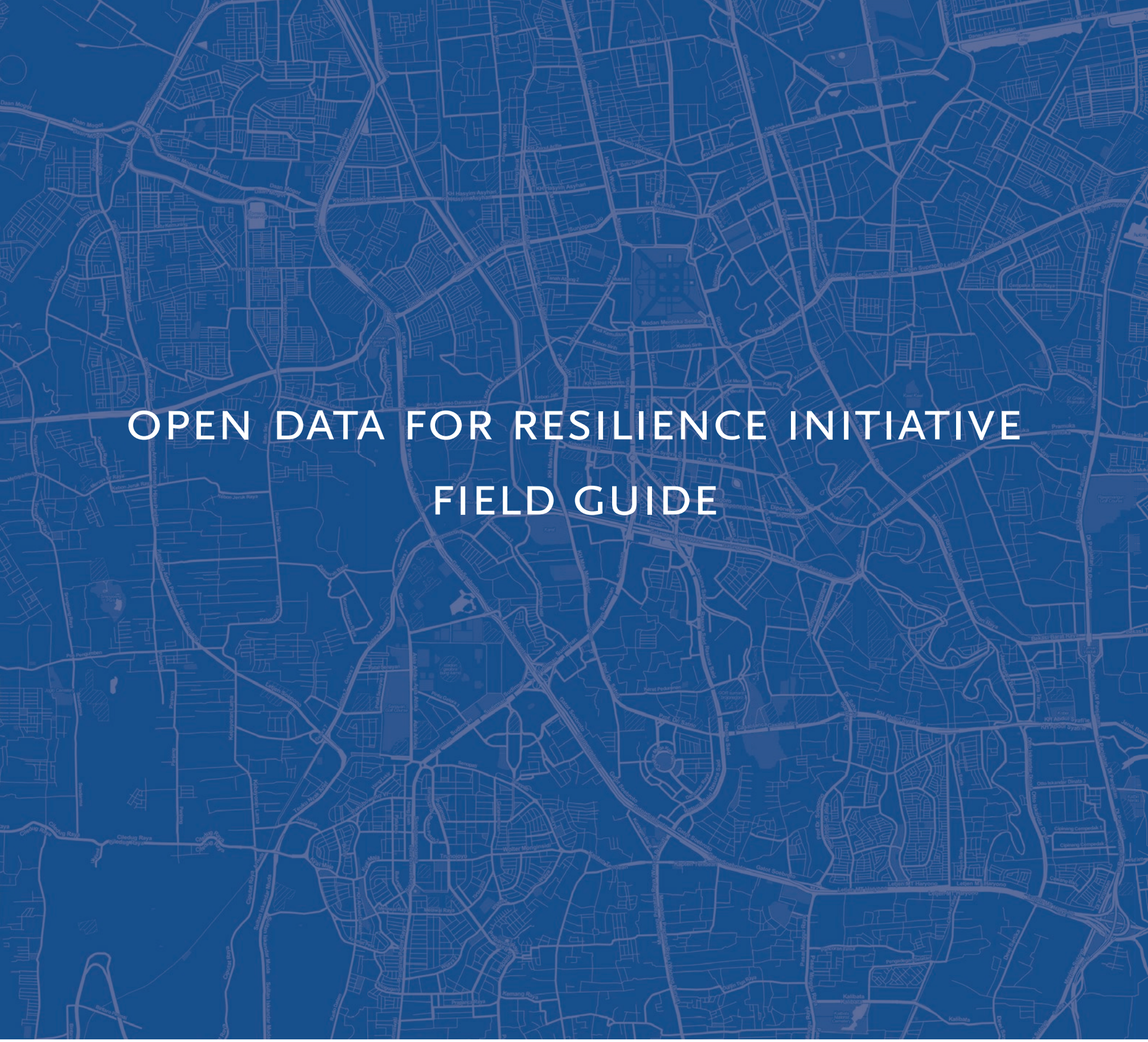

OPEN DATA FOR RESILIENCE INITIATIVE

FIELD GUIDE

THE WORLD BANK | GFDRR Global Facility for Disaster Reduction and Recovery | OpenDRI Open Data for Resilience Initiative Hosted by GFDRR | American Red Cross | OCHA United Nations Office for the Coordination of Humanitarian Affairs | UNISDR The United Nations Office for Disaster Risk Reduction | USAID From the American People

www.gfdrr.org

About GFDRR The Global Facility for Disaster Reduction and Recovery (GFDRR) helps high-risk, low-income developing counties better understand and reduce their vulnerabilities to natural hazards, and adapt to climate change. Working with over 300 national, community level, and international partners GFDRR provides grant financing, on-the-ground technical assistance helping mainstream disaster mitigation policies into country-level strategies, and thought leadership on disaster and climate resilience issues through a range of knowledge sharing activities. GFDRR is managed by the World Bank and funded by 21 donor partners.

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FIELD GUIDE

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Dedicated to those who envision a more resilient future for their communities


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Photo: Community mapping in Indonesia. Credit: Abby Baca, The World Bank Group, 2013.

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The effort to create a first version of the Open Data for Resilience Field Guide has drawn upon a wide range of experts from several institutions around the world. GFDRR would like to thank all those who contributed their wisdom, experience, and insights to the initial drafts of this guide as well as this first publication.

Core support came from GFDRR and World Bank Group staff who built the Open Data for Resilience practice within GFDRR Labs. This Field Guide is the product of John Crowley, who researched and wrote this publication, and Dustin York, who built the information graphics. Robert Soden put many hours explaining how practices worked in the field, commenting on drafts, and guiding the writing process to the final product—all while balancing the start of a doctoral program. We owe him deep gratitude for his work building OpenDRI and the fraction of his wisdom that we have managed to collect into this guide. Vivien Deparday helped the writers clarify implementation details. Alanna Simpson kept us focused on the big picture while making sure we nailed down all the details. Ariel Nuñez provided insight into the technical workings of the GeoNode and the approaches to its deployment. Emma Phillips and Keiko Saito provided collective memory about OpenDRI and insight into Africa and the Middle East. Abby Baca and Liana Razafindrazay guided our exploration of community mapping and data catalogues in the East Asia and Pacific. Through many conversations over coffee, Bishwa Pandy and Bradley Lyon helped us to see how they build communities of practice and data catalogues in the Caribbean. Mark Forni and Sonam Sultanali provided critical information about Open Cities projects in Nepal, Bangladesh, and Sri Lanka. Tariq Khokar gave advice on many occasions on open data and the policies at The World Bank.

This guide would not exist without the efforts of our growing list of partners. We owe them more thanks than can fit into a few words.

At UNICEF, Chris Fabian provided us with the initial idea to write a field guide, which is based on the *Do-It-Yourself Guide to UNICEF Innovation Labs*. His support and insight into the design and content of this OpenDRI Field Guide were invaluable. Stuart Campo detailed his experiences building an innovation lab in one of the newest countries in the world, South Sudan. Geneviève Boutin connected GFDRR into the UNICEF Innovation workshops, enabling us to see how a UN agency is building on the collective intelligence of its dedicated and brilliant field staff.

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This guide also rests on a decade of work by a dedicated group of technologists and field teams, who created the software and field practices we applied to disaster risk management. They gave freely of their time to explain processes which are buried in code or have never before been explained on paper. At the Humanitarian OpenStreetMap Team, we would like to thank Mikel Maron, Kate Chapman, Jeff Haack, Heather Leson, Nicolas Chavent, Severin Menard, and Schuyler Erle for insight into community mapping and the OpenStreetMap platform, as well as their tireless and often unsung work on the ground. For her help understanding the MapKibera process, we would like to thank Erica Hagen at Ground Truth (and extend an extra credit to her partner, Mikel Maron). At MapAction, we would like to thank Alan Mills, Jonny Douch, Anna Gibson, Liz Hughes, Vijay Datadin, Thomas Rodger, and the rest of the team for providing insights from the field and pushing us to make this guide all it could be. At BoundlessGeo (OpenGeo), we would like to thank Jeff Johnson for answering a string of questions about the GeoNode platform, Alyssa Wright for her energy for open data and community mapping, and Eddie Pickle for his support.

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By transitive property, Paul Erdos' quip that mathematicians are machines for turning caffeine into algorithms also holds for those who write about data. This publication is the byproduct of many hand-crafted cups of coffee. Many thanks go to the staff at Filter Coffee House, Tryst, and M.E. Swing's Coffee in Washington, DC, Render Coffee in Boston, and Crema Coffee in Cambridge.

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GFDRR is a partnership of 41 countries and 8 international organizations committed to helping developing countries reduce their vulnerability to natural hazards and adapt to climate change. The whole team would like to thank the generous support of our donors, who made it possible to capture tacit knowledge around the collation and collection of open data for resilience.

We would like to thank Rachel Kyte for her support in bringing this guide to the attention of the public and helping us adapt the thinking to GFDRR's new home under the Climate Change and Adaptation practice in The World Bank Group.

Finally, we get to thank the person who made this guide possible. Francis Ghesquiere, thank you for providing the support, vision, advice, and patience that enabled this guide go from a brainstorming session in a coffee-shop to this book.

FOREWORD

Archimedes once said, *"give me a lever long enough and I will move the world."* In disaster risk management, our levers tend to be shorter than we would like. Seismic retrofits, flood management programs, and climate adaptation measures only reduce risks; they cannot eliminate them. Nor can we afford to fund programs in all the places we would like. As a result, building resilient societies requires knowing where to target our scarce resources so they get the most leverage.

In many places in the world, we have limited data to tell us where to put our levers. Maps may be decades old in cities that are experiencing 3% to 5% annual population growth. Exposure data may be 'guestimates' that divide these old maps into 10km grid squares and then limit us to approximating an average vulnerability within each square. The risk assessments that build on this coarse data may not always tell us where our disaster risk management investments will give the best return in lives saved.

The Open Data for Resilience Initiative (OpenDRI) is building better access to data. From the Sahel and Horn of Africa to the Caribbean islands, open government data projects are helping ministries release disaster risk management data that analysts can access from public data catalogues. From Indonesia and Sri Lanka to Nepal and Haiti, community mapping projects are creating maps with millions of individual building footprints. Across a range of international partners, open data efforts are mapping the *terra incognita* within the realm of disaster risk management. Through efforts like the Open Data for Resilience Initiative, we are getting a better understanding of where to place our levers.

The Global Facility for Disaster Reduction and Recovery has funded the creation of this guide to capture the experiences of an initial round of founding partners who are using open data to build resilient societies. It is our pleasure to offer it under an open license with the intent of catalyzing an ecosystem around a growing wealth of shared wisdom about how to generate and manage open data projects. Please accept my invitation to contribute to this guide and expand the list of partnering organizations around it.

Francis Ghesquiere
Manager
Global Facility for Disaster Reduction and Recovery

Photo: Seismic resilience housing outside Yogyakarta, Indonesia. Credit: Abby Baca, The World Bank, 2013.

EXECUTIVE SUMMARY

Risk assessments never start from a blank slate. In every country, analysis begins between the disasters of the past and those that are projected to happen in the future. Analysts often find themselves in a situation that mirrors the citizens of the places they study: their work is born mid-cycle, between an earthquake and flood. They must build and rebuild assessments based on remnants found from previous disasters. All too frequently, the data used to generate their insights are spotty, old, and ill-suited to the task. Yet, faced with a race against the next disaster, they simply make do.

We can do better.

Countries already have existing stocks of data which remain latent, inaccessible even to other ministries and municipalities because they are in forms that prevent them from flowing freely. Some are frozen on paper. Others are blocked by technologies that lock datasets into proprietary ecosystems, stoppered by policies that prevent release beyond small groups, or fragmented into bureaucratic silos that require significant investment to assemble back into a whole picture.

Yet, even if these stocks of data could be fused into a common memory, it would not be enough. Data describe a dynamic reality. Cities are growing at extraordinary rates, with formal and informal settlements sprouting up faster than cartographers can build maps. Alongside this rapid urbanization, hazards are changing in ways that make it far less likely that historical understandings will inform prudent decisions about probable futures. Climate change is altering weather patterns and bringing extreme weather to places that have never seen such variation. Existing stocks of data about a nation's infrastructure and its relation to natural hazards each need to updated more frequently and at higher resolutions than ever before.

In a time of economic hardship and unequal globalization, few governments possess the resources to collate existing data, collect new data, and feed them all into an ecosystem of analysts who can make sense of them so that practitioners can design and implement projects that get ahead of the disaster cycle. This work must be a collective effort, engaging governments, civil society, industry, and individuals.

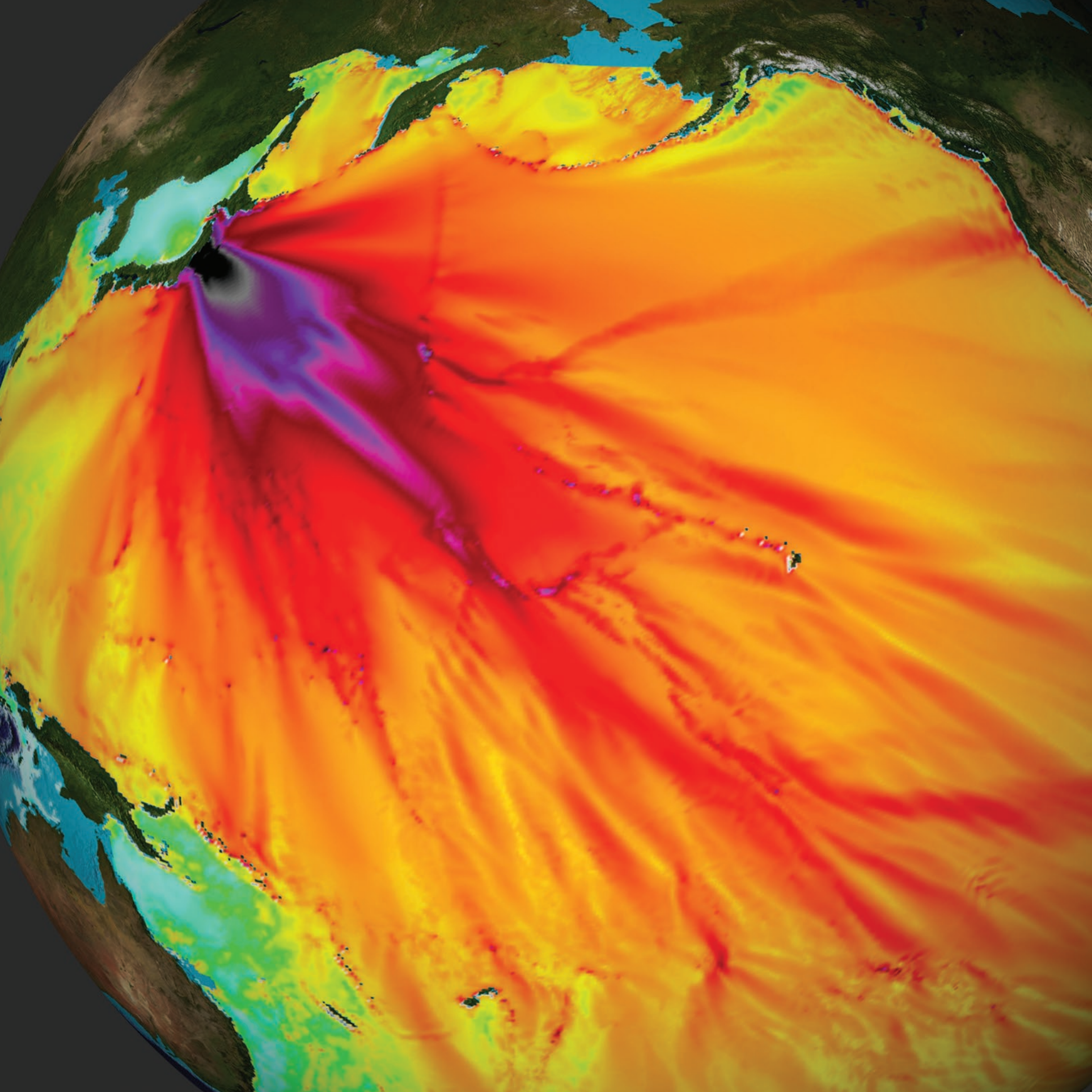
The Open Data for Resilience Initiative (OpenDRI) is a growing partnership around this core data problem. It offers governments and their partners a process for cataloguing their existing stocks of data without giving up control of those data to third parties. It offers an inexpensive method of engaging at-risk communities in the process of mapping and curating data about their changing exposure to natural hazards. And it offers a guide to building an ecosystem of entrepreneurs, researchers, and international institutions around data that a nation manages for itself.

This field guide provides planners and program officers with a map of how to implement the collective effort that is OpenDRI. It is aimed at a person who needs to write a stategic vision, craft a budget, hire personnel, and evaluate the impact of open data. OpenDRI unfolds in four phases:

- **Scoping the program**: how to define the use case—the goals and functionality of the initiative—and design an open data program to accumulate the data that is needed to support this use case.
- **Collating existing data**: how to build a data catalogue that enables many actors to collect and combine disaster risk management data in a system which enables analysts to find and apply those data to risk assessment problems.
- **Collecting new data**: how to train communities to collect data about infrastructure in their neighborhoods and curate that data over time.
- **Catalyzing the open data ecosystem**: how to build communities that curate, use, and re-use high-quality open data and drive the process of turning data into decisions.

This guide represents a first aggregation of the methods used by a range of institutions who have implemented open data programs around building more resilient societies. It is not the last word on how to design these projects, but rather should be seen as an initial scaffolding for building the next version of this guide. We encourage readers to contribute their own insights and institutions to join into a growing partnership.

Photo: Informal settlement near epicenter of 2010 Haiti earthquake in Leogane. Credit: John Crowley, GFDRR, 2011.



PREFACE

In the year 869, the residents of Miyato-jima (Japan) experienced a strong earthquake. Knowing that a tsunami might follow, many fled to the top of the nearest hill. To their horror, a wave from the sea combined with a second wave that came over the rice paddies, washing over the hill and pulling the helpless villagers out to sea. Those that survived that day placed a stone on the hill next to a rebuilt shrine, a symbol of the story of how two tsunami waves fused together. For 1142 years, the stone served as a warning to future generations not to flee to the top of that particular hill. When the 11 March 2011 earthquake struck off the coast of Sendai, residents of Miyato-jima remembered the story and fled further inland, where they watched two tsunami waves again crash over the hill.[1]

This story is an outlier—an example of collective memory reaching across 50 generations. In contrast, humans tend to remember how to plan for events that happen frequently with relatively low intensity, like seasonal flooding. Beyond isolated examples like the Miyato-jima shrine and the tsunami stones of Japan, there are few records of ancient disasters that provides sufficient data to model the periodicity or impact of infrequent events.

Because many powerful cycles of nature are not measured in years but millennia, hazards with low frequency can lurk in history's invisible depths. Volcanoes may erupt in 100, 1000, 10,000, 100,000 or 1,000,000 year cycles. Earthquakes may have similar periodicities. The historical record dates (at most) a few thousand years. Accurate scientific measurements of such low-frequency, high-intensity events are sparse and spotty until only the past few decades.

At the same time, the underlying causes of risk are changing. While the world is becoming more interconnected and interdependent, new challenges are making it less likely that wisdom received from previous generations will prudently inform decisions about the present and future.[2] From urbanization and climate change to population growth and technology, emerging risks are altering traditional approaches to disaster risk management. Among the large cities exposed to cyclones and earthquakes, the population will double from 2000 to 2050: 0.68 billion to 1.5

Facing page: Japan 2011 Tsunami Wave Height model, US National Oceanic and Atmospheric Administration Center for Tsunami Research.

1. Los Angeles Times, *Japan's 1,000-year-old warning, José Holguín-Veras, 11 March 2012.*
2. Suarez et al, *Games for a New Climate*, http://tinyurl.com/BUPardee-G4NC.

billion (NHUD, 2012). At the same time, these cities will create more concrete and asphalt—reducing permeable surface and increasing the potential for flooding, even from the rainfall amounts that currently pose little threat. Models of climate change estimate that damage from meteorological hazards will increase over the 21st century. As risks become more dynamic, it will become ever less typical that the past will serve as an accurate predictor of the future. Instead, the emerging patterns of natural hazards require rethinking current understandings of assessing and managing risk.

INTRODUCTION TO UNDERSTANDING RISK

Understanding these dynamic risks requires better information, especially how risks associated with natural hazards interact with communities that are facing rising exposure to these hazards. Currently, many governments have very limited information about their exposure to natural hazards and therefore cannot effectively manage their vulnerabilities. In many countries, base maps have not been updated in 50 or more years, the census may be more than 10 years old, and there may be little data to distinguish those buildings that have been built to withstand natural hazards and those that have not.

Without data, without collective memory, vulnerable societies cannot make different choices. They cannot prepare for expected failures or make reasonable (often low-cost) investments in mitigating risks. They may not have the evidence to enforce building codes and zoning restrictions that create resilience in the face of expected adversity. They cannot compare their historical understandings of a risk (as inherited with the wisdom of their society) with new understandings of a dynamic planet, where climate risks are changing historical understandings and opening them to hazards that they have not previously faced.

UNDERSTANDING NEW RISKS REQUIRES NEW APPROACHES

It is rare for the leaders in these communities to have the data they need to see the invisible risks when they are hidden in history or behind concrete. Within this changing context, GFDRR is taking a new approach: working with governments to open the data necessary for making better decisions around risk management.

In 2011, the Global Facility for Disaster Reduction and Recovery created the Open Data for Resilience Initiative (OpenDRI) to help people in vulnerable regions better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing information about their hazards, exposure, vulnerability, and risks.

To alter the mental models of risk across a whole population, data needs to be available to everyone, and knowledge of how to analyze and apply those data needs to be widespread. Data must be open–**legally open**, in terms of intellectual property licenses that permit them to be reused, repurposed, and redistributed without cost. They must also be **technically open**, so that any software can open them, manipulate them, and save new analyses in open formats. Data needs to be collected, analyzed, and curated by the people facing the risks. Only through this process of having the data be available to all and curated by those who are potentially affected can behavior fully change.

This guide outlines practices that a network of peers is developing across organizations. All of the partners to this guide are working to build better data around the Disaster Risk Management (DRM) cycle. Science agencies are developing better models of earthquakes, cyclones, floods, droughts, tsunamis, volcanic eruptions, and other hazards. Governments are cataloguing the exposure of their built environments to those hazards, at the same time that they are

exploring the vulnerability of their populations to the direct and indirect effects of disasters. In parallel, donors are looking at how best to help their clients target investments.

WHO IS THIS GUIDE FOR?

This guide is for managers who wish to apply open data approaches and develop a deeper understanding of how to prepare, reduce, and transfer the potential risks from natural hazards. It is written as an aid for government officials, community leaders, and personnel at international organizations, non-governmental organizations, and development agencies. To enable implementation of each part of OpenDRI in a modular fashion, this document provides an overview of OpenDRI followed by chapters that explore the theory and practice around the collation of existing data, collection of new data, and the catalysis of an ecosystem of contributors around open data. The Field Guide complements the upcoming Open Cities Toolkit, a how-to guide for implementing community mapping programs for collecting data about the built environment. The Open Cities Toolkit will available in mid 2014.

GOALS OF THE GUIDE

This guide intends to:

1. Share disaster risk management activities that have harnessed or promoted open data.
2. Explore shared challenges in using open data to increase resilience of societies who are facing risks from natural hazards.
3. Start to grow consensus around how to implement open data initiatives inside of client governments.
4. Articulate the workflows, partnerships, tools, and practices around OpenDRI.
5. Collate shared documents that can be used as templates for future implementations of OpenDRI practices.

A NOTE ON STYLE OF THIS GUIDE

The intention of this guide is to make the work itself a collective effort. It is seeded from the experience of a handful of partners, and shared with communities that work in open data or hope to emulate this approach. Curators will continue to steward the content, ensuring that added knowledge reflects the community's shared experiences.

The guide focuses on cataloguing a set of practices that have emerged over the management of open data, the curation of community maps, and the rise of practices around risk communication that illustrate the potential impact of natural hazards on a given place. The text of the guide will be published in a public wiki with limited editing rights, so that authorized individuals can edit as they learn and improve upon the original idea of OpenDRI while making the whole corpus of knowledge available to all. Overall editorial decision making will remain with GFDRR until the OpenDRI team can establish a governance structure that allows for community curation of the guide.

1

INTRODUCTION

Credible information about risk is an essential element of Disaster Risk Management (DRM). Thousands of times each year, disasters reveal decisions about how to apply this information to the management of risk.[1] When a school collapses during a moderate earthquake, citizens may point to the failure of the construction firm to adhere to building standards. Or to the failure of a government to enforce building codes. Or to the education ministry that should have retrofitted the structure to better resist known seismic risks.

In each case, critical information was missing—information that might have driven a different choice about architectural designs, building materials, the site for the building (siting), or actions to remediate a known vulnerability.

Across the disaster risk management cycle, institutions are now engaged in a process to build this stock of information. The aim is to improve the chain of decision making across an entire system—from the donors who fund retrofitting of schools to the parents who need to know how safe their local schools are.

RISK ASSESSMENT AND COMMUNICATION

Building risk assessments follows an internationally agreed approach that combines three elements: hazard, exposure and vulnerability.

- **Hazard**: The likelihood (probability/chance) and intensity of a potentially destructive natural phenomenon. For example, ground shaking in an earthquake; severe wind/storm surge in a cyclone; inundation level and velocity in a flood event.
- **Exposure**: The location, attributes, and value of assets that are important to communities (people, property, infrastructure, agriculture/industry etc).
- **Vulnerability**: The likelihood that assets will be damaged or destroyed when exposed to a hazard event. For example, the relationship between the intensity of earthquake shaking and the level of damage for different buildings.

Photo: Haiti, Partners in Health Mirebalais Hospital under construction with engineering to withstand 8.0 earthquake. December 2011. Credit: John Crowley, 2011.

1. Natural hazards, unnatural disasters : the economics of effective prevention. The World Bank and The United Nations (Washington, DC, 2010. Hereafter cited as NHUD.

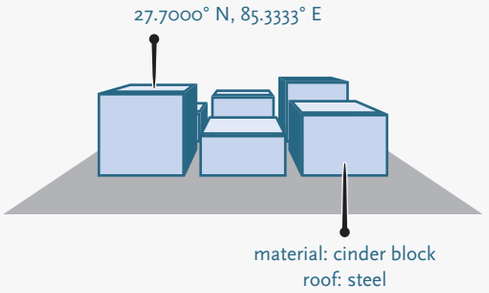
The Components for Assessing Risk

Hazard

The likelihood, probability, or chance of a potentially destructive phenomenon.

Exposure

The location, attributes, and values of assets that are important to communities.



The iterative process of understanding the threat from a given hazard unfolds through several levels of complexity. At the most basic level, an analyst can model the **impact** of hazards that might happen to people, buildings, crops etc from a single event, such as 1/100 year flood or an 8.1M earthquake. This is **Impact Modeling**, which allows decision makers to answer the question, "what if an earthquake or cyclone hits my city?" Based on this impact model, they can then make different decisions *before* an event occurs.

Impact modeling is not the same as risk assessment. **Risk** is the composite of the impacts of all potential events (e.g., looking at the impact from 10,000 cyclone events); this allows an agency to determine the annual average loss and probable maximum loss from individual or multiple hazards. Risk models can be very useful for financial planning and protection, prioritizing DRM investment within a country, and cost-benefit analysis of different risk reduction options. They are the basis for projects that build preparedness, focus risk reduction investment and action, and implement policies that slow the creation of new risks.

THE CHALLENGES OF DRM DATA

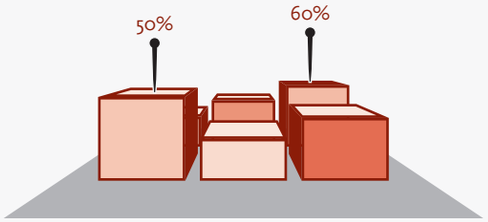
Aggregating data necessary for risk identification, impact modeling, and risk assessment has proven challenging for most government ministries. Effective disaster risk management requires a commitment to collect, curate, and analyze data about the exposure and vulnerability of the built environment over the long term. However, some governments have lacked the resources to be stewards of the data that are essential for risk assessment. Many more lack the capacity to turn the data into models that show the potential impact of a given hazard upon the important elements of their society: people, properties, economies, and the natural environment.

Efforts to centralize data often fail

That is not to say that governments and donors have not made investments to build a better stock of risk data. Many governments have worked with partners to aggregate and centralize some portion of the data that they generate. However, this approach has often failed or faltered, with two of the most common reasons being quite predictable: control and revenues. Ministries often perceive a loss of control of data that is shared widely. The gatekeeper function disappears and deals around access to the data are no longer in play. Similarly, ministries often try to sell data to other entities, including other parts of their government. When data are shared, these gatekeepers perceive a potential loss of revenue from the sale of their data. For some small GIS consultants, data is their business: they sell analyses to local, provincial, and national government officials built on data to which the consultants alone have access. Centralization of data in a single portal is often neither politically expedient nor cost effective.

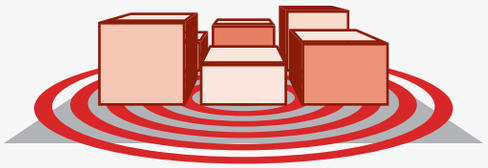
Vulnerability

The likelihood that assets will be damaged or destroyed when exposed to a hazard event.



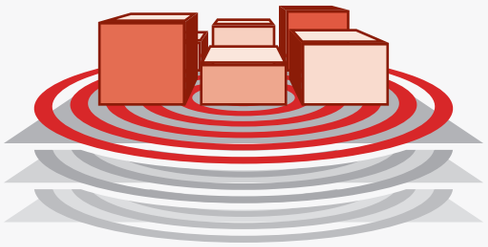
Impact

For use in preparedness, an evaluation of what might happen to people and assets from a single event.



Risk

Is the composite of the impacts of **ALL** potential events (100's or 1,000's of models).



THE RISE OF OPEN DATA

Three dynamics are changing this situation:

1. The accelerating nature of risks from natural hazards
2. The increasing need for replicable computational science
3. The expanding adoption of open government standards to drive transparency and accountability

1. Underlying risks are accelerating

Together, the process of urbanization, population growth, accelerating rates of poor construction and urban planning, and an increase in land subsidence are changing the nature and magnitude of risks in many developing countries. This acceleration is particularly pronounced in those countries most at risk of increased cyclones, floods, and droughts in cities with swelling peri-urban slums that are sited in the most vulnerable areas. For many policy makers, it is become ever more difficult to get a handle on dynamic risks.

These changing risks are driving a need for better data. To assess the risk in places facing 5% annual population growth and increased probabilities of droughts, fires, floods, and landslides, governments need higher resolution data, both temporally (collection intervals) and spatially (grid square averages). However, most governments function with data that is collected at best annually. In many places, data on the built environment have not been updated in decades or are collected across a small sample of the country. Land cover estimates may be at greater than 1km or even 5km resolution (average building abstracted from sample across grid square). There may be policy barriers to collecting the data, particularly where surveys of informal settlements by government officials might create political pressures to turn peri-urban slums into recognized municipalities.

2. Risk science requires open data for replicable results

Science progresses by the publication of methods and experimental results for peer review. Replicability of an experiment is considered a fundamental building block of scientific knowledge. For three centuries, the approach for sharing their methods and results has been the peer-reviewed journal. Scientists follow a formulaic approach to describing a hypothesis, the methods they used to test the hypothesis, and an analysis of results with a description of implications for future investigations. With the rise of computational sciences like risk assessment, this formula is changing. To replicate an experiment in a computational science like risk assessment, an expert requires not only a narrative description of the method, but also the actual software and data used to generate the published results—down to the version of the software and the state of the dataset at the time of the experiment.[2]

If a risk assessment is going to be scientifically valid and confirmed by multiple parties (including the insurers and reinsurers), DRM data need to be available along with the version of the software used to generate the results. In other words, the market is beginning to demand open data as a precondition for building a negotiated understanding of risk. This demand will become ever more prevalent in DRM decisions, which tend to be contentious and

2. Ian M. Mitchell, Randall J. LeVeque, Victoria Stodden, "Reproducible research for scientific computing: Tools and strategies for changing the culture," Computing in Science and Engineering, vol. 14, no. 4, pp. 13-17, July-Aug. 2012, doi:10.1109/MCSE.2012.38

made under conditions of uncertainty that affect the well-being of millions of citizens.

3. Open government policy is driving open government data

Open data is also emerging as a core expectation of citizens and businesses. In response, from cities to national governments and international alliances, governments are shifting to making data open by default.

This movement is a paradigm shift. For over two hundred years, government ministries treated data very differently. Their bureaucracies were organized to control the most expensive elements of information management: the production and distribution of physical paper assets and the transmission of messages across expensive telecommunication channels. At best, efforts to make these resources findable took the form of the creation of annual reference works on demographics, agriculture, and other statistical information. Data was hard to obtain, siloed into shards at various ministries, and expensive to reassemble.[3]

Today, the Internet and cellular/telecommunications networks have reduced the cost of communication by orders of magnitude. The World Wide Web has connected not only documents, but datasets to each other. It is now possible to find a dataset containing a link (e.g., URI) to another dataset and surf across that connection just like humans click on hyperlinked documents on the World Wide Web.

As Malone writes in *The Future of Work*, the cost for sharing such data is asymptotically approaching zero and the barriers to interorganizational communication are now social rather than technical and economic. Yet, even after the dot-com boom of the 1990s, most government institutions have yet to adopt organizational designs that harness this lower cost of communication. Instead, data was and still is treated as a physical asset instead of infinitely- and costlessly-replicable digital information.

In the early 2000s, governments began a policy shift to match the changed expectations of their citizens. As phrased in the G8's Open Data Charter:

"Today, people expect to be able to access information and services electronically when and how they want. Increasingly, this is true of government data as well. We have arrived at a tipping point, heralding a new era in which people can use open data to generate insights, ideas, and services to create a better world for all."[4]

In September 2011, Open Government Partnership announced that 8 governments had become the founding signatories on an agreement to make government data far more open to citizens than in the past. Subsequently, more than 65 governments have signed the declaration. One part of this declaration reads:

We commit to pro-actively provide high-value information, including raw data, in a timely manner, in formats that the public can easily locate, understand and use, and in formats that facilitate reuse... We recognize the importance of open standards to promote civil society access to public data, as well as to facilitate the interoperability of government information systems.[5]

The World Bank itself announced an open data policy in April 2010. All its data and publications would be made available under the Creative Commons 3.0 Attribution License (CC-BY), which permits free reuse and redistribution so long as the data or publication is attributed.

THE PRINCIPLES OF OPEN GOVERNMENT DATA

For data to serve decision makers across a society, data need to be fully open. This means that data must be:

1. **Technically Open:** Many government datasets are locked in data formats that can only be read by proprietary software (and sometimes hardware, like obsolete magnetic tape backup drives). The data must be released in ways that allow any device or software can read it.
2. **Legally Open:** the license under which the data is released must permit redistribution and reuse.

3. Thomas Malone, *The Future of Work*. HBS Press *(Cambridge, MA, 2004)*, especially chapters 2 and 3.

4. See G8 Open Data Charter: https://www.gov.uk/government/publications/open-data-charter/g8-open-data-charter-and-technical-annex.

5. See OGP Declaration at http://www.opengovpartnership.org/open-government-declaration.

Data is Open if

"**anyone is free to use, reuse, and redistribute it** subject only, at most, to the requirement to attribute and/or share-alike."

=

Legally Open

It is important to **place a license** on open data.

The World Bank's own data policy is licensed under:

ODC-BY
Open Data Commons Attribution License

+

Technically Open

The data needs to be made **available**, **in bulk**, in a **machine-readable** format.

category	category	category
value	value	value
value	value	value
value	value	value
value	value	value
value	value	value

3. **Accessible:** the data must be available at a public Internet address (Uniform Resource Indicator or URI).
4. **Interoperable:** the data must follow open standards.
5. **Reusable:** can be redistributed and reused in ways that were not necessarily anticipated by the curator of the original data.[6]

OPENING DATA FOR DRM

With very dynamic risks and demand for open data coming from scientists and society, governments need a pathway to collate and release data about hazards, exposure, vulnerability and risk which are fragmentary, incomplete, outdated, and sometimes inaccurate. They also need a mechanism to collect new data about buildings which are sprouting up every week. And they need a new set of practices to connect these data into the ecosystem of users who need it.

To collect higher resolution data in times of economic uncertainty and tight budgets is a difficult choice. Professional surveys of urban areas can be very expensive. Analysis of the data can also be costly. Collation of data is fraught with politics and perceived issues of revenue loss. The collection of required data for risk assessment are no longer activities that most governments can afford to do alone; there is an increasing need for collective action.

6. Cf. Bauer and Kaltenböck, *Linked Open Data: The Essentials*. mono/monochrom (Vienna, 2013).

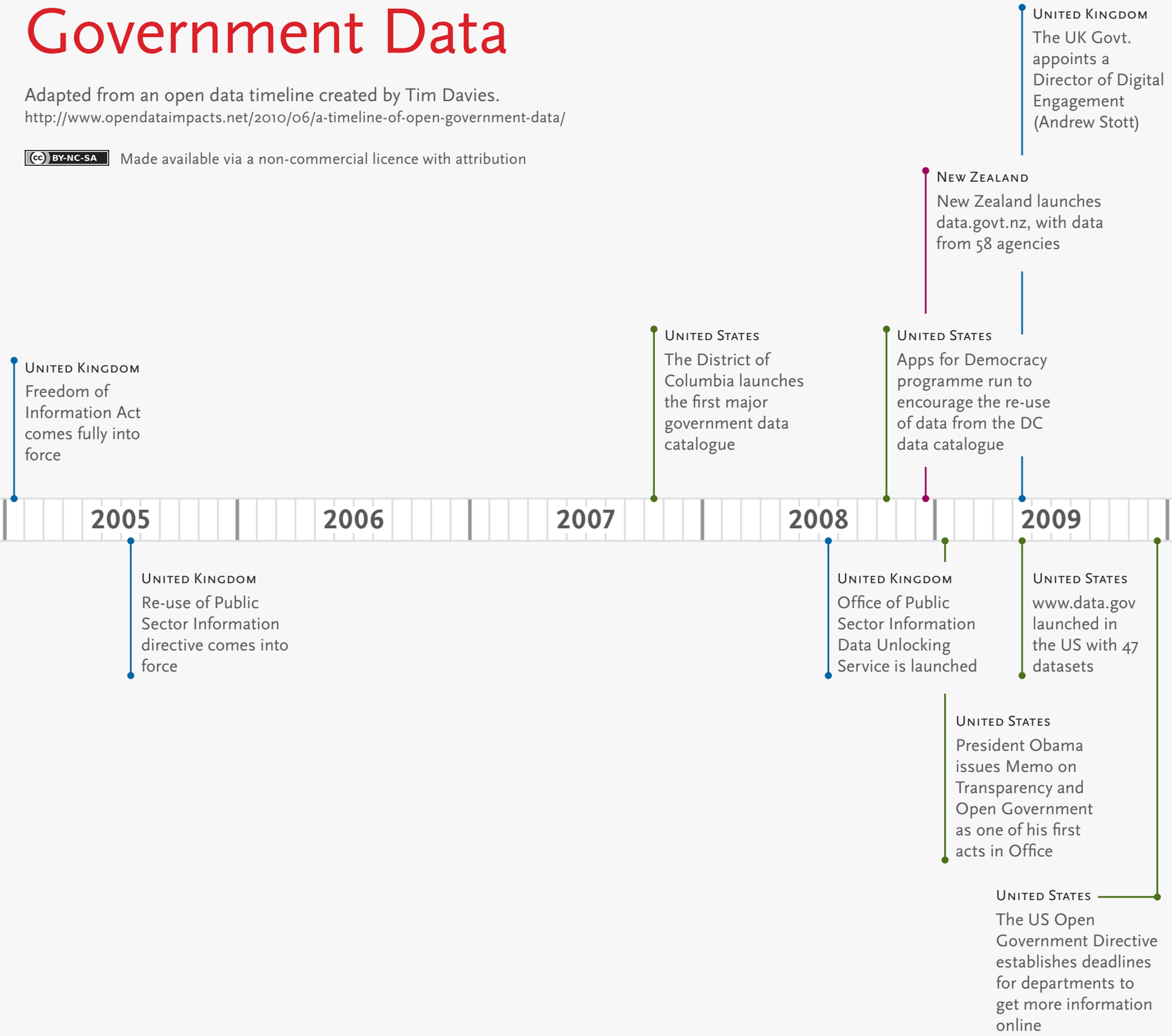
The rising need for open data and collective action

In Indonesia, Nepal, and a growing number of countries, governments have been mobilizing their ministries and citizens to collate, collect and curate the data necessary to make everyone safer. Because much of the labor is done by community organizations, the resulting maps of the built environment are being created at very low cost. Working together, members of the private sector, public sector, and community organizations are building a shared understanding of their probable futures and the actions they can take to effect their resilience to disasters and climate change. With the aid of risk managers, each government is guiding a conversation about how to invest in resilient communities.

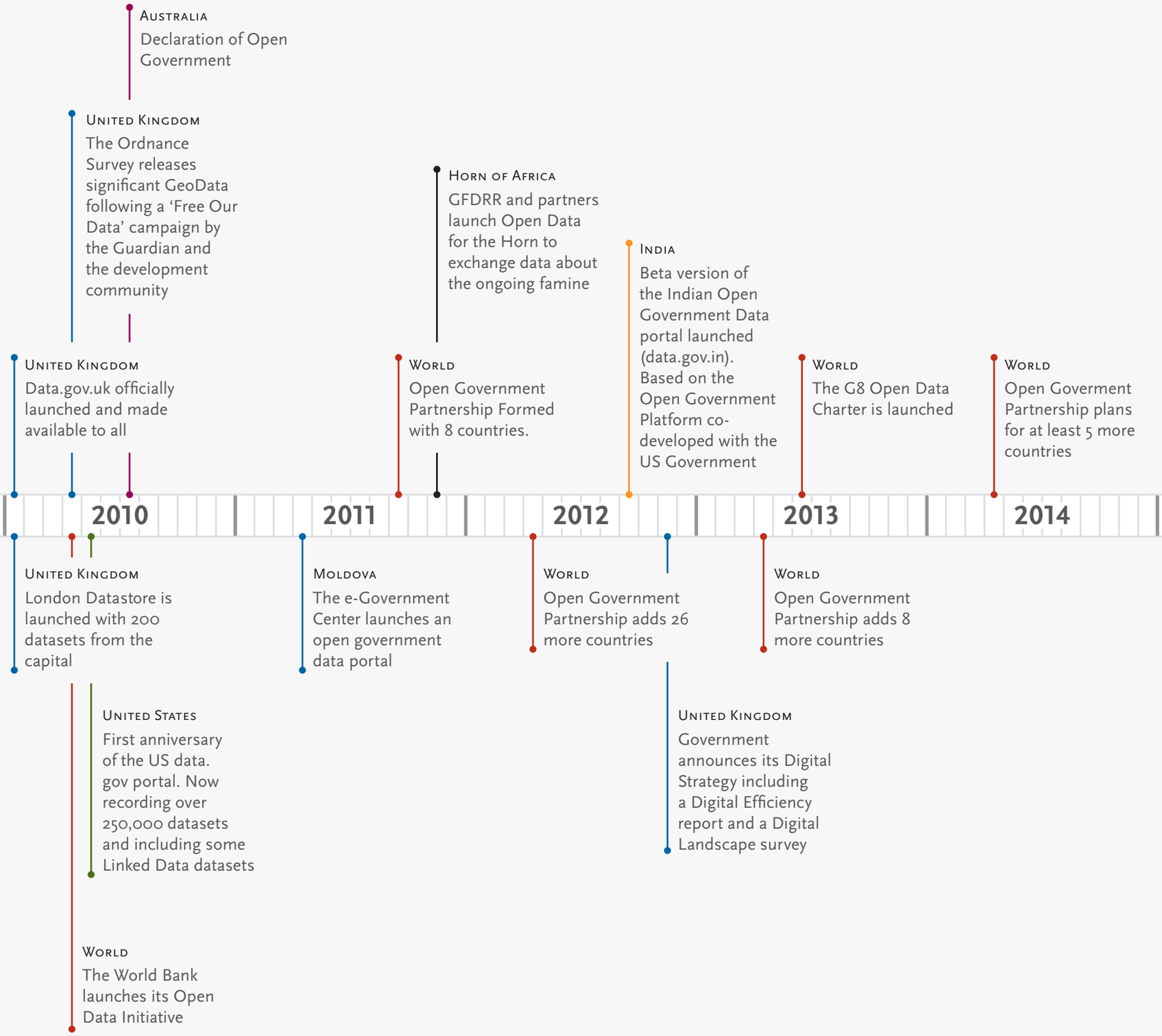
Integrating these opportunities and new technologies has become the mission for a three-year old initiative called the Open Data for Resilience Initiative. This initiative has drawn together international institutions, client governments, and community organizations to harness their collective efforts for collating existing risk data, collecting new exposure data, and catalyzing the communities of public and private sector actors to apply the data to increasing the resilience of societies. The story of how OpenDRI came to be is the subject of the next chapter.

A Brief History of Open Government Data

Adapted from an open data timeline created by Tim Davies.
http://www.opendataimpacts.net/2010/06/a-timeline-of-open-government-data/



- World
- Europe
- North America
- Africa
- Asia
- Australasia


Australia
Declaration of Open Government
United Kingdom
The Ordnance Survey releases significant GeoData following a 'Free Our Data' campaign by the Guardian and the development community
United Kingdom
Data.gov.uk officially launched and made available to all
Horn of Africa
GFDRR and partners launch Open Data for the Horn to exchange data about the ongoing famine
World
Open Government Partnership Formed with 8 countries.
India
Beta version of the Indian Open Government Data portal launched (data.gov.in). Based on the Open Government Platform co-developed with the US Government
World
The G8 Open Data Charter is launched
World
Open Goverment Partnership plans for at least 5 more countries
2010
2011
2012
2013
2014
United Kingdom
London Datastore is launched with 200 datasets from the capital
United States
First anniversary of the US data.gov portal. Now recording over 250,000 datasets and including some Linked Data datasets
World
The World Bank launches its Open Data Initiative
Moldova
The e-Government Center launches an open government data portal
World
Open Government Partnership adds 26 more countries
United Kingdom
Government announces its Digital Strategy including a Digital Efficiency report and a Digital Landscape survey
World
Open Government Partnership adds 8 more countries

THE WORLD BANK GROUP OPEN DATA READINESS ASSESSMENT TOOLKIT

To help governments prepare for open data initiatives, the World Bank's Open Government Data Working Group has developed an Open Data Readiness Assessment toolkit. This questionnaire divides readiness into several categories of action:

- **Leadership:** commitment and structures by which national leadership advance open data.
- **Policy/Legal Framework:** laws and policies around government data, intellectual property, and protection of data.
- **Institutional:** responsibilities and work processes for release and curation of government data.
- **Government Data:** availability and findability of key government data.
- **Data Demand/Reuse:** extent of existing engagement with government data within civil society and between ministries.
- **Ecosystem:** health of partnerships by which governments can catalyze the application of open data to problems in civil society, academia, and industry.
- **Financing:** support for open data efforts, including training, scaling pilots, and curating data sets.
- **Infrastructure:** evaluation of the baseline ICT resources and what infrastructure will need to be built to support open government data initiatives.

This toolkit is an evolving resource that focuses on general environment for open government data. OpenDRI implements one of the Open Data Working Group's recommendations: to develop open data assessment tools for specific topical areas (in this case, for DRM). For more information on the Open Data Readiness Toolkit, see http://data.worldbank.org/about/open-government-data-toolkit/readiness-assessment-tool.

Photo: Indonesia, Australia-Indonesia Facility for Disaster Reduction commmunity mapping.
Credit: Abby Baca, World Bank, 2013.


PETA SOSIAL DAN SUMBER DAYA
DESA NIPA-NIPA
KECAMATAN PA'JUKUKANG
KABUPATEN BANTAENG
LEGENDA
U
S
A1
AIFDR
AIFDR
AIFDR


Route Moleard
Route de Lyson
Route Marin
Route de Santo
Nationale No 1
Nationale No 2
Boulevard des Industries
Bd Toussaint Louverture
Avenue Mais Gate
New Boulevard
Autoroute des Delmas
Autoroute de Pétion-Ville
Avenue Jean Brown
Avenue Pan Américaine
Route des Dalles
Mais Gate Int'l
Zone inondable

2

OPEN DATA FOR RESILIENCE INITATIVE

The Open Data for Resilience Initiative (OpenDRI) works with governments to harness the value of Open Data practices in service of more effective disaster risk management and climate change adaptation. OpenDRI is neither a methodology or nor a toolset, but rather an evolving set of practices that can be configured to meet specific needs. For this reason, OpenDRI starts by listening.

OpenDRI began from a catastrophe. On 12 January 2010, an earthquake devastated Haiti. Buildings collapsed across an impact zone that stretched from the southern peninsula to the Artibonite valley. Hundreds of thousands were dead, injured, or incapacitated, including key staff at the United Nations Mission to Haiti (MINUSTAH) and the staff of the national mapping agency (CNIGS). As a result, critical information from both UN agencies and government ministries were buried under the rubble, including the location of the health facilities, current maps of the warren of roads in Port au Prince, and other data that would be needed to recover quickly and build a more resilient society. This vacuum of critical data could have greatly magnified the effects of an already catastrophic disaster, but instead, something unexpected happened.

For the first time, several satellite companies collected fresh high-resolution imagery of the damage and *made the data available for free.* Digital Globe, SPOT, and GeoEye each made their imagery available under an open license that permitted redistribution and reuse. The World Bank collected imagery via aircraft at even higher resolution and put this additional data under an open license as well.

These two imagery releases catalyzed a second activity never seen before: a worldwide effort to map a country in less than three weeks. More than 600 volunteers from the OpenStreetMap community started tracing the imagery, creating a highly detailed map of Haiti, including building footprints and roads in Port au Prince. Volunteers from 29 countries made about 1.2 million edits to the map, performing an estimated year of cartographic work in about 20 days—all for zero cost. This effort catalyzed a rethinking of community mapping and open data within the World Bank and several other international institutions.

Port au Prince, Haiti in OpenStreetMap
Credit: OpenStreetMap, CC-BY-SA, 2013.

FROM OPEN TO OPPORTUNITY

Within the GFDRR team, the practical reality of what had happened in Haiti fused with growing momentum around open data and open government. A set of questions emerged: if remote mappers could map a large impact zone in a crisis, what could be done before a disaster? Could GFDRR invest in collecting better data about the exposure of the built environment to natural hazards as a form of technical assistance? Could at-risk communities then curate this data for themselves, creating the opportunity for better spatial and temporal resolution of their exposure to natural hazards?

As recovery and reconstruction unfolded in Haiti (and a cholera epidemic made a bad situation worse), a second set of questions emerged. Thousands of NGOs and dozens of international institutions were all collecting data, generating information about the context in which they worked. Without a catalogue of who was producing what information on what problem, ministries and internationals alike struggled to find the data that they needed to make decisions.

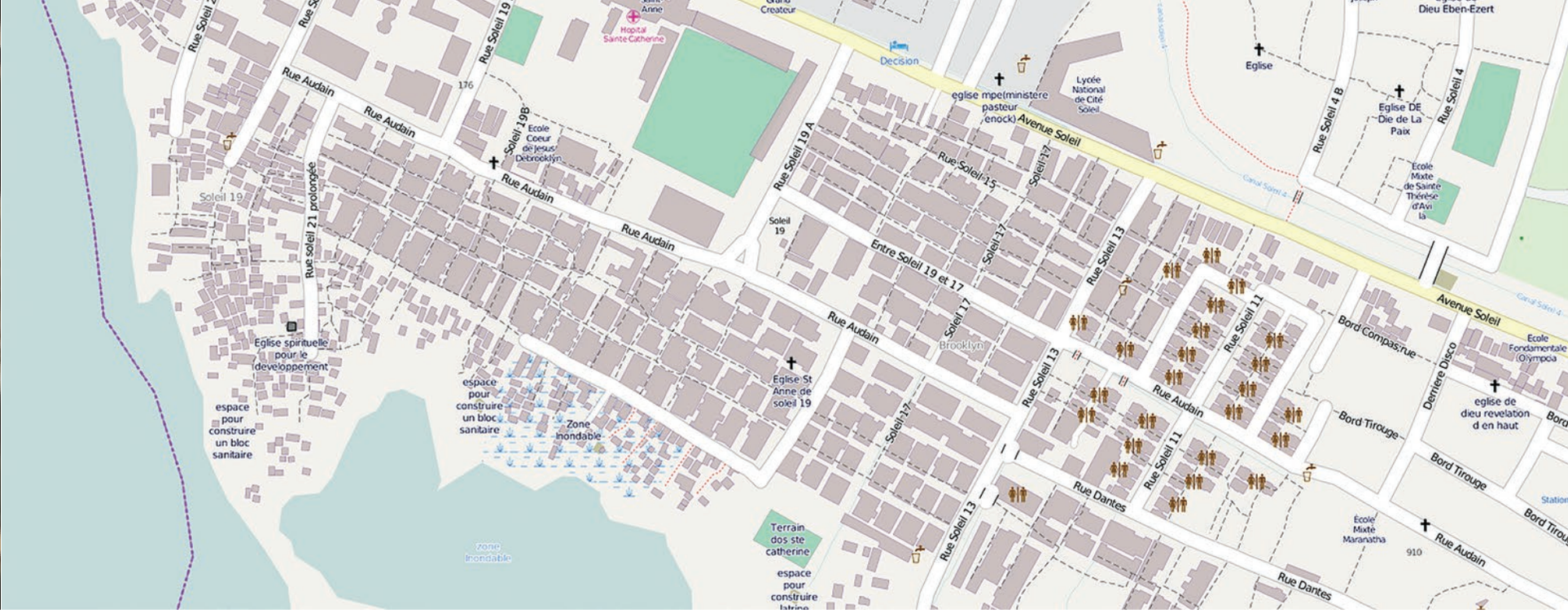
The GFDRR team set about deploying a mechanism that would allow for the collation of data across the myriad actors in Haiti. Applying a tool from previous work with the CAPRA risk assessment platform and the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), GFDRR implemented software called the GeoNode that would perform two purposes. First, it would allow actors to upload and catalogue georeferenced data. Second, it would allow actors to create links to resources that are hosted elsewhere, similarly catalogued. Anyone searching the GeoNode could find data on the server or linked from another server within a federated architecture.

In the process of applying the GeoNode to Haiti, GFDRR discovered a important lesson. For such a resource to be part of a local ecosystem, it must be built *with* a local partner, not *for* a local partner. The effort must be driven by local use case, designed by local partners, and curated by local experts. As a result, the GFDRR team has customized each subsequent OpenDRI project, based on a unique packaging of tactics around open data.

PACKAGING OPEN DATA

In 2011, GFDRR began to package these open data efforts under one label: the Open Data for Resilience Initiative (OpenDRI). Teams from GFDRR began to offer World Bank regions and client governments technical assistance around how to use open data to catalyze better information on risks.

These projects centered on applying the principles of open data, open source software, and open standards to the disaster risk management cycle. The objective was to open several types of data



for analysis to a wide range of stakeholders, including hazard and exposure data.

Where appropriate data did not exist, the OpenDRI team would often catalyze its collection, where possible as open data. Where data was already part of an archive, the OpenDRI effort would work to collate it and negotiate its release as open data or establish the appropriate controls on the data with host nation officials. The resulting ecosystem would have far more data on which to base decisions about investing in DRM.

Today, OpenDRI is an umbrella for a range of evolving tools and practices. The program works with governments who seek to harness the power of open data and open source tools to create an ecosystem around the analysis of risk data and its application to increasing resilience to natural hazards.

OpenDRI works with governments to harness the value of open data practices in service of more effective disaster risk management and climate change adaptation. An OpenDRI project offers a menu of DRM tactics for building risk data with collective action, including:

- **Collation of data and their publication in an open geodata catalogue**. Data about the exposure of a nation to natural hazards are often fragmented across multiple institutions, often under policies that hinder the aggregation of those data into more comprehensive models. Geographic Information System (GIS) and Data Management System (DMS) platforms which enable this kind of aggregation were also uncommon and (until recently) very expensive.
- **Collection of Exposure Data with Participatory Mapping**. In many places, there is no geospatial database of the built infrastructure that aggregates key attributes about its locations as well as its attributes (e.g., vintage, construction materials, elevation, and number of stories). OpenDRI works with communities to build this asset database from the bottom-up using low-cost participatory mapping techniques, where collection and curation of the data is done by the communities that those data describe.

Aerial imagery collected by World Bank and Rochester Institute of Technology, 2010. Map of Cite Soleil, Haiti, CC-BY-SA, OpenStreetMap 2014.

- **Catalyzing Open Data Ecosystems**. The development of a community around DRM data is critical for fostering information sharing, providing training, and creating the network of analysts who become the primary users (and sustainers) of risk data. This work includes building a community of technologists and organizers who build applications and tools using risk data. It also includes funding innovation labs to incubate the technology community, as well as creating risk communication tools that raise awareness of the potential impact of disasters that have not occurred in living memory.

OpenDRI also relies on parallel but separate efforts around improving the modeling of natural hazards, including weather forecasting and mid-term meteorological/climate forecasting. It also relies on cross-support from peers in risk assessment and modeling, who can take data curation that is at the core of OpenDRI and turn that information resource into actionable recommendations around risk management. *Note*: Risk Assessment is not part of OpenDRI.

The Methods by which OpenDRI performs this work are the subject of the next section of the Field Guide.

OPENSTREETMAP

The OpenStreetMap community provides a free and open map of the world. With over 1.5 million registered users, it mobilizes members to collect data at the local level with handheld GPS units and paper maps. It also mobilizes its members to trace overhead imagery.

OpenStreetMap is a confederation of organizations and technologies. OpenSteetMap.org is a database with over 2.2 billion map "nodes" hosted by Imperial College, London. The OpenStreetMap Foundation is a UK charitable organization which oversees the state of the map. The Humanitarian OpenStreetMap Team is a US non-profit corporation that applies the "principles of open source and open data sharing for humanitarian response and economic development." HOT provides support to emergency operations and training around the collection of mapping data in communities at risk.

OpenStreetMap iD Editor, Cite Soleil, Port-au-Prince, Haiti.
Credit: OpenStreetMap, 2014 under CC-BY-SA.

FROM DATA TO DECISION

The process of moving from the collection and analysis of open data to driving decisions off the data is a jump that can be difficult to make. The OpenDRI team has observed three areas where this chain of moving from data to decision is beginning to happen.

1. **Impact Modeling**. Using the data from community mapping, hazard models, and open government data (demographics, inafrastructure, etc), it is possible to use impact modeling tools like InaSAFE (see page 79) to visualize the likely impacy of a hazard on schools, hospitals, major population centers, and other scenarios. The Province of Jakarta in Indonesia has used this method for monsoon emergency planning.
2. **Damage Loss Calculation**. Based on the attributes collected by community mapping (building types, use, footprint, materials, etc), it is possible to calculate the approximate value of hundreds of thousands of individual structures in an urban area. In aggregate, these calculations provide a higher-resolution view into potential losses than estimations.
3. **Rubble Calculation**. Similar to the data for damages, community mapping provides planner with a better understanding of the potential volume of rubble that may occur after an earthquake. USAID is using data from Nepal for this purpose.

THE PRINCIPLES OF OPEN GOVERNMENT DATA

The principles expressed at the Sebastopol meeting on Open Government Data capture a comprehensive view of open government data.

- Data must be complete.
- Data must be primary.
- Data must be timely.
- Data must be accessible.
- Data must be machine-processable.
- Access must be non-discriminatory.
- Data formats must be non-proprietary.
- Data must be under an open license or license free.
- Data must have permanence and be findable over time.
- Usage costs must be *de minimus*.

For more background information, see http://opengovdata.org/.

OPEN GOVERNMENT DATA

Some useful references around open government include:

Open Government Partnership: an international platform of open government reformers in 63 countries, including a commitment to "make more information public in ways that enable people to both understand what their governments do and to influence decisions." http://www.opengovpartnership.org/about/open-government-declaration.

G8 Open Data Charter: A set of shared principles around the management of open data for G8 governments. https://www.gov.uk/government/publications/open-data-charter

UK Open Data Policy Paper: An exploration of ways that UK government is building transparency, access, and trust around open data. https://www.gov.uk/government/publications/open-data-white-paper-unleashing-the-potential

US Open Data Policy: hosted on GitHub to foster collaborative editing, the US Open Data Policy outlines specific metadata standards and procedures for use across federal agencies. http://project-open-data.github.io/

3

METHOD

OpenDRI's mission is to support larger DRM initiatives in a country (such as risk assessment and preparedness) by creating the living data ecosystem necessary for ongoing disaster risk management. That said, OpenDRI is not itself a comprehensive approach to risk assessment. Instead, it is an evolving set of practices that can be configured to meet specific needs. Because no two countries face the same exposure to natural hazards and climate change (or practices around curating disaster risk data), OpenDRI starts by considering the local context.

OpenDRI approaches the problem of collating, collecting, and catalyzing open data as a matter of customizing an effort to both meet local needs and support broader DRM strategies. The method is designed to start in areas where government clients are committed to a DRM agenda and are ideally ready to engage with open data principles and expand to other challenges as those clients are ready.

The OpenDRI Team has learned to ask deep questions to see if partners are ready for the challenge of collecting, assessing, and curating data about the built environment. Risk data is inherently spatial and requires substantially more care than non-spatial data through its life cycle. The team is considering developing a diagnostic tool to capture tacit knowledge of the specialists who have implemented OpenDRI in challenging environments.

The two core elements of the current diagnostic are common across many open data projects:

1. Identifying champions who are already trying to perform this work and are positioned to enable OpenDRI to connect to necessary resources and people.
2. Defining a clear use case for open data by listening to the champions and other partners.

Photo: OpenStreetMap training, Indonesia.
Credit: Abby Baca, The World Bank, 2013.

Phases & Practices Roadmap

Three Typical Designs

A Collate
Data exists but needs to be integrated across ministries

B Collect
Data does not exist and must be collected

Scoping

Identify local champions for open data, and design the work plan.

Work Plan

Identify Use Case

Ask what analytical problems need to be solved and what data are necessary to perform analysis

Mobilize Champions

Identify the chief supporters for open data

Survey Existing Data

Determine what data is available from stakeholders

Design Project

Collaborate on a design for OpenDRI

Personnel

- OpenDRI Specialist
- Local DRM Specialist
- Risk Assessment Specialist

A Collating

Catalogue and standardize the data that governments already possess, but have not yet made accessible to a range of partners.

Work Plan

Scope	Campaign	Build	
Define what data is needed	Recruit stewards of needed data	Create a data catalogue	

B Collecting

Develop a network of local citizens to collect and curate new data about the exposure of their communities to natural hazards.

Work Plan

Scope	Import	Build Tools	
Define the area to be mapped	Build on existing data	Compile Field Papers maps and forms	

A + B Collate + Collect

Connects top-down and bottom-up efforts, integrating existing data and collecting new data.

Personnel & Partners

- Local Champion
- OpenDRI Specialist (Catalogue)
- Data Catalogue Support Firm
- Data Curator

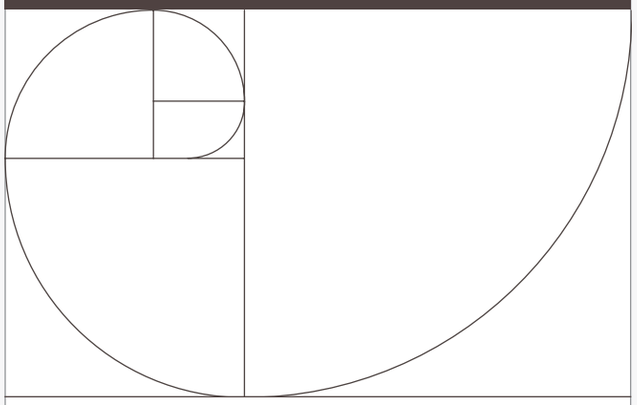
Prepare	Release	Catalyze
Collate and cleanse data	License data for open use	Train and empower users

Personnel & Partners

- Local Champion
- OpenDRI Specialist (Mapping)
- University Partnerships
- Innovation Lab or Logistics Firm
- Science/Engineer Support Firm

Collect	Enter Data	Check Quality
Collect data from the field	Densify the base map	Close the gap between actual and expected

Catalyzing



Build the community of practitioners around OpenDRI who apply open data to DRM.

Work Plan

Create Open Data Working Group

Found Innovation Lab

Integrate Partners

Demonstrate application of data with risk communication tools

Personnel

- Community of Practice Manager
- Innovation Lab Firm
- University and International Partners
- Risk Communication Tool Developers

IDENTIFYING CHAMPIONS

OpenDRI is a process of changing minds about traditional approaches to data. The work is rarely easy or straightforward. Opening data for wider use can raise issues of fear, create uncertainty, and break power structures around the control of data flows.

When OpenDRI is invited into a new site, it starts by empowering the local champions who have already been trying to address these challenges—often without the authority, resources, or convening power to bring the whole system together on their own. Rather than introduce an external power dynamic to an already complicated situation, the OpenDRI team listens to these champions, identifying the constraints, challenges, and fears of those who hold data. These conversations often center around two groups of questions:

Inside Government: What factors will drive or constrain the release and integration of existing data that is fragmented across ministries and the organizations that are supporting the ministries or managing their own operations around DRM?

Additional Partners: Within the country's OpenStreetMap community, local/municipal governments, universities, UN agencies, start-ups, and other development partners, what factors will drive and constrain the collection of new data and the curation of those data by the communities that the data describes? How open are these data? What studies by universities and science agencies have been published and what recommendations did they lay out?

DEFINING A CLEAR USE CASE

The use cases for the data drives each implementation of OpenDRI. They provide the reason to collect, cleanse, and open data. The use cases are also the engine that drives a community to contribute to a common goal. They provide the reasons for the community to continue to care about the data long after the OpenDRI project has ended its formal implementation. Each use case contains a scoped analytical problem that a client needs to solve around DRM. These might include:

- **Retrofits**: Where should a government invest in retrofitting municipal structures? Which schools, hospitals, and municipal buildings are most exposed to the hazard or hazards that are most likely to impact the region?
- **Emergency Preparedness**. Which areas are most likely to flood and what are the best evacuation routes? Where should shelters be sited? Which populations will be most affected?

OPENDRI PROCESS

While each OpenDRI engagement is customized to the situation, they tend to unfold in similar ways:

1. **Scoping Mission:** face-to-face meetings with officials to determine who will champion the effort, what the use cases are, and how ready the client is to engage in an open data project. This mission will also determine if the client needs to collate existing data, collect new data, catalyze an open data ecosystem, or some combination of the three.
2. **Collating Existing Data:** working with governments and other partners to aggregate, cleanse, and release data sets that they already curate.
3. **Collecting New Data:** working with communities to collect new data about their exposure to natural hazards.
4. **Catalyzing:** building a sustainable ecosystem around open data is usually a matter of catalyzing activities around the application of the newly available data to decision making. When data solves problems, it remains vital and current. When data is pushed into silos, it becomes stale and rarely used.

ALIGNMENT WITH HYOGO FRAMEWORK FOR ACTION

The *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters* (HFA) defines the agreement that the international community is pursuing to reduce losses from disasters "in lives and in the social, economic and environmental assets of communities and countries."

OpenDRI provides a mechanism for countries to address several priority actions under the HFA:

Identifying and Assessing Disaster Risks
Teaching local nations how to collate existing DRM data and collect new data about the built environment contributes to creating the infrastructure for national and local actors to "research, observe, analyse, map and where possible forecast natural and related hazards, vulnerabilities and disaster impacts." OpenDRI also creates an open exchange for these data and fosters *in situ* geospatial capabilities. (HFA III.B.2.iii).

Building a culture of safety and resilience at all levels
Fostering a well-informed populace requires dialogue between local and international stakeholders based on relevant and current information about their risks. OpenDRI creates a platform for the collation and collection of spatial and statistical data as well as a forum for building a network of stakeholders around the application of open data to disaster risk reduction. (HFA III.B.3.i)

Strengthening disaster preparedness for effective response at all levels
Effective response requires coordinated action from preparedness to response and recovery. OpenDRI fosters partnerships across sectors and communities around the creation of data necessary for identifying and preparing for disasters.

OpenDRI strives to change the culture around risk thinking so that is it based on locally-generated data, curated by local officials and communities, and translated into local action. The availability of this data helps local actors identify, mitigate, and prepare for disasters. It also provides the baseline data required for interdependent, coordinated action between international agencies. For these reasons, OpenDRI is one approach to fostering local resilience within an interdependent, international, multi-agency partnership, where control of the initiative rests with national ministries.

For more information on the Hyogo Framework for Action, see http://www.unisdr.org/we/coordinate/hfa.


1 Description
1 Use Cases
3 Goals
1 Interested Parties
3 Wireframes
3 Technical Diagrams
IT Assumptions
IT Requirements/Prerequisites
Feedback/Discussion
State (Needs "*")
Prior Art
= links

4

SCOPING

Existing OpenDRI projects have not been standalone efforts, but instead have been components of larger DRM initiatives. In each case, the country context has provided an environment where a network of partners were ready for the challenge of collecting, assessing, and curating data about the built environment.

The two most important factors for success are to find the champions who are already trying to perform this work and to define a clear use case for open data.

Assessing the readiness of this network of partners for OpenDRI requires a scoping mission (site visit) that looks at the country content across the four areas that fuse into OpenDRI:

1. **Open Government Risk Data**. What data does the government collect about natural hazards, the built environment, and other risk factors? How does the government collate, coordinate, and analyze this data? How is this data made available to other parts of the public and private sectors?
2. **Open Mapping and Technology**. What is the status of the open mapping community in the country? What are the coverage (extent) and accuracy of the mapping data? What kind of open technology community exists to turn mapping data into useful tools?
3. **Risk Assessment and Communication**. What kind of hazard and risk assessment does the country engage in? Who is responsible for risk assessment? How do risks get communicated to the public and how does the country track how the public uses this information?
4. **Hazard Monitoring, Modeling, and Communication.** What is the status monitoring of major risks (including weather forecasting)? How does the country communicate those risks?

Based on this scoping mission, the OpenDRI management team will work with the client to customize the project to local needs.

GFDRR Labs founder, Stu Gill leads a design meeting.
Credit: Abby Baca, The World Bank, 2013.

SCOPING MISSION OBJECTIVES

The scoping mission assesses the readiness of government and community to engage in the systematic management of data around the threats that a region faces from natural hazards. In many ways, this process will always need to be customized to the context. For thousands of years, cultures have faced a unique blend of hazards with designs and tools that reflect local beliefs. With rapid urbanization, globalization, migration, and population growth, many of these traditional ways have come under strain. That said, these approaches are familiar and trusted. OpenDRI missions often begin with problems that reflect the areas where societies are ready to make adaptation, providing a pathway to understanding how new techniques and technologies can be fit to local contexts, beliefs, and practices.

With this need for customization and sensitivity to local context, OpenDRI tends to start from a practical problem that can be solved in the immediate future. The scoping mission looks for the champions and works with them to find how possible it is to build the basic feedback loop of OpenDRI using existing data on hazards and exposure, combined with existing models around vulnerability and risk.

In most countries, it will not be possible to aggregate hazard and exposure data from existing datasets. (That said, in countries with sufficient data, the scoping mission team can work with the ministries to develop customized training programs oriented at connecting them with more advanced risk analysis).

GFDRR is developing a diagnostic tool to aid in understanding the readiness of a client country for OpenDRI, focused on assessing each component of the open data process. This tool will complement the existing World Bank Open Data Readiness Assessment Tool, which focused on general aspects of data management versus the more specific DRM data practices.

Staffing the Team

The scoping mission team should be multi-disciplinary, drawn together from the partners that will be sponsoring the project and connected to the contacts/early adopters in the host government. In most situations, the team will include:

- **OpenDRI Deployment Specialist**: surveying the open data ecosystem around the DRM cycle requires experience and expertise. The OpenDRI specialist will build relationships, identify early adopters, and establish the context for an OpenDRI implementation. He or she will lead the design phase and be responsible for building the diagnostic report.
- **Regional/Country DRM Specialist**: OpenDRI should be one component of a larger country and/or regional DRM strategy. The scoping mission should include a DRM specialist who can incorporate elements of the local and regional strategy, and connect local partners to resources from other OpenDRI or DRM/DRR activities.

In an ideal situation, the team may also include:

- **Risk Assessment Specialist**: some countries may require specialized technical assistance in risk assessment, modeling, and data curation. Such missions should include a risk assessment specialist.

This scoping mission team will likely form into the OpenDRI Leadership Team, which would be composed of the OpenDRI Project Lead (often filled by the Deployment Specialist), the Regional/Country DRM Lead, and other related positions from the region or practice area.

WHAT AND WHY: DEFINING THE MISSION AND USE CASE

The scoping mission team should start by building consensus around the purpose of the trip and determine who will be the primary starting points for seeding the effort. When possible, it is desirable to perform much of this work ahead of travel.

Strategic Intent

The team should explore what outcomes OpenDRI might create in the country context. In some countries, the objective may focus on the aggregation of data that is spread across many organizations. In other countries, the data may not exist at all and may need to be created. Defining the outcomes will focus the interviews and open the opportunity to explore avenues that might otherwise remain unknown or poorly scoped.

WHO: CREATE AN INITIAL LIST OF CONTACTS

OpenDRI generally begins with a request from an official at a government ministry. This champion should be able to guide the Scoping Mission Team on who to talk with. Such entities might include:

Government Ministries

Which government ministries are involved in the DRM cycle? It may be useful to create a matrix of the hazards that the country faces with the datasets that often accompany the study of these hazards.

Incubators/Tech Community

Is there a logical place to host OpenDRI within government or non-governmental actors? What incubators exist and how well connected are they with the tech community?

Existing OpenStreetMap Community

What is the state of the existing local OpenStreetMap (OSM) community and its leaders? What does the map look like? What are their strengths and constraints? How would capacity building change the OSM community?

Universities

Which universities have a geomatics or GIS department? Which have civil/structural engineering?

Civil Society Organizations (CSOs)

What CSOs exist in the areas which need to be mapped? What capacities do they have?

Private Sector

What private sector entities are involved in the collection, curation, and sale of data within the DRM cycle? Some countries contract with outside entities to be stewards over datasets, such as hospitals, schools, and critical infrastructure. What license has the government negotiated for this data?

HOW: SURVEY THE ECOSYSTEM FOR OPPORTUNITIES AND CONSTRAINTS

The OpenDRI mission team should set about building connections from the initial list of contacts. The primary purpose is not to sell OpenDRI; it is to listen to problems and think about appropriate solutions, many of which may not be solvable with the OpenDRI approach. OpenDRI fits best in context which are ready for it and where it will address immediate problems.

Determine the Fit

Client ministries and the offices of international organizations/development partners at the regional and country levels set strategic objectives that may include risk assessment, disaster preparedness, mitigation, post-disaster needs assessment (PDNA), and recovery. OpenDRI can fit into each part of the DRM cycle. For the World Bank, regional DRM leads will need to determine if and how an OpenDRI project fit into broader DRM agenda.

The key step in determining if OpenDRI fits into strategic intent is to listen. Listen to the potential partners and the problems they are having managing risks from natural hazards. Where do they want to start? What politics and constraints are they facing and why?

Assess Government Support/Constraints

Key questions about open data

- Are government ministries selling data? If so, to whom and what kind of revenue are the data generating? Is the sale price of datasets for DRM being kept to the minimum possible?
- Who are the early adopters who are willing to share data? Why?

One of the biggest impediments to opening data is the practice of selling government data. The scoping mission team should ask—are ministries selling data that are core to risk assessment: satellite imagery, maps, demographic data, cadastral data, hydro-met data, etc? What support is there for opening this data? Are there legal constraints or regulatory issues? Privacy issues? If so, are there ways to work through those issues and lawyers/legal advisors who are willing to build solutions instead of putting up roadblocks? Is it necessary to compare the potential loss of revenues from data sales against a financial model that shows the potential effects of opening the data (e.g., the likely impact of risk reduction investments that would occur if the data were available)?

Survey Data Sets

While donors may not intend to fund the collection of duplicative datasets (at least not intentionally), this activity happens frequently for a variety of reasons: licensing of existing data may not allow for reuse or derivative works, no one may know of the existence of the data, the data may be of poor quality, etc. The scoping mission should work to find data sets that already exist within government.

Assess Open Technology and Mapping Community

Another set of tactics around creating open data for resilience centers on harnessing the energy of the open technology and community mapping communities in a client country. By analyzing the efforts of university departments, civil society groups, and the open-source software/community mapping communities, the scoping team can find new avenues for expanding data sets as well as applications that make those data useful to a wide audience.

Community mapping efforts work best when situated in an existing community organization that can act as a sponsor. In places where such organizations exist, the scoping team should explore the readiness and enthusiasm in those organizations for hosting community mapping. In places where no such organizations are ready or willing to help with community mapping, the scoping mission team should look for ways to harness or create an incubator/innovation lab to catalyze the development of both community mapping and open technology communities.

Leadership

The leaders of open technology efforts span a wide variety of leadership styles and capacities. It is critical for the scoping mission team to identify and meet with these leaders to determine if they are aligned with the values of the effort and if they have the leadership and management capacity to administer a complex project. In some cases, leaders may need training in a specific area; the scoping mission team should note this need and plan to provide it as part of the training curriculum in the design phase. (It may be important to think about ensuring that leadership is spread among a number of individuals).

Organizational Capacity

To write a contract to support an effort, it may be legally necessary for the organization to be incorporated or formed into an entity with the authority, governance, and fiduciary structures to commit to performing certain actions and receiving money, and providing a clear account of work performed. The scoping mission team should inquire into the status of each open technology organization. Is it incorporated? Is it capable of receiving funding from the government or international institutions? How capable is it of performing on contracts? What training do members need?

Community Mapping

OpenDRI encourages the collection and curation of data about the built environment to be in open platforms; OpenStreetMap is one widely used example. The scoping team should determine what platform is going to be best in a particularly context. This will entail inquiring into the coverage and accuracy of existing data, while also analyzing the curation capacity. The political and security context will also play into any decision to collect data with community mapping.

Assess Sustainability

Sustainability is a function of the breadth of institutions that require data to drive decisions. The scoping team should look at the capacity of this ecosystem of users to use and subsequently fund the curation of the data over time. Sustainability may require thinking how data might catalyze social entrepreneurs who can build services using the data, as well as non-profits that can provide services to those who need to collect more data over time.

Assess Risk/Impact Modeling Partners

To determine the data structure for field surveys about the built environment, it is often prudent to build partnerships with structural engineering, architecture, and other risk assessment partners. The scoping mission team should inquire into potential partners and determine the fit with the project. What kind of data do they already have? Will such firms make past, current, and/or future data collections open?

Assessing Readiness

When the team arrives back from its mission, it must build a set of recommendations about actions. Is the context ready for OpenDRI? Who will be the primary partners, and what will be the use cases that drive that partnership? Who has invested in DRR/DRM activities and at what funding level?

Building a Budget

While number can vary widely depending on the country context, GFDRR will be publishing a budget template that categorizes costs based on previous experiences.

Convene Open Data Advisory Working Group Meetings

It is important to keep the process of engaging and developing relationships among the early adopters between the scoping mission and the design and pilot phases. The scoping mission team should convene meetings of an open data working group. In some cases, this has been done online via voice over IP (VOIP) calls, such as Skype. In many contexts, these meetings are led by a local country representative. These meetings can provide a forum for discussing online issues, exploring ideas, and generating connections between members of the community who might not otherwise know each other.

OUTPUTS

The key outputs from the work after the mission are a mission report, a diagnostic report, and a concept note.

Mission Report

The Scoping Mission report captures the narrative experience of the team, as well as their analysis of the use case and recommended actions.

Diagnostic Report

The Diagnostic Report is a tool that will be used to assess if a country is ready for OpenDRI. GFDRR is preparing the first draft of a diagnostic report for release in mid 2014.

Concept Note

The Concept Note describes the DRM context of the proposed OpenDRI project, the key problems to be solved (use case), the proposed plan of action, schedule, and estimated budget.

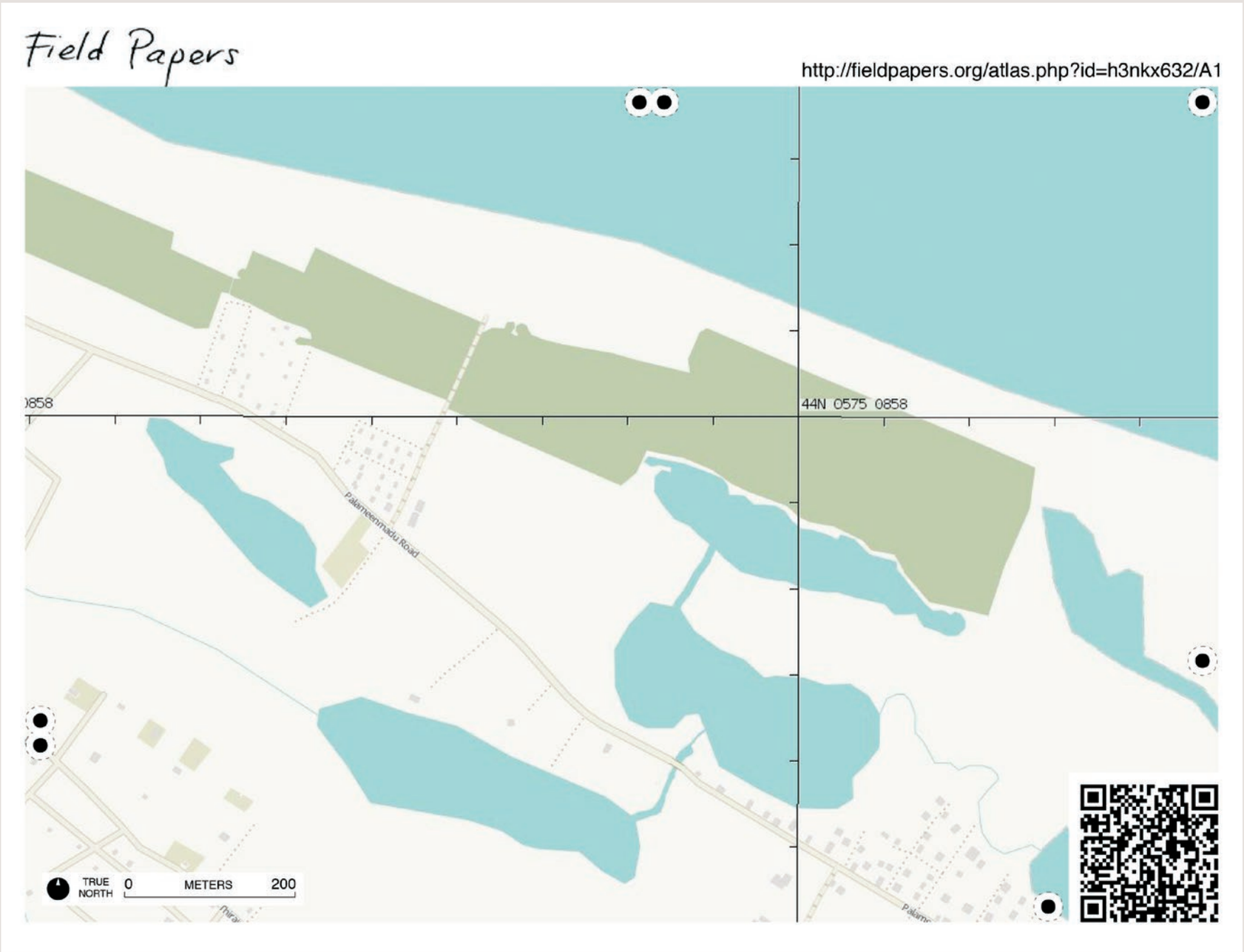
SRI LANKA: SCOPING MISSION

In November 2012, the Open Cities team and the local GFDRR DRM specialist started to pilot Open Cities activities in Sri Lanka. This ongoing project is taking place in an environment that is both ready for open data and facing significant data-sharing challenges. Geographic information on asset exposure and vulnerability data sets (such as a road networks and schools) is fragmented among ministries that have historically sold them to one another and to a range of international organizations, each of whom has its own data management system.

The Open Cities consultant, the local GFDRR DRM specialist, and a champion in the Disaster Management Centre (under the Ministry of Disaster Management) sought to develop a work plan and to establish an open data working group to support the project. Toward that end, they met with the National Survey Department, Department of the Census and Statistics, Nation Building Research Organisation, Information and Communication Technology Agency, Department of Meteorology, several universities, UN agencies (Office for the Coordination of Humanitarian Affairs and UNDP), the local World Bank team, and country offices of donors (USAID and the Japan International Cooperation Agency).

The DMC champion, the local GFDRR DRM specialist and the Open Cities consultant worked together to form the Open Disaster Data Advisory Committee, which would establish policies, practices, and standards to facilitate data sharing between government agencies and would also open the data to the public. These parallel tracks have led to two activities, both of which are now being implemented in Sri Lanka. The first is the deployment of a GeoNode as a data catalogue. The second is a pilot project that engages the community of Batticaloa in areas at high risk to floods in collecting exposure and vulnerability data (building footprints and their basic structural attributes) using OpenStreetMap.

The GeoNode can be viewed at http://www.riskinfo.lk, and the community mapping data can be seen through http://openstreetmap.org and RiskInfo. Sri Lanka is also working with the World Bank DRM team to develop a work plan that would support a larger DRM initiative related to urban risk in several river basins in Sri Lanka. It is also working with UN teams to support ongoing capacity building for disaster management.



FIELD PAPERS

Field Papers allows anyone to print a paper map of a region, write on it, and scan it back into a GIS using any camera or scanner, including cell phone cameras. The QR code in the lower left corner contains all the geographic information necessary to upload the map into an OpenStreetMap editor and any trained mapper can trace the annotations into OpenStreetMap.

The photo on p. 32 shows a mapper in Batticaloa, Sri Lanka annotating an A3 size map akin to the one shown above.

OPENDRI FRAMING QUESTIONS

The GFDRR Labs team is building a diagnostic tool to capture the questions in a questionnaire that could would be submitted as a report from the Scoping Mission. This diagnostic tool will be available in mid 2014. As an intermediate step, the OpenDRI team has assembled some of the questions that they commonly ask when performing scoping missions. Because each engagement must be customized to context, so must the questions be customized to the unique needs of the place and time.

Determining how ready a given country context may be for OpenDRI entails exploring four general classes of questions: *What*, *Who*, *How*, and *Why*? What specific use cases OpenDRI would pursue to meet DRM objectives and what data sets are necessary to support those use cases? Who curates the data to support the use cases or who would collate or collect those data? How do those entities manage those data, including any policies or laws around those processes? How would the client country's ecosystem would sustain the initiative? Why is OpenDRI the right method to support the larger DRM program in the country?

What

1. What are the DRM challenges that need to be addressed in the country?

- **Inventory of Hazards**: what hazards does each region of the country face? How is climate change affecting those hazards?
- **Inventory of Exposure**: What is the exposure of the country to various natural hazards and climate change? How is the exposure of the country to hazards changing in relation to the changes in socioeconomic shifts and climate change?
- **Inventory of Socioeconomic Indicators**: how fast is the country's population and built environment changing in each of its regions?

2. What DRM initiatives are being implemented or planned to address these DRM challenges?

3. What use cases and programmatic DRM goals would OpenDRI support? How would OpenDRI fit into these larger DRM initiatives?

4. What policies and laws govern the use of the datasets to support the use cases, as well as the processes/practices around collation, collection, and curation of these data sets?

Who

Who are the stakeholders to the use cases for open DRM data? What are their agendas and priorities? How well do these agenda align with the overall DRM goals of the country office, region, and/or sector?

Collating Existing Data

Who are the key government champions? Who are the key stakeholders in the broader ecosystem? Who are the gatekeepers? Who are the opponents?

Who owns the key datasets for supporting the use cases? Is there sufficient data to answer the analytical questions raised within the use cases? If stakeholders collectively have sufficient data to support the use cases, which will make it available? What are the usage restrictions? What is the level of stakeholder support for open data?

Collecting New Data

Who are the key members of the mapping community? Who owns the datasets the support the use cases and under what licenses?

Who are the members of scientific, engineering, and survey communities that current supply data to the stakeholders?

Who trains community mappers in the country? What capacities do they have? How would capacity building change these organizations?

Catalyzing an Open Data Ecosystem

Who runs the co-working spaces and innovation labs in the country? What capacities have they demonstrated and how would new capacities change the spaces? If no such spaces exist, what capacity exists to create them within local organizations?

Who are the key leaders in the open technology community in the country? Do they have capacity to absorb funding or participate in an innovation lab around DRM challenges?

Who teaches geography/GIS/geomatics courses in the country? Who are their alumni and how could these alumni be mobilized? Who are the students and what additional training would be needed to mobilize them?

How

How do the stakeholder make decisions based on the current data: models, rules of thumb, etc.? How do they know they have sufficient data to make these decisions? What data do they need to drive these decisions and models, when, and why?

How do the stakeholders set policy around open data? What laws are in place? What open government initiatives are in place? How would OpenDRI integrate with these initiatives? By what processes would the stakeholders need to release existing data?

Collating Existing Data

How do the stakeholders curate the data sets that support the use cases? How do they aggregate data from local levels and then provide better data back to these local sources? How would they envision improving or rethinking this feedback loop?

How do the stakeholders currently make the data findable and manage metadata? What processes and practices do they use? How would the stakeholders host a data catalogue?

How do they manage data quality? How do they know data are accurate or identify inaccurate data? What policies are in place around minimum data quality and staleness/age?

Collecting New Data

How would community mappers collect data? For field surveys, how would they collect data: paper, tablet, or smart phone? For remote mapping, how will they get access to overhead imagery?

How will community mappers sustain their efforts? What organizational design and funding model might work in the local context?

Catalyzing an Open Data Ecosystem

How does the local open technology community sustain itself? How do they coordinate efforts? What channels do they use to communicate? How do they mobilize volunteers? What cultural traditions should be followed around supporting volunteers (meals, transportation, etc)?

Why

Why is OpenDRI the right approach to support larger DRM initiatives?

Collating Existing Data

Why is OpenDRI the right approach to collating and releasing existing data? How will OpenDRI enable local actors to release their data? What data will be open and what data needs to be available within a bounded community?

Collecting New Data

Why is OpendRI the right approach to collecting new data in communities? How would OpenDRI enable these specific communities and client ministries to collect better data versus traditional survey techniques?

Catalyzing an Open Data Ecosystem

Why is OpenDRI the right approach to mobilizing group resources?

5

COLLATING EXISTING DATA

OpenDRI works with partner institutions to solve a core problem: how to catalogue and standardize the data that governments already possess and build an ecosystem where these data can be found and used by a range of partners.

When ministries or international organizations collect information, it often gets stuck in a black hole: a place where it may be useful within a small orbit, but invisible to the rest of the universe. Until institutions both organize information in a systematic manner that can be shared with others and create tools to make the information useful to others, information's power remains underutilized or even latent.

OpenDRI has piloted methods and platforms to collate datasets within and between institutions that work across the DRM cycle. These efforts center on helping ministries open data sets to wider orbits of institutions, with the preferred approach being to make data both legally and technically open. The collation phase centers on building this open data ecosystem around a free and open-source data catalogue (e.g., GeoNode). The following guide to collating data builds on experiences in approximately two dozen countries.

LISTENING TO CLIENT PROBLEMS

The design of OpenDRI starts from a difficult reality: collating data is huge challenge for ministries officials everywhere in the world. Many governments have tried to aggregate and centralize some portion of the data that they generate across the national, provincial, and local levels. These efforts have often failed for several reasons:

- **Control**: the perceived loss of control that proceeds making data available beyond its originating agency; and
- **Funding:** the perceived loss of potential revenues from selling the data to interested parties, including other ministries.

Nepal, Kavre Valley school construction, 2008.
Credit: John Crowley, 2008.

Creating an Open Disaster Risk Management Data Catalogue

1 Scope

Define the project scale and put a data template in place

Use Case

To identify which school buildings and health facilities are in greatest need of seismic retrofitting.

Data Template

Main Categories	Input Datasets
Administrative Area	
	Provincial Boundaries
	District Boundaries

Define Use Case

Clearly delineate the use case and scope of the project. Define the analytical problem and measure the curated data against it.

Create Data template & Questionnaire

The template is a spreadsheet of categories to align with collected data, and the questionnaire is a way to collect information from stakeholders.

2 Campaign

Forge the connections that ensures project partnerships

Perform One-on-One Interviews

Interviews represent a grassroots campaign for open data. There are three benefits to this approach.

1. Collect information from stakeholders.
2. Get a commitment from ministries for open data sharing and participation.
3. Build trust and forge relationships.

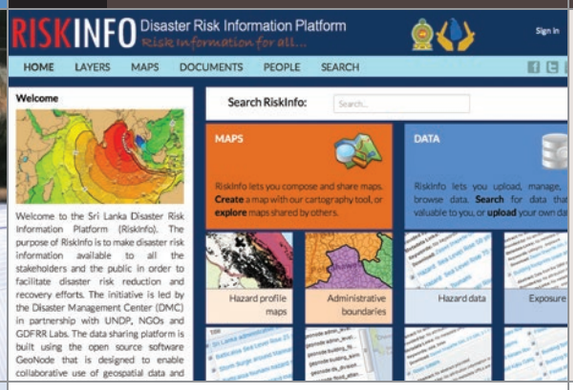
Organize an Open Data Working Group

The working group owns the methods and practices for an open data node, and sustains the long-term goals of the endeavor.

This organization is also sensitive to political concerns and is instrumental in advocating for open data sharing between ministries.

3 Build

Create a node and hire a curator to populate it with data



Build a Data Catalogue

Carefully determine the node architecture. Does it start out as a single node, or a federated collection of nodes between ministries?

Identify a Data Curator

The data curator is the point person for collecting, cleansing, and uploading data into the node.

The role requires a technical background in geographic information systems, and often a deft political sensibility while working with various stakeholders.

Data Curator

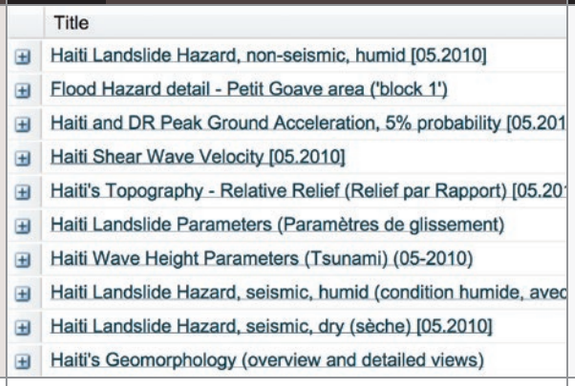
Open Data Working Group

Co-Design the Project with Open Data Partners

Early adopters function as champions and sustain the project in the long term. In general, ministries and partners will have a set of problems that can only be solved by aggregating data. It is thus important to listen to and design in full partnerhip with this open government data community. In the interest of creating a scalable practice, a node also involves creating the policy/legal environment where the data and a community of practice can benefit from an open resource.

4 Prepare

The curator collates and cleans the data



Collate the Data

Take the template adopted during the scoping phase and populate it with functional data.

Describe the Data

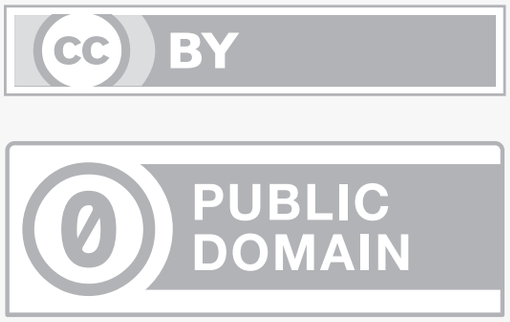
Document essential details about how the data was created and how the data should be used in standardized metadata. Capture fitness-for-use and describe the limitations of the data in clear, non-technical language to guide users that are undertaking risk assessments or engaging in risk reduction activities.

Cleanse the Data

Check and correct for old, inconsistent, or non-standard formatting in the data.

5 Release

Prepared data becomes a resource upon licensing and release



License the Data

Explicitly place a license on the data to ensure utility and reinforce a culture of openness for the curated data.

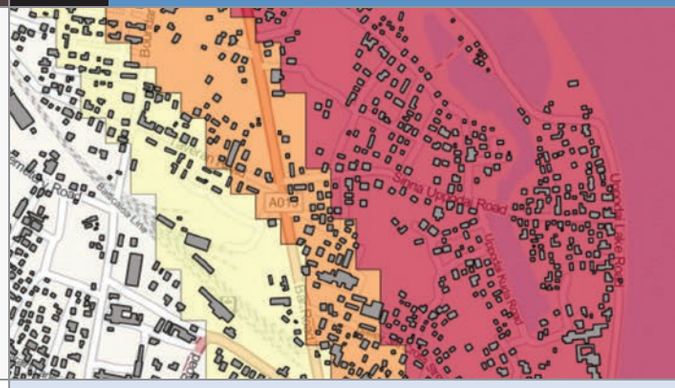
Release the Data

With all the prior steps in place, release the data so that it can become a powerful resource for risk assessment.

The release of data may happen over time, but getting to this step represents an accessible and functional node.

6 Catalyze

Empower the working group to catalyze an open data ecosystem



Connect Data Creators and Users

Create relationships between those who generate data with those who apply it to analytical problems in disaster risk management.

Engage the Community

Listen to the use cases of the stakeholders, generate data that meets those needs, and host workshops that allows users and data providers to discuss how they applied the data to solving a problem.

- **Technology**: tools used to catalogue data have been inadequate to the task, with weak user experience design or network bandwidth requirements (upload and download) that exceed available capacity.

A critical element of OpenDRI's method is to leave data sets under the control and curation of the ministries that created them. Instead of aggregating data into a central repository, OpenDRI can create a catalogue of existing data repositories. Potential users can search data about the datasets (metadata) to find what they need.

OBSTACLES TO DATA SHARING

Despite the potential value of opening data for risk identification and mitigation, countries lack the resources, training, and software to share data for DRM. In many nations, the information necessary to catalyze this type of risk management thinking is blocked by a range of problems:

Fragmentation of Specialists

Risk assessment is a multidisciplinary process, but these experts rarely sit in one organization. Specialization has driven the design of modern bureaucracy towards hierarchies. While this structure is efficient for transactions and coordination of workflows, the flow of information across (and between) organizations can be a challenge. Gatekeepers can prevent the timely flow of information, or may limit it in ways that hinder its use and reuse by others outside the original organization.

Data Fragmentation

Multidisciplinary analysis requires data from across specializations, yet these data are often spread into shards across many silos. They may be difficult to reassemble. They may be in proprietary formats or locked under intellectual property licenses that require expensive payments. Some ministries may charge other parts of their own governments for use of the data, or might even have installed platforms that allow others to access the data but not download it.

Data Duplication

While donors may not set out to fund two or more collections of the same data, the outcome of having closed data is often just that. One ministry may not know what other ministries possess or are currently collecting. This problem becomes more acute when NGOs are involved, as communication across partners is often not as good as it might be. Fusing separate datasets may not be possible, or may be very costly, if the groups are using different standards, software, and practices around its collection and quality assurance.

Data Access/Availability

While policies may allow data to be made available, the data curators might limit access or use of the data to specific parties. In this sense, access is discriminatory: it is only for certain approved entities.

Data Staleness and Incompleteness

Data may reflect best knowledge from an investment made more than decade ago. In some countries, the last census or high-quality map may be decades old. Data about exposure may have never been collected at the level of resolution necessary to use for risk assessments. Data may also be outdated and/or incomplete.

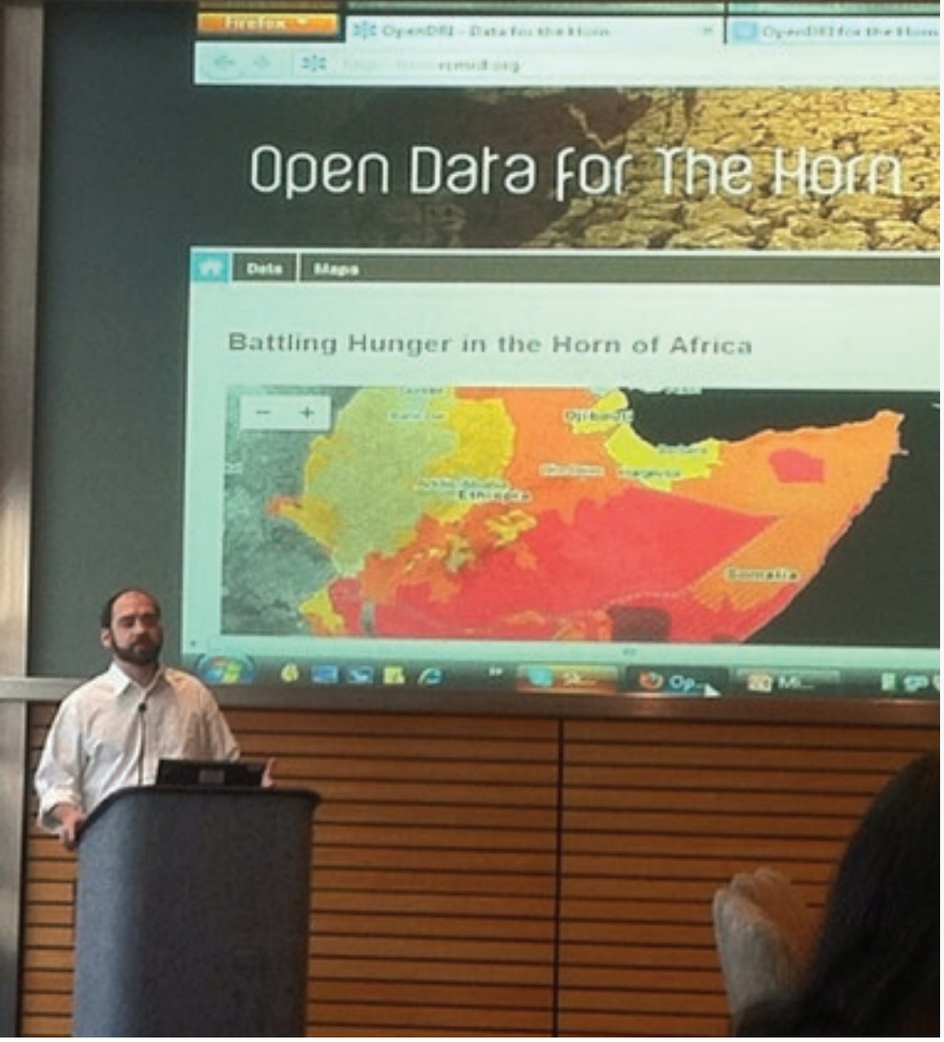
Data can be Expensive to Collect and Maintain

Data about buildings and built environment is resource-intensive to collect and maintain (time, cost, personnel, etc), as can be data about hazards. The stock of buildings and infrastructure changes at the rate of construction minus the rate of destruction, mediated by a range of other factors, including the rapid increase in population, the rate of urbanization, and rapid expansion of informal settlements.

WORKPLAN: DESIGNING THE DATA COLLATION PROCESS

Because of these obstacles, collating government data is both a technical and political process. For this reason, OpenDRI partners with a government counterpart to build the technical infrastructure and to support partners' efforts to lobby for opening DRM data.

OpenDRI provides clients with an opportunity to develop the practices necessary for curating their DRM data. It is mostly a process of building support for the release of existing data and a commitment to collecting new data among a range of actors. The work is mostly about listening to the problems that ministries and partners are having around releasing DRM data, then seeking out the underlying problems. The data that ministries need to make decisions may be hidden behind fears about what the data describe



Open Data for the Horn

Ever since famine ravaged the Horn of Africa in the 1980s, myriad international and regional institutions have monitored the food security situation, including WFP, OCHA, NASA, and the World Bank. While such programs provided ongoing reports, there existed no mechanism to aggregate the underlying datasets into a comprehensive set of maps that enabled collective analysis or exposed gaps in understanding. When the worst famine in 60 years unfolded in the region in 2010-2011, stakeholders lacked a protocol and platform to share and find data they needed to make decisions about both humanitarian action and development investments.

In November 2010, GFDRR Labs hosted a meeting between the major international and regional actors, focused on 1) creating a data catalogue to collate all information and 2) identifying a regional institution host and curate it. Working with the Nairobi-based Regional Centre for Mapping of Resources for Development (RCMRD), GFDRR funded the developed of a GeoNode data catalogue called Open Data for the Horn. This resource provided over 60 dynamic layers ranging from imagery to analytical products like Normalized Difference Vegetation Index (NDVI) and food security maps. In September 2013, RCMRD relaunched the platform.

GeoNode presentation by Robert Soden,
Credit: DevelopmentSeed.org, 2011. Used with permission.

(national security), the accuracy and age of the data (data quality), or a lack of knowledge of how to harness the data for decision making (capacity building in risk assessment). Regardless of rationale, partners will often want to know that they are not the first or only organization to release data.

CORE DATA TEAM

The Collating process general engages the following individuals and firms in the process of building a data catalogue around a stock of open data:

- **OpenDRI Lead (Program Level)**: the lead program-level manager at the sponsoring institution (such as GFDRR Labs), as a member of the OpenDRI Leadership Team.
- **OpenDRI Data Catalogue Specialist (Country Level)**: a consultant hired by the sponsoring institution who works at the country level on the collation of data across national and international partners.
- **Local Champion**: an official at a host government ministry or agency who is the official link into the government's efforts in DRM.

The Data Catalogue Team may also engage three other roles, depending on the context:

- **Data Curator**: a local national who focuses on the collation, cleansing, release, and stewardship of the data catalogue. He or she may be a consultant or occupy a post in a ministry.

- **OpenDRI Knowledge Manager (Country or Program)**: a consultant funded by the supporting institution who manages the Open Data Working Group. He or she will organize workshops, trainings, and webinars. He or she also connects individuals with problems with those who may have solutions, both in country and between countries.
- **Data Catalogue/GeoNode Support Firm**: a firm which supports customization of the data catalogue (often a GeoNode) to local needs and who provides ongoing support, training, and upgrades.

Terms of Reference (ToRs) for each position appear in Appendix A.

THE PRACTICE OF COLLATING EXISTING DATA

1. Design

Based on the scoping mission, the team will have a map of the champions, allies, skeptics, and gatekeepers for data related to the DRM cycle. It is the early adopters who will function as champions. In general, they will have a set of problems that can only be solved by aggregating data. The scoping team should map out these use cases and decide with which ones which will likely form the core of the initial pilot.

Define the Use Case for the Data

The definition of the use case—a method from software development which explores how a system will be used from the perspective of those who will be using it—drives the effort around data collection. The use case maps two things: 1) the analytical problems that a specific client needs to be solved, 2) the reason to collect, cleanse, and open data around those analytical problems. It also provides a clear scope for the data that needs to be collected. By diving into the analytical problem that needs to be solved, the OpenDRI Open Data Specialist and government counterpart can focus conversations with other ministries and DRM partners around data that is critical for risk identification and assessment.

Tip: Government officials tend to need to see use cases for data before they release data.

2. Data Campaign

OpenDRI is not a whole-of-government open data program. Rather, it focuses on opening data around the DRM cycle. An OpenDRI team should design a campaign around obtaining data in specific areas, while keeping an open mind and open ear around data that may be ancillary but valuable to other actors in the DRM cycle. This campaign starts from scoping out the data that would be most useful for the analytical problems that need to be solved and then mapping out the potential relationships that will be needed to obtain that data.

Create a template for data collection.

Data catalogues require certain metadata to create findable open linked data. Based on the metadata from the GeoNode or the data catalogue already in use in the client government, the OpenDRI Data Specialist and government counterpart should build a template around the common metadata that will be needed for certain types of information. These include the geographic extent of the dataset, its age, and the type of risk information it contains.

Conduct One-on-One Interviews

Data is often fragmented across ministries or hidden in a small niche groups of analysts. To find these pockets of risk data, the OpenDRI Data Specialist needs to rely on the government counterpart and the DRM lead for the country to schedule one-on-one (or small group) meetings with representatives from the ministries and DRM partners who might hold important data sets. There are two goals for these meetings. First, to fill out the template so that the effort can begin to build a data catalogue. Second and more importantly, to build trust with the ministries and answer their concerns about lost revenue, reduced control, and costs of data cleansing and release. The meeting should also try to obtain a commitment from the ministry or DRM partner to participate in an Open Data Working Group.

Focus on DRM data, not all data

OpenDRI cannot solve all data sharing problems in a society. It focuses on the issues around the DRM cycle and the datasets that support decision makers around risk assessment, mitigation, preparedness, response, recovery, and reconstruction. The collation of data should center on a) data necessary for solving the use case(s)

DATA CATALOGUES AND GEONODE

When implementing an open data initiative, governments require a platform that enables them to release data sets to both the public as well as more limited audiences. This platform must either be capable of hosting the data, including geographic data, which has special requirements for its storage and visualization, or it must provide a catalogue of other online resources where the data reside. In either case, the platform must make data findable—including data which may be stored at a remote server (usually hosted by the institution that curates the data set).

OpenDRI has deployed a platform called GeoNode to meet these needs in over two dozen countries. GeoNode is a web-based open source platform that facilitates the collation, sharing, management, publication and collaborative use of geospatial data. It packages several mature and stable open-source software projects under a consistent and easy-to-use interface allowing users to share data and create interactive maps. GeoNode includes a built-in map composer and viewer; analysis and reporting tools, geospatial data storage; and data mixing and map creation.
See http://geonode.org/ for more information.

TAXONOMY OF EXCUSES COMMONLY USED TO AVOID RELEASING DATA

At CEBTI Gov 2.0 conference in 2010, Andrew Stott (UK Director of Digital Engagement) led a working group through a discussion of the reasons why government agencies refuse to release data. This taxonomy is based on this brainstorm as well as research for this report.
See http://egovau.blogspot.com/2010/11/reasons-for-not-releasing-data-in.html.

Business Case

- Direct costs of release with vendors
- Direct costs of cleansing data
- Lost Revenue
- Unclear use case

Legal Case

- Privacy
- Licensing
- Ownership/Provenance
- Classification/Caveats/Secrecy
- Sensitivity, whether commercially sensitive or if the combination with other data would make the data sensitive

Organizational Issues

- Lack of Mandate/Authority to release
- Risk to reputation
- Never done it before

Technical

- Data format (paper or proprietary formats)
- Large file sizes
- Bandwidth requirements and costs

Data Quality

- Accuracy
- Age/Decay
- Incompleteness

Fear, Uncertainty, and Doubt

- Fear of misuse
- People would focus on wrong things
- May cause unnecessary public discussion
- People might use out of date copies
- People would get upset

of early adopters, and b) the data sets that ministries are already prepared to release (*i.e*, low-hanging fruit).

Survey Existing Data Sets

While donors may not fund the collection of duplicative datasets (at least not intentionally), entities in country may collect data which already exists. This may happen for a variety of reasons: licensing of existing data may not allow for reuse or derivative works, no one may know of the existence of the data, the data may be of poor quality, etc. The scoping mission should try to find data sets that already exist within government.

3. Build An Open Data Working Group

When data collation is done by an outside organization, trust in the process will be slower to build than when the collation process is owned and managed by the confederation of ministries that curate the data. The Open Data Working Group has been a proven method in Latin America and South Asia for ensuring that methods, policies, practices, and technologies around OpenDRI align with the politics and operational requirements of the institutions that are releasing data. It is common to find that ministries may be willing to open data, but only when they know that they will not be alone in doing so. The Open Data Working Group provides the venue for creating and sustaining this trust.

4. Data Collection

Once the members of the Open Data Working Group have committed to releasing data, the hard work of obtaining the data begins. Any data that does exist need to be converted into formats that can be released via an open data platform and placed under open licenses. Data that is missing will need to be collected.

The bottom-up portion of the OpenDRI Design phase mobilizes the champions for open data and provides a framework for them to connect fragmented resources into a more comprehensive, integrated data ecosystem. Two tactics in this approach are data catalogues (usually with GeoNode) and community mapping (usually with OpenStreetMap).

Aggregating data around the DRM cycle is only partly a technical problem. It is mostly a process of building support for the release of existing data and a commitment to collecting new data among a range of actors. This work often starts by exploring the existing workflows around client decisions and helping the stakeholders map out what data are necessary to support those decisions. By seeing what data need to be assembled to support key decisions, the champions can begin to build political support around one or more use cases for the data.

5. Build Open Data Catalogue

Gathering data from existing archives requires a strategy around aggregating and cataloguing those data. In general, the critical step in this strategy is to implement a data catalogue, which provides a place for all the newly-released data to reside. The design of this data catalogue requires close collaboration between OpenDRI's implementing partners and the Open Data Working Group.

The design of a data catalogue architecture generally begins with a choice: using existing government systems (often proprietary) versus implementing new open systems. This choice needs to be made in conjunction with the client based on several factors:

Client Infrastructure

If the host government has made major investments in building a spatial data infrastructure that uses a proprietary solution, it will likely wish to use OpenDRI as a method of driving additional open data into that infrastructure. If the client has a fragmented ecosystem with several different platforms (or different versions of the same software), a free and open source solution may be ideal.

Compatibility with Web Services

The basic principles of open data require that the complete dataset be available on a public Internet address in an open data format using an open web services protocol (e.g., WMS, WFS). If the current implementation of a spatial data infrastructure does not support web services, it would be prudent to work with the client to build a set of tools that enable open data. More recent versions of ESRI software generally support web services, but the specific version in use will matter.

Extent of Partnerships

Data that deal with hazards, exposure, vulnerabilities, and risks may be spread over a large number of organizations that are inside and outside of government. They may all be centralized in a handful of ministries. The design of the data catalogue will be heavily influenced by the magnitude of the data aggregation/

collation problem. In most cases, OpenDRI will implement one or more GeoNodes for georeferenced data.

Backup Workplan

A data catalogue will contain critical data. It will also link to data resources that are hosted on external sites. It is not uncommon for servers to go down at the very moment they are most needed. There will be certain datasets which will need to be backed up, even if they are curated by external resources (in which case a synchronization plan will also be needed).

Resources

- **InaSAFE Guides**: http://inasafe.org
- **US Open Data Policy Implementation Guide**: http://project-open-data.github.io/schema/
- **US Open Data Policy Metadata Schema**: http://project-open-data.github.io/schema/

6. Hire a Data Curator

Management of the process of data collection is both a technical and social process. OpenDRI works best when a curator is given the task of expanding the adoption of open data and then adding value to the data sets that are made available. This individual (or in some cases, individuals) have been seconded from other institutions, hired on contract, or had the role designated as official government duties. The structure is less important than the legitimacy of the position and the skill of the individual. A ToR appears in the Appendix A.

Archival Workplan

Data catalogues become unusable when analysts need to sort through large amounts of outdated data to find what they need. The Data Curator will need to establish an archival strategy that ensures data freshness. One technique is to tag each dataset with a metadata field for a "data review date" and follow a business workflow to ensure data are recertified as current.

7. Data Collation

A mantra in open data is to always leave data better than one found it. Improvement comes not only in changing the quality of the data, but also in defragmenting it—collating it from many sources into a superset that everyone can use. A key role of the curator and members of the Open Data Working Group is to systematically collate data from many sources and make it findable and useful to the DRM community and general public. This work will require:

- Identifying data sets that are candidates for release
- Negotiating the license under which the data will be released
- Creating and curating the metadata that describes the data
- Cleansing the data and preparing it for release
- Uploading data to storage server and linking that source within the data catalogue

8. Cleanse Data

There is no such thing as a 100% accurate dataset, even in the best managed data centers in the world. In cases where stewardship of DRM data has been spread over multiple institutions and poorly funded, data generally needs cleansing prior to its release. Data that institutions may open during an initial pilot tend to suffer from several additional issues:

- **Open data can be old data.** It may be released from archives where its currency is low and risk to the ministry for its release is low.
- **Data may not have the right schema for DRM analysis**. To analyze how a range of structures in a given area will react to a hazard, an analyst requires data that feed into specific aspects of a model. Data collated from ministries may not have the needed fields or fit the requires schema, so they may need to be collected afresh.
- **Data may need cleansing**. Data is often collected in ways that prevent its use in analysis. Location information may cram all geographical data into a single column in a database, so that GPS coordinates are mixed with postal addresses or even narrative descriptions. Quantitative models need to have information in specific formats.
- **Geographic data may be in another projection**. There are many ways to turn the three-dimensional surface of the earth into a flat, two-dimensional map. These various methods are called projections. Some geographic data may have been collected using a projection different from the ones used in modern web services architectures. OpenDRI has discovered data in old projections that were customized to specific countries and are incompatible with modern projects. It can be a colossal drain on staff time to convert to projections that are compatible with open data.

USAID Development Credit Authority: Crowdsourcing Data Cleansing

In 2012, USAID faced a challenge similar to many ministries: it needed to map the impact of $200 million program whose geographic data had been collected with inconsistent formats. Addresses ranged from just the name of a country or province to full street addresses. USAID also had to deal with a complicated privacy issue. The 177,000 records about the program included personal information that could not be released to the public.

To explore how to solve this problem, the staff at USAID performed an experiment. They timed how long it would take to hand-code fixes to each record, and discovered that this process would take months to complete. They also explored using natural language processing to automate extraction of geographic information from the records. This approach eliminated 40,000 records which only had the country listed and also classified about 67,000 records at the subnational (state or provincial) level, leaving about 10,000 records needing to be processed by humans. Instead of trying to perform this work in house, they attempted something entirely new: they crowdsourced data cleansing.

Working with an international volunteer group called the Standby Volunteer Taskforce (SBTF), USAID worked with the vendor for the US national open data catalogue, data.gov, to build a tool that would allow volunteers to quickly analyze and categorize records. They developed a workplan to have 300 volunteers process 10,000 records over period of several days. To deal with the potential privacy issues, the USAID team

To cleanse the data, it is often necessary to task the Data Curator to prepare data for release and make its metadata available in the data catalogue. The design of the OpenDRI engagement needs to include this work. It also needs to guard against a danger inherent in hiring a data curator: focusing on trying to perfect small datasets at the expense of getting as much data possible available to the community of users.

The process of cataloguing data often means adding detailed metadata. Developing simple, practical standards that everyone can use consistently will work out better than complex standards that can only be catalogued by experts.

9. Data Licensing and Metadata

Open data must be both technically and legally open. Technical specifications for open data formats follow international standards, usually with some extension for local needs. Legal standards generally follow the format of licenses that ensure data remain open over time, especially when a community begins to add value to the original data set and build derived works. The World Bank has established the license for its projects around a set of concepts:

- You can use it freely
- You can re-use it freely
- You can redistribute it freely
- We ask for attribution
- Data may be used for commercial and non-commercial purposes

Other entities have developed their own licenses (US, UK, etc), but generally follow similar formats.

Creating Policies to Manage Open Data

When ministries begin sharing data that has previously been closed, policy and legal question often arise. Some of these issues center on access, privacy, and standards. The OpenDRI team will need consider several questions:

- **Access**. Who can view the data? Do some data need to be kept private for security reasons (such as some data about nuclear power plants)?
- **Privacy**. What the data alone or as a mosaic reveals about others? Do the data reveal information about citizens that needs to be kept private? How can the data be released for DRM purposes in ways that protect citizen privacy?

enlisted the help of the USAID General Counsel's office, which determined that it would not be acceptable to show volunteers any records with full street addresses. In compromise, the USAID GeoCenter and DCA teams negotiated an agreement: they would replace all numbers in the records with a string of x's, thereby making anything viewable by a volunteer accurate only the street name. The General Counsel agreed, and the process launched in May 2012.

The results were far better than expected. 145 volunteers finished the work in 16 hours. USAID worked with GISCorps (a non-profit organization composed of professional geospatial experts) to analyze the results. The accuracy of the volunteers classification was about 85%, beating the natural language processing, which had an accuracy of 64%. In the process, they proved the capability of asking citizens to take a role in preparing data as volunteers. It is a capacity worth exploring for open data initiatives around the world. For a full case study, see USAID's report, With a Little Help from the Crowd http://www.usaid.gov/sites/default/files/documents/2151/USAIDCrowdsourcingCaseStudy.pdf

US Metadata Standards

When the US created an open data policy, its Office of Management and Budget was tasked with building a set of metadata standards that all US federal agencies would need to follow. The Common Core Metadata standards are now available on GitHub at http://project-open-data.github.io/.

- **Standards**. What is the national standard for certain data types? Do ministries use formats that are compatible with each other? What is the cost of translating data from one format to another as it now moves from ministry to ministry and outside partners? If there are problems with standards and data translation, what is the standard that the nation will follow?
- **Metadata**. How can users find the data they need? Metadata provides a common language to describe the data. In this way, experts in various specialties can define their vocabularies and enable others to find the data that they need.

Building Curation Capacity

As data scales in size and interconnection, the challenges of curating it increase. When a system is flooded with high volumes of poor quality data, it becomes far less useful than it was when it started with a few solid datasets. The Data Curator needs to become the steward of the data. He or she will not only add new data, but also remove data that has become stale and cleanse data that contains errors in accuracy or formatting. The Data Curator will need to establish and apply data typologies and hierarchies. The Data Curator will also need to work with the entities that store the data to ensure that multiple copies are archived and synchronized, so that the loss of any one node in the network does not lead to the loss of access to the data. The Quality Assurance capacity and Monitoring and Evaluation around OpenDRI need to be tied to the quality, findability, and usage of the data under curation.

10. Data Release

The release of the data often occurs over time, as the data curator makes it available on a GeoNode or data catalogue. However, GFDRR works with its clients to create a process around the launch of a data catalogue to public view. In general, there are two steps:

1. **Soft Launch**: an early release of the data catalogue to the community of practitioners around DRM data, focused on identifying any bugs or issues with the platform or data before wider release. This phase may be in place for weeks or months.
2. **Public Launch**: the release of the data catalogue to the general public or the audience that the Collate effort has scoped. Public events often include an open data day, hackathon, or other cross-sector activities that draw together stakeholders into a common space.

SCALING DATA CATALOGUES

After early adopters have added data to a data catalogue, the slow process of building a network of users begins. The sign for this work to start is if a Data Curator and partners have loaded data and a user base begins to *use* the data catalogue to solve immediate problems. The usage indicates that the pilot happened in a fertile environment for additional work.

In general, there are three approaches to scaling open government risk data:

- **Expanding the number of data catalogues**. The politics of centralizing data can hinder efforts to scale open data projects. With the advent of tools to link datasets to each other, data catalogues no longer need to be centralized. Instead, they can form a confederation of catalogues. In this way, each ministry can own and curate its own data, and choose what data to make available to whom. The confederation of catalogues might offer other ministries very different access rights than the rights afforded to the general public.
- **Adding data sets to each data catalogue**. Often the initial data sets are limited to information which is considered to be low risk and high reward for its release. Expanding the data available in each catalogue will work towards data which might have lower rewards or higher risks for its release.
- **Increasing interconnections**. As the number of data catalogues increases, the usefulness of the information will drive more interconnections between data. As the density of interlinked datasets increase, so will the perceived value of the network. Each data set can be viewed as a LEGO™ piece. When topography data from one ministry can be combined with meteorological forecasts and river gauge data, flood models can be built to predict flood damage from future events.

In each case, planning how to scale requires considering several factors:

- **Meeting the use cases of partners**. The availability of data often exposes new use cases, many of which may have additional data needs. The Open Data Working Group and Data Curator can explore these emerging needs and work with the stakeholderrs decide which direction to take the additional effort.
- **Building relationships with gatekeepers to other data sets**. Data catalogues often become gravity wells for information: they pull others with data toward growing supernodes. This credibility enables the OpenDRI to locate islands of data which may be considered core to DRM, but may be held outside of government (often survey or GIS firms). Negotiating the release of these data sets has sometimes proven to be relatively easy when there is a place to host the data without cost to the gatekeepers.

GEONODE CORE CONCEPTS

A GeoNode is a data catalogue for geospatial information. Analoguous to the Open Knowledge Foundation's CKAN platform for open structured data, the GeoNode software allows one or more organizations to upload geospatial data sets that comply to open standards to a central location. GeoNodes can also be federated, so that each organization can retain stewardship of their own data sets and open specific data to others from outside the organization via web services.

Layers

Layers are geospatial data expressed in either vector or raster format (i.e., polygons or pixels). Layers store one data set, such as a map of the school building polygons or a satellite image taken on a specific date. Each layer can contain metadata that describe the provenance of the data, its owner, license, and other key attributes necessary for applying that data set in a risk model or when making a policy decision. Layers can also be rated and can allow users to have a dialogue about the data through comments.

Maps

Maps allow users to combine two or more layers (and the associated styles that govern appearance) into composite resources. Maps can pull layers from the local GeoNode, from a remote GeoNode, or via web services from other remote sites (such as an ESRI ArcServer, Google Earth Appliance, or other GIS tools).

Documents

GeoNodes support uploading of documents, such as PDFs or images. Documents can be associated with layers or maps, allowing users to upload reports that describe methodologies used to produce datasets or analyses based on the combination of layers into a map.

Metadata

A GeoNode supports (and strongly encourages) the use of metadata to describe the provenance, accuracy, and other attributes of data. Metadata formats can be configured to use one of several international standards, including ISO 19139:2007 and Dublin Core.

Web Services

A web service allows a GeoNode to import or export data via standard protocols. Layers and maps can be exposed as web services, so that analysts at partner organizations can import the layer or map into their own geographic information systems. A GeoNode can also pull data from remote sites so that analysts can view data from partners in their maps.

GEONODE IN SRI LANKA

To enable better disaster risk modeling, the Government of Sri Lanka partnered with GFDRR, UNDP, and OCHA on the development of OpenDRI. A component of that program was to collate data around hazards and exposure and prepare them to be uploaded into a GeoNode.

Working with the Disaster Management Centre (DMC), the National Survey Department, Department of the Census and Statistics, Nation Building Research Organisation, Information and Communication Technology Agency, Department of Irrigation, several universities, and the international partners, the OpenDRI team supported DMC in the aggregation of data that had been stored in static PDFs, old paper maps, and several databases into a GeoNode, which the Government dubbed RiskInfo.lk.

The data in the RiskInfo.lk GeoNode is currently available to authorized users in the OpenDRI partnership, in preparation for launch. This transitional state is typical for open data projects, as the partnership reviews data with the parties and affirms that it is ready for release to the public. Some layers may be restricted to authorized users.

Administrative Boundaries

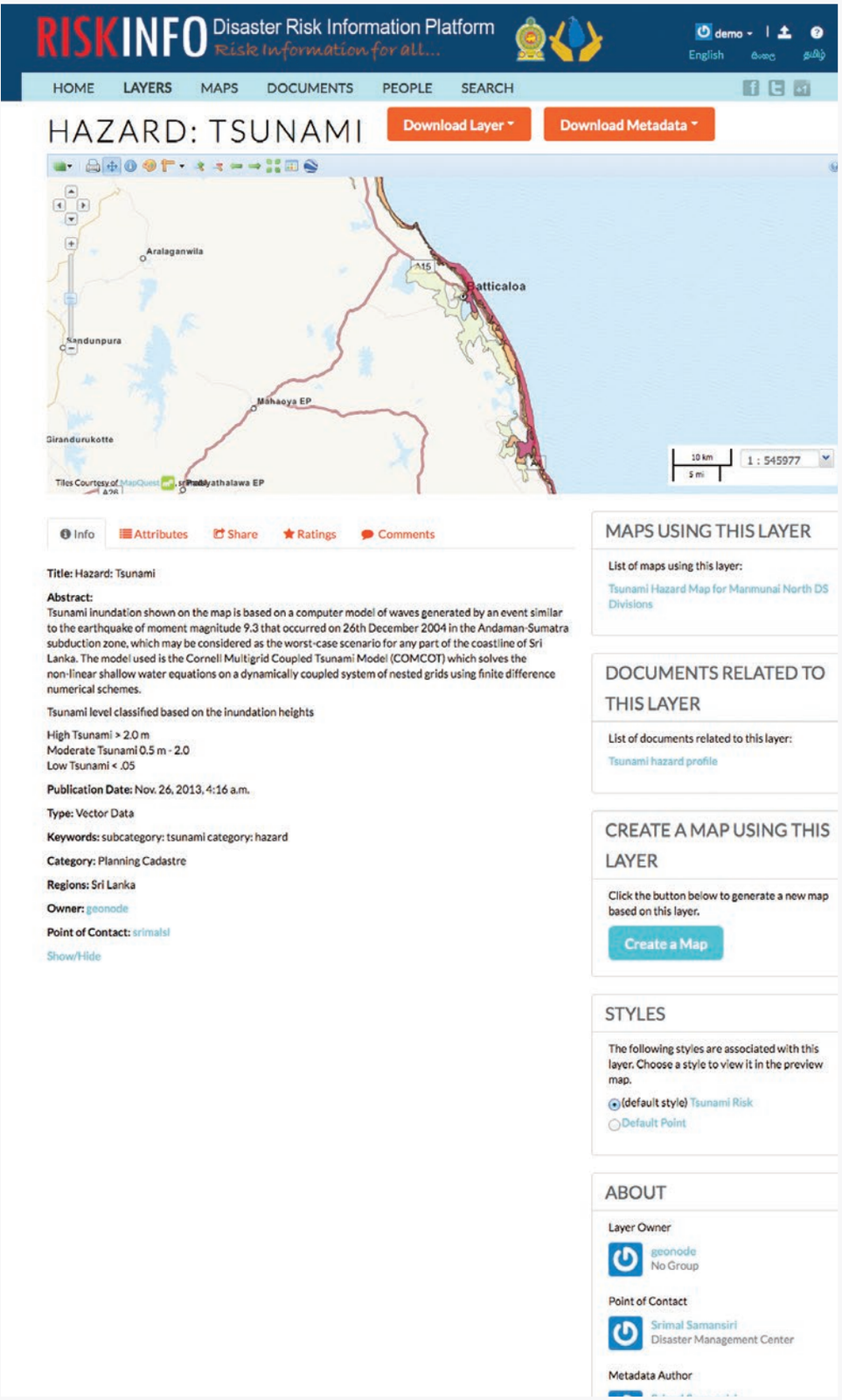
The partner to the GeoNode digitized the administrative boundaries to level 5 for Sri Lanka (this is smallest administrative unit, called a grama niladhari or GN).

Hazard Layers

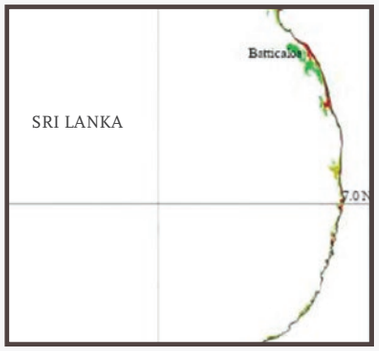
Hazard data was divided among several partners. Nation Building Research Organisation had landslide data. DMC had worked with UNDP and other parters to build a multi-hazard risk profile that aggregated data on earthquakes, floods, cyclones, and tsunami. These data were available with methodologies in a 236-page PDF.

Exposure Data

The OpenDRI partners worked with the Department of Census and Statistics to get demographic data into the GeoNode, and subsequently uploaded OpenStreetMap building data.



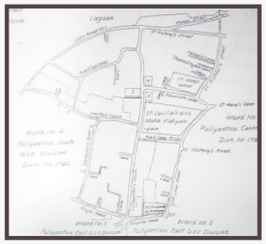
Converting Static PDFs to Dynamic Data



The OpenDRI team worked with the Disaster Management Centre to perform the process of turning the data in the 236-page risk profile report into digital data in the GeoNode. This work included taking maps like figure at right and converting it to map that could be uploaded into the GeoNode.

Converting Paper Maps to Digital Maps

Grama niladhari often had paper maps that reflected changes that had not been entered into the national map. OpenDRI created a process to digitize the map, first by tracing satellite imagery into OpenStreetMap, then using the paper maps to add and annotate the landmarks. The Disaster Management Centre extracted the mapping data from OpenStreetMap and uploaded it to the GeoNode.



Creating a Tsunami Inundation Map with UNDP Data and OpenStreetMap

With the new data in the GeoNode, the Disaster Management Centre was able to create the map at right by combining the tsunami hazard map with the new digitized paper maps.

See Also

Riskinfo GeoNode: http://riskinfo.lk

EVENT GEONODE FOR YOLANDA

Supertyphoon Yolanda (international name Haiyan) made landfall in Guiuan (central Philippines) as one of the strongest cyclones on record: 305 km/hr sustained winds with a 6m storm surge and waves that may have exceeded 12m. Yolanda subsequently made landfall on four more islands before heading back to sea and weakening into a tropical storm, eventually dissipating over China.

Damage across the central Philippines was severe. UN agencies estimated that approximately 11 million people were displaced and over 6200 killed. Entire sections of cities were leveled by wind and water. Understanding the extent and magnitude of the damage was core to both the response effort and the planning for recovery and reconstruction.

Working together, the GIS team from the American Red Cross's International Department and the team from the GFDRR Labs set up a GeoNode data catalogue to collect all geospatial data that was technically and legal open. Over three weeks, the Yolanda GeoNode combined team collected over 72 layers of geospatial data, including damage assessments performed by the EU Joint Research Centre, UNOSAT, the US National Geospatial Intelligence Agency (NGA), and the Humanitarian OpenStreetMap team. The GeoNode also hosted hundreds of situation reports and PDFs from the Red Cross and OCHA, many of which contained geospatial data. Importantly, the GeoNode also collated data from collective efforts of the OpenStreetMap community, which made over 4.5 million edits from 1600 mappers who worked from 82 countries.

The technical team behind the GeoNode—BoundlessGeo and LMN Solutions, working under the US Army Corps of Engineers—developed a technique to extract footprints of damaged buildings from these OpenStreetMap data, place them under version control in a tool called GeoGit, and make daily snapshots available. In the process, the techanical team prototyped a new approach to tracking growing amount damage assessment data that are generated by the OpenStreetMap community. This technique will be explored by OpenDRI as a potential capability for future operations.

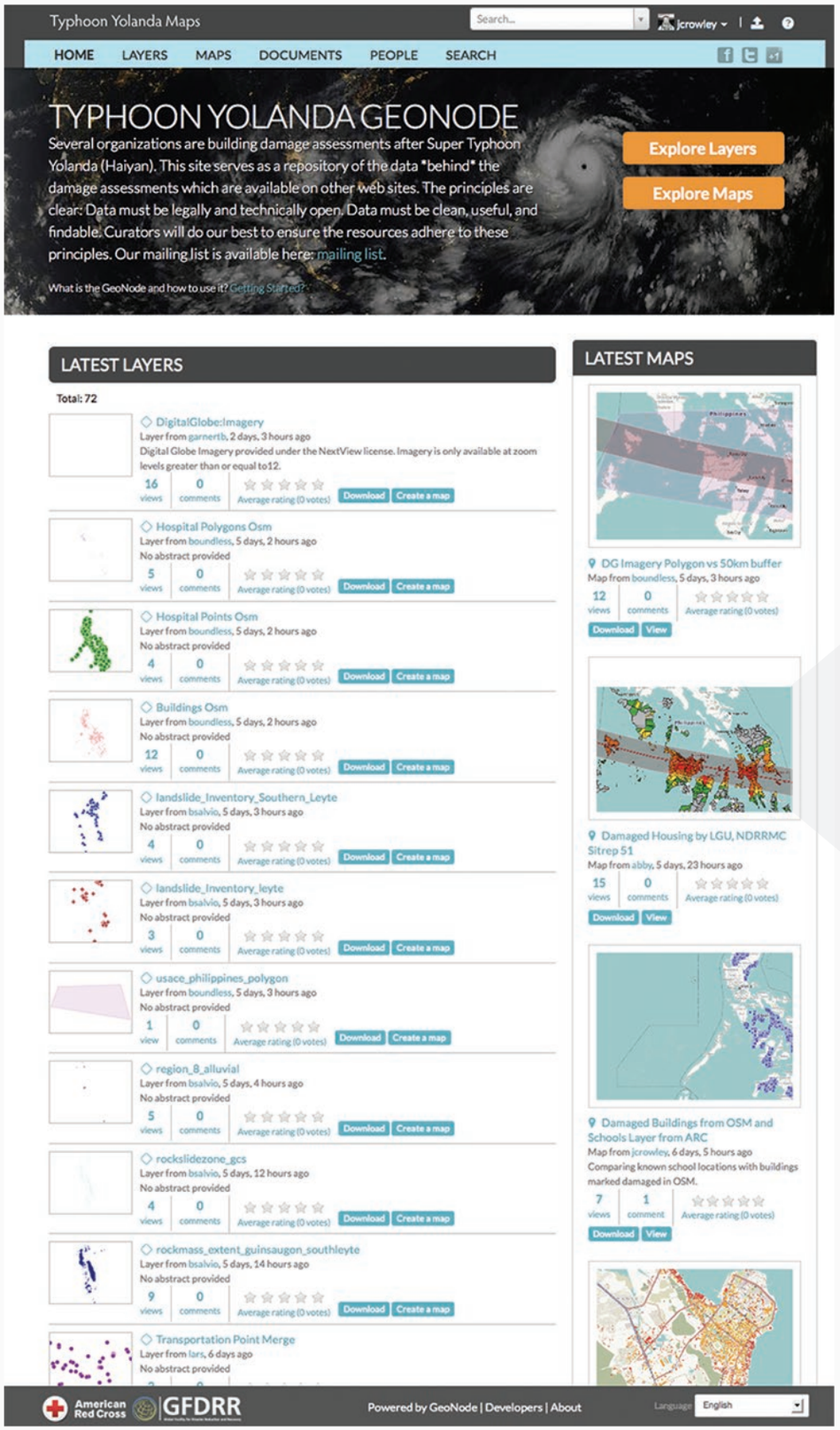
The Yolanda GeoNode is an example of a GeoNode for a specific event. This tactic can be used to make specific subsets of data available to a community who needs them to support the specialized use cases of response operations. The data in the event GeoNodes can be rolled back into GeoNodes where ministries curate data for their general operations. Yolandadata.org is still operating in response mode.

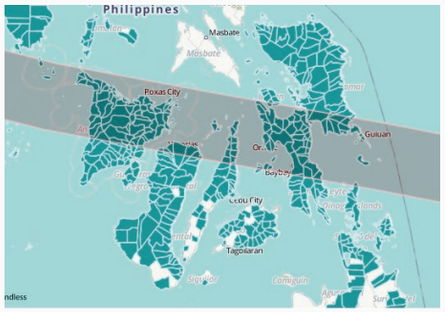
See Also

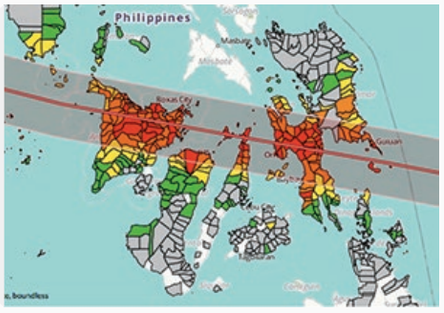
Yolanda GeoNode: http://yolandadata.org

OpenStreetMap Yolanda: http://wiki.openstreetmap.org/wiki/Typhoon_Haiyan.

GeoGit Version Control for GeoData: http://geogit.org/







Users can create maps by combining layers and styling the data. Here, the user combined the 50km buffer around the Yolanda storm track with the national disaster National Disaster Risk Reduction and Management Council (NDRRMC) damage assessments from its Situation Report #51. Styles render damage values with color intensity.

In an experiment, BoundlessGeo and ARC extracted buildings from OpenStreetMap tagged as damaged (orange) or destroyed (red). This damage layer was available as a web service that was updated daily. ▾

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▲ Red Cross teams on the ground used paper maps derived from this damage data to target assessments and aid to the most heavily damaged areas.

6

COLLECTING NEW DATA

OpenDRI develops a network of citizens who are prepared to collect and curate data about the exposure of their communities to natural hazards.

Collecting data from field environments has special challenges, especially in countries where maps are poor and addresses are often a more a narrative than a numerical postal address. Cities and informal settlements tend to be very dynamic communities, where change is a constant element of the environment. When data about these built environments do not exist or are either outdated or inaccurate, it is necessary to collect new data. OpenDRI focuses on this type of data.

Governments generally take two approaches to this challenge: *traditional surveys*, which place GIS data into a national map or spatial data infrastructure; and *community mapping*, which place data into a growing public database like OpenStreetMap. Traditional surveys generally collect data using survey methods that are performed by professionals who are licensed and monitored by associations or national standards bodies. In some contexts, these methods may be best suited to the task of collecting DRM data. That said, traditional surveys can be slow, expensive, and accessible only to experts. In contrast, community mapping efforts collect data using an emerging set of techniques that train communities to curate data about their own built environment. This approach offers speed, value, and an opportunity to educate communities about different ways of thinking about the risks they face.

Community mapping for DRM is a relatively new form of data collection. While community mapping had its start more than two decades ago in participatory GIS, the variances between its methods and traditional survey data often caused difficulties for national mapping agencies. The methods of community mapping developed under OpenDRI are specific to mapping using online tools with standard cartography, satellite imagery tracing, and GPS-based field surveys. Data quality is checked at multiple stages in a project by third parties (usually university GIS departments), and variances lead to corrective action in training and tools.

Community Mapping in Indonesia with Australia-Indonesia Facility for Disaster Reduction, Humanitarian OpenStreetMap Team, and the OpenStreetMap Indonesia team.
Credit: Abby Baca, The World Bank.

Collecting Exposure Data via Community Mapping

A typical workflow based on a project undertaken in Batticaloa, Sri Lanka.

1 Scope

Define the area (extent) and schema for the map

Define the Scope

- Determine the area to be covered
- Create a data capture workflow/process

Data Collection

- Create general guidelines for tagging the local features to be mapped
- Develop a schema for collection

Training

Teach the core team the mapping tools and proper data entry methods, and train the collectors in data collection methods.

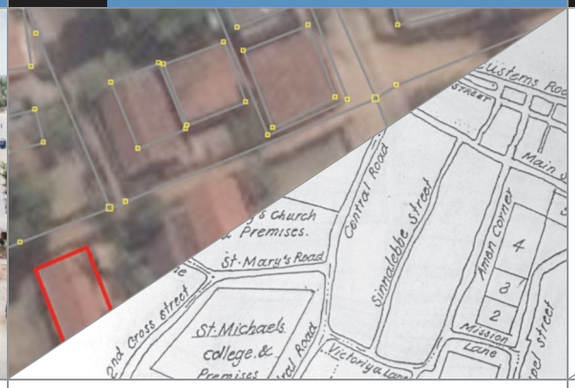
Personnel

- Project manager & core mapping team
- Local construction practice experts
- Disaster risk management experts

Refine the schema if incomplete

2 Data Import

Collect and import more contextual information



GPS Data Collection

- Collect GPS traces of roads and administrative boundaries.

Data Import

- Acquire existing digital map data
- Transcribe existing paper map data
- Trace imagery to extract geographic features (building footprints, roads, etc.)

Note: Data import requires the proper authorization

Seek feedback from local stakeholders.

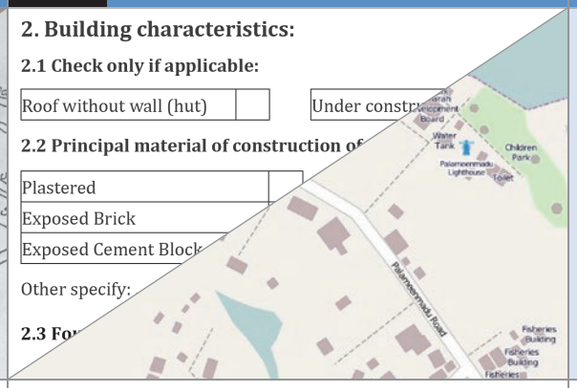
Personnel

- Project manager & core mapping team
- Technologists
- Remote mappers (local or international)

Cleanse and remove inaccuracies

3 Field Papers

Compile and Print a Base Map and Survey



Field Papers Base Map

1. Prepare the field paper maps (OpenStreetMap and imagery versions).
2. Print the field paper maps and disseminate to the survey team.

Survey Questionnaire

1. Prepare a building survey questionnaire needed to populate the data characteristics.
2. Print the questionnaires and disseminate to the survey team.

Personnel

- Project manager & core mapping team

Reprint corrected materials

Scaling Up

The process for compiling data for the initial pilot area can be replicated to map other neighboring areas, or to map more asset types within the same area.

A Recursive Cycle

- Adherence to process and structure
- Continually assessed for quality

4 Field Survey

Have the field survey teams begin to collect data

Field Collection

- Log building and asset characteristics based on first-hand observation.
- Correct the imported data/base map (administrative boundaries, landmarks, roads, etc.) based on field observation and discussion with the community.
- **Optional:** Use the questionnaire to fill out more detailed exposure data by interviewing community stakeholders (necessity for interview depends on the depth and quantity of data being collected).

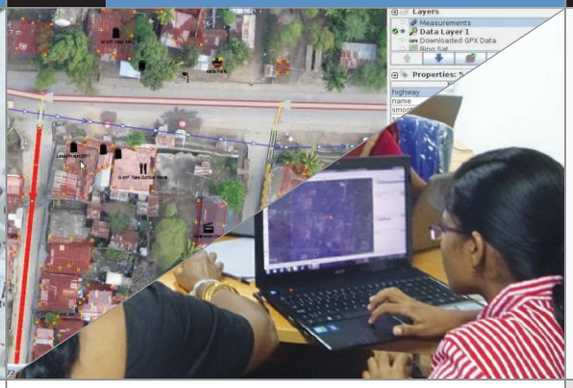
Personnel

- Project manager & core mapping team
- Field data collectors, split according to established geographic divisions

Re-train for greater data accuracy

5 Data Entry

Enter data survey results, edit and update the map



Data Entry

1. Densify the base map with information collected by the survey team.
2. During the collection effort, employ a continuous quality check process to verify the collected results.
3. Revisit results and calibrate based on the quality check, and continue the field survey process.

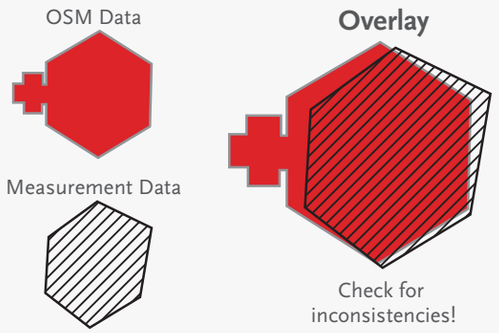
Personnel

- Project manager & core mapping team
- Remote mappers

Verify the compiled results

6 Quality Check

Resolve the gap between the expected and actual results



Possible Outcomes

- Retraining personnel to ensure greater data accuracy.
- Another field survey to fill in missing information.

Iterative Process

1. Complete this check until results match the level of expectations specified at the beginning.
2. Think of an accurately mapped area as a process that can be replicated and scaled to other areas.

Personnel

- Project manager & core mapping team

WORK PLAN

Aggregating data from existing sources rarely creates a comprehensive repository about the exposure of a region's built environment to natural hazards. For this reason, OpenDRI also develops a network of people who are prepared to collect and (importantly) *use* data about the exposure of their communities to natural hazards. This approach generally applies techniques from participatory/community mapping. To date, this work has applied a set of techniques built around OpenStreetMap, a free and open map of the world built upon a stack of open source software.

The work process for community exposure mapping generally unfolds in iterative phases, starting in one neighborhood then deploying members of the original team as trainers over a larger number of similarly-sized neighborhoods. This approach works from three lessons learned:

1. It is wise to start a pilot, where one develops solutions to local challenges on a small scale before trying to take the effort to the whole country.
2. Community mapping is a local activity driven by local relationships. These relationships are best kept on the community level for sustainable curation.
3. The success of one or two pilots does not automatically translate into a national program. Scaling is an unfolding campaign that evolves over time and adapts to local context, rather than following a formula (e.g., a beta-test followed by full-scale national launch).

While community mapping is never a cookie-cutter process (either between countries or neighborhoods), OpenDRI approaches the design and implementation of each iterative phase by pursuing six activities:

1. Preparation
2. Base Data Aggregation
3. Base Map Generation
4. Field Surveys
5. Data Entry
6. Data Quality Assessment

Scaling the initiative follows a similar workflow, though with the addition of a project management layer to ensure that training is consistent, data is of similar quality, and curation is handled by local organizations.

Note: The implementation of OpenDRI in South Asia, the Open Cities Project, has created a toolkit which covers the implementation details of community mapping. This section provides a strategic overview of the Open Cities methodology: a description of *what* needs to be done. The Toolkit provides detailed technical advice on *how* these steps might be implemented. A link to this resource will be added when the Toolkit is published in mid 2014.

CORE PERSONNEL

The project will start with a Core Mapping Team that includes three roles:

- **OpenDRI Lead (Program Level)**: the lead program-level manager at the sponsoring institution (such as GFDRR Labs), as a member of the OpenDRI Leadership Team.
- **OpenDRI Community Mapping Lead (Country Level)**: a consultant from the sponsoring institution who works at the country level on the collection of exposure data via community mapping.
- **Local Champion**: an official at a host government ministry or agency who is the official link into the government's efforts in DRM.

The Core Team will recruit, train, and manage a Community Mapping Team composed of several of its own teams, which may overlap or even be condensed into a single team in certain contexts:

- **Field Survey Team**: a team of volunteers (sometimes number 50) that visits sites and maps the built environment.
- **Data Entry Team**: a team of volunteers (2+ people) that are trained to enter data from paper questionnaires and FieldPapers into the community mapping platform (usually OpenStreetMap).
- **Data Quality Assessment Team**: a small team of geospatial experts (1-2 people) who examine samples of the data collected by the field survey teams and entered by the data entry teams. This work usually entails visiting a sample of sites and tracking the data through the data entry process to ensure that the training and tools are working up to standard.

COMMUNITY MAPPING PLATFORMS

For several decades, participatory mapping has used paper and other tools to help communities develop maps of their surroudnings. While these maps were useful for an intended (often limited) purpose, they often did not provide sufficient geographic accuracy to use for official government cartography. In 2004, the paradigm began to change.

Upset with the licensing of geographic data from the UK's Ordinance Survey, a group of geographers founded OpenStreetMap to "encourage the growth, development and distribution of free geospatial data and provide geospatial data for anybody to use and share." (see http://wiki.openstreetmap.org/wiki/History_of_OpenStreetMap). In 2006, they launched openstreetmap.org, based on the concept of a wiki—a form of collective intelligence that allows registered users to collaborate on the construction and curation of a shared repository of knowledge. OpenStreetMap is a geographic wiki that allows any registered user to make and edit maps.

Most GIS platforms use a top-down feature taxonomy to structure data. OpenStreetMap (OSM) uses a bottom-up tagging system, by which users can tag any object as a key-value pair (e.g., building_use = school). This approach has the benefit of being incredible flexible and easy to explain to lay users. It has enabled OSM to scale to billions of nodes and 1.5 million users in only 8 years. That said, the tagging system also creates complexities when integrating OSM data into traditional GIS platforms.

OpenDRI has an approach to balance the need to import data into traditional modeling tools with the power of key-value tags: an evolving set of standardized tags for describing buildings and infrastructure so that the exposure of geographic objects to specific natural hazards can be modeled using traditional risk assessment methods. OpenDRI also harnesses the flexibility of OSM's tagging system to capture elements that may be unique to the local context, such as architectural styles.

OpenDRI follows The World Bank Group's policy around using an open license for efforts that mobilize local citizens to collect data about their communities:

"The World Bank only supports citizen-mapping efforts that give users free access to the map data they create. While citizens are free to choose the projects and tools that best meet their goals, our guiding principle is simple: if the public helps to collect or create map data, the public should be able to access, use and re-use that data freely."

Cf: http://blogs.worldbank.org/insidetheweb/maps-for-open-development

STARTING FROM SCRATCH: THE INITIAL PILOT

The first pilot of a field data collection effort initiative generally starts in one city, and potentially, within one neighborhood of a large city. The objective is to train a small pool of energetic mappers into a core team that can a) collect the first data and adapt initial approaches to the problems they discover in the field, and b) recruit and train other mappers as the initiative moves into the scaling phase. OpenDRI has thus far used community mapping as the tactic to implement this objective.

1. Preparation

Successful community mapping projects start with well-tailored designs and motivated, well-trained personnel and volunteers. Designing the effort may take a period of weeks or months from first conversations to the launch of an initial pilot. This period requires the Core Team to identify the analytical problem in DRM that needs to be solved, and then define the scope of the work and the local implementation strategy (which usually unfolds with an innovation lab or local logistics firm). This shared understanding will be captured in a Work Plan.

The Work Plan will answer the following questions:

Scope

Based on the use case defined in the Concept Note for the OpenDRI country effort (an output from the Scoping Mission), the team will need to identify the specific data that need to be collected to drive a set of analytical problems. Because field surveys will cover a relatively wide area, there is also an opportunity to collect a limited but important set of additional data, which may prove useful for other analytical problems that emerge only when data begin to be cleansed and made open. The Core Team will need to decide what other data could be collected alongside these data, without overburdening the system.

Data Models

In general, data models are small and focused, allowing the field survey team to build quality exposure data quickly. The Core Team should work with risk assessment and DRM experts, comparing data models recommended by this design process with the models from previous OpenDRI engagements. See Appendix B, Data Models. An example for buildings:

key	possible values
addr:housenumber	address number of the building, ie 25/5 or 19A
addr:street	street name
name	name of building
building	{yes | construction}
building:levels	number of levels in the building
building:use	{residential | commercial | industrial | utility | multipurpose |hospital | clinic | place_of_worship | government | school | college | community_centre}
building:vertical_irregularity	{yes | no}
building:soft_storey	{yes | no}
building:material	{plaster | brick | tin | cement_block | glass | bamboo_sheet | wood}
building:structure	{RCC_with_beam | RCC_without_beam | brick | steel | timber | bamboo}
start_date	year of construction, or range, ie. 2003..2013
building:condition	{poor | average | good}

Start-up Plan

Community mapping initiatives share a great deal in common with start-up firms. They require a mechanism to recruit and train personnel; a space to work; and a mechanism to handle logistics, travel, and equipment. Community mapping initiatives also share an important characteristic with grassroots organizing campaigns: they also build from one-on-one relationships towards a community-based effort, where an initial small team learns a task and then eventually becomes the trainers in other communities. Scalability depends on the replication of this distributed leadership model to initiate pilots across the total area requiring mapping.

The start-up plan tends to balance between the aspects of starting a new organization with the need for building a durable campaign. OpenDRI has used two designs for creating this balance:

1. **A Coworking Space or Logistics Firm**: a company (for profit or non-profit) that provides office space, operations support, and

equipment management services for the trainers, technologists, and survey teams. This option may evolve into an innovation lab and may be more appropriate in certain contexts which are not ripe for an innovation lab, but where a co-working space is still necessary for community mapping.

2. **Innovation Lab**: a special co-working community that is designed to catalyze innovative thinking about problems that cross sectors. Innovation Labs tend to be (or create) hubs where members of the open technology community can develop business concepts and interact with officials from government ministries, NGOs, and international organizations.

For ToRs for each type of firm, see Appendix A. The key decision that the Core Team needs to make in the Work Plan is whether to build an innovation lab or contract services from a logistics firm. A discussion of the merits of each appears in Chapter 7. Each design will require a certain set of personnel or firms to be hired. These job descriptions appear in Appendix A.

2. Start-Up

Executing the Work Plan begins once the innovation lab or logistics firm has been put under contract and key professional personnel appropriate for either case have been hired (see Chapter 7, Innovation Lab). The key activities in start-up are a) recruiting and training the teams that will perform field surveys, enter data into a GIS, and b) generating the base maps that these teams will use to perform their initial mapping efforts.

Train Survey and Data Entry Teams

The Community Mapping Team starts by recruiting OpenDRI community mapping trainers, who have expertise in the application of community mapping practices to the collection of exposure data, preferably in the local context. The trainers need to ensure that the team builds skills in several areas:

- Mapping and GIS
- Software Development and Graphic Design
- Outreach, training and mobilization

Once the space and staff are hired and ready for work, the pilot is ready for training in the Community Mapping Team how to collect exposure data. In general, this training will consist of the following foundational skills:

- **OpenStreetMap**: how to enter data into the OpenStreetMap wiki or other geospatial platform.
- **Field Data Collection Techniques**: how to use a GPS unit, paper maps, and field survey tools to collect data that can be entered into the OpenStreetMap database. Note: there is some controversy around how to train volunteers to examine a building and understand how its construction is exposed to natural hazards, including common signs of structural weakness. The National Society for Earthquake Technology–Nepal has built a training manual to teach how to read a building for structural weaknesses. In general, it is best to collect basic characteristics about a building: its use, wall and roofing materials, number of storeys, and potentailly, the shape and weight of the floors.

Base Data Aggregation

In many cities, data sources may exist that might provide a scaffolding for survey work. Some may already be in OpenStreetMap. Some may exist in the geographic information systems of government ministries or international organizations. The Core Mapping Team should work with the Local Champion to aggregate these existing maps and determine if their licenses allow for import into OpenStreetMap (see Licenses under OpenStreetMap Wiki).† Road networks and building footprints are among the most valuable data for exposure mapping. Papers maps can be traced; more often, they are used to add building use and other attributes in the community mapping platform.

Import Existing Map Data

If existing data is sufficiently accurate and can be made compatible with the OpenStreetMap license, they can be imported into OpenStreetMap. If this work is to be done, the Core Team and Community Mapping Team should determine if the technical skill exists in their roster to perform the work internally. If not, the Core Team should consider hiring an OpenStreetMap Data Consultant to perform a data import and quality evaluation afterwards.

3. Field Survey Preparation

The quality of exposure data collection is determined by the design of the field survey tool and the training of the team. In every implementation of OpenDRI, the Community Mapping Team has learned from the initial pilot and revised both the tools and

† See Licenses, http://www.openstreetmap.org/copyright.

Open Cities Dhaka – Building Survey Form

Surveyor Name: Date:

Field Paper ID: Ward / Block number: _____ Map Building

ID:

1. General Information:

1.1 Holding #:

Building name:

Street name:

1.2 Building usage:

Residential			Hospital		
Commercial			Religious		
Industrial			Government Building		
Utility			School		
Mixed			College		
			Community Center		
			Other specify:		

2. Building Characteristics:

2.1 Number of Stories: **2.2 Vertical Irregularities? ❑ Yes ❑ No**

2.3 Is there a Soft Storey? ❑ Yes ❑ No (Long / Short direction)

2.4 Walls: (Cladding & Partitions)

| plaster | brick | tin | cement_block | glass | bamboo_sheet | wood |

2.5 Main Load Bearing System

| RCC_with_beam | RCC_without_beam | brick | steel | timber | bamboo |

retrained the team as the initiative scaled. The team should prepare to revisit the questionnaire and the training curriculum over time.

Generate the Field Survey Questionnaire

Except where tablets and smart phones are widely available, field survey teams will carry paper copies of a survey form to perform their daily work. The design of this form merits care and attention of both the Community Mapping Team and the Core Team.

Based on the data model from the Preparation phase, the team will work with the Community Mapping Lead, local universities, local government champion, and other experts to develop the questionnaire that surveyors will use in the field. This document should be kept as simple as possible, yet cover the necessary data the supported use cases. It can be changed, but alterations affect how commensurate data will be between earlier and later versions, and may require resurveying large areas. Careful thought should go into this document. The OpenCities Toolkit has deeper levels of detail on how to build the questionnaire. Examples of building survey forms appear in the Documents chapter of this guide.

Build Field Papers Maps

Field Survey Forms are the mechanism for capturing structured data about specific structures and roads. Survey Teams also tend to carry a special type of paper map called FieldPapers. This resource allows a team to print a up-to-the-minute atlas of the area in which they are mapping. It also provides an easy method for labeling each building with a number and then marking the associated survey form for that building wiht the same number. Each FieldPaper also carries two important other resources:

1. **Registration Points**: graphics that allow for software to scan the map back into digital format and align it with the base map in a GIS. On the map at right, small circles in patterns are the registration points.
2. **A Georeferenced QR code**: a two-dimensional bar code that embeds the geopgraphic information, including the bounding box and zoom level. These data allow the scanned image to be rectified in a GIS, so that the Data Entry Team can trace any new data directly into a GIS or OpenStreetMap.

The Community Mapping Team should prepare FieldPapers for the area to be mapped, ensuring adequate coverage of basic data like roads and major landmarks. Waterways should also be mapped.

Train Field Survey Teams in Questionnaire and FieldPapers

The training on the questionnaire and FieldPapers will focus on the specific data schema that needs to be collected. This additional training for the field survey teams will focus on how to assess basic building characteristics in the local environment.

4. Field Surveys

When surveyors have been trained, the pilot begins to collect data via mapping parties. These events organize between 10-40 mappers to collect data in a specific region of a city, with the goal of being as comprehensive as is possible for that region.

Collect data with Field Survey Teams

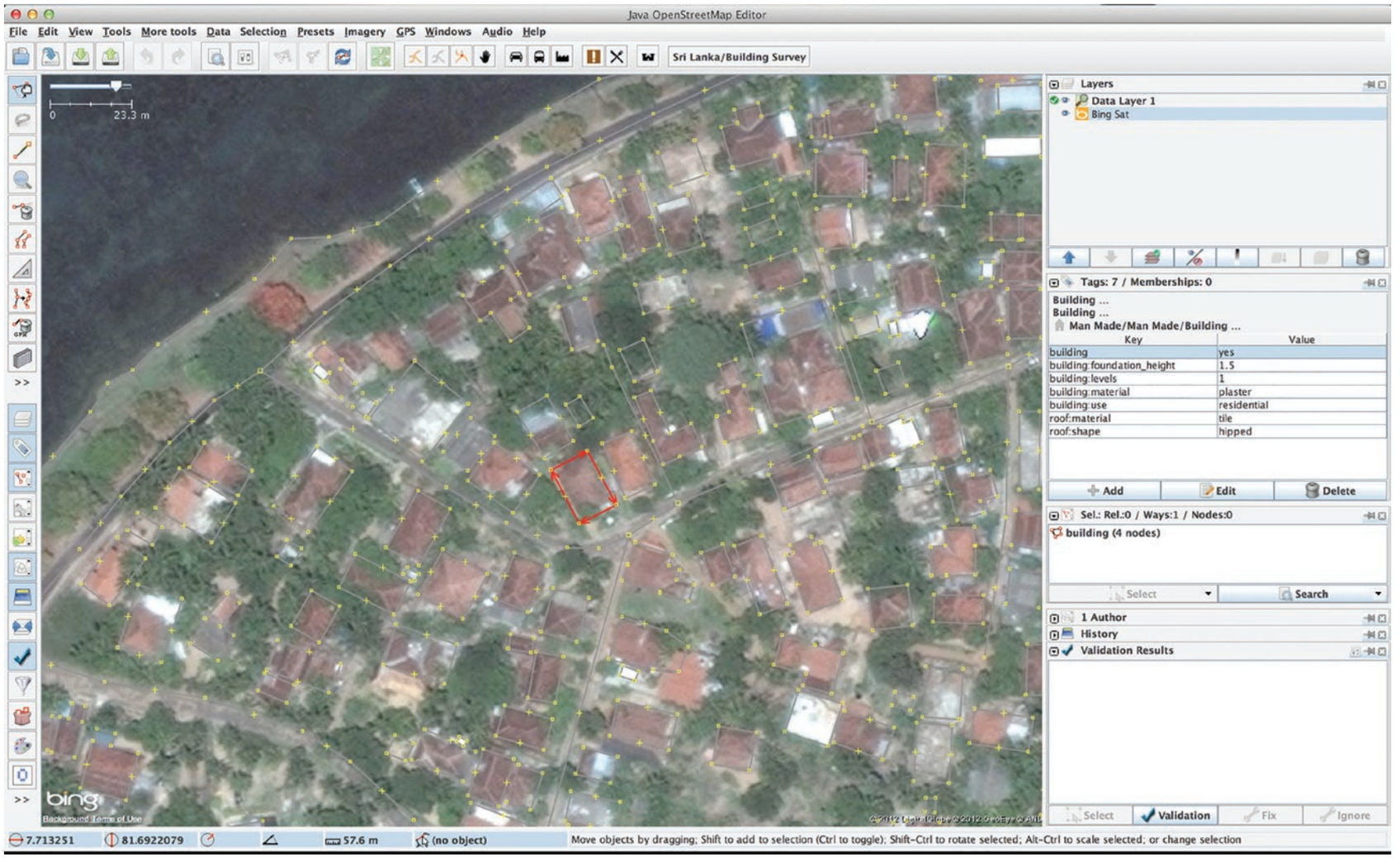
Mapping parties generally last several hours, depending on how long the team needs to travel from the work space to the area that needs to be surveyed. If transportation is needed, the incubator/logistics company should arrange for rentals, drivers, or other arrangement suitable to context. Mapping parties should honor local customs for volunteer activities, which often include the provision of food and beverages.

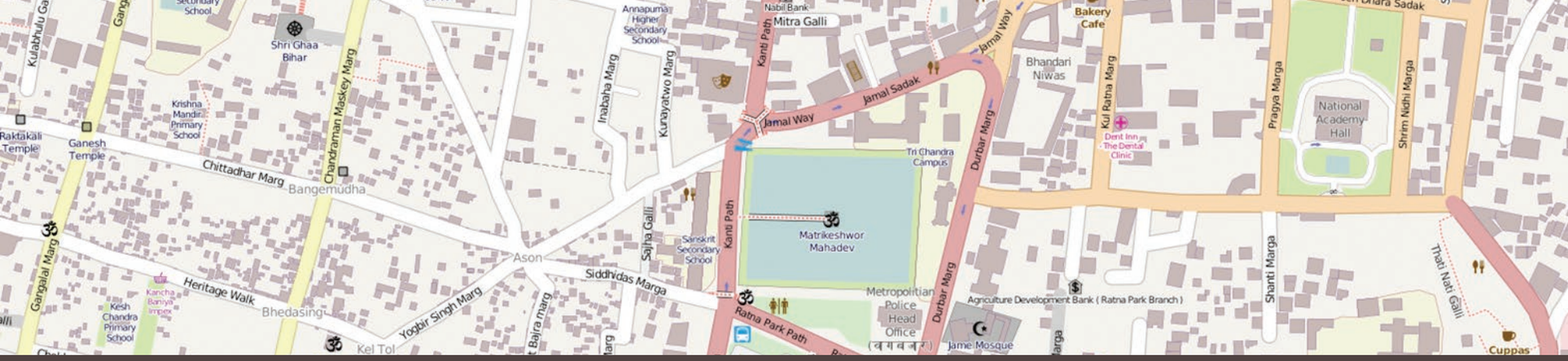
5. Data Entry

When teams return to the work space, the data needs to be entered into a GIS (such as OpenStreetMap) not only as a formal project, but also as a social activity. In many cases, members of the field survey team will enter each other's data as a form of cross check. In other cases, the Data Entry Team will be responsible for entering all data into a GIS and any associated databases.

Adding Geographic Data to Base Map

Building polygons, roads, waterways, and other mapping data will need to added to the GIS as geographic information. This work usually occurs via one of several free and open source GIS desktop tools or web-based platforms, including QGIS and the Java





OPEN CITIES: OPENDRI IMPLEMENTATION IN KATHMANDU

The people of Kathmandu face the highest risk of losing their lives from an earthquake of any urban population in the world. In 2012, the World Bank and GFDRR started working in partnership with the Government of Nepal to launch a project to better understand seismic risk, in order to build resilience in the education and health infrastructure of the Kathmandu Valley. The first step of this process was the creation of a disaster risk model to determine relative vulnerability of the buildings in which such facilities were housed. As this has been completed, the next phase is for this model to be used to prioritize plans for subsequent building retrofits of schools and health facilities to improve structural integrity in the face of earthquake.

In November 2012, World Bank staff and consultants began the year-long project by assembling a team of mappers and community mobilizers. The team was responsible for a wide variety of tasks covering field surveying and software development to providing training and awareness raising on OpenStreetMap to a range of community groups, particularly several universities and start-up clubs across Kathmandu Valley.

The 4-person core mapping team (later expanded to 6), was composed of university graduates from Kathmandu University that were recruited based on their prior contribution to Nepal's then-nascent OSM community. These core members were paid full-time salaries at rates commensurate with the local salary structure for recent graduates in technical disciplines. In addition, the project recruited 6 part-time interns from Kathmandu University and 11 volunteers from Tribhuvan University. Office space for the team was located within a co-working space. This gave the team access to meeting rooms, reliable connections to the internet and opportunities to interact with other technologists and entrepreneurs, some of whom would later themselves become active in OpenStreetMap.

Open Cities Kathmandu surveyed 2,256 schools and 350 health facilities in the Kathmandu Valley. In addition to collecting a comprehensive list of health and school facilities structural data, the team worked to create a comprehensive base-map of the valley by digitizing building footprints, mapping the road network, and collecting other major points of interest.

The Open Cities Team also conducted significant outreach to universities, technical communities and government in order to grow the OSM community. Over 2,300 individuals participated in OSM trainings or presentations during the first year of the project. In addition to the use of school and health facility data to plan retrofitting activities, the data has been used in a number of transportation planning applications and USAID has incorporated it into disaster preparedness planning exercises. The American Red Cross has also recently begun to contribute to OpenStreetMap in Kathmandu, signaling further interest from development partners. A local NGO called the Kathmandu Living Labs, comprised of participants in the first phase of the Open Cities Project, has been created in order to continue the work.

OpenStreetMap Editor (JOSM), or proprietary tools like ArcGIS, which now have an OpenStreetMap plugin.

Adding Questionnaire Data to any other databases

Some data that ministries may wish to collect may include personally-identifiable information, such as names of a school principal and his or her cell phone number. Such data should not be placed into OpenStreetMap or other public databases, but instead entered into other private databases (along with a plan for handling this data in ways that are appropriate to local laws and customs). The Data Entry Team will ensure that these data are entered into the appropriate data platform.

Celebrate

Mapping is a social activity. It might be technical and tedious, so leaders should ensure that volunteers also have fun. For many years, large mapping parties have traditionally ended with map cakes, where the frosting is printed into a map that reflects the hard work of the team. The activity builds a sense of collective accomplishment. It also forms the core energy and network of relationships that allow for the project to scale.

Photo: Map Cake from Marikino Mapping Party, Philippines, CC-BY-SA, Credit: Andre Marcelo-Tanner, 2010.

Keeping Mapping Social

Making work with volunteers fun is a critical business practice. Community Mapping Leads repeatedly emphasized the importance of fun and food in the cultures where they work. Without a budget for food, they would have been unable to recruit and retain volunteers. Without making the activity social and fun, they would have had to pay for the services of mappers (and might not have achieved the results they did).

6. Data Quality Assessment

OpenDRI has used two types of data quality assessments to create a quality improvement cycle in its work:

1. Small Samplings

Throughout the field survey work, the Data Quality Team will perform evaluation of small samples of the data. The intention is to discover if the training and tools are accurately capturing useful exposure data. In past engagements, the Science/Engineering Partner (see ToR) has taken on the role of performing these data quality assessments.

It is also important that the Community Mapping Lead work with local universities and other OpenDRI experts to assess the quality of the data that is being entered into OpenStreetMap. OSM novices often make mistakes, and this problem is amplified if additional attributes are collected. When a pattern emerges in the consistent miscoding of certain information, the management team should train volunteers around the issue.

2. Comprehensive Assessments

After the completion of a significant amount of data collection, OpenDRI has commissioned university professors and scientists to perform a full review of the accuracy of the data as compared to traditional GIS data. Such reports serve to allay the fears of government ministries, which may have past experience with participatory mapping projects that presented data with wide variance in positional accuracy. These studies create a sense of greater authority and trust around OpenDRI exposure data. A good example is the University of Gadjah Mada (UGM) study from Indonesia.†

† See *Evaluation of OpenstreetMap Data in Indonesia: A Final Report*. Arias, T et al. Department of Geodetic & Geomatics Engineering, Faculty of Engineering UGM and HOT (Humanitarian Openstreetmap Team). 2012.

Quality Improvement Process

Based on samples of ongoing work and (later) comprehensive assessments, the Core Team and Community Mapping Team will assess the quality of the training and the need to revise the questionnaire or other tools. The learning loop should proceed from these ongoing reflections on the quality of work, constantly mapping the gap between actual data quality and expected data quality and developing a plan to improve the data collection process.

SCALING THE PILOT

Scaling the collection of exposure data is a matter of adapting to local context and the use case. In some places, it has entailed expansion by geography, where OpenDRI via a city-by-city campaign, where leaders from one successful pilot help build a project in a successive city. In other places, scaling has focused on increasing the density of the map in a city, expanding on work to collect schools to collect all buildings. In the future, scale may mean increasing the number of partners around the data—a type of expansion that is one of the goals of this field guide. In this case, fostering the use of the data across a larger range of institutions would be intended to drive better collective decisions across the whole DRM cycle.

As OpenDRI scales, it is important to remember that the goal of open data is to remain as simple as practical, so as to avoid large hierarchies and instead create a dynamic of "small pieces, loosely joined." The goal is for each community to curate its own map; aggregation will occur organically through the natural linkages around open data projects inside a shared "commons" like OpenStreetMap.

Expanding each site

Each new pilot will generally start by cloning the previous cities, with customizations made for each new context. Some areas of customization include architectural traditions of a particular city, natural hazards in the specific place, language, and custom. The organizational design will be similar: incubator plus facilitator and related staff.

Preparing pilots to be sustainable entities

The difficult part of community mapping with volunteers is converting a pilot into a sustainable entity. The communities that come together to collect exposure data are not meant to be a one-off. They must curate that data over time to create a viable risk management ecosystem. While the costs are low, these organizations need to sustain a small set of paid leaders around a network of volunteer surveyors. The OpenDRI team needs to consider strategies to fund and sustain these efforts. To date, all pilots are still working off initial funding and none have developed revenue models in either the not-for-profit or for-profit spaces. Some groups might well be able to develop social ventures/social entrepreneurship models.

An important element of current work is partnerships with local universities. By integrating risk assessment into the curricula of geospatial and structural engineering courses, the OpenDRI team has been able to expose the next generation of government officials, engineers, and analysts to thinking about risk in terms of probable futures. Students have become an important source of volunteers, especially as they seek to gain experience in a new set of skills.

Data Authority and Quality

Because data collected from community mapping is collected using methods from participatory mapping, traditional GIS professionals need to see proof of the accuracy of the data. They want to know that the data is reliable and to know where it is inaccurate (all data has errors, the trick is achieving benchmarks for quality control; i.e., an acceptable statistical level of accuracy). OpenDRI team has had success contracting with local academic institutions to perform a quality assessment study on community mapping data. One such report was done by UGM in Indonesia. It catalyzed a change to the conversation about community mapping in the client government, which subsequently expanded its use of OpenStreetMap. University College, London and Kathmandu University performed a similar study for the community mapping work in Nepal.

COMMUNITY MAPPING WITH THE RED CROSS IN HAITI

By Robert Banick

Gran No Pi Djanm and GIS

The American Red Cross is using OpenStreetMap as a cornerstone of its Gran No Pi Djanm (Creole for "A More Resilient Great North") project in Haiti's North, Northeast and Northwest. Investments in geographic information management and a proactive approach to collaboration with existing OpenStreetMap community organizations have positioned the American Red Cross to implement more data driven and integrated programming.

Gran No Pi Djanm is a 3.5 year, $12.5 million integrated program to measurably improve the livelihoods and resilience of communities in Haiti's Great North. The program targets approximately 185,000 direct beneficiaries in 10 target communes.

Gran No Pi Djanm is piloting the use of map-based data visualizations to make sense of project and participatory information at every relevant geographic scale within the project. GIS staff from the American Red Cross's offices in Washington, DC and Port-au-Prince worked with program managers during project design to integrate mobile data collection technology, georeference key project information and incorporate participatory GIS methods into the standard participatory vulnerability and capacity assessment used by the global Red Cross network.

As a result, program staff will be able to make evidence-based decisions to support more integrated, resilient programming. Managers and staff will be able to track assessment and monitoring data, see key indicators by location and relate sector specific needs from livelihoods, water and sanitation, shelter and health to one another. Staff will be better able to navigate Haiti's notoriously difficult terrain and understand individual communities at a glance. Overall better mapping will help staff visualize community needs and the hazards they face, particularly as they relate to each geographic location. Community-reported needs, hazards and accessibility data will be packaged as GIS layers and input into technical activity plans.

Using OpenStreetMap

OpenStreetMap was identified early on as the best and most sustainable foundation for mapping analysis. OpenStreetMap is an accessible, openly editable map for contextualizing project data and participatory GIS exercises. Within Gran No Pi Djam baseline surveys, monitoring data, participatory assessments, navigation and micro-mitigation project planning are all powered by open data from OpenStreetMap. Additionally, OpenStreetMap improves the sustainability of project outputs: it preserves base data collected for the project, allowing communities, governments, companies or other NGOs to utilize the data in the future.

The American Red Cross is involving staff and volunteers at all levels in the creation and use of OpenStreetMap data. Red Cross responsibilities for OpenStreetMap are organized into a tiered "pyramid" of roles:

1. Dozens of Red Cross volunteers trained to collect quality geographic data in the field using GPS devices, Field Papers, smartphones or CaerusGeo printouts.
2. 25 program staff trained to manage field data collection exercises and input data so collected into OpenStreetMap or primary data collection software like CaerusGeo.
3. Three GIS analysts based in Washington DC and Port-au-Prince Haiti use open-source tools to collate, validate and package the incoming data into attractive maps and analysis for project staff.

OpenStreetMap has a long history in Haiti. In the aftermath of the devastating 2010 earthquake, remote volunteers and community groups on the ground collaborated to make an extremely detailed map of Port-au-Prince and other affected areas, which became the primary map used by humanitarian organizations and government for relief and recovery operations.

The American Red Cross is building on this groundwork by employing key members of the existing Haitian OpenStreetMap organizations COSMHANNE and COSMHASTM. They will orient the 25 program staff working with OpenStreetMap, lead the initial trainings and mentor these staff during the initial months of mapping activities. This work should create long-term linkages between local actors and connect Red Cross staff with technical experts.

Right: Community mapping in Haiti, ©American Red Cross, 2014. Used with permission.

Looking Forward

The American Red Cross believes that GIS underpinned by open data has a strong role to play in improving the impact of community-based disaster risk reduction programs. As such, successful field methods and approaches to community engagement developed during the course of this pilot will be captured and incorporated within the American Red Cross's international programming portfolio. It is our hope to ground information management, analysis and overall disaster response activities on a strong foundation of open data wherever possible.

American Red Cross International Services

The American Red Cross International Services Department works with the global Red Cross and Red Crescent network to meet the needs of the world's most vulnerable communities. It promotes cost-effective, community-based programs while building the capacity of its partners. It works with communities to build resilience to future disasters, from training local first responders to helping mitigate common hazards. During crises, it provides technical support, relief supplies, and financial assistance to ensure rapid response and recovery.


AIDS
CANDLELIGHT MEMORIAL
Never Give In, Never Forget

7

CATALYZING AN OPEN DATA ECOSYSTEM

OpenDRI catalyzes a change to mindset: it builds a community of practitioners who apply open data to their daily problems, and in so doing, creates a sustainable ecosystem around a living and growing corpus of data that describe a dynamic society.

Before an OpenDRI engagement, decision makers and their datasets tend to be loosely connected. As the data catalogue and community map fill out, the curators for each dataset come into closer relationship with each other. As they work out policies around how to make data findable and available to a wider audience, they often find themselves asking and answering questions which had previously been closed to them, either for lack of data or direct connection to specific expertise. This curiousity generates a demand for workshops, data, and tools that help answer their evolving questions. In the process, interconnections between people and data grow denser.

OpenDRI catalyzes this relational power through data. By linking data together, OpenDRI links decision makers together. By making data open, OpenDRI opens minds to different decisions.

Catalyzing the ecosystem of users around open data is still a new and evolving practice at OpenDRI. Catalyzing and sustaining change is difficult. Without continuous funding, most development efforts falter, 'brain drain' may pull key talent to other organizations, and stakeholders revert to the data sharing practices that they used prior to the OpenDRI engagement.

OpenDRI's designers take a practical approach to this problem: catalyzing open data ecosystems with periodic or occasional influxes of energy and resources. The development partners who funded and catalyzed the initial collation and collection of data work in concert with local actors. Together, they build institutions and processes that keeps the data fresh and the community around the data vibrant and productive.

Photo: Malawi community mapping.
Credit: Emma Phillips, 2013.

Tactics for an Open Data Ecosystem

Open Data Working Group

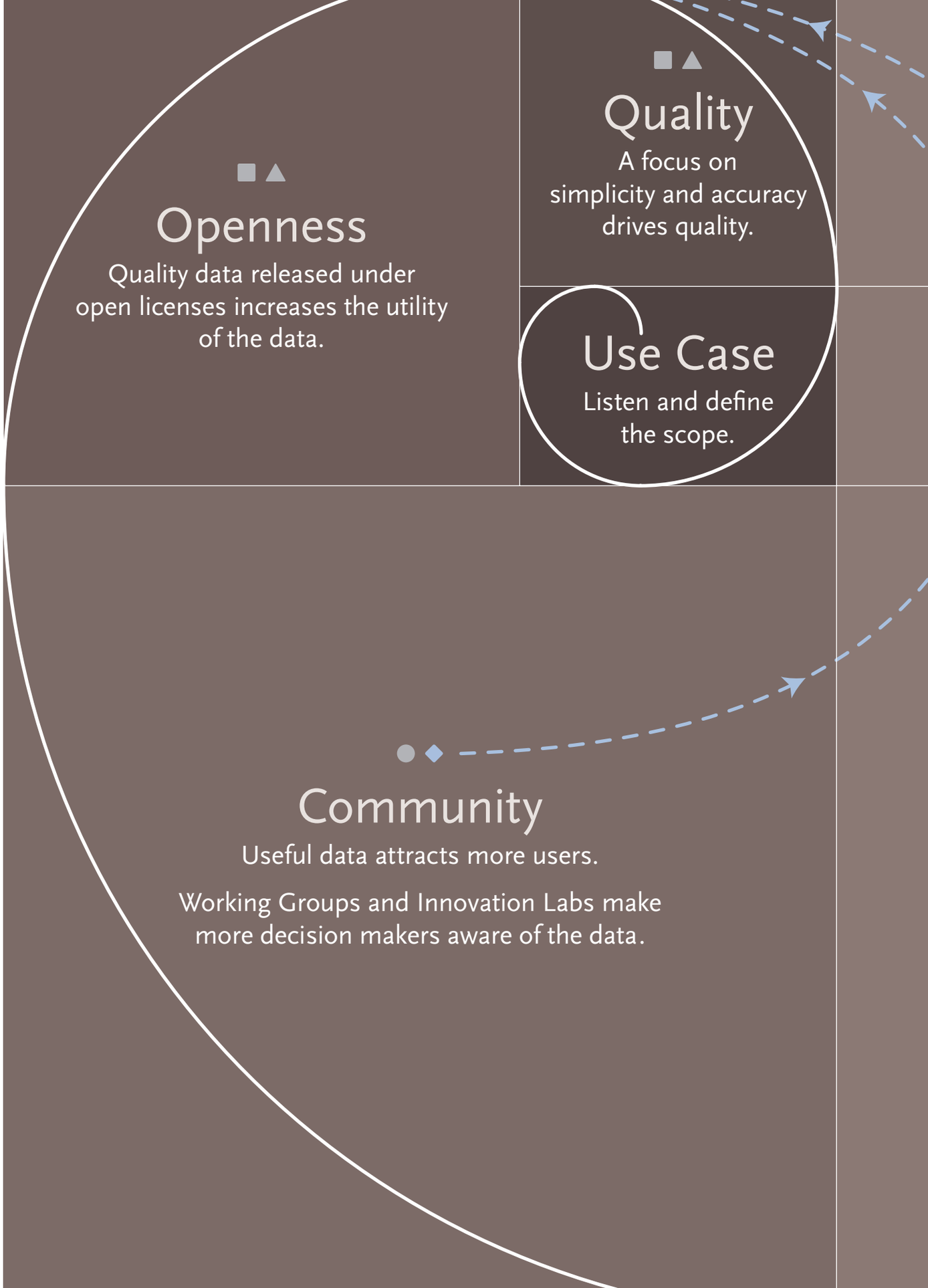
A task force builds open data policies, hires data curator, confronts technical challenges, and builds capacity of stakeholders to make use of open data.

Innovation Lab

A neutral co-working space creates platform for connecting top-down data collation with bottom-up data collection. Entrepreneurs and NGOs collaborate on tools to visualize and use open data.

University and International Partners

Universities teach students how to collect, clean, and analyze data for problem solving. Scientists analyze data and publish assessments of the data as well as studies that apply data to DRM problems. Students become labor pool for community mapping, as well as ministries and NGOs. International partners join open data ecosystem, decreasing costs and increasing ability to coordinate.



Catalyzing an Open Data Ecosystem

Risk Communication Tools

Decision makers need tools to visualize data. The simplest form is a risk communication tool such as InaSAFE, which provides a method for seeing the potential impact of one event on infrastructure across a city or region.

Risk Assessment

OpenDRI exists to provide the data for risk assessments, which provide a more comprehensive analysis of risks across many potential events. OpenDRI ends where risk assessment begins.

Applications

The capacity to apply data to decisions increases, driving desire to curate and collect more data.

OBJECTIVES

The OpenDRI Leadership Team for each engagement needs to create the framework into which it can inject bursts of sustaining energy. The sustaining phase creates an architecture for continued work. This design must include a plan for ongoing training, occasional funding for small projects, and a framework for champions to grow a locally owned, long-term, sustainable open-data ecosystem.

OPERATING PRINCIPLES

1. Open data is a practice, driven by a clear use case and focused on helping champions make better decisions around that use case.
2. Open data is only as useful as it is trusted by (and applied to) local decision making. Make it as high quality as possible.
3. Open data requires policies that permit reuse and make it easy to find the data that drive local decisions. Open data must therefore be technically and legally open.
4. Sustainability is a function of the breadth of community that needs the data to make decisions and the interconnections between data and decision makers.
5. Creating an innovation space enables private sector, public sector, and international organizations to build applications on top of data. These spaces also make data useful beyond the original intentions of the OpenDRI Leadership Team.

Across the regions where OpenDRI is active, leadership teams have developed several approaches to fostering adoption of these principles.

- **Open Data Working Groups**. A task force of stakeholders that can tackle policy and technical challenges, introduce key people to each other, obtain training in new tools, and exchange practices and tools.
- **Innovation Spaces**. A neutral co-working space where DRM stakeholders can interact with the open technology community on experiments that solve evolving challenges.
- **Open Data Events**. A campaign to drive awareness of what can be done with open data and build relationships between developers, entrepreneurs, and decision makers.
- **Risk Communication Tools**. Software that enables non-technical users to fuse data from data catalogues, community mapping platforms, and scientific organizations into visualizations about risks in their communities.
- **University and Science Partnerships**. Formal and informal arrangements with universities to train students in the methods around open data and open source GIS, as well as collaborations on studies that monitor the accuracy of OpenDRI programs.
- **International Organizational Partnerships**. Formal and informal collaborations within and between UN agencies, World Bank teams, science agencies, and NGOs to develop the OpenDRI approach around open data.

Each of these approaches is itself an evolving practice. This chapter summarizes the approach without diving into the specific steps to implement this work so that these practices can evolve.

OPEN DATA WORKING GROUP

Creating the environment where open data can take root is often best done by creating a neutral space where partners can discuss concerns, explore policy options, and review the demonstrations of open data projects from other countries. To address underlying issues that prevent data sharing, it is necessary to confront the technical, policy, and science questions together. OpenDRI's experience points at the importance of establishing a working group around open data.

Who

The Open Data Working Group usually starts from local champions and expands through one-on-one relationship building with key stakeholders in DRM. Members tend to include:

Ministry Officials with responsibilities around DRM, ICT, Open Data, and Open Government

The Open Data Working Group owns the commitment between ministries to share data. As such, these ministry partners are ideal hosts for the training and networking events. They are also a key source of information about how well software is working for national needs and how it might be adapted for the future.

Photo: Caribbean Community of Practice meeting.
Credit: Bradley Lyon, The World Bank. 2013.

CARIBBEAN COMMUNITY OF PRACTICE

The World Bank's Latin America and Caribbean Region (LCR) DRM team helped to develop and foster a vibrant community of practice among the Caribbean states, with technical assistance from the World Bank investment projects and financial support from the European Union in the framework of the Africa, Caribbean and Pacific-European Union Natural Disaster Risk Reduction Program managed by GFDRR. The LCR DRM team developed a set of regional and national activities to connect key stakeholders and reinforce established relationships through a coordinated set of activities:

Open and collaborative geospatial data sharing platform: LCR DRM team has helped to implement open source, collaborative, geospatial, data-management platforms in nine countries in the Caribbean region, including: Antigua and Barbuda, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Saint Lucia, and Saint Vincent and Grenadines (SVG), and Trinidad and Tobago, as well the Caribbean Community Climate Change Center. These platforms are used by myriad practitioners in each country, primarily ministries of works and physical planning, as well as academics, development agencies and the Community of Practitioners from Caribbean OpenDRI.

Cross Sector Workshops & Training: the Caribbean DRM team convenes a series of regional workshops and technical trainings to bring key DRM stakeholders and practitioners together to discover common problems and seek out relevant solutions that are tailored to the region. The workshops and training often include Advanced GIS training, software development, and spatial data management skills that demonstrate applications of open-source tools to more effectively manage risk and inform decision making processes.

Community Webinars: LCR DRM team hosts a series of regular webinars that explore case studies and good practices from the Caribbean OpenDRI community to share experiences and keep decision makers aware of emerging trends, new features of tools, and use cases that help in DRM decision-making.

Partnerships: In collaboration with faculty at educational institutions like the University of the West Indies in Trinidad and Tobago, the LCR DRM team developed an Advanced Geospatial Training guide that is now serving as a foundation to the university curricula. This framework is ensuring that the next generation of GIS and risk managers understand the value that open-source/open-data tools can generate around DRM and appreciate the utility of these tools around the Caribbean region.

Innovation and Tool Development: The LCR DRM team introduced the GeoNode, OpenStreetMap, OpenDataKit, and QGIS platforms to the region. As a result, these tools have been embraced by the Caribbean OpenDRI Community and are in wide use. The LCR DRM team also helped to fund the development of a free version of a LiDAR tool that will allow viewing and generating digital elevation model from raw LiDAR data. The team is developing a training material and online tutorials to manage LiDAR data.

Support to DRM Operations: The goal of Caribbean OpenDRI is to support informed decisions aimed at reducing disaster risk. To foster a culture of informed decision-making, LCR DRM team helps governments across the Caribbean region apply OpenDRI practices for engaging regional communities and piloting multi-sector investment strategies to address disaster and climate change risk. For example, Dominica is using OpenDRI platform to develop data from a hurricane shelter assessment. Saint Lucia is creating an asset inventory of road networks, and Belize will be collecting exposure data for all its buildings. OpenDRI was useful during the damage and loss assessment aftermath the flood event in SVG and Saint Lucia.

Academic Community

University professors and their students in geology, geomatics, geography, and GIS are key partners in sustaining OpenDRI. They often are the heart of the geospatial community in a country.

Social Entrepreneurs

The youth who discovered the Internet and mobile phone are now building software to tackle the challenges with which they grew up. They bring energy and ideas to the Working Group.

Activities

Open Data Policy Development

A key step in the formation of the working group is to get members to commit to opening their data. It is this commitment that provides the necessary policy guidance and political cover for mid-level government officials to perform the practical actions by which data moves from a closed server to an open data catalogue.

The goal of the work group including building consensus, addressing underlying issues of sharing, exploring solutions to technical problems preventing data sharing, exchanging stories and best practices, and resolving conflicts. Many problems may not be technical, but may center around licensing, revenues, laws, regulations, and policies. Removing these impediments to data sharing in DRM is only possible by creating consensus among those who need data and control the data.

It is also important to focus on specific use cases. Working Groups that work on policy questions in the abstract tend to get stuck on edge cases and, as a result, become risk averse. Groups that focus on practical use cases can assess the potential political liabilities around a specific scenario and find solutions that may be imperfect, but get the group started on sharing more data.

Ongoing Training and Networking

The more connections OpenDRI creates between ministries, analysts, data collectors, data curators, and communities, the greater value that network will bring to the individuals who join it. The greater the capacity of each member of this network, the more capacity the network will have to analyze its risks. OpenDRI has been catalyzing these connections and capacity through training programs. Some meetings bring individuals from the region to a site where they can meet each other, discuss shared problems, and explore common solutions. Other meetings occur via webinars, where one or more speakers can broadcast their presentation to dozens or even hundreds of individuals.

Communications within and about Open Data

The use and usefulness of open data expands with the breadth of its network. Telling the story of successes and challenges is an important component of building a community of practice around OpenDRI. In the Caribbean, OpenDRI staff task a community manager with collecting stories from members, hosting webinars and workshops, and writing a monthly newsletter. This approach expands awareness of engagements across myriad island countries and connects members together as they confront shared problems.

INNOVATION SPACES

Innovation Labs harness an opportunity inherent in open technology: new tools can lower barriers to solving problems, exposing a gap between current practice and the imaginations of local entrepreneurs and open data champions. Exploring how to bridge this gap often requires bringing together a diverse range of actors in a shared collaborative space, where engineers, NGOs, and government officials can be free to experiment and iterative on new tools and practices without fear of failing.

This last point bears clarification. To try an approach that is truly new requires failing. If one is not failing, one is not pushing beyond the current conception of the challenge into areas which are only outside the current comfort zone. Most international development projects provide few ways to protect a collaborative learning environment where innovators can explore avenues which might not work—let alone might not be functional—on even the third or fourth try.

Innovation Labs create this safe place to experiment on iterations of an idea. Open Data and open technology thrive when technologists can work in close collaboration with policy makers, lawyers, and field personnel to explore multiple solutions that might meet their collective needs. Some of these solutions will be dead ends, but the process of discovering these failures allows the group to find the pathway that will work for most or all of the stakeholders.

The process of bringing these stakeholders together requires creating a safe, fun place that rewards design thinking and leaves the work to the participants (rather than shifting the burden to

external consultants). In this way, they can work together to learn how to ask the questions of the data which get them thinking about the nature of risk and how those risks might affect their operations and communities.

Designing an Innovation Space

Innovation spaces can start in a number of forms. Two of the most common are:

Coworking Spaces

OpenDRI's efforts to create an innovation space might start by piggybacking on existing coworking spaces, where technology entrepreneurs pay a small rent to a firm that operates an office where a community can work in loose coordination. Such spaces are emerging around the world, with some of the more famous having brands that are recognizable amid the logos of development and humantiarian action (e.g., iHub in Nairobi). Many coworking spaces serve as incubators or accelerators for start-ups, providing mentorship and introducing entrepreneurs to potential investors. They might also be virtual spaces, where the partners coordinate online via shared workspaces and chat.

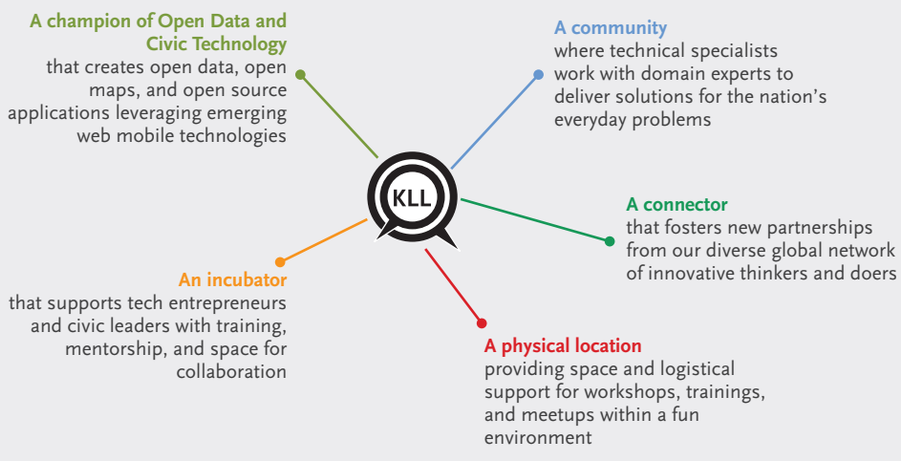
OpenDRI has worked with coworking spaces in Nepal and found them to be ideal ways to start programs with relatively low start-up costs. They are a place where software developers and entrepreneurs can interact with community mappers, government officials, and NGOs and discover shared problems. An additional benefit comes entrepreneurs discover not only how rich the OpenDRI data is and learn how to integrate their software with the open data services offered by OpenDRI.

Coworking firms can also serve as facilitators. They can do things that international institutions may find difficult in their procurement processes. Coworking firms can purchase and maintain computing equipment and mapping gear (e.g., GPS units, printers, software). They can contract with local transportation companies, enabling community mappers to travel to locations that require ground transport. They can also host meetings and trainings, which in many cultures requires catering to local expectations on the provision of food and beverage.

Kathmandu Living Lab

The Kathmandu Living Labs started in 2013 as an Open Cities investment in a coworking space to support a local effort to map schools and health facilities in OpenStreetMap. After building relationships between the local technology community, government, NGOs, and international organizations, a team of dedicated mappers created the Kathmandu Living Lab to co-create and implement both mobile and internet-based technology solutions to enhance urban resilience and civic engagement in Nepal.

The team is working to "localize successful models of open government and civic innovation to improve urban planning and management." It is also working to build partnerships with local and international organizations to improve open data in Nepal. More information is available at http://kathmandulivinglabs.org.



Innovation Labs

Innovation Labs are coworking spaces where the sponsoring entity takes a more active role in the curation of the people and relationships around the design challenges in the local context.

Innovation Labs may start in the community mapping portion of a project. They may be a standalone entity used to catalyze connection between sectors. They may even be a virtual space instead of a physical location. In each case, they play an important role in building and sustaining an OpenDRI engagement.

Building an innovation lab is something that has become an art form for UNICEF, which has launched over a dozen labs across their portfolio of member states. A *Do-it-yourself Innovation Lab Guide* inspired this OpenDRI field guide. The *DIY Guide* has work plans, terms of reference, and designs for Innovation Labs clearly articulated in an easy-to-read format. The *Innovation Lab DIY Guide* is available at http://www.unicefinnovationlabs.org/.

UNICEF has developed a set of working principles around the curation of design thinking in their Innovation Labs. Some of these principles are:

- **Fail quickly and openly**. Learning happens quickest when failure is transparent to all and a team of champions from many stakeholders can mobilize group resources to find the best or fastest solution.
- **Emphasize Openness**. UNICEF will not work with someone who is not open source and open data. Being open allows for fastest learning and building local capacity.
- **Collaborate with local partners**. UNICEF cannot do everything itself. Unless the sponsoring institution is collaborating on problems with local partners, the innovation will likely stall at some point in the future. For any idea to be scalable, it has to be built by people in the place one intends to scale it.

When OpenDRI has established a space for innovation, it has started the effort by identifying local coworking spaces, or where such spaces have not existed, contracted with a local facilitator to create one. In the OpenDRI context, innovation labs tend to be an evolution of the coworking space into an entity with deeper integration between the communities of developers, risk managers, entrepreneurs, and international actors.

Management of this evolution requires deep understanding of the local context. The OpenDRI Lead should work with the Country/Regional DRM Lead to determine what is the best approach.

Managing Innovation Spaces

UNICEF's *DIY Innovation Lab Guid*e is a very useful resource for those who wish to curate design process in a local innovation space. Managers who want to design an innovation space can start from the templates, ToRs, and other resources from the UNICEF guide. That said, OpenDRI introduces several issues which are unique to data collation and collection:

- **Growing data means deepening relationships**. To gain trust among the gatekeepers of key datasets, managers should invite these individuals into the innovation space, where they can see how the data will be used and build relationships with those who would be using the data.
- **Start with a gift**. Building trust sometimes requires a catalyst—a gift that shows that the relationship can be mutually beneficial. Hard-to-find DRM data is a great way to get a community of skeptics involved with OpenDRI.
- **Collaborate instead of competing**. Experience in Indonesia has revealed that contests may generate immediate action by a large community, but the energy is rarely sustained beyond the period of the contest. Building a durable community of contributors requires daily work that contests cannot provide. A key lesson is that contests are useful recruiting tools, but not a method for sustaining an OpenDRI effort.

Sustaining Innovation Spaces

When an innovation space is successful, it will develop a need for a revenue model. When the innovation space has its own revenue model, the community gains a stable place for other activities to occur. It also establishes a neutral space between government, private sector entities, and community-based organizations. The financial stability of this living lab is an important aspect of OpenDRI sustainment. The founders of this space should be encouraged to seek grants, contracts, and other financial support to keep the space vibrant and growing.

Revenue models to support coworking among technologists are not always adequate for supporting specific client ministry requirements. In the process of expanding the use of OpenDRI tools and practices, government ministries may encounter software

interoperability problems or discover the need to extend a tool to include features that were not foreseen during the initial OpenDRI implementation. This moment is ideal for a small investment—potentially in the low $10,000s USD—to help add features to the software. Because OpenDRI promotes an open-source software model, licensing is already established to allow for the feature to be usable by other countries as they encounter similar challenges or desired functionality.

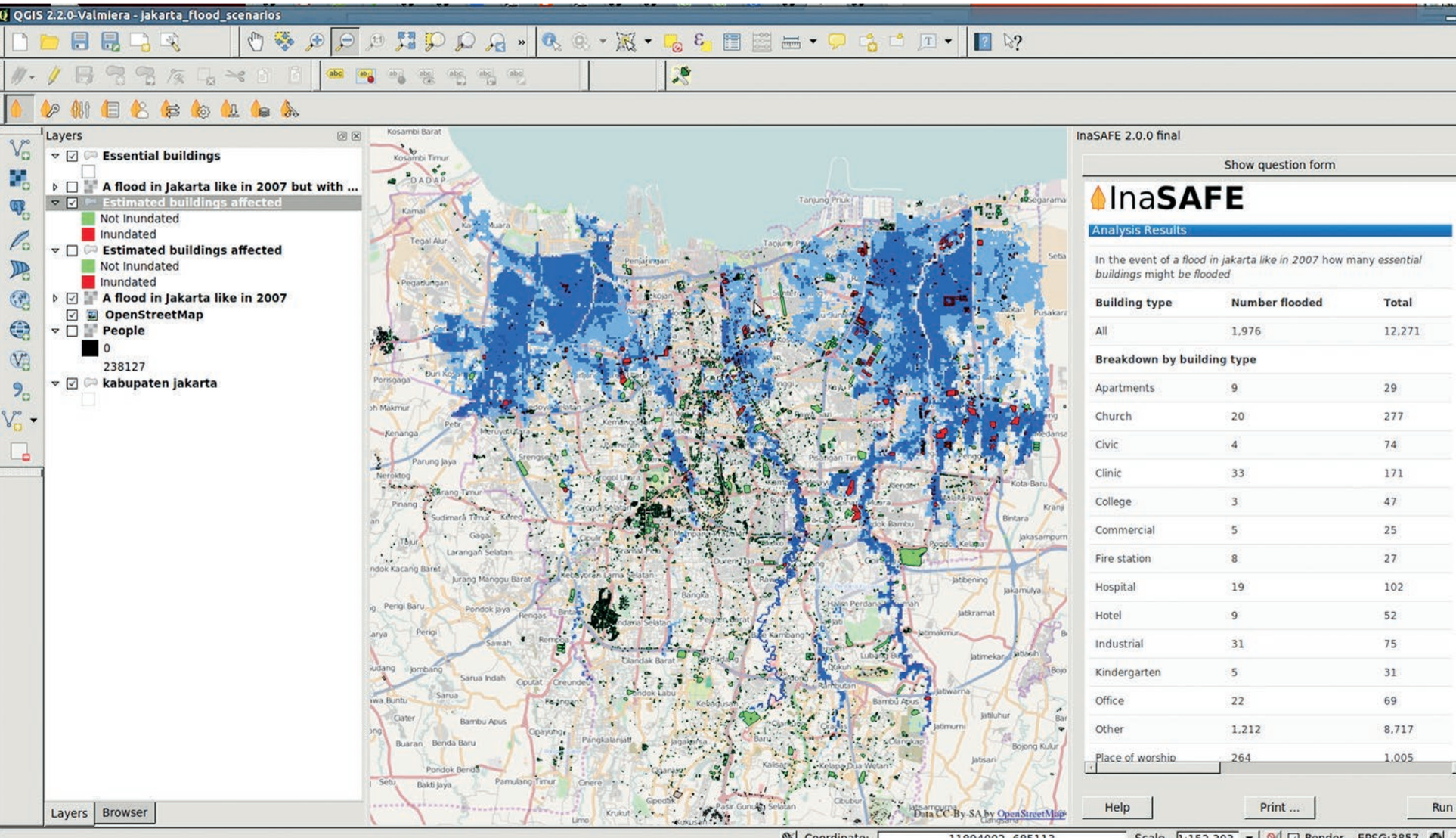
Evaluating Impact

When entrepreneurs and ministries are producing open-source software based on OpenDRI data or software, it is very likely that these products would not have emerged without the OpenDRI engagement. The success of the sustaining phase can be viewed, in part, by the creation of spaces for this type of software development to occur.

OPEN DATA EVENTS

While innovation spaces draw together a targeted community, open data events create ways for the general public to participate in OpenDRI. Through hackathons, workshops, and demonstrations, interested citizens can learn about risk, interact with the data the describes their community's exposure to those risks, and contribute to the effort to build better risk data.

OpenDRI participated in the International Open Data Day, which is an annual "gathering of citizens in cities around the world to write applications, liberate data, create visualizations and publish analyses using open public data to show support for and encourage the adoption open data policies by the world's local, regional and national governments." Open Data Days in Kathmandu allowed citizens and expatriots to see the data that is available about Nepal, see demonstrations of visualizations and applications based on



those data, and contribute to making more data available. More information is available at http://opendataday.org/.

OpenDRI also runs hackathons, which draw together developers and engineers around a set of challenges that the sponsoring agency has collected from local stakeholders. Hackathons are often run as competitions to build the best hack—not in the sense of a cyber exploit, but in the older sense of an elegant solution. However, this competition is more a means to create a sense of fun. Hackathons are best used to create relationships between developers who might not be aware of each other's skills, resources, tools, and data. Two examples of hackathons are the Random Hacks of Kindness, which GFDRR sponsors with Google, Microsoft, Yahoo! and NASA (http://www.rhok.org/); and Code for Resilience, which GFDRR cosponsors with The World Bank's Transportation, Water, and ICT group (http://www.codeforresilience.org/).

RISK COMMUNICATION TOOLS

Having better hazard and exposure data has little practical effects if local officials cannot interrogate the data and visualize how their built environment might interact with a potential hazard. To change the mindset of planners at all levels of government, it is not only necessary to give them maps and open up government data; they must also have simple tools that allow them to visualize potential disaster scenarios. Because traditional risk assessment models require a great deal of training and expertise, they are not always immediately usable by stakeholders to OpenDRI. In fact, there is a strong argument to leave modeling to these experts. However, visualizing impact is strongy encouraged.

Through an OpenDRI partnership, the World Bank-GFDRR has worked with the Government of Indonesia's National Disaster Management Agency - BNPB and the Government of Australia on an open-source risk communication tool called InaSAFE. This free plugin can be added a desktop GIS application called QuantumGIS. With minimal training, it allows officials working in DRM to load existing hazard maps with Community Mapping exposure data and run a scenario against a known hazard. For example, in Jakarta, local officials can visualize the impact of a flood against OpenStreetMap exposure data with a few mouse clicks.

An active training program around the management of risk data and its application to risk assessment is an important component in the effort to change the mindset around risk. InaSAFE provides an tangible link between these trainings and their application to disaster preparedness and response planning. More information on the program is available at the new website, http://inasafe.org.

UNIVERSITY AND SCIENCE PARTNERSHIPS

Universities are core partners in many OpenDRI engagements. Their academic departments around geography, geomatics, and GIS provide many of the students who volunteer to engage in community mapping. They also train many of the individuals who will curate geospatial data in government ministries and the private sector. When OpenDRI can integrate methods around open data and community mapping into the curricula of university programs, it ensures continued extension of an open approach to data collection and curation.

OpenDRI has also enlisted universities to perform evaluations of the quality of data produced by community mapping. Having a professor from a local university assess the accuracy of data collected by volunteers provides a clear set of recommendations for improving operations at the same time that it provides an honest understanding of the strengths and weaknesses of the data. Knowing the accuracy of the data has enabled national mapping agencies to set policies around the integration of community mapping data into official government data.

Universities train many of the geospatial professionals, government officials, and scientists who will be using OpenDRI data. GFDRR has found great success working with local professors. Training programs for OpenDRI can be given to universities to integrate into their courses, and data access provides students and faculty with a rich source of information to explore through research in graduate programs. In turn, the community of young professionals continues to expand the mental model of thinking in terms of risk management, providing a stable source of critical thinkers in the future.

OCHA HUMANITARIAN DATA EXCHANGE (HDX)

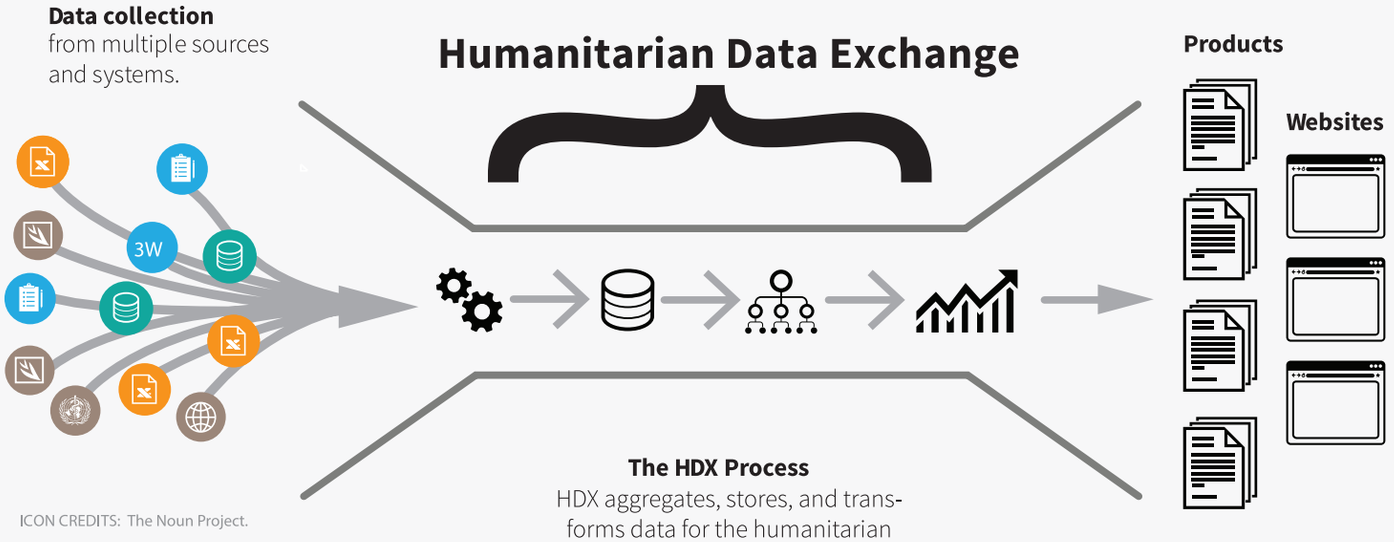
Like disaster risk data, humanitarian data can be difficult to aggregate and apply to decision making. To address this challenge, the UN Office for the Coordination of Humanitarian Affairs launched the Humanitarian Data Exchange (HDX) project to prepare the baseline data necessary for tracking and responding to crises and emergencies. The HDX aims to make humanitarian data easy to find and use for analysis.

HDX has three components:

- The **HDX Dataset Repository**, where data providers can upload their raw data spreadsheets for others to find and use.
- **HDX Analytics**, a refined database of high-value data that can be compared across countries and crises, with web-based tools for analysis and visualisation.
- **Standards** to help share humanitarian data through the use of a consensus Humanitarian Exchange Language.

HDX works by principles very much in line with OpenDRI:

- **Aggregation, not creation**: HDX will aggregate data that already exists. OCHA is not working on primary data collection or the creation of new indicators.
- **Progressive data enhancement**: As data moves from the crowd-sourced dataset repository into the curated CHD database, OCHA will take it through a quality review process to ensure that it is sourced, is trusted, and can be combined with data from other sources.
- **Open data**: HDX will provide technical support for (a) sharing any data, and (b) allowing data providers to decide not to share some data for privacy, security or ethical reasons. Terms of use for data shared through the site will be available soon.
- **Open technologies**: HDX will use open-source, open content, and open data as often as possible to reduce costs and in the spirit of transparency. OCHA will use an open-source software called CKAN for the dataset repository. All of OCHA's code can be found on GitHub.



ICON CREDITS: The Noun Project.

The HDX Process
HDX aggregates, stores, and transforms data for the humanitarian community.

PARTNERSHIPS WITH INTERNATIONAL ORGANIZATIONS

The partners to this guide are actively seeking to build connections between national data sets around DRM with the datasets used by others in disaster risk reduction and disaster response operations. These partners have built (or are building) data catalogues that may augment national efforts. It may also be in a client nation's interest to ensure that the data used in these international data catalogues is aligned with the data collected via OpenDRI and other approaches to open data run by client nation ministries.

Key partners in the process include OCHA, which is building a Humanitarian Data Exchange (HDX) that expands the Common and Foundation Operational Datasets (CODs and FODs) with data about ongoing projects in their portfolio of countries. The HDX Project aims to track 600 indicators for every country in the world. It includes a Semantic Web project called the Humanitarian Exchange Language, which provides a mechanism to translate between various ways of describing humanitarian action and disaster risk data using Extensible Markup Language (XML) and (in phase 2) the Resource Description Framework (RDF)—the core standards for the Semantic Web (aka Web 3.0). UNDP has an extensive network of operations aggregating disaster risk data.

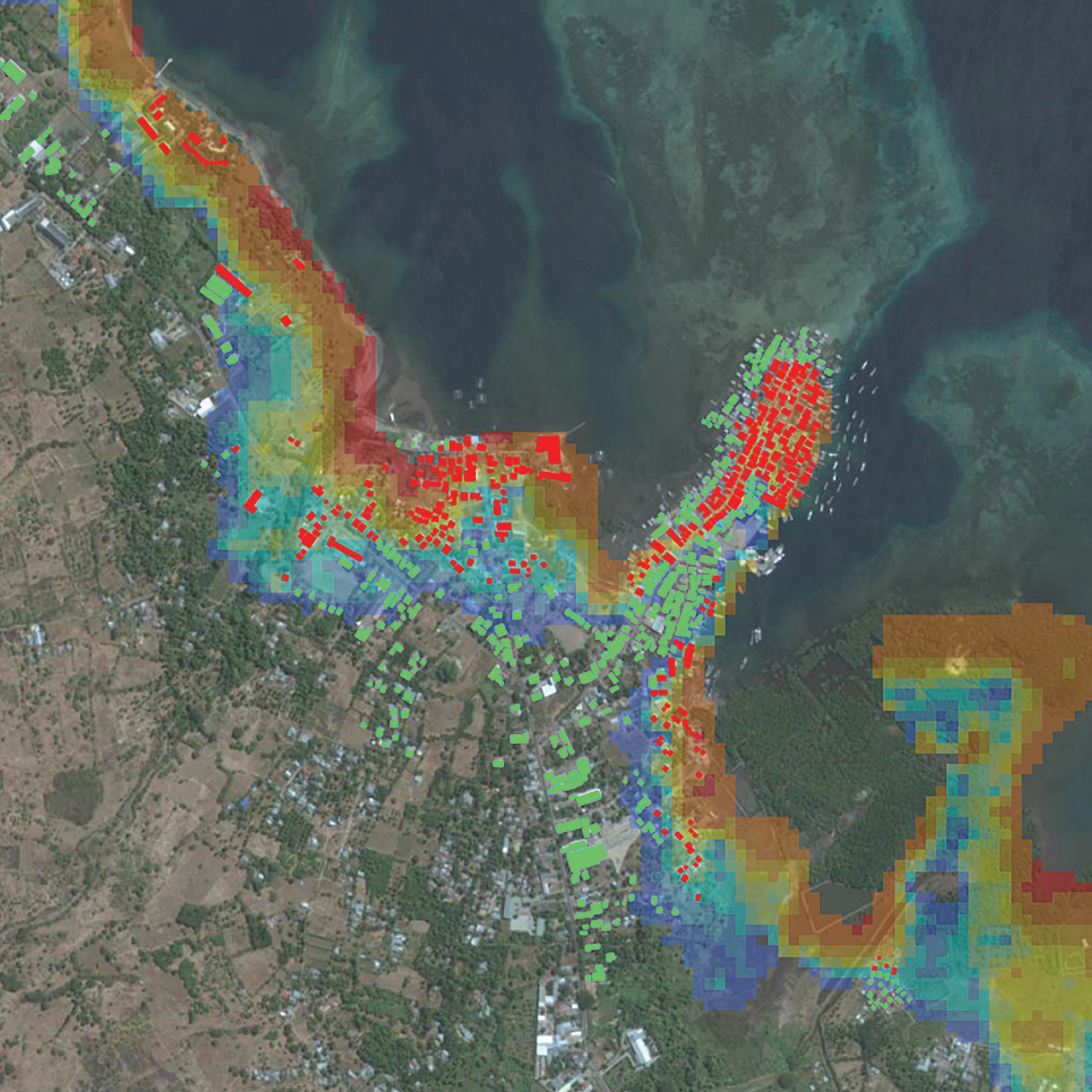
WHEN DOES OPENDRI BEGIN AND END?

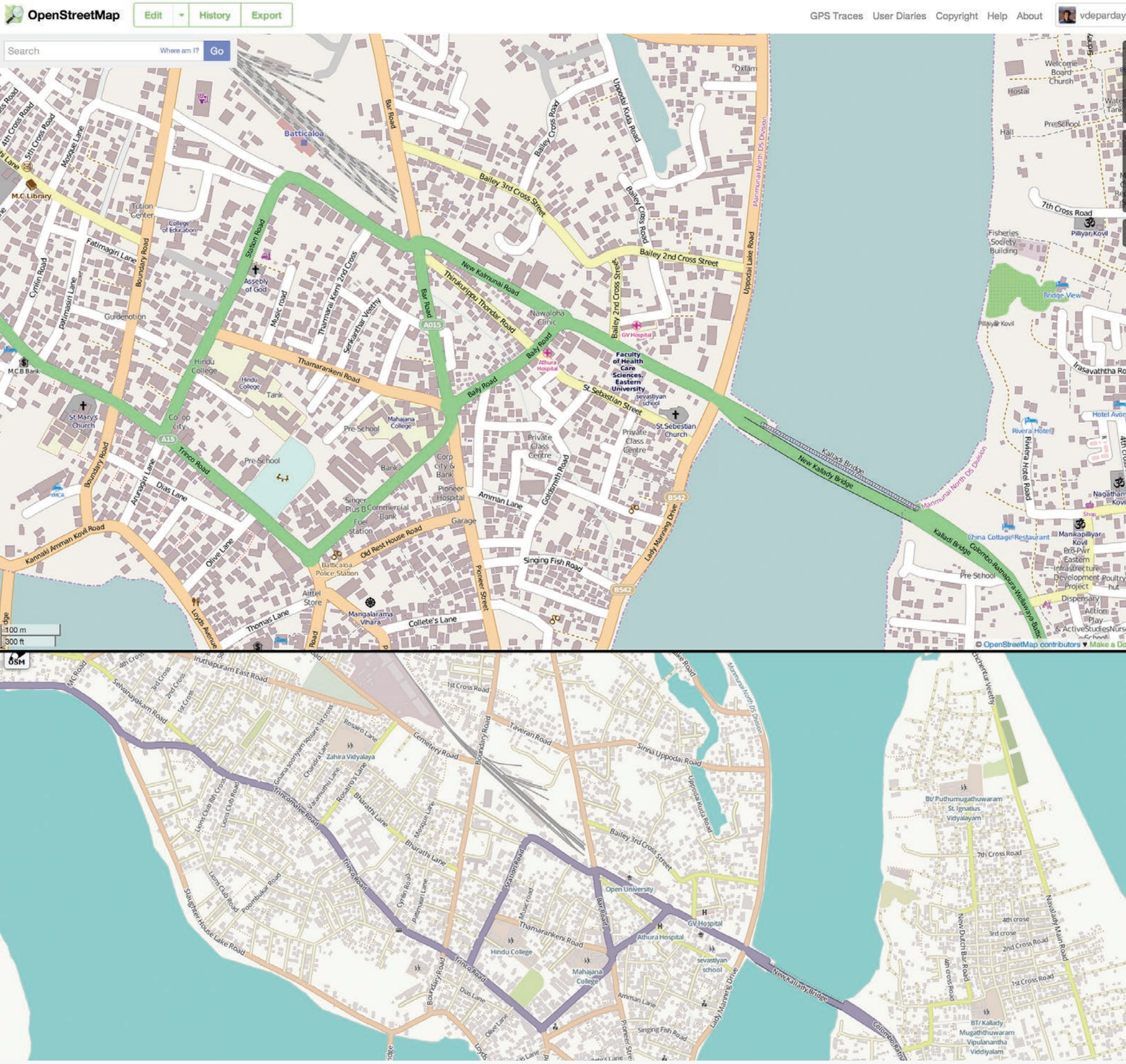
There is a point in the maturation of risk thinking that OpenDRI must clarify its scope to be around data collection and curation, not risk assessment. When tasks around OpenDRI become more focused on the analysis of data than the management of the data, OpenDRI can transition to working on other efforts in DRM capacity building and risk assessment.

Catalyzing is meant to provide bursts of energy to local champions. It is not a mechanism for continuous investment. The challenge facing OpenDRI staff is knowing how to determine when OpenDRI has met its intended goals. It is not an easy task or obvious decision. The original objectives set forth in the initial Concept Note may have shifted to more advanced risk thinking. As the pilots have evolved into a larger efforts across greater areas, the efforts have grabbed the attention of high-level leaders, who want to continue low-cost, high-output work. They may also want to engage in deeper risk assessment projects, which provide them with the data necessary to engage with larger disaster risk management programs, such as retrofitting thousands of municipal facilities against earthquake. Creating such a shift in the mindset and awareness of decision makers is itself a success. However, this level of attention may require additional capacity building, which may require additional work in open data.

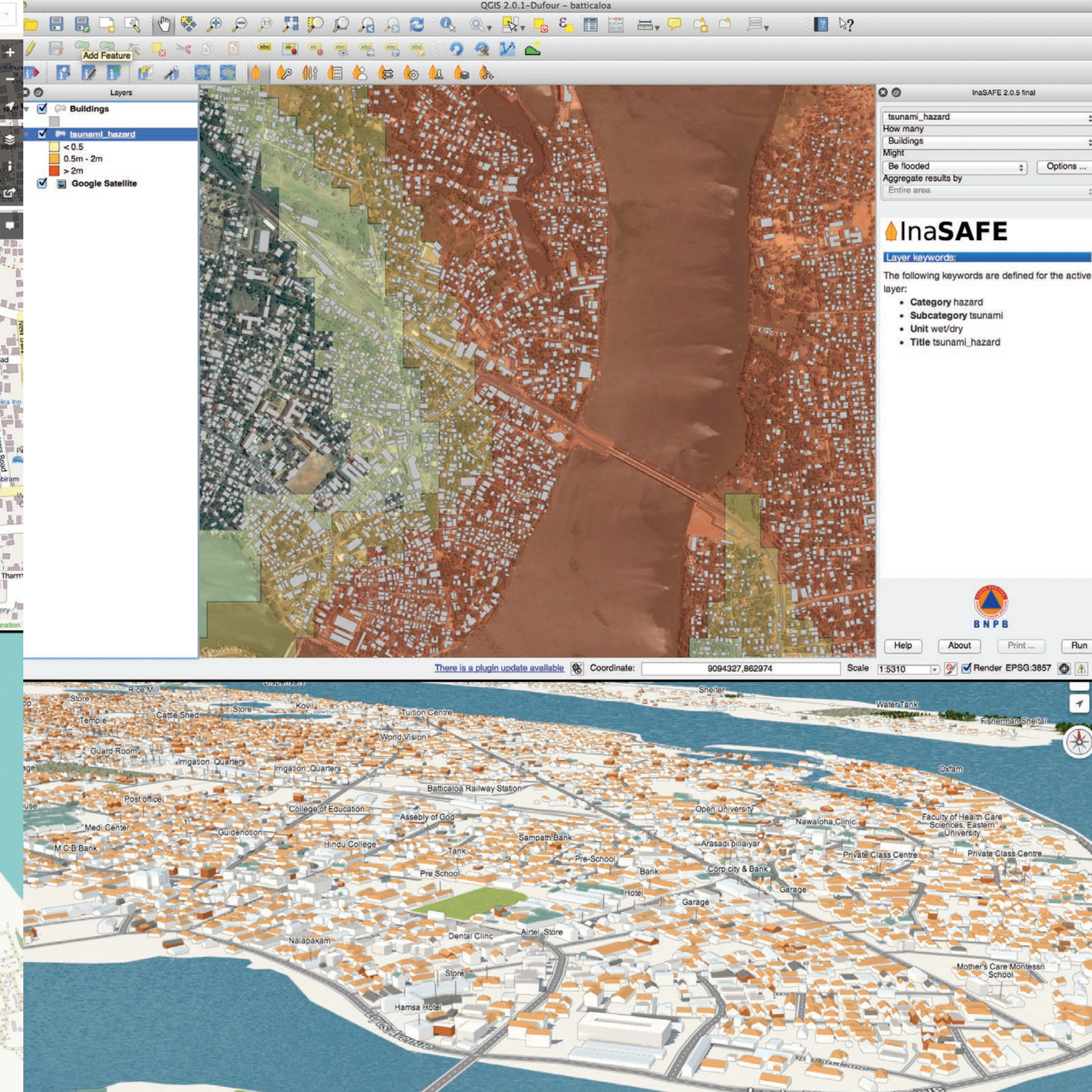
The cycle of OpenDRI has yet to close in any of its projects. We are privileged to work with a growing network of champions whose stewardship of data is creating the collective memory that will spare countless lives and make our societies more resilient against the challenges that are arising from climate change, urbanization, and other crises of the 21st century.

Graphic: InaSAFE analysis of potential tsunami damage to Maumere, Indonesia.
Credit:: GFDRR and AIFDR, 2013.





OpenStreetMap rendersings of Batticaloa, Sri Lanka. Top left: OSM in the Humanitarian OpenStreetMap cartography. Bottom Left: OSM in the default OSM cartography. Top right. OSM as the base layer in IanSAFE analysis of tsunami hazard to the city. Bottom left: OSM data used to render 3-dimensional map of the city from F4Map. Map data © OpenStreetMap contributors.


QGIS 2.0.1-Dufour – batticaloa
Add Feature
Layers
Buildings
tsunami_hazard
< 0.5
0.5m - 2m
> 2m
Google Satellite
InaSAFE 2.0.5 final
tsunami_hazard
How many
Buildings
Might
Be flooded
Options ...
Aggregate results by
Entire area
InaSAFE
Layer keywords:
The following keywords are defined for the active layer:
Category hazard
Subcategory tsunami
Unit wet/dry
Title tsunami_hazard
BNPB
Help
About
Print ...
Run
There is a plugin update available
Coordinate:
9094327,862974
Scale
1:5310
Render
EPSG:3857
Rice Mill
Store
Temple
Cattle Shed
Store
Kovil
Tuition Centre
World Vision
Guard Room
Irrigation Quarters
Irrigation Quarters
Batticaloa Railway Station
Post office
College of Education
Assebly of God
Medi Center
Guidenotion
M.C.B Bank
Hindu College
Tank
Pre School
Sampath Bank
Pre-School
Bank
Hotel
Garage
Garage
Dental Clinc
Airtel Store
Nalapakam
Store
Hamsa Hotel
Shelter
Water Tank
Fisherman Sheltal
Oxfam
Open University
Nawaloha Clinic
Faculty of Health Care Sciences, Eastern University
Arasadi pillaiyar
Corp city & Bank
Private Class Centre
Private Class Centre
Mother's Care Montessri School

8

EPILOGUE

When shared, collective memory can grow into a general consciousness and extend across many generations. Open data is becoming a tsunami stone for the modern age—a digital collective memory for societies that have faced disasters, rebuilt, and asked how they can avoid replicating designs that proved weak before the forces of nature. Over time, open data can lead to more resilient societies by creating a shared understanding of how to best manage risk and then design approaches to managing those risks.

In less than decade, readers will look at the initial version of this guide like an early piece of new software. Its creators hope that it will have provided a useful scaffolding for expanding the practices around the collation and collection of open data, as well as the approaches that we take to catalyzing communities to apply open data to decision making. If it has done so, it will have done its job, but only if others keep building upon it.

We therefore invite thinkers from around the world to extend this guide. We have placed it under a Creative Commons license to foster the creation of a collective memory around open data practices. If you do build upon the Guide and add your insights in any language, please contribute your experiences and insights back to the global community. More information will be made available on coordinating a collective effort via the GFDRR.org web site.

Open data is a new way to give voice to a community's needs. We hope that the emerging set of methods described in this Guide empowers those who are producing and curating open data in their communities. Together, as partners, we hope to build the collective memory that our grandchildren will need as they make decisions about risk in a world where climate change will affect their everyday lives. They will need a far deeper understandings of their past to inform the decisions that they need to make to protect the future of their own children.

Photo: Kathmandu, Nepal.
Credit: John Crowley.


AIFDR

APPENDIX A: PERSONNEL

Past OpenDRI engagements have used a variety of organizational designs to support their objectives. Some have used very small teams, focused on closely scoped goals. Some have employed a mix of contractors and volunteers to collate and collect data, build tools to support future OpenDRI engagements, and train local officials on the platforms. All have adapted their personnel to meet needs as they have been discovered.

What follows is a listing of the various positions that OpenDRI has used in past engagements which demonstrates the general classes of positions which have been hired. To meet the needs of any particular engagement, a programming officer would select the group of roles needed for the work. He or she may also need to create positions that meet specific local requirements.

This chapter follows the structure from each of the phases:

Scoping and Management

The OpenDRI Leadership Team, including the Scoping Mission Team.

Collating

The Core Data Team and related Data Catalogue Team positions.

Collecting

The Core Mapping Team and related Community Mapping Team positions

Catalyzing

The OpenDRI Leadership Team and related positions for Open Data Working Groups, Innovation Labs, Risk Communication Tools, Partnerships, and Hackathons.

To assist with this selection process, the following table summarizes some of the more common configurations of positions:

Indonesia OpenStreetMap team with Humanitarian OpenStreetMap Team Executive Director Kate Chapman, Jakarta, 2013.
Credit: Abby Baca, The World Bank, 2013.

FOUR EMERGING PERSONNEL STRATEGIES

City Collect: Kathmandu

STRATEGY

To collect building footprints and exposure data for schools and health facilities in Kathmandu to support a plan to retrofit these facilities against seismic risks.

PERSONNEL

OpenDRI Lead/Project Manager

Project lead funded by regional office of World Bank. Open data expert with a software development and GIS background in international development.

OpenDRI Community Mapping Lead

Recent PhD graduate in Geography with focus on OpenStreetMap.

OpenDRI Knowledge Manager

Short-term consultant focused on documentation and cross-pollination of ideas.

Coworking Firm

A Kathmandu-based coworking space to facilitate community mapping and host the start-up operations of OpenDRI.

Innovation Lab/Kathmandu Living Lab

An Kathmandu-based NGO that formed based on the communtiy mapping work. Team with geography, software, mobile, and DRM backgrounds.

Science/Engineering/Tech Support Firm

A local science/engineering NGO that provided training on exposure mapping and QA on data collected by community mapping teams.

Country Collate and Collect: Sri Lanka

STRATEGY

To support a national effort to collect building footprint and exposure data and to support a more effective risk assessment.

PERSONNEL

OpenDRI Deployment Specialist: Combined community mapping and data catalogue

A GFDRR Labs short-term consultant with OpenDRI experience and a GIS background.

Local Logistics Support Firm

A local firm contracted to provide transportation, purchase and maintain computing equipment, and manage mapping gear.

Data Curator

An expert in the aggregation, cleansing, and stewardship of data sets.

Country Partnership: Indonesia

STRATEGY

Support a multi-institutional partnership to collect better exposure and hazard data and visualize the potential impact of hazards on the built environment.

PERSONNEL

OpenDRI Lead/Project Manager

Project lead funded by regional office of World Bank. DRM expert with a background in civil engineering and international development.

Community Mapping Firm

A small international NGO with a mission to train and support community mapping using OpenStreetMap.

Coworking Firm

A Jakarta-based coworking space to facilitate community mapping and host the start-up operations of OpenDRI.

Science Support Firm

Geoscience Australia is providing support to AusAID in the form of risk assessment and geoscience expertise, mentoring, consulting, and software development.

Regional: Caribbean

STRATEGY

Foster open data through the deployment of data catalogues and training programs that build relationships within and between the DRM staff of the Caribbean islands.

PERSONNEL

OpenDRI Open Data Specialist

A World Bank DRM specialist with OpenDRI experience and a technical and business background.

Data Curators

Varies by nation. Data managers as both consultants to OpenDRI and as national staff.

OpenDRI Knowledge Manager

A World Bank Knowledge Management specialist with OpenDRI experience.

GeoNode Trainer

A GFDRR Labs short-term consultant with OpenDRI experience and a GIS background.

OpenDRI Lead/Project Manager

Background/General Description

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here and the DRM program that OpenDRI is supporting,*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*]. The OpenDRI Lead/Project Manager will coordinate and manage these activities in [*country*].

Duties and Accountabilities

Under the direct supervision of [*managers*], the incumbent will report to [*supervisor*]. S/he will be responsible for the following activities:

- Operationalize OpenDRI Program: Work with the regional OpenDRI team to design and execute the [*area of responsibility*] Exposure Mapping activities of the [*country*] OpenDRI program with a particular focus on the collection and open dissemination of assets at risk/exposure data for [*cities or regions*].
- OpenDRI Strategy: Work with the [*regional*] team to design, execute and manage the strategy for the [*area of responsibility*] component of the regional OpenDRI strategy.
- Partnership Building and Outreach: Identify, mobilize, and coordinate partnerships amongst key stakeholders to support the OpenDRI regional strategy.
- OpenStreetMap Community: Play an active role to build and manage the [*country*] OSM community including organizing meetups, giving presentations, and participating in IRC and email lists.
- OpenStreetMap Training: Lead the building of local capacity to provide on-demand training and guidance on OSM data collection and usage for DRM purposes.
- Quality Control/Assurance: Contribute to the design and oversee quality control processes to ensure data collected during activities is accurate and applicable to the regional World Bank DRM portfolio
- OpenDRI [*Country Name*]: Provide support on an ad hoc basis to [*managers*] to ensure alignment of all project activities with the overall OpenDRI [*country*] effort.
- Document Lessons Learned: Produce reports to document lessons learned throughout the project to inform future OpenDRI projects.

Selection Criteria

- Experience working in disaster risk management or international development, preferably in the region, on data-sharing, SDI, or GIS topics.
- Strong communications skills, ability to lead trainings and give effective presentations and the conduct and use of risk assessments.
- Experience using and contributing to OpenStreetMap and providing training and guidance to new mappers.
- Understanding of major concepts and issues involved with disaster risk management.
- Master's degree or or equivalent professional experience in relevant field.
- Fluent in English.

OpenDRI Deployment Specialist/Data Catalogue

Background/General Description

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here and the DRM program that OpenDRI is supporting,*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*]. The OpenDRI Deployment Specialist/Data Catalogue will coordinate and manage the collation of existing data in [*country*].

Duties and Accountabilities

Under the direct supervision of [*managers*], the incumbent will report to *[supervisor, usually the OpenDRI Lead/Project Manager*]. S/he will be responsible for the following activities:

- Operationalize OpenDRI Program: Work with the regional OpenDRI team to design and execute the [*area of responsibility*] data collation activities of the [*country*] OpenDRI program.
- OpenDRI Strategy: Work with the [*regional*] team to design, execute and manage the strategy for the [*area of responsibility*] component of the regional OpenDRI strategy and local data collation strategy.
- Data Collation: Establish mechanisms to collate and curate data to support risk assessment activities in the region using the data catalogue specified by the local partners/clients.
- Partnership Building and Outreach: Identify, mobilize, and coordinate partnerships amongst key stakeholders to support the OpenDRI regional strategy and data collation objectives, with a focus on the collation of data sets that these partners already curate.
- Quality Control/Assurance: Contribute to the design and oversee quality control processes to ensure data collated during activities is accurate and applicable to the regional World Bank DRM portfolio.
- OpenDRI [*Country Name*]: Provide support on an ad hoc basis to [*managers*] to ensure alignment of all project activities with the overall OpenDRI [*country*] effort.
- Document lessons learned: Produce reports to document lessons learned throughout the project to inform future OpenDRI projects.

Selection Criteria

- Experience working in disaster risk management or international development, preferably in the region, on data-sharing, SDI, or GIS topics.
- Experience using and training the data catalogue specified for this engagement and providing training and guidance to new users [*usually specified as GeoNode*].
- Strong communications skills, ability to lead trainings and give effective presentations and the conduct and use of risk assessments.
- Understanding of major concepts and issues involved with disaster risk management.
- Master's degree or or equivalent professional experience in relevant field.
- Fluent in English.

OpenDRI Deployment Specialist/Community Mapping

Background/General Description

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here and the DRM program that OpenDRI is supporting,*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*]. The OpenDRI Deployment Specialist/Community Mapping will coordinate and manage the collection of new exposure/asset data via community mapping in [*country*].

Duties and Accountabilities

Under the direct supervision of [managers], the incumbent will report to *[supervisor, usually the OpenDRI Lead/Project Manager*]. S/he will be responsible for the following activities:

- Operationalize OpenDRI Program: Work with the regional OpenDRI team to design and execute the exposure mapping activities of the [*country*] OpenDRI program, with a particular focus on the collection and open dissemination of assets at risk/ exposure data for [*cities of regions*].
- OpenDRI Strategy: Work with the [*regional*] team to design, execute and manage the strategy for the [*area of responsibility*] component of the regional OpenDRI strategy.
- Partnership Building and Outreach: Identify, mobilize, and coordinate partnerships amongst key stakeholders to support the OpenDRI regional strategy and community mapping strategy.
- OpenStreetMap Community: Play an active role to build and manage the [*country*] OSM community including organizing meetups, giving presentations, and participating in IRC and email lists.
- OpenStreetMap Training: Lead the building of local capacity to provide on-demand training and guidance on OSM data collection and usage for DRM purposes.
- Quality Control/Assurance: Contribute to the design and oversee quality control processes to ensure data collected during activities is accurate and applicable to the regional World Bank DRM portfolio
- OpenDRI [*Country Name*]: Provide support on an ad hoc basis to [*managers*] to ensure alignment of all project activities with the overall OpenDRI [*country*] effort.
- Document lessons learned: Produce reports to document lessons learned throughout the project to inform future OpenDRI projects.

Selection Criteria

- Experience working in disaster risk management or international development, preferably in the region, on data-sharing, SDI, or GIS topics.
- Experience leading community mapping or participatory GIS activities, with a particularly focus on OpenStreetMap.
- Strong communications skills, ability to lead trainings and give effective presentations and the conduct and use of risk assessments
- Experience using and contributing to OpenStreetMap and providing training and guidance to new mappers.
- Master's degree or or equivalent professional experience in relevant field.
- Fluent in English. Local language skills encouraged.

OpenDRI Knowledge Manager

Background/General Description

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here and the DRM program that OpenDRI is supporting,*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*]. The OpenDRI Knowledge Manager will coordinate and manage the documentation of the OpenDRI deployment, including all project documents, links to data, photographs, training materials, Field Papers. S/He will also document lessons learned.

Duties and Accountabilities

Under the direct supervision of [*managers*], the incumbent will report to *[supervisor, usually the OpenDRI Lead/Project Manager*]. S/he will be responsible for the following activities.

- Document each phase in the collation of existing data and collection of new data, including major documents and data sets. These resources will be made available online in open format.
- Build relationships between stakeholders through trainings, webinars, and communities of practice.
- Document lessons learned: Produce reports to document lessons learned throughout the project to inform future OpenDRI projects.

Selection Criteria

- Experience working in disaster risk management or international development, preferably in the region, on data-sharing, GIS, or open data.
- Experience documenting field work for small teams.
- Experience building vibrant communities of practice.
- Strong communications and presentations skills, ability to lead trainings and give effective presentations.
- Experience preferred in using and contributing to OpenStreetMap and providing training and guidance to new mappers.
- Bachelor's degree or higher in relevant field
- Fluent in English. Local language skills encouraged.

Data Curator

Background/General Description

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here and the DRM program that OpenDRI is supporting,*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*]. The Data Curator will coordinate the collation of data, data munging/cleansing, and data upload into the data catalogue. The Curator will become the primary steward of the data.

Duties and Accountabilities

Under the direct supervision of [*managers*], the incumbent will report to [*supervisor, usually in a local client ministry*]. S/he will be responsible for the following activities.

- Work with the OpenDRI Deployment Specialists and OpenDRI Lead/Project Manager to obtain rights to existing data sources from key stakeholders.
- Manage the process to cleanse and prepare the data for upload into a data catalogue, including ensuring that all data is annotated with clear and precise metadata that meet international and local standards.
- Curate data over time, ensuring that dynamic datasets reflect current realities within budgets and time constraints.

Selection Criteria

- Experience working in disaster risk management or international development.
- Experience working with geospatial databases and curation of data sets.
- Strong communications and relationship management skills preferred.
- Bachelor's degree or higher in a related field, with preference for information science, library science, GIS, or computer science.
- Fluent in local language(s) with strong English skills also preferred.

GeoNode Trainer

Background

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here and the DRM program that OpenDRI is supporting,*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*].

A core component of the strategy in [*country*] is the collation of existing data into a GeoNode, an open source software platform that facilitates the creation, sharing, and collaborative use of geospatial data. To promote collaboration, the GeoNode is designed on Web 2.0 principles to:

- Make it very simple to share data;
- Provide user statistics;
- Easily add comments, ratings, tags;
- Allow collaborative filtering;
- Provide rankings of best 'views' and data sets contributed—such as highest rated, most viewed, most shared;
- Allow connectivity between several GeoNode instances to augment the collaborative potential of government GIS programs.

The GeoNode Trainer will develop materials and training materials that will serve as the curriculum for local stakeholders who will be engaged in the development and maintenance of a GeoNode for DRM data. [*university, other partners*] itself will also participate in the training.

Objective

The selected consultant will be required to develop and facilitate a [*n-days*] Training on GeoNode for Geospatial Data Managers (TGDM). The TGDM should focus on advanced theory and practice for the GeoNode to enhance GIS data use. The services to be provided include the following:

- a detailed table of contents of the training program along with learning outcomes,
- a training manual with visuals (slides), case studies, and references, and
- a guidance note for the adoption of the training materials as a university level II course.

[*optional*] The TGDM training will also be held in parallel to the Advanced Training for Software Developers (ATGSD) for GeoNode software developers in the region. Therefore, the selected consultant will be expected to collaborate with the ATGSD facilitator to identify sessions in which both training groups would meet to discuss their work responsibilities and build collaboration to integrate software developer and user groups.

Target Audience

The target audience will primarily be advanced GIS users and GIS data managers (mainly from ministries of [*list of participating ministries*] with basic knowledge of GeoNode platforms and competent in GIS technology. There will be approximately [*number*] participants.

Required Components and Expected Results of the Training

The advanced training will focus on sessions that aim to create lessons that include practical exercises that directly relate to each trainee's respective country/agency needs. Thus, the training should help advance the particular project needs to complete the installation, launch and/or improve the use of the GeoNode. In all instances, the training is meant to build capacity and improve knowledge sharing of open-source platforms between spatial data managers and software developers in the region and support DRM operations in [*countries*]. The training should be structured on the following components and dependencies of the GeoNode:

The training will be structured on the following components of the spatial data management:

- Common GIS analysis and practices;
- Advanced GeoNode configuration and use;
- Using Open Source desktop GIS (QGIS);
- Integrating GeoNode into existing GIS workflow;
- OSM mapping concept, tools and field work for collecting exposure data;
- Data quality control (QA/QC);
- Spatial data infrastructure;
- Advanced map projection system;
- Advanced metadata concept;
- Advanced cartography.

Tasks

The consultant will undertake the following tasks, based on the schedule of activities (below):

- Propose a draft agenda and outline for the training manual
- Develop a draft and final version of the training manual based on feedback from the World Bank team
- Conduct the TGDM training in parallel to the ATGSD training in [*previous workshops*]
- Develop evaluation questions for an online survey to conduct a training assessment by the participants;
- Submit a summary report on the training, including a description of the initial knowledge of the participants, the knowledge level after the training and lessons learnt from the training
- Develop a conceptual curriculum for a university level curriculum in collaboration with the ATGSD facilitator.

Selection Criteria

The consultant will be evaluated based on the following criteria:

Minimum Requirements:

- Advanced degree in GIS or similar field or equivalent professional experience.
- Minimum 3-years experience with ArcGIS or other desktop GIS software

Preferred Qualifications:

- Demonstrated ability to work in international contexts
- Familiarity with DRM-specific data needs
- Familiarity with GeoNode and open source GIS and data management tools such as OpenLayers/GeoExt, PostGIS, GeoNetwork, GeoServer, and OpenStreetMap
- Experience with teaching and/or conducting trainings on technical topics.

GeoNode Support Firm

I. Background

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here and the DRM program that OpenDRI is supporting,*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*].

The GeoNode Support Firm will provide technical support for the installation and maintenance of the GeoNode in [*organization that will host GeoNode*].

II. Description of tasks and activities

The following tasks will be completed to achieve the stated objectives.

Task 1. Initial Installation and Customization:

An instance of GeoNode will need to be installed and configured on servers owned or managed by the [*host minstry*]. The firm will provide hosting recommendations (remote vs. in-country) and necessary support during the procurement process. Once installed, the software will be customized to achieve basic branding goals including relevant logos, the name and description of the project, and a custom theme. The theme should include a categorical entry point to the available tools of the portal, including, at least entry points to:

- spatial tools and maps,
- the spatial data catalogue, and
- a knowledge sharing entry point which provides a user-friendly content management system to upload experiences, images and videos and navigate this user-generated content on a map interface.

Task 2. Population of the GeoNode with Initial Data

Once the GeoNode is installed on government servers, the firm will work with staff of the [*host ministry*] to populate the platform with available spatial datasets relevant to climate and disaster risk in the country. The majority of initial data should come [*sources*] but should also include other sources identified in collaboration with the World Bank and the Government of [*country*], and be prepared in readiness to accommodate data that will become available under [*related initiatives*]. Specifically, the firm will be responsible for:

1. Uploading identified spatial data layers.
2. Ensuring metadata is entered into the platform, in compliance with World Bank GeoSpatial Metadata standards (based on ISO 19115:2003).
3. Styling of uploaded datasets using the SLD format to allow for basic visualization on the platform.
4. Creation of a suite of basic "mashups" or maps with data made available on the platform in close collaboration with relevant stakeholders.

Task 3. GeoNode Training

The firm will provide a series of trainings to staff of [*participants*]. The trainings should cover the basic usage of GeoNode including uploading and managing data, using both offline SLD editors and GeoNode for styling data, creating metadata, and making maps. It is envisioned that this type of training be provided twice, once covering basic topics at the outset of the project and once covering more advanced topics 2-3 months later; and will be based on hands-

on training in carrying out the activities listed under Task 2.

Staff of the [*host ministry*], where the GeoNode will be hosted, should also receive separate trainings covering topics related to GeoNode administration and troubleshooting as they will be the primary actors in the country responsible for maintaining the platform.

[*any special support requirements to DRM programs*]

The training materials developed will be shared with the GeoNode community for use in other contexts. Thus one of the deliverables of this task will be a training package including sample data, necessary handouts, powerpoint presentations, and a trainer's guide that will facilitate the conduct of the trainings provided in the future.

Task 4. Platform Upgrades and On-call Technical Support and Troubleshooting

The mapping platform will be based on the free and open-source software, GeoNode. There is an active developer community around this tool and a number of improvements, modifications, and bug fixes are regularly contributed to the platform. As the open-source community continues to grow, it is anticipated that the rate of such improvements will increase.

The contracted firm will be responsible for performing software upgrades to the latest version of GeoNode as of [*date*]. Corresponding adjustments to the branding and any other customizations to the site should be made as required.

Additionally, the firm will also provide 15 hours per month of ad-hoc troubleshooting, bug-fixing, perform upgrades until the latest version as of [*date*] and other technical assistance at the request of site administrators or the World Bank. This support will last for a period of [*n, often 3*] months (potentially extended thereafter).

III. Resources: The World Bank will provide the following resources to the project.

1. Facilitation of necessary access to staff and officials of the Government of [*country*].
2. Decisions and feedback on the design process of all code and training materials written as part of this project.

IV. Deliverables

1. Initial GeoNode install and customization/branding
2. Initial import of data and metadata, styling of imported data, creation of a basic suite of disaster risk maps.
3. GeoNode trainings (Basic and advanced end-user, administrator) and training materials.
4. Platform upgrades and ad-hoc technical support

V. Requirements

1. In accordance with the GeoNode project, all software products must be open source.
2. All work shall be tested for all major web browsers including Windows Explorer 7.
3. Language. All software produced in associated with this contract will be in English, All documents produced in association with this contract will be in English.

VI. Schedule of Activities

Task	Description	Deliverable	Due Date
1	Initial Installation and setup	Install of custom branded GeoNode	06/08/12
2	Data import	Initial import of data and metadata, styling of layers, creation of maps	06/08/12
3a	Basic Training	Basic end-user and administrator trainings for GeoNode, training materials	06/08/12
3b	User on-the-job training	Training to illustrate the potential of the system developed to facilitate decision making in a spatial context.	During visits from 06/08/12 to 09/14/12
3c	Advanced Training	Basic end-user and administrator trainings for GeoNode, training materials	09/14/12
4	Maintenance and Support	15 hours per month remote technical support, software upgrade	12/12/12

The contract will be complete by [*date*].

Community Mapping Firm

I. Introduction and Objectives

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*].

II. Services Provided

Strategy and Trainings

By hosting a series of meetings, workshops, and training sessions, the Firm will help the OpenDRI teams in each country develop strategies and the technical capacity to undertake data collection using OSM.

In consultation with the OpenDRI team and local partners, trainings will be developed to meet the needs of the individual projects, but would likely include topics such as:

- Strategies for community and student engagement
- Advanced concepts in OSM editing using JOSM – presets, conflicts, quality control, data imports, etc
- Extracting data from OpenStreetMap with the HOT Tasking Server or QGIS
- Training of the trainers and how to host successful mapping parties
- Management of large surveying and data collection processes

III. Online Technical Support

One people are excited by OSM one of the easiest way to quell that excitement is technical problems. By providing specific online technical support to those previously introduced to OSM the community will not get frustrated and stop participating. A specific Q&A time will be scheduled as well as asynchronous assistance through mailing lists and Facebook.

IV. Logistics

The Firm will be responsible for the in country logistics of its own staff, with recommendations from local World Bank staff. The required venues for trainings and workshops will be arranged by the local OpenDRI teams and other in-country partners.

IV. Requirements

- Language - All documents produced in association with this contract will be in English.
- License - Any training materials produced will be licensed in the public domain and shared with the OpenDRI community for use in other contexts.

V. Schedule of Activities and Payment

Task	Description	Payment % of Contract	Deadline
1	Inception Report	10	Month 1
2	Mid-term Progress Report	45	Month 2
3	Final Report	45	Month 4

The contract will be complete by [*end date*].

Vi. Contact Details

POC - email@institution.tld

Local Logistics Firm

I. Introduction and Objectives

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*].

The firm will support activities [*1,2, and 3*] through the provision of necessary hardware and office space, hiring and management of local staff and interns on the project, and coordinating other logistics as necessary for the successful completion of the project. The Technical and Financial Proposals for this contract should detail the exact services to be provided along with all associated costs.

II. Services Provided

Provide one (1) project coordinator, [*number, sometimes 4*]]project supervisors to manage the project and [*number, often 20*] interns to collect and map field data required by the OpenDRI project. The firm will also ensure the required office space for this team.

- Necessary logistics for training, mapping parties, and surveying activities.
- Equipment management for technology used by volunteers.

III. Deliverables

- Inception report outlining the work plan and deliverables.
- Mid-term progress report.
- Final report.

IV. Requirements

- Language - All documents produced in association with this contract will be in English.
- License - Any training materials produced will be licensed in the public domain and shared with the OpenDRI community for use in other contexts.

V. Schedule of Activities and Payment

Task	Description	Payment % of Contract	Deadline
1	Inception Report	10	Month 1
2	Mid-term Progress Report	45	Month 2
3	Final Report	45	Month 4

The contract will be complete by [end date].

VI. Contact Details

POC - email@institution.tld

Coworking Firm

I. Introduction and Objectives

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*].

The Cowkring firm will support activities [*1,2, and 3*] through the provision of necessary hardware and office space and coordinating other logistics as necessary for the successful completion of the project. The Technical and Financial Proposals for this contract should detail the exact services to be provided along with all associated costs.

II. Services Provided:

Provide will provide a friendly environment for OpenDRI staff and volunteers/interns to meet and build the OpenDRI program in [*city or country*]. The Firm will also ensure the required office space for this team.

- Necessary logistics for trainings, events, meetings, mapping parties, surveying activities, and incubator/accelerator mentoring events.
- Equipment management for technology used by volunteers.
- [*optional*] Inubator or Accelerator services to the OpenDRI initiative.

III. Deliverables

- Inception report outlining the work plan and deliverables.
- Mid-term progress report.
- Final report.

IV. Requirements

- Language - All documents produced in association with this contract will be in English.
- License - Any training materials produced will be licensed in the public domain and shared with the OpenDRI community for use in other contexts.

V. Schedule of Activities and Payment

Task	Description	Payment % of Contract	Deadline
1	Inception Report	10	Month 1
2	Mid-term Progress Report	45	Month 2
3	Final Report	45	Month 4

The contract will be complete by [end date].

VI. Contact Details

POC : email@institution.tld

Living Lab/Innovation Lab Firm

I. Introduction and Objectives

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*].

The Living Lab/Innovation Lab Firm will create a safe space for experimentation and exploration of ideas across the OpenDRI engagement, sectors, and stakeholders.

II. Services Provided

- Connections between stakeholders who have umet challenges and problem solvers who can collaborate on solutions using open technologies.
- Community curation between stakeholders to OpenDRI, brokering relationships across sectors, organizations, areas of DRM expertise, and open technologies.
- Incubation of open technology solutions, which may take form of donor-sponsored programs, social enterprises, or start-up companies around open data generated by OpenDRI.
- Physical space and necessary logistics for trainings, events, meetings, mapping parties, surveying activities, and incubator/accelerator mentoring events.
- Equipment management for technology used by volunteers.

III. Deliverables

[*deliverables are highly dependent on context. They should focus on driving a use case from initial (simple) solutions using open technologies to more robust tools supported by a growing local community with sustainable revenue models*]

IV. Requirements

- Accelerator/Incubator Expertise: experience and skill in accelerating the development of solutions to problems using open technologies and open data.
- Language - All documents produced in association with this contract will be in English.
- License - Any training materials produced will be licensed in the public domain and shared with the OpenDRI community for use in other contexts.

V. Schedule of Activities and Payment

Task	Description	Payment % of Contract	Deadline
Dependent on deliverables and context			

The contract will be complete by [end date].

VI. Contact Details

POC : email@institution.tld

Science/Engineering/Tech Support Firm

Background

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing data about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The [*World Bank region or organization*] is developing the Open Data for Resilience Initiative (OpenDRI) in [*country*] with the aim of supporting evidence-based and innovative solutions to [*briefly state the client's use case*].

[*explain use case in detail here*]

This implementation of OpenDRI will be composed of several complementary components: 1) the collation of existing government data; 2) the collection and open dissemination of asset/exposure data with community mapping; and 3) the development of a community around the application of the data to decision making in distaser risk management (DRM, with a particular focus on the development of [*software, communities of practice, risk communication, or other outcomes*].

In this context, Terms of Reference for providing scientific support to this OpenDRI project is received from OpenDRI World Bank team and this proposal is prepared by science partner based on the TOR received and submitted to World Bank.

Scope of Work

Based on the TOR, following four main tasks are expected:

Task 1: Data Modeling

In partnership with the World Bank team as well as other partners from [*other partners*], science partner will develop a data model describing the attributes to be collected as part of the disaster vulnerability assessment. These attributes can be identified even by non-engineers with limited training and usable as a first-pass asset survey which will later be used for exposure and vulnerability analysis for the area of responsibility. This data model may also provide a framework for and guidance towards similar efforts being undertaken in other cities in the region. The data model will be developed to support [*specify link to use case*].

Task 2: Development of Training Materials

Once the data model has been developed, science partner will develop training materials that include slide presentations, documentation and photographs, and handouts. The training materials will be used to train student volunteers for the collection of attributes for each of the buildings. These training materials should be piloted with a small group of volunteers early in the process and revised as necessary based on the success of these volunteers to accurately capture the desired information.

Task 3: Training to Mappers and the OpenStreetMap Community

In partnership with the World Bank OpenDRI team, science partner will develop and lead series of trainings designed to provide basic understanding of disaster risk in area or city of responsibility, the nature and role of risk assessment in DRM, and the usage of data being collected as part of the project. The training will prepare student participants to perform the structural assessment of buildings using OpenStreetMap tools. In consultation with the World Bank team, these trainings could be more focused on Train-the-Trainer activities which would prepare local WB consultants to deliver these trainings themselves.

Task 4: Quality Assessment of Data Collected

A critical goal of this project is to produce data that can inform scientific risk assessment by the World Bank and other institutional partners. In order to collect quality data that is required for earthquake risk assessment, periodic review of the collected data and possible use of it for risk assessment purpose will be done. The main report will be delivered at the end of the project. A shorter

mid-term report will be prepared while mapping activities are underway in order to assess progress and allow time for correction of training materials or modifications to the approach.

Proposed Methodology

Detail qualitative vulnerability assessment is proposed for special buildings like schools, hospitals and Government buildings.

Data Modeling

The data model will be developed to collect different vulnerability factors qualitatively and use them to estimate probable damage grade at given intensity of earthquake.

Following are the general information collected for each individual buildings of schools, hospitals and government offices.

- Collect general information of all the buildings that can be collected from outside of the building. This could include include: building typology, number of storey, use of the building, floor type, and/or roof type.

Development of Training Materials

Preparation of Ready-to-Use Training Materials:

Three kinds of documents are planned to be prepared to make this training curricula.

- Surveyors Guide
- Participants workbook
- Slide Presentations for Trainings

In addition to these documents as the part of the training manual, a good set of standard references that science partner is using for training to engineers in countries for the buildings inventory survey will be given in digital forms as the reading materials to the interested participants.

The training materials will be developed using photographs/ sketches to explain technical details to non-engineering participants

The training curricula will be about 1/2 day in class and 1/2 day in field. The first half, the class room sessions, also includes the earthquake risk and preparedness measures as well as the loss estimation process in general to sensitize the participants on effects of accuracy of information to be collected

Training to Mappers and OpenStreetMap Community

The one day training, including the field work, will be given to the selected participants who are selected by OpenStreetMap team of the World Bank country office. Tentative number of 10 trainings are visualized and planned for this including participant's workshop.

It is presumed that the logistics of the training will be directly arranged by OpenStreetMap team of the World Bank country office.

Preliminary Data Collection, Survet Process/ System Developoment, Quality Assurance

Preliminary data on public schools, health clinics and government buildings will be collected

Periodic field monitoring and random sampling check will be done to insure the required quality of the collected information

Further guidance/ refresher course will be given to selected groups of participants as and when required

BUDGET

Depends on context.

WORK PLAN

Tentative work plan for implementing these activities is proposed as below: Activities (over 4 months):

Task	Description	Deadline
1	Data Modeling	Month 1
2	Development of Training Material	Month 2
3	Training to Mappers and OSM Community	tbd
4	Preliminary Data Collection, Survey Process/System Development, Quality Assurance	tbd
5	Reporting	tbd


UNITED NATIONS
OCHA

APPENDIX B: DOCUMENTS

An OpenDRI project generates documents at each phase: scoping, collating, collecting, and catalyzing. The core document templates provided here are meant to create a scaffolding for a manager to customize them to local content. These document include (by phase):

Scoping and Management

- Concept Note
- Budget Categories

Collating

- Data Survey Form

Collecting

- Data Model
- Building Survey Forms
- Monthly Progress Report

Photo: Sri Lanka community mapping.
Credit: Vivien Deparday, GFDRR, 2013.

Concept Note

Introduction

Open Data for Resilience Initiative (OpenDRI) helps societies better understand the historical and changing risks they face from natural hazards. OpenDRI is a partnership of governments and international institutions that are building a deeper, collective understanding of risk by sharing information about their hazards, exposure, vulnerability, and risks.

In order to build resilient societies, policy-makers and the public in [*country name*] must have access to the right data and information to inform good decisions—decisions such as where and how to build safer schools and health facilities, how to insure farmers against adverse weather, and how to protect economies against future climate impacts. The worldwide movement towards Open Data policies and practices has been shown to improve decision making, support the achievement of development goals, and increase the efficiency of planning processes.

In [*country name*], OpenDRI is working with [*stakeholders*] to explore how OpenDRI could improve the data that drives decision making. [*country name*] faces a range of challenges: [*hazards*]. Data about these hazards is currently fragmented across the partners and difficult to assemble back into a complete picture. The Government of [*country name*] has already taken some steps to bring the data together, including [*explanation*]. The Government is now seeking to amplify this work through OpenDRI.

Concise statement of the objectives

This program aims to [*concise statement of use cases in a bullet list or longer explanation in subheadings*].

OpenDRI will work with [*lead client ministry*] to help it establish the necessary policies, information infrastructure, data, tools to improve data that drives decision-making around disaster risk management and climate change.

Scope of the Project

[*OpenDRI may include several activities, a menu of which are detailed below. Each should be tailored to the client use case and local context*]

- Develop a policy framework and working groups for sharing spatial data to enhance disaster resilience and sustainable development.
- Develop an operational mechanism (including necessary ICT infrastructure) to collate existing data about disaster risk management via a data catalogue, aligned with a policy framework to manage these data sets.
- Engage in community mapping activities for the efficient collection of exposure data and to increase public awareness of disaster and climate risk.
- Catalyze the application of collated and collected data to shared problems within and between the public and private sectors, academia, and civil society organizations. Such work would include methods to raise awareness, build relationships, foster innovative problem solving, and/or academic research.
- Train stakeholders in the use of risk communication tools to visualize the impact of potential hazards using the data that OpenDRI has made available via the data catalogue and community mapping platforms.
- Strengthen the capacity of data provider and user agencies on effective use of information and the system developed through development and support of open source tools.

Outline of near-term tasks

- Finalize the concept paper and obtain the concurrence of main stakeholders such as [*stakeholders*].
- Set up a governance framework for the management and sustainment of OpenDRI in [*country*]. This framework would generally have a set of policies to govern the work process. The organizational arrangements would also include a top level policy body such as a Project Advisory Committee or Open Data Working Group.

- Pilot a data catalogue for DRM data within the [*partner ministry*]. The available information, including the outputs of [*any related projects*], will be made available through the platform and training will be given to key partners.
- Pilot the customization and use of available open-source technologies for the operational use of disaster and climate risk information within key government agencies such as the partners)).
- In partnership with [*partners*] departments, develop a strategy for the use of community mapping within risk identification activities, with a particular emphasis on major urban areas.

Estimated costs

Upon acceptance by critical partners of the concept note, a detailed workplan and budget will be developed. It is expected that initial technical, financial, and human resources support to the establishment of the [*country*] Open Data for Resilience Initiative will be provided by [*list of partners*], GFDRR, and the World Bank.

Schedule of Activities

Deliverable	Time-period
1. Scoping	
Finalization of Concept Paper, agreement of key partners.	
2. Collating Existing Data	
Inventory of existing data	
First meeting of OpenDRI advisory committee	
Initial installation and customization of data sharing platform, training to key partners	
Recruiting data curator	
Preparing data for upload to data catalogue	
Projected release of data catalogue by client	
Pilot of risk communication tools for use of disaster risk data	
3. Collecting New Data	
Development of community mapping strategy	
Definition of area to be mapped	
Importing of existing mapping data	
Customization of community mapping tools (data model and survey forms)	
Launch of community mapping activities in key urban areas	
Commission of quality assessment study and/or engineering firm	
4. Catalyzing Open Data Ecosystem	
Contracting with coworking space or innovation lab	
(option) Open Data Day/Hackathon event	
(option) Training for DRM staff	

Monthly Progress Report

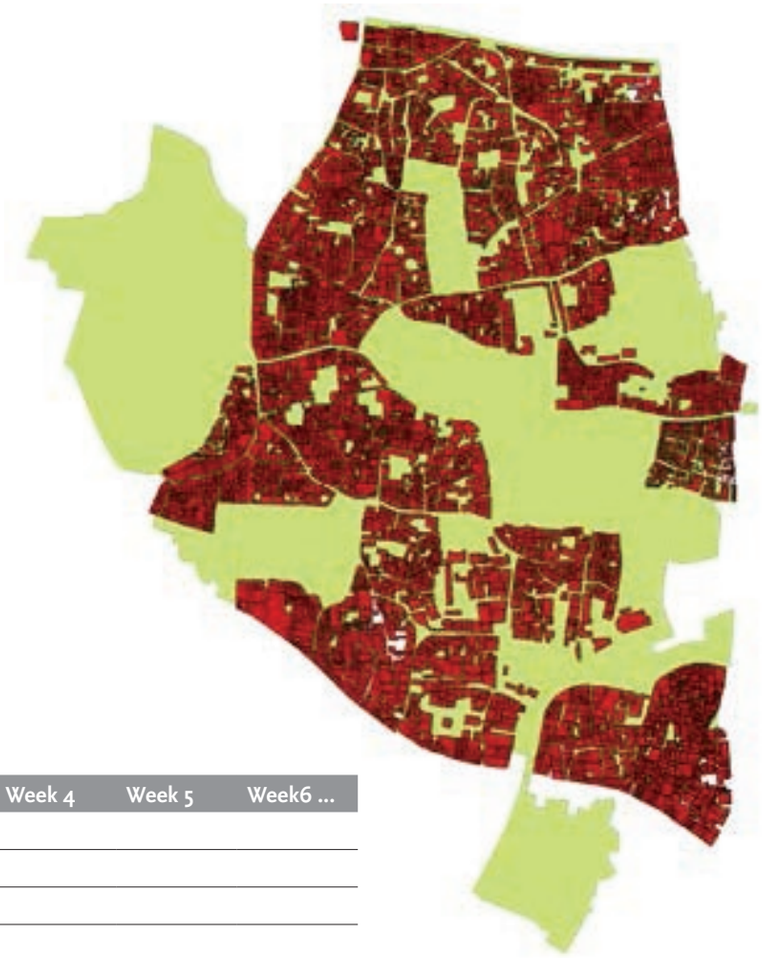
15 January 2014

Project Updates

A bulleted list summarizing project accomplishments, meetings with partners, mapping activities, adjustments to project design, trainings, and quality checks. Unexpected changes (positive or negative) should be noted.

Mapping Progress

Use your GIS software to generate a visual explanation of your progress since the last report. This example shows building completed overlayed on the target area.



Data Collection

Metrics	Week 1	Week 2	Week 3	Week 4	Week 5	Week6 ...
Total blocks in the focus area						
Number of buildings mapped						
Total buildings mapped						
Number of blocks complete						
Number of survey teams working						
Average buildings mapped per team						
Number of blocks remaining						
Estimated weeks to completion						
Number of buildings re-surveyed						
Number of re-surveyed buildings with error						
Percentage of buildings with error						

Exposure Data Inventory Form

Input Datasets	Spatial Coverage	Highest Resolution Available
Administrative Area		
Admin 1 Boundaries	(National, provincial, district, local)	
Admin 2 Boundaries	(National, provincial, district, local)	
Admin 3 Boundaries	(National, provincial, district, local)	
Admin 4 Boundaries	(National, provincial, district, local)	
Admin 5 Boundaries	(National, provincial, district, local)	
Admin 6 Boundaries	(National, provincial, district, local)	
Demographic and Social Characteristics		
Population Distribution (age, gender, education, income etc)	(National, provincial, district, local)	
Characteristcs of social vulnerability	(National, provincial, district, local)	
Residential Building Stock Characteristics		
Location and building footprint	(National, provincial, district, local)	
Occupancy (single family, multi-family, mixed occupancy)	(National, provincial, district, local)	
Construction type (reinforced concrete, un-reinforced concete, light wood construction, adobe, engineered steel)	(National, provincial, district, local)	
Wall type - Roof type	(National, provincial, district, local)	
Number of floors/storeys	(National, provincial, district, local)	
Era of construction	(National, provincial, district, local)	
Construction quality and level of maintanence (eg. self-constucted, local masons, non-engineered or engineered, poorly or well maintained)	(National, provincial, district, local)	
Building replacement cost	(National, provincial, district, local)	
Government Building Assets (eg. schools, public administration building, health clinics, hospitals)		
Location and building footprint	(National, provincial, district, local)	
Number of occupants (day/night)	(National, provincial, district, local)	
Construction type (reinforced concrete, un-reinforced concete, light wood construction, adobe, engineered steel)	(National, provincial, district, local)	
Wall type - Roof type	(National, provincial, district, local)	
Number of floors/storeys	(National, provincial, district, local)	
Era of construction	(National, provincial, district, local)	
Construction quality and level of maintanence (eg. self-constucted, local masons, non-engineered or engineered, poorly or well maintained)	(National, provincial, district, local)	
Building replacement cost	(National, provincial, district, local)	
Location of Key Infrastructure Assets		
Road	(National, provincial, district, local)	
Rail networks	(National, provincial, district, local)	
Bridges	(National, provincial, district, local)	
Dams and Key Water Management Infrastructure	(National, provincial, district, local)	
Airports	(National, provincial, district, local)	
Harbours	(National, provincial, district, local)	
Utility Networks	(National, provincial, district, local)	
Cultural and Religious Landmarks and Buildings		
Location	(National, provincial, district, local)	
Economic Characteristics (eg. GDP per km)		
Cost of repair of a road per km		
GDP per area		
Land Cover (e.g forest, agricultural, urban area, water bodies)	(National, provincial, district, local)	
Land Use (eg. residential, commerical, industrial, agricultural etc)	(National, provincial, district, local)	

Data Model

The data model is a chart of the features and attributes of those features that a project would collect in the field. As described in Chapter 6, designing the data model is a process of determining the priorities of the project in coordination with your partners.

After a data model has been defined, the OpenDRI team must determine how the features will be mapped using the OpenStreetMap tagging system. In OSM, features are drawn as points, lines, or polygons, and tags are applied to these features to describe their attributes. Common tags can be studied at http://wiki.openstreetmap.org/wiki/Map_Features.

OpenStreetMap utilizes a free-tagging system. That is, mappers can describe attributes of the objects they map using any set of tags they wish. However, in order to maintain data uniformity, it is important that users around the world agree on the same tagging conventions to represent features (which is why nearly all tags are in the English language). For most attributes that could be mapped, there is probably an existing tagging convention which can be found on the OSM Wiki. Still, when OpenDRI teams are mapping new features or attributes, it may sometimes be necessary to invent new OSM tags. It is a good idea to discuss this with the OpenStreetMap mailing list for the country in parallel with tagging@openstreetmap.org.

The following data model is an example that was designed in the Open Cities Dhaka pilot project:

Streets

key	possible values
highway	{primary | secondary | tertiary | residential | living_street}
name	name of street
surface	{asphalt | concrete | brick | unpaved}
width	number in meters of street width
oneway	{yes | no}

Buildings

key	possible values
addr:housenumber	address number of the building, ie 25/5 or 19A
addr:street	street name
name	name of building
building	{yes | construction}
building:levels	number of levels in the building
building:use	{residential | commercial | industrial | utility | multipurpose |hospital | clinic | place_of_worship | government | school | college | community_centre}
building:vertical_irregularity	{yes | no}
building:soft_storey	{yes | no}
building:material	{plaster | brick | tin | cement_block | glass | bamboo_sheet | wood}
building:structure	{RCC_with_beam | RCC_without_beam | brick | steel | timber | bamboo}
start_date	year of construction, or range, ie. 2003..2013
building:condition	{poor | average | good}

Building Survey Form

Open Cities Dhaka – Building Survey Form

Surveyor Name: Date:

Field Paper ID: Ward / Block number: _____ Map Building ID:

1. General Information:

1.1 Holding #:

Building name:

Street name:

1.2 Building usage:

Residential			Hospital		
Commercial			Religious		
Industrial			Government Building		
Utility			School		
Mixed			College		
			Community Center		
			Other specify:		

2. Building Characteristics:

2.1 Number of Stories: **2.2 Vertical Irregularities? ❑ Yes ❑ No**

2.3 Is there a Soft Storey? ❑ Yes ❑ No (Long / Short direction)

2.4 Walls: (Cladding & Partitions)

plaster | brick | tin | cement_block | glass | bamboo_sheet | wood

2.5 Main Load Bearing System

RCC_with_beam | RCC_without_beam | brick | steel | timber | bamboo

Methodology

Buildings and features are drawn on Field Papers and marked with an identifying number. Mappers note this identifying number in the Field Paper ID field of this survey form, and then add attribute data that conform to the data model designed for the field data collection work. Survey forms vary for each project and adapt to changes in design. This survey conforms to the Buildings data model on the page 112.

RESOURCES

Resources are described using language adapted from their respective web sites:

Software

GeoNode: "GeoNode is an open-source web-based application and platform for developing geospatial information systems (GIS) and for deploying spatial data infrastructures (SDI).
http://geonode.org/

Java OpenStreetMap Editor (JOSM): An extensible, open-source editor for OpenStreetMap built on Java 6. *https://josm.openstreetmap.de/*

InaSAFE: Free software that produces realistic natural hazard impact scenarios for better planning, preparedness and response activities. It provides a simple but rigorous way to combine data from scientists, local governments and communities to provide insights into the likely impacts of future disaster events. *http://inasafe.org*

OpenStreetMap: a community of 1.5 million members who are buildig a free and open map of the world. *http://openstreetmap.org*

QGIS: A Free and Open Source Geographic Information System. *http://www.qgis.org*

Web Sites

LearnOSM: step-by-step guides to get started with contributing to OpenStreetMap and using OpenStreetMap and using OpenStreetMap data. *http://learnosm.org*

MapGive/Imagery to the Crowd (Ittc). IttC publishes high-resolution commercial satellite imagery purchased by the United States Government, in a format that volunteers easily map into OpenStreetMap. IttC addresses significant data gaps for humanitarian and development needs. http://mapgive.state.gov/.

OpenDRI: Open Data for Resilience web site at GFDRR Labs. http://gfdrr.org/opendri

World Bank Open Data Essentials: The subsite for the World Bank Open Data Team's work on open government data. http://data.worldbank.org/about/open-government-data-toolkit/knowledge-repository.

Photo: GeoNode Developers Summit, 2012
Credit: Abby Baca, The World Bank, 2012.

LEGENDA :

= BATAS DESA
= BATAS DUSUN
= JALAN POROS PROVINSI
= JALAN POROS BANYORANG
= ASPAL HOTMIX
= JALAN TANAH
= JEMBATAN

= RUMAH KAYA 44/5,8%
= RUMAH SEDANG 185/24,5%
= RUMAH MISKIN 417/55,2%
= RUMAH SANGAT MISKIN 110/14,5%

= KANTOR CAMAT

= KANTOR DESA

= KANTOR K U A

= KANTOR PERTANIAN


= KTR CABANG DINAS

= PEGADAIAN

= GUDANG GABAH


= G U D A N G PERKEBUNAN DAN PERTANIAN

= RUKO


= TEMPAT PEMBIBITAN RUMPUT LAUT

= PUSKESMAS

= PUSKESWAN

= POSYANDU


= PEKUBURAN UMUM


= SUMUR BOR


= BAK AIR

= - TAMAN KANAK - KANAK
= - T.BERMAIN

= SEKOLAH DASAR


= SUNGAI

= SALURAN IRIGASI

= LAHAN SAWAH

GLOSSARY

AIFDR: Australia–Indonesia Facility for Disaster Reduction.

AusAID: Australian Agency for International Development, now part of the Department of Foreign Affairs and Trade.

OCHA: The UN Office for the Coordination of Humanitarian Affairs.

OpenStreetMap: a project that creates and distributes free geographic data for the world, with over 1.5 million members.

Node: in network theory, a node is a connection point where lines meet.

UNICEF: United Nations Children's Fund.

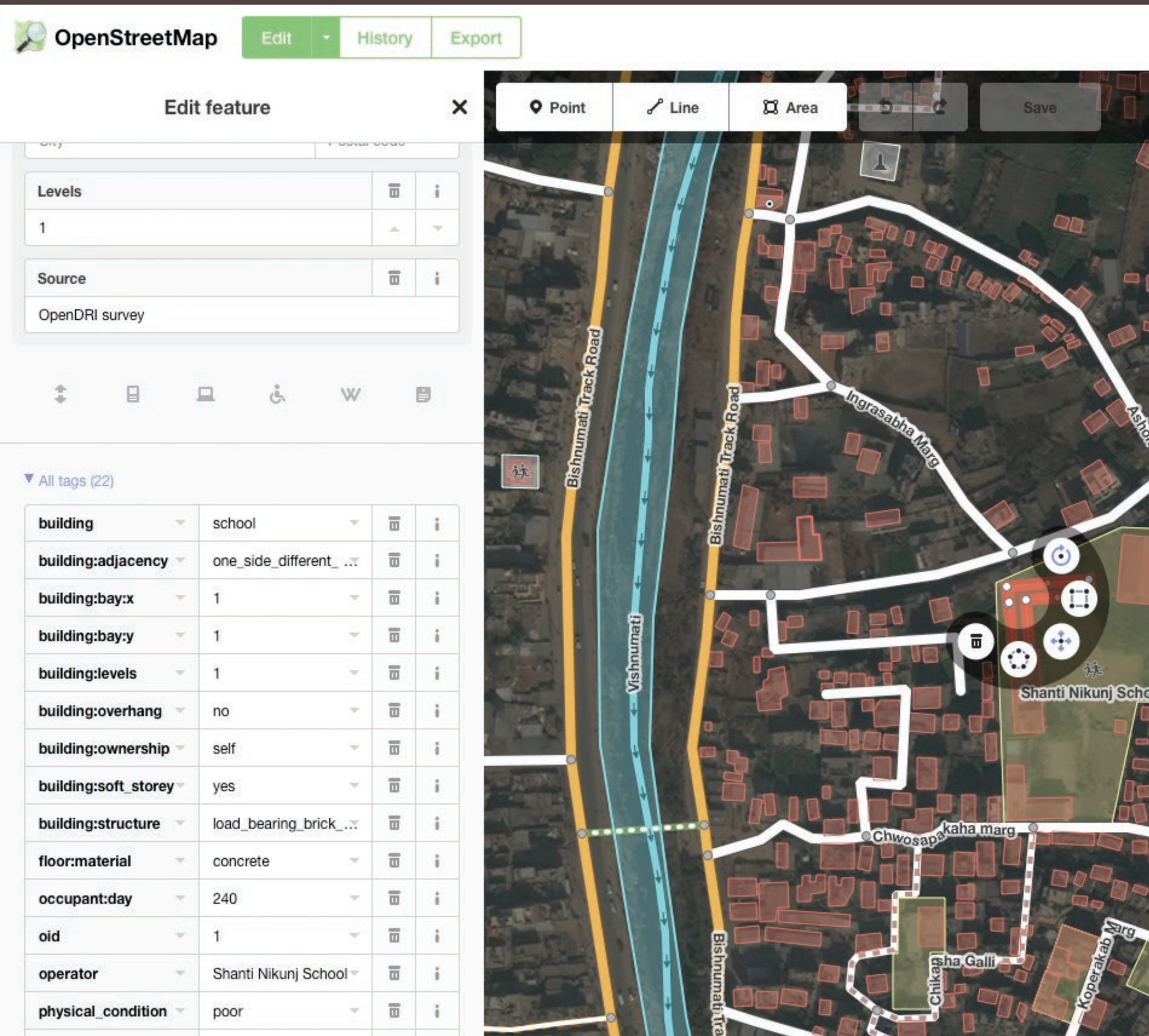
UNISDR: United Nations Office for Disaster Risk Reduction, formerly the UN International Strategy for Disaster Reduction.

UNDP: United Nations Development Programme.

USAID: United States Agency for International Development.

OPENSTREETMAP: BEHIND THE CURTAIN

Mapping Exposure Data in Kathmandu, Nepal.




Damai Tole
Kankeshori marg
Kotilingnan Galli
Sahid Nirgun Marg
Gangalal Marg
Chokhachhe Galli
Chokhachhe Galli
Kampukot Marg
Yogpir Singh Marg
Hridayachandra Singh Galli
Yatkha Road
Cosmo De Cafe
Taleju Temple
Hanuman Dokha Palace
Sukra Path
Khyakyaba Marg
Chwosapakaha marg
Maru Tole
Ganga Path
Ganga Path
Gyachemuga Galli
Nisthananda Marg
Lyak usa gal
Path

GFDRR

Global Facility for Disaster Reduction and Recovery