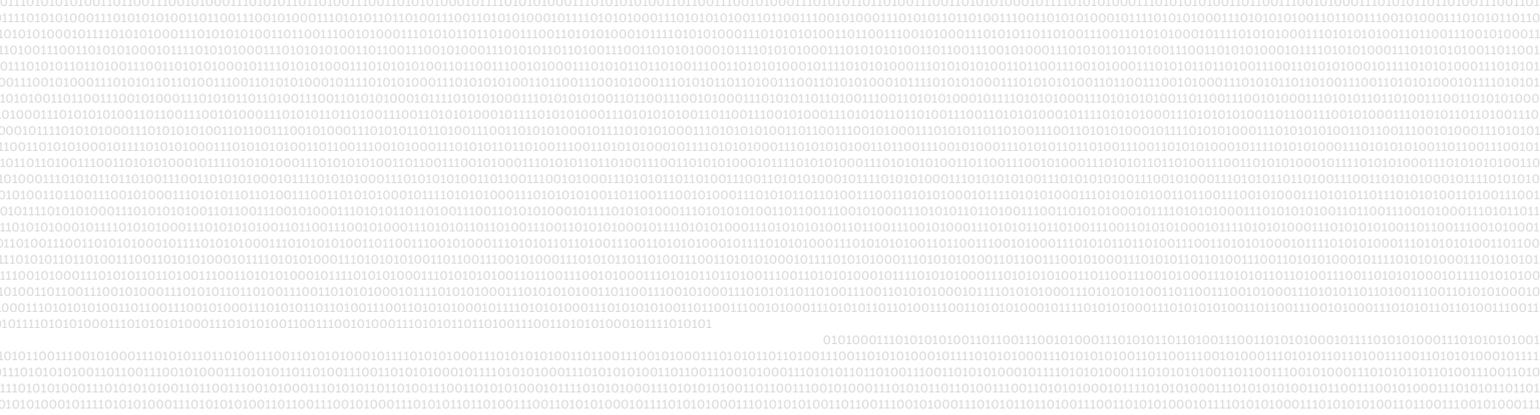




OPEN DATA
FOR RESILIENCE
INITIATIVE
OVERVIEW



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Published in Washington D.C., May, 2013

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Washington, D.C. 20433
U.S.A.

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First printing May 2013

COVER IMAGES Left to right: OpenStreetMap; GeoNode flood analysis in Jakarta Province, Indonesia; and InaSafe geospatial software.





Acknowledgments

The release of this publication would not have been possible without the support and contributions of many people. The OpenDRI team takes pleasure in thanking the leadership of the GFDRR and regional Disaster Risk Management teams of the World Bank for supporting the quiet but steady work of OpenDRI implementations across the globe, and lending their expertise, staff, and resources throughout the many missions that led to this point. We also express special gratitude and thanks to our partners and collaborators for widely opening their doors and making us part of their own ecosystems, especially to our counterparts in national governments who have truly been the champions and implementers of this work.

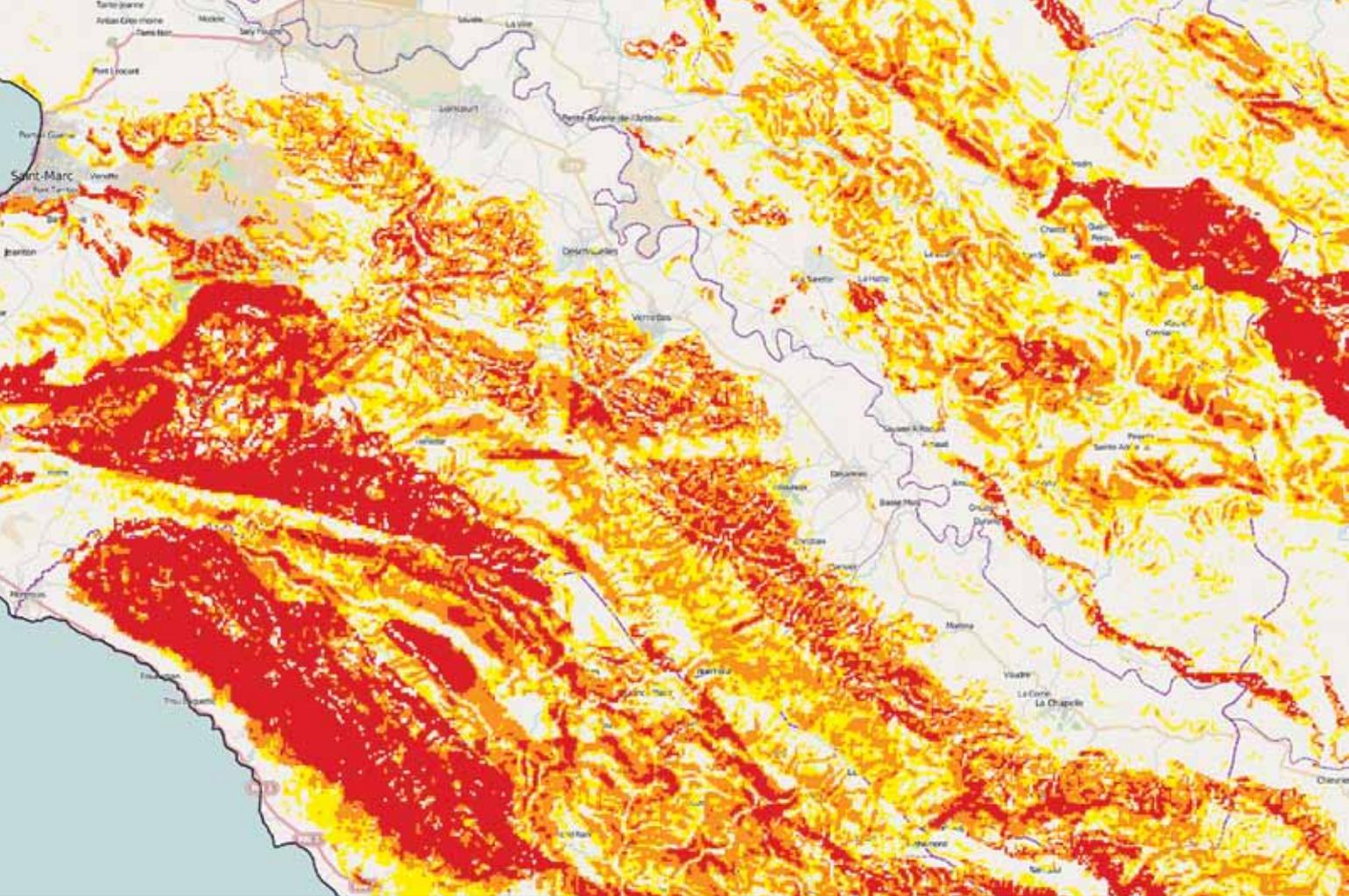
For readers of this final version

This final document, released in May 2013, is the result of a collaborative effort among the authors and readers of a draft version released in February 2013. The collaborative effort was intended to allow OpenDRI partners and other stakeholders provide input into the process of articulating the Open Data for Resilience Initiative (OpenDRI). The authoring team was able to incorporate the greater portion of those suggestions; for that open collaboration, this publication is much better.

We thank all who contributed.

Goal of the OpenDRI Overview

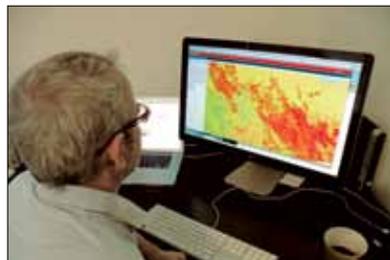
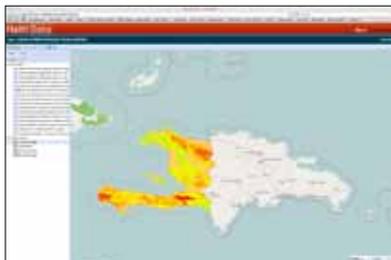
The goal of this document is to communicate the vision, approach and impact of the Open Data for Resilience Initiative (OpenDRI). This program, launched in 2011 by the Global Facility for Disaster Reduction and Recovery (GFDRR), is a critical component of the strategy toward helping countries better understand and manage disaster and climate risk. Access to the right information for decision-making is an essential component of building resilience and cuts across all components of this agenda. OpenDRI has developed programs in over 20 countries to achieve this end. This publication documents the successes and lessons learned throughout the course of this work. As we look toward continued expansion of OpenDRI it is important to reflect on what has already been accomplished and look for new ways to continue to make the philosophy and practices of the Open Data Movement relevant to the work of GFDRR and the World Bank.



TOP AND BOTTOM Haiti Data/Landslide macronization hazard. Haiti's GeoNode <http://haitidata.org/maps/38/view>

Contents

Acknowledgments	1	disaster risk management	9	Europe and Central Asia	35
Goal of the OpenDRI Overview	1	Open source tools build resilience and global communities	9	Latin America and the Caribbean (LCR)	36
For reviewers of this version	1	Looking Forward	10	OpenDRI Team	43
Foreword	3	Regional Overviews	11	OpenDRI Partners	46
Better decisions for resilient societies	4	South East Asia (SAR)	12	OpenDRI in the News	46
The Open Data for Resilience Initiative (OpenDRI)	4	East Asia and the Pacific	16	Abbreviations	48
The OpenDRI approach	5	Africa Region	21	Document References	50
OpenDRI implementation workflow	6	Case study Nepal	24	Online References and General Links	50
What exactly is <i>open</i> data?	8	Case study Indonesia	28	Additional Credits	52
Open data strengthens societies beyond		Middle East and North Africa (MENA)	34	Contact OpenDRI team	Inside back cover



Foreword

By Francis Ghesquiere

*Head of the Global Facility for Disaster
Reduction and Recovery (GFDRR) Secretariat
& Manager of the Disaster Risk Management
(DRM) Practice Group, World Bank*

***What if an earthquake
hit your city tomorrow?
How many schools would
be affected? How many
students would be at
risk? These are only some
of the questions facing
policy makers in disaster-
prone countries around
the world.***

While highly specialized technical expertise is required to address these questions, the answers do not have to be complex. Collecting and communicating risk information in a simple way is a first essential step in supporting government officials, communities, and individuals in their efforts to manage the risks they face.

As countries and cities in the developing world grow at record pace—and with them, so does exposure to disasters—there is a window of opportunity to make development efforts disaster-conscious and resilient.

The Open Data for Resilience Initiative (OpenDRI) aims at providing decision-makers with the necessary tools to generate, collect, and share risk information in support of a more proactive approach to risk management.

This booklet offers examples of where the OpenDRI has been active, giving a sense of the variety of applications and solutions available. Understanding risk is the first step to managing disaster risks and achieving resilient development—OpenDRI delivers innovative solutions to improve that understanding.



OPEN DATA FOR RESILIENCE INITIATIVE OVERVIEW

Better decisions for resilient societies

To build resilient societies, policy-makers and the public must have access to the right data sets and information to inform good decisions—decisions such as where and how to build safer schools, how to insure farmers against drought, and how to protect coastal cities against future climate impacts.

Sharing data and creating open systems promotes transparency, accountability, and ensures a wide range of actors is able to participate in the challenge of building resilience.

Too often, however, these data are scattered across a wide range of actors from different ministries or administrative units, the private sector, and international or non-governmental organizations. Existing data sharing arrangements between these groups are frequently weak or informal and technology limitations or specious concerns related to

privacy, security, or cost recovery hamper best-practice approaches. Risk analysis has also typically been a closed process conducted by private consultancies and expert practitioners with limited participation or input from the broader government sector and the public. This has led to a lack of meaningful use of the outputs in policy-making and planning processes, unnecessary duplication of work, and a failure to meaningfully communicate this information to at-risk populations.



The Open Data for Resilience Initiative (OpenDRI)

OpenDRI is a dynamic and expanding partnership between governments, private companies, academic institutions and international organizations throughout the world that aims to reduce the impact of disasters by empowering decision-makers with better information, data, knowledge and the tools to support their decisions.

OpenDRI builds upon the World Bank’s broader Open Data Initiative and provides a mechanism

for enacting the first policy recommendation of the joint World Bank/United Nations (UN) flagship report, “Natural Hazards, UnNatural Disasters – The Economics of Effective Prevention,” which establishes the importance of data sharing to reduce vulnerability to disasters. OpenDRI is currently implementing these mechanisms around the world to improve disaster and climate resilience.

In 18 months since OpenDRI’s inception, the initiative has

achieved solid outcomes and demonstrated a fundamentally different and dynamic approach to understanding risk and building resilience. Throughout some of the world’s most vulnerable geographies, successful models are being replicated; preferred practices are being shared and implemented; collaborative strategies are being leveraged and are changing landscapes; and capabilities to plan for, and respond to disasters have improved.

The OpenDRI approach

OpenDRI works in collaboration with ongoing natural disaster risk management (DRM) and climate change adaptation projects carried out by expert teams in the various regions of the World Bank. These engagements incorporate open data and open source decision support tools at various stages of program design and implementation. For instance, the teams are:

- Facilitating the creation of state-of-the-art open source data-sharing platforms that enable open access to climate and risk information, including capacity building and training for host agency(s).
- Assisting governments to develop commitments and institutional arrangements in support of open data policies and practice in the disaster and climate change space.
- Facilitating emerging partnerships and networks among international organizations, non-profit organizations, governments and civil society to make their data available to other collaborators.
- Building capacity in government and civil society to use climate and disaster risk information for better decision-making.
- Fostering and promoting global innovation and bringing sectors and industries together to share data, analytical tools and successful practices and encouraging further tailoring and optimization.

Countries around the world have embraced the OpenDRI approach successfully. For example, in Haiti, following the January 12, 2010 earthquake, large amounts of geospatial information, data and knowledge created by GFDRR/ World Bank-funded projects have been disseminated to the public to effectively support the country's rehabilitation recovery and development processes for longer-term sustainability.

The Pacific Risk Information Systems (PaRIS), serving 15 Pacific Countries,

including Vanuatu, Fiji, Samoa, Papua New Guinea, Marshall Islands and 10 others, is one of the largest collections of geospatial information in this region providing detailed risk information to a broad spectrum of key decision-makers, including disaster risk management, planning, and public finance agencies.

The Sahel, an area in the horn of Africa where food insecurity and malnutrition are already chronic, these existing insecurities are predicted to grow as over 15 million people try to cope with continuing drought conditions. To ensure early warnings, the Sahel Response tool is a collaborative effort that pulls together leading data sources and knowledge streams and shares these across the region between partners and donors, resulting in actionable responses on behalf of at-risk populations.



NEPAL OpenDRI Mapathon, Open Data Day, Feb. 2013. Courtesy of www.osmnepal.org

OpenDRI implementation workflow

OpenDRI engagements generally follow an iterative process, from client requirements to a gradual capabilities development to meet those needs. That said, most engagements break down into four phases, each comprising its own set of deliverables:

1 **INTAKE** An identification process for the client’s use case; assessment of context readiness for open data related work and linkages to the larger strategic interests of other partners, including the World Bank’s regional and country offices. This phase culminates in an informal readiness report.

Process
Upon receiving a request, OpenDRI staff evaluate:

- Use Case** Is there a clear use case for the data?
- Support** Is there government buy in to opening data?
- Fit** Does the effort fit into a broader DRM agenda?
- Funding** Is there funding for an OpenDRI program?

Readiness Report
Is this client ready for OpenDRI?
Is it a strategic priority?

Use Case
Support
Fit
Funding

4 **LEARNING** The continuous improvement and expansion of open data’s use and application, including growing the number of agencies and individuals who use open data in their daily DRM work. The learning phase informs the way in which the effort will scale, as well as future designs for additional clients.

Revised Tools & Practices
What innovations do partners need to solve emerging problems? Who can develop those solutions? How can these solutions be sustained?

Process
OpenDRI works with partners to develop living ecosystems around the data.

- Training** Striving toward deeper levels of modeling and analysis.
- Scaling** Expanding the breadth of institutions using the data.
- Revising** Refining tools and practices.

Codeveloped Solutions
What partners and problems drive the demand for open data? How should they curate the data in the local context?



2

DESIGN An exploration of the structures and process by which an OpenDRI engagement might unfold, leading to a concept note and terms of reference for potential consultants.

Concept Note

Is this client ready for OpenDRI? Is it a strategic priority?

What work plan will achieve client goals? What partners, incubators, and data are available? What lessons learned should be integrated from previous engagements?

Process

OpenDRI staff engage with the client country, asking:

Partners What local partners and ministries will contribute?

Incubation Is there a local incubator and tech community to support the project?

Sustainability What is the strategy for long-term sustainability?

Data Do partners have data that can be made open?



3

IMPLEMENTATION Process and software development to support participatory mapping (OpenStreetMap), open data exchanges (GeoNode), and risk modeling (InaSafe), followed by data collection and risk analysis with the client. The solution of choice is then co-developed with each client and their partner's network.

Process

OpenDRI team identifies consultants to partner with client on a campaign to collect, co-map, cleanse, and analyze new data around the DRM cycle, and to prepare existing data for release. Work includes:

Project Management Stewarding the new data collection, existing data release, and training in the use and curation of the data.

Government Coordination Ensuring alignment and planning for co-development/release of data.

Linkages Connecting ecosystem of partners together and institutionalizing practices.

Quality Assurance Performing ongoing review of data as it is collected and commissioning studies from local universities and experts to gauge data accuracy.



What exactly is *open data*?

In its simplest framing, data can be said to be *open* when it is both legally and technically open. For data to be considered *legally open*, it must be released under a license that allows for the reuse and redistribution for either commercial or non-commercial uses.

Examples include the Creative Commons suite of licenses or the Open Data Commons Open Database License (ODBL).

Technically, open data is data that is available over the web on a permanent address, which can be downloaded or accessed through an Application Programming Interface (API) in structured and nonproprietary formats. Open formats for geospatial data, which comprises the majority of

risk-related information, include shapefile, GeoTiff, and CSV or OGC compliant web services.

The open data philosophy has existed within the scientific community for decades, championed by those who argue that facts cannot be copyrighted and point to the many ways in which free access to basic data encourages beneficial research and innovation in academia and the private sector.

More recently there has been a strong emphasis on open government data as part of a larger strategy to promote transparency, accountability, and participation in governance. The Open Government Partnership (OGP) is a new multilateral initiative under which 47 governments have committed themselves to adopting

these principles as part of anti-corruption efforts, improving delivery of public services, and other endeavors. Web-portals like Data.gov have made significant amounts of valuable government data available.

Development institutions such as the World Bank, the African Development Bank, and US AID have also adopted open data policies and practices in the last few years as part of efforts to make the development process more inclusive and transparent.

Resources

- <http://creativecommons.org/>
- <http://opendatacommons.org/licenses/odbl/>
- www.opengeospatial.org/standards
- www.opengovpartnership.org/

Open data strengthens societies beyond disaster risk management

By embracing the principles of collaboration, transparency and accountability, open data not only helps countries and a region reduce vulnerability to disasters, but is also seen as a key strategy for promoting a broader range of social goods. The open data philosophy has existed within the scientific community for decades, and points to the many

ways in which free access to basic data encourages beneficial research and innovation in academia and the private sector. More recently there has been a strong emphasis on open government data as part of a larger strategy to promote transparency, accountability, and participation in governance. The Open Government Partnership (OGP) is a new

multilateral initiative under which 47 governments have committed themselves to adopting these principles as part of anti-corruption efforts, improving delivery of public services, and other endeavors. In many countries, OpenDRI efforts are just one component of a wide range of efforts and initiatives promoting the open data agenda.

www.opengovpartnership.org

Open source tools build resilience and global communities

OpenDRI seeks to utilize and develop innovative software tools that make open data actionable to DRM activities and effectively communicate risk information to the public. As part of these efforts, OpenDRI projects leverage open source software and support the growth of technical communities that use and develop these tools. This approach increases in-country capacity for disaster risk management activities. Frequently mentioned tools throughout this report include:



GeoNode

GeoNode—A web-based platform for sharing and visualizing geospatial information. www.geonode.org



InaSafe—A desktop and web-based GIS tool that produces realistic natural hazard impact scenarios for better planning, preparedness and response activities. www.inasafe.org



OpenStreetMap (OSM)—An global online database and user community of over one million members that allows volunteers to collaborate towards creating a free and open map of the world. Often called the “Wikipedia” of maps. www.openstreetmap.org



INDONESIA Community mapping at village level. Courtesy of DRM Unit, World Bank Country Office, Jakarta.

Looking Forward

Building on the successes and lessons learned over the past eighteen months, the OpenDRI team is now undertaking a number of activities to review progress and look for ways to further refine the approach and engage new partners. The team has expanded to include members from most World Bank regions. We have assisted numerous countries to adopt their own open data agenda in service of better understanding and managing risk. We have supported the development of award-winning open source software and we have engaged citizens from every walk of life in the collective challenge of building resilience.

Through consultations with a broad range of stakeholders, we are working to develop a long-term strategy for ensuring the philosophy and practices of the open data movement are made relevant and

actionable to GFDRR's mission and assistance to government counterparts. This overview report is a critical component of this effort. Although the process is still underway, there are a number of priorities that have been identified:

- ● Establish partnerships at the international level with key development partners and the private sector to promote institutional commitments to open data in support of the wider disaster risk management and climate change adaptation agenda;
- ● Develop better documentation of ongoing work and the production of case studies, fact sheets, and best practices in order to assist partners, both within and external to the World Bank, develop their own open data projects;
- ● Engage broader communities of risk information consumers

through hackathons or similar activities that can develop innovative applications and data visualizations in cooperation with their targeted users in government, civil society, and the public; and

- ● Build deeper connections to other open data activities being undertaken by other teams within the World Bank and in the global open data movement. Successful open government data initiatives require broad institutional commitment from high levels of government in order to be sustainable. Through partnerships with open data efforts operating in other sectors, OpenDRI engagements will have deeper impact, benefit through alignment with similar activities, and make contributions to the broader development agenda in the countries we support.



PHOTO Kathmandu City. ©Thinkstock.com

South Asia Region (SAR)

Open Cities

The Open Cities project is an ambitious regional effort currently underway to engage local volunteer and technical communities in the urban resilience building challenge. The program is composed of two complementary components:

1. Community-driven and participatory approaches towards collection and open dissemination of asset/exposure data for urban centers; and
2. Partnering with sector experts and technologists to support the development of innovative software applications and data visualization tools.

These applications will leverage newly created asset inventories and other sources of open data through

a series of regional hackathons, code-sprints, and innovation challenges that build upon lessons learned from successful GFDRR-supported projects, e.g., Random Hacks of Kindness (RHOK).

www.rhok.org

Open Cities launched mapping and data visualization activities in November 2012 in Kathmandu, Nepal; Colombo, Sri Lanka; and Dhaka, Bangladesh. Following successful pilots in these three cities, it is anticipated that the hackathon series will begin in late 2013 and other key urban areas in the region will launch additional data collection efforts. The project team is currently cultivating partnerships with universities, the private sector and development partners on behalf of the initiative to garner additional financial support and technical expertise.

www.opencities.org



Nepal

Nepal's Kathmandu Valley is one of the most seismically at-risk places in the world. A combination of poor construction practices and a history of governance challenges have left the country extremely vulnerable to earthquakes and other hazards. The World Bank is launching seismic risk reduction activities aimed at retrofitting schools, health facilities, and government buildings in the Kathmandu Valley. OpenDRI will support risk assessment activities planned for 2013 to help prioritize these investments through community mapping activities and the opening of existing risk information.

Currently, in Nepal there is strong capacity within the university system, certain government ministries and civil society organizations like the National Society for Earthquake Technology (NSET) and the International Centre for Integrated Mountain Development (ICIMOD), to champion open data efforts and provide technical assistance related to data management. Nonetheless, weak data sharing arrangements have frequently been cited in meetings with relevant stakeholders as a significant impediment to producing high quality risk assessments. Consequently, a number of institutions in Nepal have expressed strong interest in participating in a project that would increase access to these existing risk datasets.

OpenDRI, in partnership with the Ministry of Home Affairs (MoHA) and the Asian Disaster Preparedness Center (ADPC), will launch an open data platform to host gathered or produced data as part of the 2010 multi-hazard risk assessment conducted by the country. MoHA will receive training on the use and maintenance of the platform. These activities will be conducted in tandem with targeted outreach to local critical institutions and data-holders to assess capacity and participation interest in a broad-based open data commitment, to become effective in 2013.

www.osmnepal.org

Sri Lanka

In Sri Lanka, natural disasters, such as floods and landslide, cause significant damage to properties

and infrastructure. However, the country has not had sufficient policy backing to integrate disaster risk reduction into settlement planning, infrastructure development and other development interventions. As a result, thousands of people settle annually in highly vulnerable areas.

Assisted by advancements in risk assessment and the generation of risk information, the Sri Lankan government is in the process of formulating policies to integrate risk reduction concerns into the development planning portfolio. Nonetheless, there are still no knowledge-sharing platforms in place to take risk information to development planners.

Consequently, OpenDRI is partnering with the government of Sri Lanka to develop a long-term institutional

OpenStreetMap (OSM)

www.openstreetmap.org



Often called “the Wikipedia of Maps”, OpenStreetMap (OSM) is a global online database and user community of over one million members that allows volunteers to collaborate towards creating a free and open map of the world. With support from the World Bank and other development partners, the OpenStreetMap community played an active role in mapping Port-au-Prince, Haiti, following the January 2010 earthquake. Hundreds of volunteers worked together to produce the most accurate and up-to-date map of Port-au-Prince and surrounding areas ever created. This map played a critical role in response and reconstruction efforts. Since then, OSM has been used as part of OpenDRI projects in a number of other countries to facilitate community-based mapping, quickly create information on critical assets and infrastructure, and ensure that as broad as possible section of society are involved in the process of risk identification.

strategy towards the creation, maintenance, and opening of disaster risk information. So far, progress has been made by organizing a series of meetings, video conferences and workshops to discuss open data. Additionally, training sessions on GeoNode, InaSafe, and community mapping are underway.

The OpenDRI team is also supporting the creation of an open disaster data working group and launching spatial data sharing platforms within the Disaster Management Center and the Urban Development Authority to help ensure that risk information collected or created through DRM programs is widely available. Finally, the city of Colombo has been selected as one of the pilot cities for the regional Open Cities project. Community mapping activities in Metropolitan Colombo began in December 2012.

Bangladesh

Bangladesh is a densely populated and low-lying country exposed to cyclone, flood, tsunami and seismic hazard. The World Bank Bangladesh DRM program launched a large risk identification and mitigation program in October 2012. A key component of the program will be the development of a risk information sharing program and platform to be supported technically and institutionally by OpenDRI.

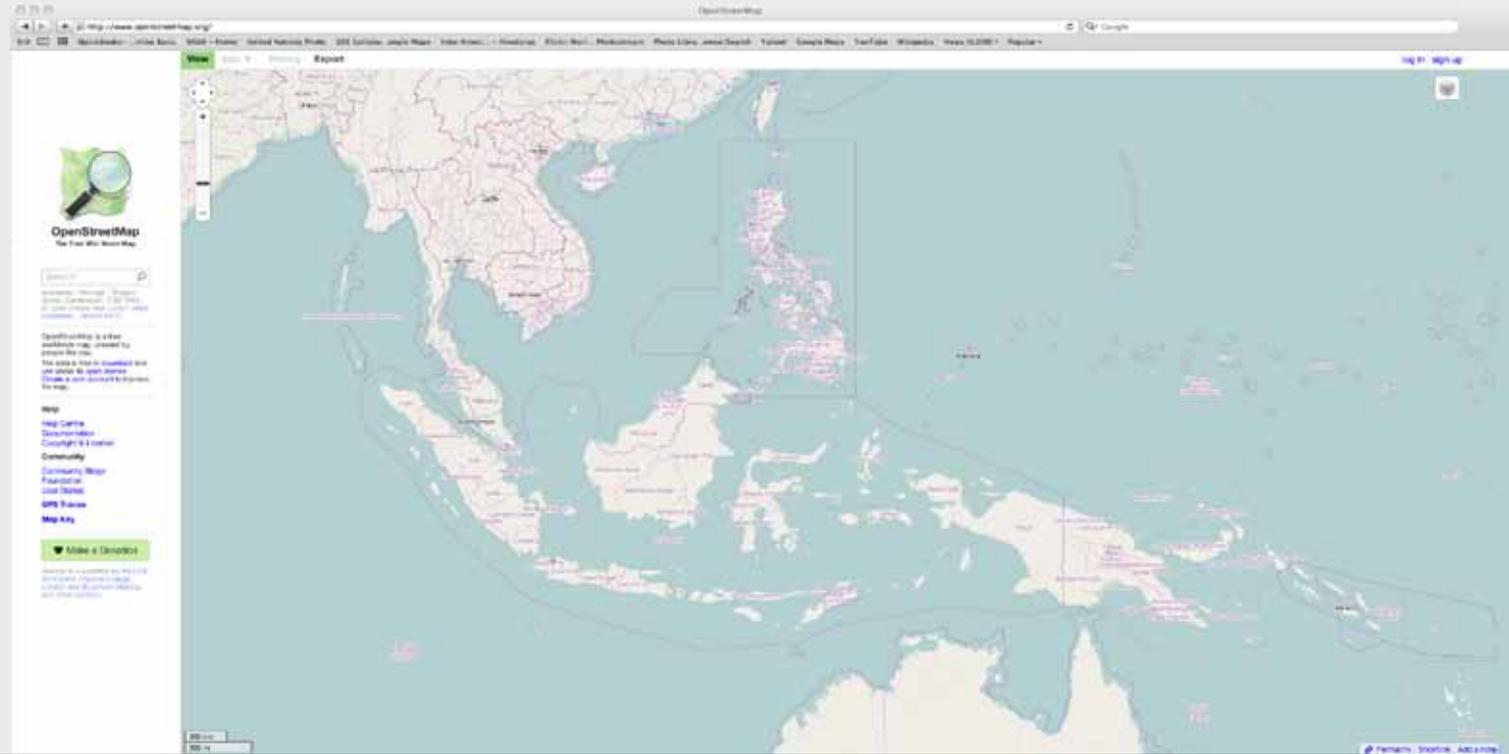
The platform will initially be used to share and visualize detailed asset data collected for Dhaka as part of recent risk assessment activities. The OpenDRI team is also partnering with the Bangladesh OpenStreetMap community to collect information on evacuation routes and vulnerable buildings in the densely settled and at-risk sections of the Old City of Dhaka.



INDONESIA Participatory mapping for flood preparedness led by government officials, Jakarta. Courtesy of Abigail Baca, World Bank.

SAR OpenDRI At-A-Glance

SAR Countries	OpenDRI Program Highlights (activities and outreach)	Geospatial System(s) and mapping software
Nepal	<ul style="list-style-type: none"> ● A number of institutions have expressed strong interest in participating in a project that would increase access to existing risk datasets in need of being opened. <p><i>Expected in 2013:</i></p> <ul style="list-style-type: none"> ● A broad-based risk data-sharing commitment among local institutions and data-holders. ● In tandem with the open data platform launch activities, targeted outreach to local critical institutions and data-holders to assess capacity and participation interest to collaborate in a broad-based open data commitment. 	<ul style="list-style-type: none"> ● OpenDRI, in partnership with the MOHA and ADPC, will launch an open data platform to host gathered or produced data as part of the 2010 multi-hazard risk assessment conducted by the country. ● Active OpenStreetMap efforts collecting building stock data in the Kathmandu Valley began in November 2012 and will inform risk assessment in order to prioritize school and health facility retrofitting. <p>www.opencities.org www.osmnepal.org</p>
Sri Lanka	<ul style="list-style-type: none"> ● OpenDRI partnering with Sri Lanka’s government to develop long-term sustainable DRR strategy. ● Public outreach via meetings, video conference and workshops to discuss whether open data are being opened. ● World Bank supporting the creation of a disaster working group and launching spatial data sharing platforms to help ensure that risk information through DRM programs is widely available. 	<ul style="list-style-type: none"> ● OpenDRI supporting creation of open disaster data working group and launching spatial data-sharing platforms within Disaster Mgmt. Ctr. and the Urban Dev. Authority to help ensure risk info collected or created through DRM programs is widely available. ● Training on GeoNode, InaSafe and community mapping are underway. ● Community mapping activities in the Metropolitan Colombo area began in December 2012.
Bangladesh	<ul style="list-style-type: none"> ● Launched a DRM program in October 2012. 	<ul style="list-style-type: none"> ● OpenDRI will support the development of a risk information sharing program and platform to share and visualize detailed asset data collected for Dhaka and two other cities as part of recent risk assessment activities. ● OpenDRI partnering with Bangladesh OpenStreetMap community to collect info on evacuation routes and vulnerable buildings in the densely settled and at-risk section of Old City of Dhaka.



EAST ASIA AND THE PACIFIC www.openstreetmap.org

East Asia and the Pacific (EAP)

Overview

The EAP's disaster risk management portfolio has multiple projects implementing the OpenDRI approach. The portfolio is rapidly expanding in the area of high technical disaster and climate risk assessments with core components related to geospatial risk information, open source software development, and policy dialog on open data.

The *Building Urban Resilience in East Asia* initiative, started in 2010, aims to increase the resilience of cities to disasters and climate change impacts by using a risk-based approach in public investment decision-making process. The objective of the initiative is to demonstrate a scalable methodology and practical

tools for risk assessment, which can be used for city-level investment decisions.

Financing for Building Urban Resilience comes from the Australian Agency for International Development (AusAID) and the World Bank's East Asia and Pacific Infrastructure for Growth Trust Fund (EAAIG). Outputs benefiting the region already include: the InaSafe software platform, the Urban Resilience Handbook, and pilot projects in Jakarta, Indonesia and Can Tho, Vietnam. Lastly, OpenDRI has been highlighted in the recent publication "Strong, Safe, and Resilient: A Strategic Policy Guide for Disaster Risk Management in East Asia and the Pacific."



East Asia Indonesia

Indonesia is exposed to a wide range of disasters including large magnitude earthquakes, tsunamis, volcanic eruptions and floods. These events have caused significant human and economic impacts, ranking Indonesia 12th among the top 35 countries that have high mortality risk from multiple hazards. Indonesia's National Agency for Disaster Management (BNPB) officially launched the InaSafe software platform at the *Fifth Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR)*, October 24, 2012. This open source disaster impact modeling tool was developed in partnership with the BNPB, the Australia-Indonesia Facility for Disaster Reduction (AIFDR), GFDRR, and the World Bank EAP Disaster Risk Management team through the AusAID-EAP Infrastructure for Growth Trust Fund (EAAIG). BNPB is using InaSafe to support emergency contingency planning in high-risk provinces and districts.

As part of the InaSafe approach to developing contingency planning and preparedness scenarios, OpenStreetMap tools are used to develop high-resolution baseline data on critical infrastructure. The collected information was analyzed using InaSafe during the 2012 Jakarta flood contingency planning and can be openly accessed and used for

<http://inasafe.org>

<http://www.bnpb.go.id>

future emergency planning exercises. Across Indonesia, nearly a million buildings have been mapped in the OpenStreetMap platform and can be incorporated into the InaSafe preparedness analysis set. Customized resources are being developed and supported by the Humanitarian OpenStreetMap Team (HOT) and AusAID-AIFDR to increase community-building and beginner/intermediate-level training in Bahasa, Indonesia's official language.

Related to the OpenStreetMap activities, the World Bank-GFDRR has started a policy dialog with the Indonesia's national mapping agency, Geospatial Information Agency (BIG), to integrate elements of open data and participatory mapping into Indonesia's Geoportal. A senior government official presented these experiences at the Open Data session of the Understanding Risk (UR) Forum 2012 in Cape Town, South Africa.

The Philippines

The Philippines is among the top global disaster hotspots, ranking 8th among countries most exposed to multiple hazards including earthquakes, volcanic eruptions, floods and tropical cyclones. In terms of percentage of GDP, the country ranks 13th in economic risk from natural disasters, with activity amounting to at least 85% of GDP located in at-risk areas. October 2012 marks the beginning of OpenDRI projects in the Philippines under the Building Urban Resilience program. The project will focus on supporting the Department of Interior and Local Government (DILG) to empower Local Government Units (LGUs) in their planning and investment decisions.

The Government of the Philippines' flagship initiative under the Department of Science and Technology, Project NOAH (National Operational Assessment of Hazards),

INDONESIA Communities sharing knowledge to ensure maps are as realistic as possible.



is a key partner in this work with their mission “to undertake disaster science research and development, advance the use of cutting edge technologies and recommend innovative information services in government’s disaster prevention and mitigation efforts.” The collaboration will extend functionality of the NOAH tool suite with InaSafe to enable wider and more effective use of the climate and disaster risk information by LGUs and civil society.

Additional OpenDRI partners in the country include the University of the Philippines GIS and Geodetic Engineering Departments and members of the active OpenStreetMap community. The Philippines OpenStreetMap

Foundation participated in an Open Development Training organized by World Bank’s Knowledge for Development Center (KDC) providing an overview of the OSM including a history of Philippines-based activities supporting disaster response. In November 2012, the Open Source Geospatial foundation in the Philippines (OSGeo-PH), the University of Philippines Department of Geodetic Engineering (UPD-GE), OpenStreetMap Philippines (OSM-PH) and the Environmental Science for Social Change (ESSC) organized a series of pre-symposium workshops showcasing free and open source technologies including GeoNode, Quantum GIS and OSM.

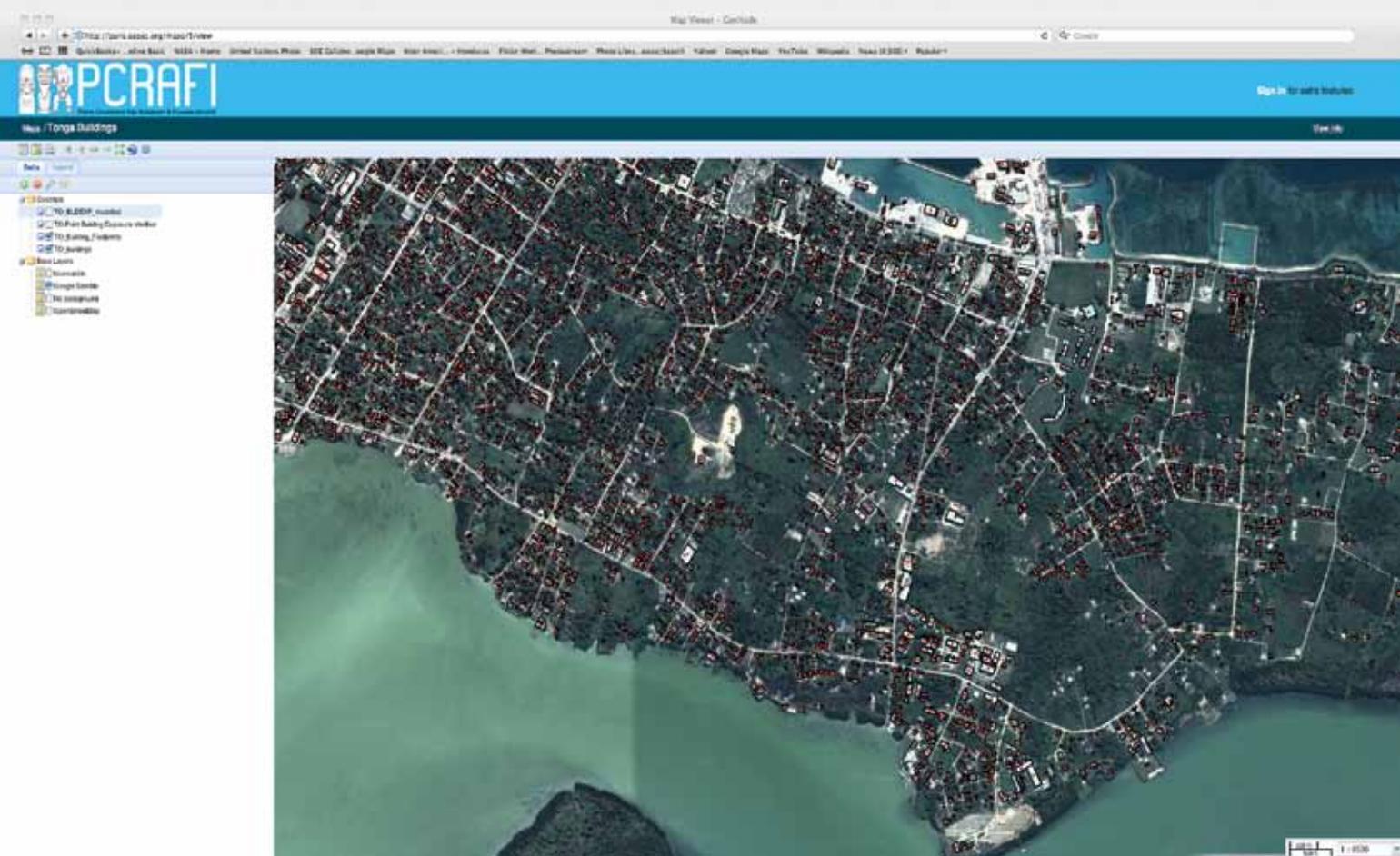
Vietnam

in the tropical monsoon area in South East Asia, Vietnam is one of the most flood hazard-prone areas in the Asia Pacific Region. Infrastructure and people are increasingly concentrated in vulnerable areas such as floodplains and coastal areas, suggesting that disaster-related losses will increase in the future with the uncertain impacts of climate change.

OpenDRI engagements through the pilot activities of the Building Urban Resilience Program have been underway since 2011. The current focus is supporting the Can Tho Comprehensive Flood Risk Management Master Plan project, where critical geospatial flood risk data are being collected and can be leveraged to demonstrate OpenDRI concepts and enhance GIS capacity at the subnational scale. At the national level, a component of the pipeline project Managing Natural Hazards in Vietnam is the improvement of information systems for better data sharing in order to strengthen disaster preparedness. The project is still at the feasibility stage; however, there is a good opportunity to reinforce the OpenDRI capacity in the country and create linkages with existing projects in other sectors such as through Urban Upgrading in Can Tho and Transportation Management in Haiphong.



VIETNAM Ho Chi Minh City skyline. © Thinkstock.com



TONGA GeoNode at <http://paris.sopac.org/maps/5/view>

Pacific Island Countries

The Pacific Island Countries¹ are highly exposed to the adverse effects of climate change and natural hazards, which can result in disasters affecting their economic, human, and physical environment and impacting their long-term development agenda. Since 1950, natural disasters have affected approximately 9.2 million people in the Pacific Region, causing 9,811 reported deaths.

Launched in December 2011, the Pacific Risk Information System enhances management and sharing

of geospatial data within the Pacific community. The system enables the creation of a dynamic online community around risk data by piloting the integration of social web features with geospatial data management. Exposure, hazard, and risk maps for 15 Pacific Countries were produced as part of the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI)² and are accessible through this platform as powerful visual tools for informing decision-makers, facilitating communication and education on disaster risk management.

The risk information captured in the platform and shared by all users is

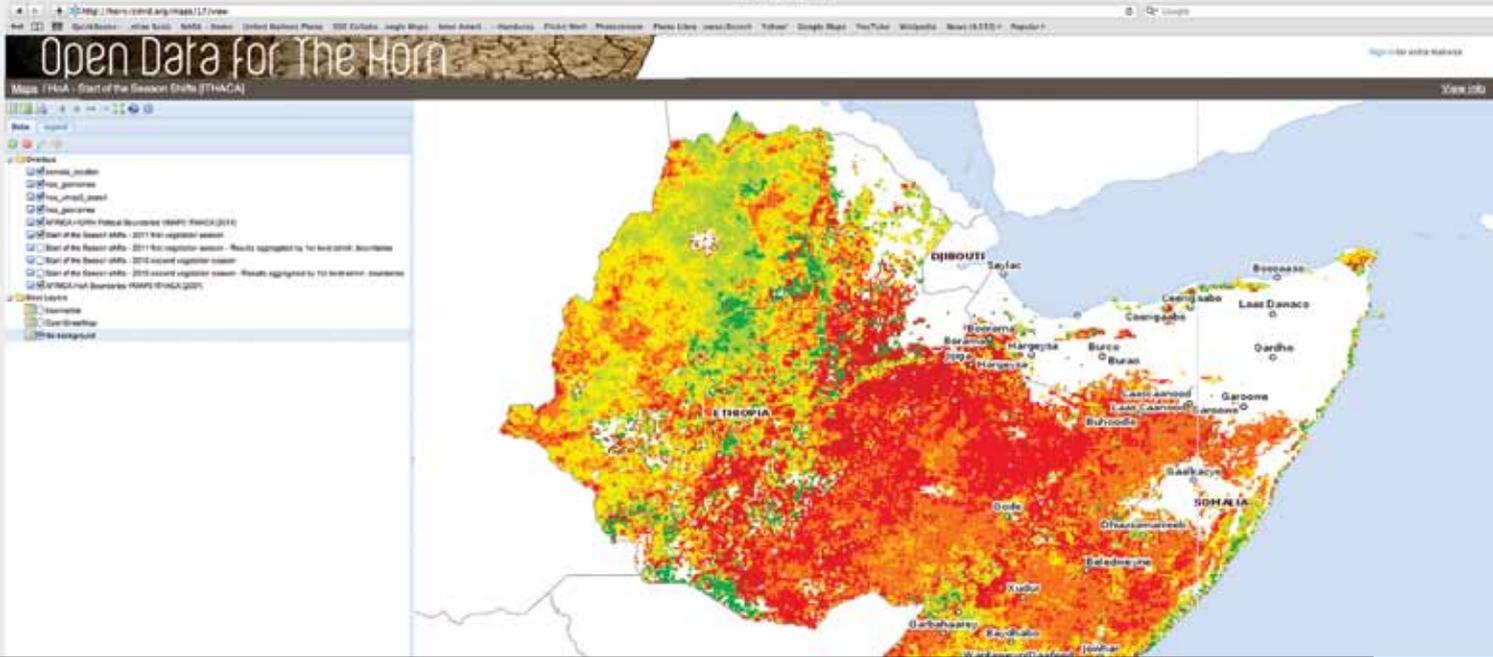
the foundation for future steps of the PCRAFI, as well as any government and donor projects related to macro-economic planning and disaster risk financing; urban investments and infrastructure planning; and rapid post-disaster damage estimation.

<http://paris.sopac.org/>

- ¹ The Pacific Island Countries covered under the Pacific Risk Information System (PCRAFI) are: Cook Islands, Federate States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea (PNG), Samoa, Solomon Islands, Timor Leste, Tonga, Tuvalu, and Vanuatu.
- ² PCRAFI is a joint program between the Secretariat of the Pacific Community SPC/SOPAC, the World Bank, and the Asian Development Bank, with financial support from the Government of Japan and the Global Facility for Disaster Reduction and Recovery (GFDRR).

EAP OpenDRI At-A-Glance

EAP Countries	OpenDRI Program Highlights (activities and outreach)	Geospatial System(s) and mapping software
Indonesia	<ul style="list-style-type: none"> Across Indonesia, nearly half a million buildings have been mapped in the OpenStreetMap platform and can be incorporated into the InaSafe preparedness set of analyses. 	<ul style="list-style-type: none"> BNPB using InaSafe to support emergency contingency planning. InaSafe platform launched October 24, 2012. OpenStreetMap tools develop high resolution baseline data on critical infrastructure. http://inasafe.org http://www.bnpb.go.id
The Philippines	<ul style="list-style-type: none"> OpenDRI program began in October 2012 focused on supporting government in their planning and investment decisions. 	<ul style="list-style-type: none"> The OpenStreetMap Foundation participated in an Open Development Training providing an overview of the system including Philippine's disaster response activity history. Plans to adopt InaSafe to integrate spatial and statistical information collected at national, regional and LGU level for disaster risk mitigation and development planning.
Vietnam	<ul style="list-style-type: none"> At a national level, a component of the pipeline project, Managing Natural Hazards, is the improvement of information systems for better data sharing in order to strengthen disaster preparedness. Regionally, current programmatic focus is supporting Can Tho Comprehensive Flood Risk Management Master Plan project. 	<ul style="list-style-type: none"> For Can Tho Comprehensive Flood Risk Management M.P. project, critical geospatial flood risk data are being collected and can be leveraged to demonstrate OpenDRI concepts and enhance GIS capacity at the subnational level.
Pacific Island Countries	<ul style="list-style-type: none"> The risk information captured in the geospatial platform is the foundation for future steps of the PCRAFI as well as any government and donor projects related to macro-economic planning and disaster risk financing, urban investments and infrastructure planning, and rapid post-disaster damage estimation. 	<ul style="list-style-type: none"> The Pacific Risk Information System, launched 2011, enhances management and sharing of geospatial data within the Pacific community. The PCRAFI produced exposure, hazard and risk maps for fifteen Pacific countries and are accessible through this platform as powerful visual tools for informing decision-makers. http://paris.sopac.org/



HORN OF AFRICA GeoNode at <http://horn.rcmrd.org/maps/17/view>

Africa Region

Horn of Africa and the Sahel

To respond to the ongoing drought crises in the Horn of Africa and the Sahel, the World Bank Africa DRM team and GFDRR have helped establish *OpenDRI for Drought Resilience in Africa*³, currently developing a series of open source mapping platforms to support government, international organizations, and NGOs collect and map critical data in order to develop rapid response and risk reduction plans. These web platforms provide open access to geospatial data and knowledge sources on the drought collected by various development agencies, humanitarian organizations, and technology developers working in the region.

In the Horn of Africa, a European Union (EU) - Africa Caribbean and Pacific (ACP) grant has recently been approved to support further development of the open source mapping platform. The platform is being hosted by a regional mapping agency, the Regional Center for Mapping Resources for Development (RCMRD), Nairobi, Kenya. <http://horn.rcmrd.org> Next steps for additional development include:

1. Ensuring data is collected, aggregated, and updated.
2. Organizing a series of training workshops on open data, platform utilization, and drought risk assessment. These workshops will be targeted at GIS and non-technical users and will aim at building knowledge-sharing community among users.

3. Organizing a Random Hacks of Kindness hackathon, led by the Kenya Red Cross, to engage technical volunteers in using the data to develop software solutions for disaster risk management challenges.

Based on the success of the Horn of Africa and the Sahel geospatial platform, and the need to respond to the information gap on the drought in West Africa, the *Sahel Open Source Mapping Platform* was launched. In-line with the AFR DRM resilience strategy for the region, this platform seeks to build collaboration among national governments, multilateral organizations, regional structures, and NGOs, to generate and share drought-risk related knowledge and information. www.sahelresponse.org

In support of the broader World Bank response to the Sahel droughts, the OpenDRI team will partner with a regional agency to manage the platform, host workshops on open data and drought risk assessment with the goal of promoting the use of climate information to inform decision-making and to foster drought preparedness and resilience in the region.

³ Partners and collaborators of the OpenDRI for Drought Resilience in Africa include: Development Seed, Google, the Famine Early Warning System Network (FEWS), National Aeronautics and Space Administration (NASA) SERVIR, the United Nations Office for Coordination of Humanitarian Affairs (UNOCHA), the UN Refugee Agency (UNHCR), the United State Department's Humanitarian Information Unit (HIU), and the World Food Programme (WFP).

Malawi

Through the efforts of several international agencies and the World Bank, a variety of studies have been conducted in recent years to better understand Malawi's vulnerability to natural hazards and the effects of climate change, along with the status of its natural resources on which the majority of rural livelihoods and the economy rely. As part of these studies, important datasets related to vulnerability, impacts, climate change, disaster risk reduction and preparedness have been collected and created. All too often this data has not been widely distributed or made available to the Government of Malawi or other important actors involved in building resilience in the country.

In partnership with OpenDRI, the Shire River Basin Management Technical Team and the Department of Disaster Management Affairs launched an online platform in November 2012 to help ensure that historical and current project data remains electronically accessible and useful to the Government of Malawi, the public and other key stakeholders in the country.

In addition, a community mapping process is being organized using

OpenStreetMap to collect exposure data for the flood risk modeling exercise in several districts. This exercise will also be useful for the ongoing Post Disaster Needs Assessment (PDNA) training and preparedness program. All the data collected will be hosted on the Malawi GeoNode (MASDAP). Furthermore, through the deployment of the InaSafe software as part of this community mapping exercise, the data collection activities in turn will enable both scenario assessments: ex ante, and rapid damage ex-post assessments; thus, improving capacity for flood contingency planning and response in Malawi. www.masdap.mw

Mozambique

Mozambique's geographic position, location and size make it exposed to extensive flood hazards and intense cyclones and windstorms. Long, severe droughts mobilize national and international attention. Historical data on disaster events shows that Mozambique suffered 62 major events in 51 years (1957-2008), i.e., 1.2 events per year on average (INGC, 2009). Influenced by these statistics, Mozambique's national disaster management agency, The Instituto Nacional de Gestão das Calamidades (INGC), in

collaboration with the World Bank and the GFDRR, has developed a sustainable OpenDRI work plan currently under implementation.

In 2012, GFDRR Labs conducted on-site training for their GeoNode instance, Moz-Adapt, available in both English and Portuguese. Training included spatial data uploading and updating, map creation using existing layers, map sharing and other technical site management aspects. The training also focused on helping local programmers prepare GeoNode site launches and planning for the publication of a highly tailored and localized training manual.

Community-building and outreach activities have taken place with the National Water Directorate (DNA) team to discuss the site and ways it could provide ready access to a centralized data repository for INGC partners. Participants are keen to utilize the site and rally the support of other regional offices that have other data repositories and are at the forefront of emergency responses. Further regional training and promotional and communication dissemination strategies are being planned with data contributors, partners and district directors. <http://moz-adapt.org>

SAR OpenDRI At-A-Glance

AFR Countries	OpenDRI Program Highlights (activities and outreach)	Geospatial System(s) and mapping software
<p>Horn of Africa and the Sahel</p>	<ul style="list-style-type: none"> OpenDRI will partner with regional agency to take ownership of the open source mapping platform, host workshops on open data and drought risk assessment with the goal of promoting the use of climate information to inform decision-making and to foster drought preparedness and resilience in the region. 	<ul style="list-style-type: none"> OpenDRI for drought resilience in Africa is developing a series of open source mapping platforms to develop rapid response and risk reduction plans. www.horn.rcmrd.org The Sahel open source mapping platform was launched in line with the resilience strategy for the region. www.sahelresponse.org A grant has been approved to support further development of the open source mapping platform.
<p>Malawi</p>	<ul style="list-style-type: none"> Important datasets related to vulnerability, impacts, climate change, disaster risk reduction and preparedness have been collected and created. 	<ul style="list-style-type: none"> In partnership with OpenDRI, the Shire River Basin Mgmt. Technical Team and the Dept. of Disaster Mgmt. Affairs launched a platform in 2012 to help ensure data sharing mound the public and key stakeholders. Community mapping activities and InaSafe implementation for PDNA efforts began in April 2012. www.masdap.mw
<p>Mozambique</p>	<ul style="list-style-type: none"> The World Bank and Mozambique’s national disaster mgmt. agency have developed a sustainable OpenDRI work plan under implementation 	<ul style="list-style-type: none"> OpenDRI imparted training to Admins of their geospatial platform in 2012. Community outreach for the site is currently in progress. http://moz-adapt.org



OpenDRI Case Study Nepal

Overview Nepal and Indonesia represent two cases where the OpenDRI team helped clients not only collect and analyze high-resolution exposure data, but also build an ecosystem of partners around the management, treatment, reuse and preservation of those data. Each of the efforts took unique turns to meet the context needs of each country, but share the common goal of using open data to improve resilience.

Introduction

Nepal is one of the 20 most disaster-prone countries in the world, with 28% of the population potentially exposed to risks from three or more hazards. The capital city of Kathmandu is the world’s most at-risk city in terms of potential death due to earthquake. The risk is amplified given the country’s social, economic, and political characteristics that

increase its vulnerability. With an annual population growth rate of 6.5 percent and one of the highest urban densities in the world, the Kathmandu Valley’s rapid development has been uncontrolled.

Constraints to building resilience are particularly high in Nepal, and a comprehensive approach to disaster risk management (DRM) is hampered by a lack of robust and up-to-date

information about the country’s built environment. The design of a successful DRM program and its implementation also face other challenges, including poor access to data collected or produced by actors who undertake surveys and analysis, but have not yet adopted open data practices. The Nepal OpenDRI initiative was launched in 2012 to help increase the amount of publicly accessible



NEPAL Kathamandu, pre-OpenDRI and progress as of March 2013. Before and after shots.



NEPAL Bhattarai 2010, JGIS. Housing typology visualization, New Baneshwor area Kathmandu. Digitized /converted into 3D.

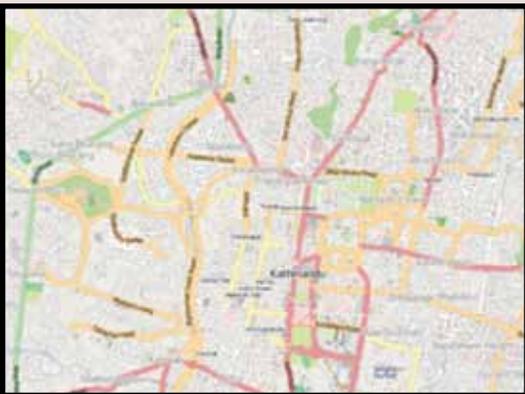
data on hazard, exposure, and vulnerability in the country, and to facilitate the use of this data in an effort to support the government in adopting evidence-based disaster risk management strategies.

Participatory Mapping of Critical Infrastructure in the Kathmandu Valley

GFDRR and the World Bank are working with the Government of Nepal (GoN) and the Nepal Risk Reduction Consortium (NRRC) to develop a seismic retrofitting strategy for critical building stock in the Kathmandu Valley, with an emphasis on schools, health centers, and government administrative offices. A key precondition for this process will be updating information on the exposure and vulnerability of these structures. GFDRR Labs has partnered with the Nepal OpenStreetMap (OSM)

Community to collect this data using community mapping techniques. Since November 2012, the project has trained over 1,000 participants in mapping using the OSM open-source platform. A wide variety of government institutions, university students, civil society groups, private sector institutions, and international organizations have been convened through OpenDRI in the process of collecting critical data sets in the Kathmandu valley.

With the support of OpenDRI Nepal and the GoN, a team of dedicated mappers from Kathmandu University's



OPEN DATA FOR RESILIENCE INITIATIVE OVERVIEW

GeoMatics and Engineering programs are introducing fellow students from across the Kathmandu Valley to key concepts in seismic risk assessment, exposure surveys and OSM. Once trained, participants are working together to collect detailed

structural information about public buildings—this includes over 4,000 structures across the Kathmandu Valley. This data will be finalized and made available through OSM in July 2013.

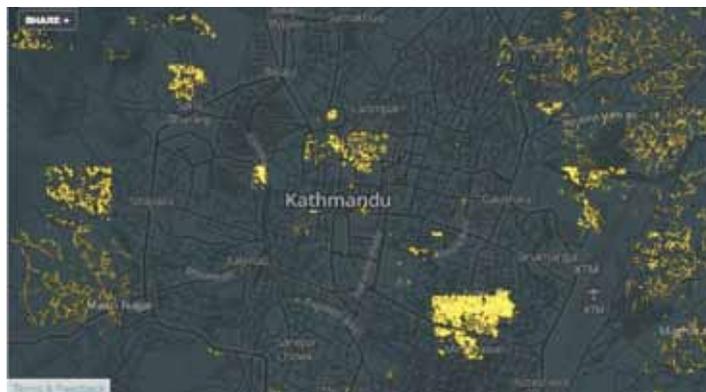
The data produced as part of this effort will not only inform retrofitting activities

implemented by the GoN with assistance from development partners, but also be available to support a wide variety of urban applications as part of the Open Cities Project (see page 12). Open Cities appears on the first page of the South Asia region (SAR) write up). One of the notable aspects of this effort is the opening of the datasets—all data and visualizations collected to date are available at these web link locations respectively:

- www.openstreetmap.org
- www.opencitiesproject.com

Open Data Day To foster a culture of exchanging and using open data, GFDRR and the World Bank participated in a multi-city Open Data Day event held on February 23, 2013. In Kathmandu, OpenDRI Nepal co-organized an event with the Mozilla Foundation, WikiMedia Nepal, and several local universities and software development companies. The event included an OSM mapathon, a hackathon, and several lectures on open data and open source software. The OSM mapathon linked over 100 mappers in Kathmandu, Washington, DC, New York City, and London as all participants added data on Nepal’s built environment to OSM. Students from Kathmandu University, Nepal Engineering College, Amrit Science College, and the Institute of Engineering of Tribhuvan University partnered with mappers in other locations to create over 7,000 building footprints in just 20 hours. The figure above shows the areas that were mapped on *Open Data Day* in yellow.

<http://www.osmnepal.org/open-data-day-nepal-2013/>



NEPAL Map showing areas of heaviest editing during *Open Data Day*.

Open Data Working Group and Open Risk Data Platform

In parallel, GFDRR and the World Bank are working with Nepal’s Ministry of Home Affairs (MoHA), the NRRC, and other organizations to formulate a long-term strategy that will ensure disaster risk data created by various in-country entities are widely available to support disaster resilience efforts. An Open Data Working group has been formed towards this end and several institutions are in the process of launching open data platforms that for the first time will make available accurate disaster risk data to all stakeholders.



NEPAL Nepali women mapping in Nepal's First *Open Data Day*, February 2013.

Women's Mapping Party Many technical communities suffer from a lack of female participation. In Nepal, efforts are underway to ensure that the OpenDRI project is inclusive for anyone who wants to participate and contribute. On February 23, 2013, Nepal's first *Open Data Day*, OpenDRI Nepal brought a significant number of female mappers. Encouraged by this exciting new initiative to map their community, a Women's Mapping Party was organized a few weeks later. During the mapping party, young female participants learned how to edit data in OSM. Then, in groups of four, the women conducted field visits in the Baneshwor neighborhood of Kathmandu to verify and collect additional geospatial data. They returned with GPS traces and uploaded their data in OSM, experiencing how new mappers can contribute to improving OSM only a few hours after being exposed to the platform. Those who organized the Women's Mapping Party are helping OpenDRI Nepal set an example for other technical communities around the world.

OpenDRI Case Study Indonesia

Overview The work in Indonesia demonstrates two concepts: 1) How to engage citizens in collecting and curating new data from their own communities about their current exposure to natural hazards, and 2) how to apply the use of simple risk impact tools to communicate vulnerabilities and inform decision making at all levels: national, provincial, municipal, and community.

Questions without answers

When scientists predicted that the 2011/2012 Indonesian monsoon season would be worse than usual, the Governor of Jakarta Province asked some tough but expected questions. How ready would the province be for the flooding? What areas were most likely to flood and

what were the contingency plans for each sector-specific agency? Government officials initiated their research into the exposure of health, educational, and public works facilities to the upcoming rains, thinking that such data would be readily available. However, after a few weeks of work, they discovered they lacked the data to quantify their answers.

In parallel, technical experts had discovered their own disaster risk management questions without adequate answers. Beginning in 2010, the GFDRR Labs formed a working partnership with an AusAID and Government of Indonesia initiative known as the Australia-Indonesia Facility for Disaster Reduction (AIFDR) with the goal of applying innovation and technology to the challenges of disaster risk management. AusAID seconds technical specialists from Geoscience Australia (GA) to build capacity by developing robust hazard and risk information. One example is the real-time earthquake mapping akin to the US Geological Survey’s Shakemap, which has been implemented in partnership with the Indonesian Meteorological, Climatological and Geophysical Agency (BMKG). Together with the World Bank/ GFDRR, AIFDR aimed to develop innovative tools to increase the national disaster management



INDONESIA Community mapping. Local government staff engaging students.



InaSAFE

InaSafe is free software that produces realistic natural hazard impact scenarios for better planning, preparedness and response activities. The free software that produces realistic natural hazard impact scenarios for better planning, preparedness and response activities. The software allows users to combine data from many sources and explore the impacts a single hazard would have on specific sectors, e.g., location of primary schools and estimated number of students affected by a possible tsunami.

This open source tool enables anyone to download a free GIS editor (QuantumGIS), install the InaSafe plugin, and pull in hazards and exposure data layers either with manual offline sources or via internet web services.

Afterwards, he/she could run a risk impact analysis to show the vulnerability of certain infrastructure or populations to a specified hazard. For example, disaster management officials near the Mount Merapi volcano can use InaSafe to combine a hazard layer provided by national volcano experts showing the likely impact zone of an eruption and a population data set to determine the location vulnerable communities that would need evacuation. www.inasafe.org



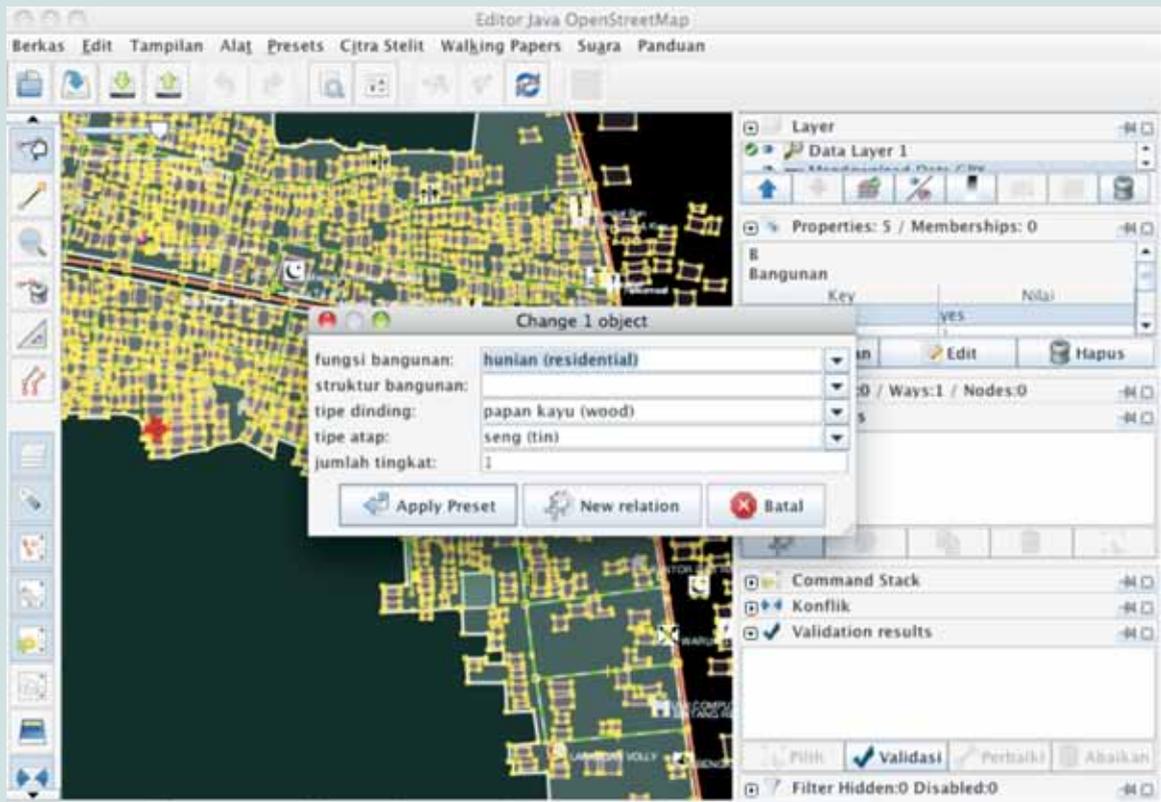
agency's (BNPB) capacity to use risk information for disaster preparedness, including a free and open source platform called InaSafe. The InaSafe tool enables detailed hazard information to be combined with exposure, both population and the built environment, to characterize possible disaster impact scenarios. As in the case of the aforesaid Jakarta government officials, the efforts of BNPB and AIFDR were hampered when translating hazard data into risk impact information due to a lack of quality exposure data.

The solution to this issue would bring together the World Bank country office, GFDRR Labs/ OpenDRI, AIFDR, AusAID, and officials from across the national, provincial, and municipal governments of Indonesia. Each would play an interdependent role that would come together into a unique disaster risk reduction ecosystem.

Building a locally curated data ecosystem

To address the issue of exposure data, AIFDR turned to participatory mapping. In early 2011, AIFDR contracted the Humanitarian OpenStreetMap Team (HOT) to build capacity in Indonesia to use OpenStreetMap tools to collect building footprints and basic risk vulnerability attributes about buildings. HOT trained over 500 Indonesians, working through Local Governments, civil society organizations (CSOs)

OPEN DATA FOR RESILIENCE INITIATIVE OVERVIEW



INDONESIA The Java OpenStreetMap (JOSM) Editor supports the Bahasa language and allows for the mapping of features such as buildings, roads and critical infrastructure using free and open source software.

and universities, to enter data collected from GPS units and survey forms into OSM, and to trace satellite imagery into OpenStreetMap. As a pilot within one year, this OSM mapping effort created over 250,000 building footprints across the country. It was a great start, but scaling the effort would require additional partners including collaboration with the newly reorganized national Geospatial Information Agency, Badan Informasi Geospasial (BIG).

Without clear validation efforts, government officials were reluctant to accept the crowdsourced data from OSM as a basis for authoritative preparedness activities. To address these concerns, AIFDR commissioned a quality assessment from Gadjah Mada University’s Department of Geomatics and Geodetic Engineering. It also engaged in a partnership with GFDRR, which sponsored several new tools to add an auditing capability to

OSM, as well as a mechanism to make it easier for Indonesia officials to extract data from the OSM database. Together, these efforts started to bear fruit. The assessment showed that the data were generally of good quality, with recommendations around improving field data collection practices. Through the involvement of WB-GFDRR and the World Bank’s Indonesia country team, partnership grew to include stakeholders from Province of Jakarta Disaster Management



INDONESIA Local Government officials from Jakarta reviewing critical infrastructure and neighborhood boundary data mapped in OpenStreetMap with support from University of Indonesia students.

Agency (DKI BPBD) and the various agencies responsible for flood risk management. Subsequently, the innovation that followed served to transform stakeholders' thinking about the potential uses and applications of participatory mapping for disaster risk reduction.

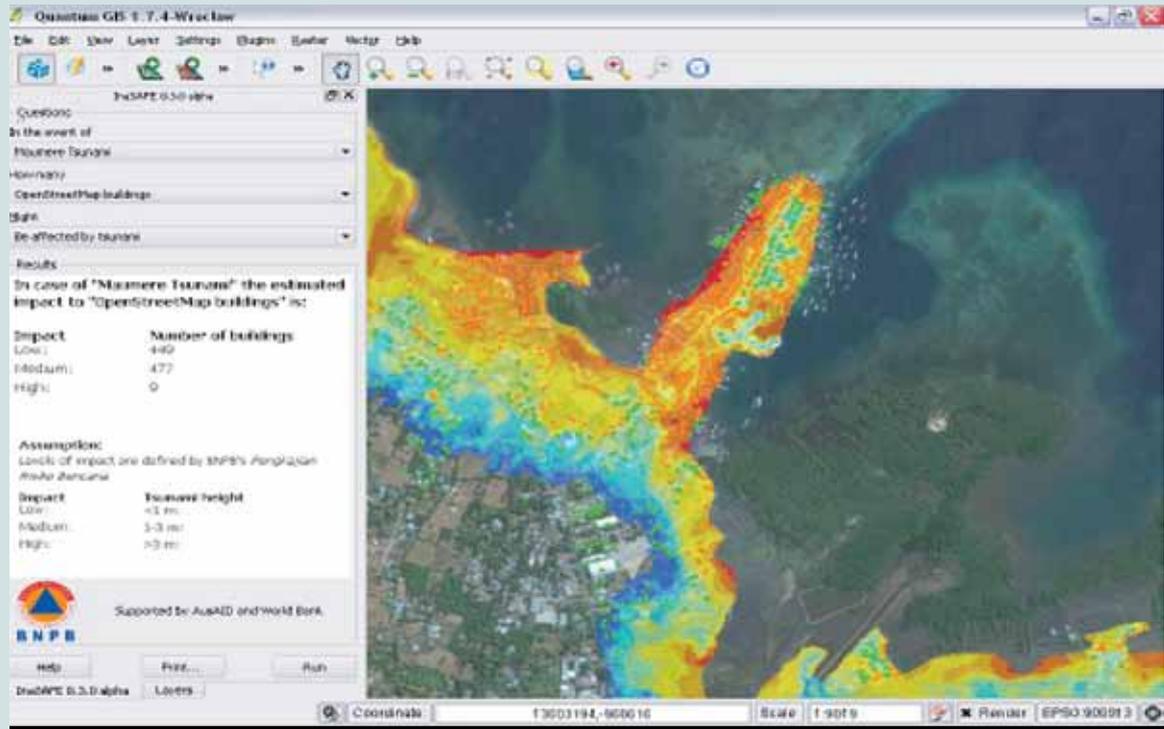
Mapping Jakarta for US\$20K

Under the direction of the Governor of Jakarta, DKI BPBD

coordinated with the five urban districts and over 300 Ward officials to participate in mapping workshops with HOT, World Bank/GFDRR Labs, AIFDR, UN-OCHA and student mappers from the University of Indonesia. In March and April 2012, over the course of a few weeks, approximately 8,000 buildings and critical infrastructure and 2,700 neighborhood boundaries were mapped. The relatively modest sum of US\$20,000 supported the logistics of the

mapping exercise; however, it should be acknowledged that all partners—local government and international organizations—made investment of staff time. Importantly, local government officials remained connected to the process, and for the first time, made corrections to the maps and signed off on an authorized version of the neighborhood-level administrative boundaries of Jakarta. The success of this program attracted the attention

OPEN DATA FOR RESILIENCE INITIATIVE OVERVIEW



INDONESIA InaSafe informs disaster risk reduction decision by providing a simple scenario impact analysis, such as the displaying the number of buildings affected by a tsunami.

of the national Geospatial Information Agency (BIG), who initiated a dialogue around using this approach to mapping to create authoritative data. Eventually, this led to the creation of a formal program, the *Participatory One Map Initiative* (POMI) that ensures such work meets national standards.

Rich Data, Rich Models

Over the past two years, OpenStreetMap activities in Indonesia have mapped nearly one million buildings that for some areas include a collection of

exposure attributes such as age, structure type, number of stories, and construction materials. To take advantage of this rich exposure data and scenario hazard maps, the InaSafe tool has been designed to support BNPB's contingency planning activities at all levels of government, including supporting officials who do not necessarily have the technical expertise to perform traditional risk impact assessments.

Next Steps

The World Bank EAP, OpenDRI, and AusAID continue to partner

with BNPB to expand the capabilities of provincial and municipal governments to access and apply risk information for disaster risk reduction activities. Most local government counterparts have limited in-house GIS capabilities and have rarely engaged in evidence-based contingency planning. The next frontier of OpenDRI is bringing this quantitative thinking to strategic thinking at the local level, so that accumulated wisdom of cities can fuse with the expanded context of this emerging open data ecosystem.



InaSafe Awarded Top 10 Open Source Project

Wired Magazine featured InaSafe as one of the 10 winners of Black Duck's™ Open Source Project Awards for 2012, selecting it for special recognition among thousands of other notable open source projects. It was one of the only projects selected that is being developed outside Silicon Valley, establishing InaSafe project partners as key leaders in open source software development. This software was also given special attention by Indonesian President Susilo Bambang Yudhoyono during the *Fifth Asian Ministerial Conference on Disaster Risk Reduction*, on October 24, 2012.

INDONESIA Indonesian President Susilo Bambang Yudhoyono endorsing InaSafe. Courtesy of Clare Price AusAID.

InaSafe Code Sprint in Pavia

In November 2012, the OpenDRI team partnered with World Bank DRM professionals and programmers from six other international institutions at the first InaSafe code sprint hosted by the Global Earthquake Model (GEM) in Pavia, Italy. The week-long sprint assembled a wide range of technical experts to demonstrate the adaptability and scalability of the technology and to recruit new partner organizations in the InaSafe software development process. Four new features emerged from the collaborations:



ITALY InaSafe software demonstration in Pavia.

- **Flood Impact Analysis:** a new method to generate map layers that depict probable flood extents and intensity given bounded region and time span parameters.
- **Earthquake Fatality Impact Prediction:** new methods to rapidly assess earthquake impact for any country in the world, by adding PAGER Fatality Impact Model.
- **Risk Visualizations:** improvements to maps so they can depict and communicate risk information better.
- **Rapid Response Analysis:** scoped future approach to develop a rapid mapping and visualization tool for use during the initial stages of a disaster response operation.



YEMEN Sanaa. Traditional Yemen houses. ©Thinkstock.com.

Middle East and North Africa (MENA)

Yemen

The Global Facility for Disaster Reduction and Recovery is assisting the Arab Academy build greater technical capacity, comparable to that of the Regional Center for Disaster Reduction (RCDRR), so it can operate in the region as an OpenDRI partner. The RCDRR, with assistance from the World Bank, had launched a three pillar program to support the Islamic States, especially the MENA countries in building disaster risk management capacity.

RCDRR's Risk Knowledge Program focuses on providing tools and the training required to build an understanding of natural hazards and risks through risk assessments and open risk data. The RCDRR team launched a data-sharing platform to host the results from Yemen's multi-hazard risk assessment completed in 2011. The next step is to transfer the platform to the Yemen Geological Survey and provide the necessary trainings for platform use and maintenance.

<http://yemen.rcdrdri.org>





KYRGYZ REPUBLIC Bishkek. ©Thinkstock.com.

Europe and Central Asia

Kyrgyz Republic

The geography and topography of the Kyrgyz Republic makes it highly prone to natural hazards. These include hydro meteorological, geological, geophysical, and biological hazards. Natural hazards include earthquakes, land and mudslides, avalanches, windstorms, droughts, breakthrough of glacial lakes, floods, rise of sub-soil waters, and river erosion. The country is classified as the most seismically dangerous territory in Central Asia and 3,000 to 5,000 earthquakes are registered annually. Devastating seismic catastrophes occur every 5-10 years. On average, natural disasters cause approximately US\$30- 35 million of damage and losses annually.

The Government of the Kyrgyz Republic is concerned that the risks and consequences associated with various

natural disasters will inflict great damage to the national economy and the population. Key stakeholders like the Ministry of Emergency Situation (MoES), have identified the critical need to improve the mechanism for collection, management, and dissemination of disaster risk data in Kyrgyzstan so it has the opportunity to be shared more broadly and effectively on behalf of disaster risk reduction practices. In partnership with World Bank, the Ministry of Emergency Situations (MoES) has decided to launch the Kyrgyzstan Disaster Risk Data Platform to fulfill this requirement. OpenDRI will support the platform in close communication with MoES. The Kyrgyz Disaster Risk Data Platform is capitalizing on the lessons learned from other Open DRI experiences in country projects with similar characteristics.



Latin America and the Caribbean (LCR)

Bolivia

For several decades, Bolivia has been victim to disasters caused by nature and man’s intervention. To alleviate this national challenge, the Bolivian Ministry of Defense, through its Vice Ministry of Civil Defense (VIDECI), is leading the National Strategic Agenda for Disaster Risk Management, whose fundamental pillar is the promotion of a culture of prevention through educational and capacity building strategies on risk assessment and reduction. Membership to this comprehensive national strategy includes Bolivian federal and local authorities, research institutes and universities, international organizations, NGO’s, civil society and the private sector.

As part of this national DRM strategy, The World Bank and VIDECEI are collaborating on the development of SINAGER, an integrated system for disaster risk management. The platform has a geospatial component called GeoSINAGER, a GeoNode-based open source software. The project involves building capacity at the agency level and installing GeoNodes in various Bolivian ministries and institutions to promote local ownership and data exchange. Five of these GeoNodes have already been installed and are operational in the Ministries of Health, Civil Defense, Geology and Mining and in the Geography Military Institute.

GeoSINAGER is also working closely with GeoBOLIVIA, the country’s Spatial Data Infrastructure (SDI) program, to ensure bi-directional data flow between systems. There is an interesting synergy between these two platforms due to the utilization of Open Geospatial Consortium standards and architectures, based on

Europe’s INSPIRE directive. The Andean committee for disaster awareness and prevention, *Comité Andino para la Prevención y Atención de Desastres (CAPRADE)*, is looking to the Bolivian experience to decide how to organize its own risk data; the Bolivian SDI will be instrumental in their process.

In November 2012, VIDECEI and the United Nation’s Development Programme (UNDP-Bolivia) in La Paz hosted their first national Disaster Risk Information Collection and Integration Capacity Building Workshop, an advanced GeoNode training workshop and technical dialogue for the usage and construction of GeoSINAGER. OpenDRI led the hands-on workshop tailored for government agencies, scientific institutions and technical experts.

VIDECI’s growth plan is to implement GeoNodes across all decentralized governmental agencies so everyone can visualize risk information. Aside from the current six GeoNode installations that currently exist in different government agencies, 20 more are planned to be installed in 2013, and eventually throughout nine of their largest ministries. Beyond implementing at the federal level, they are also planning municipal-level implementations; La Paz itself has 337 municipalities. Their vision is to extend to at least 18 municipalities in the next two to three years. Lastly, they appreciate the need to promote this work at all levels in order to foster national enthusiasm and engagement, so plans for community engagement are also underway. <http://geosinager.defensacivil.gob.bo/>





COLOMBIA Bogotá. ©Thinkstock.com

Colombia

Colombia's population resides mainly in two areas: the elevated Andes, where water shortages and land degradation already pose a threat, and in the coastal and insular areas where the expected increase in sea level and floods will affect human settlements and economic activities. In addition, the country presents a high incidence of extreme weather events and associated disasters which can be linked to improper land use and watershed management planning, and are exacerbated by climate variability. The most common causes of disaster events include: floods (40%), landslides (26%), earthquakes (15%), volcanic eruptions (7%) and others (9%).

In response to nationwide flooding from 2010-2011, self-organized Colombian civil society shared datasets among volunteers via social media and online communication platforms and supported a mapping effort during the crisis by identifying the most affected places and the flood extent.

In parallel to World Bank supporting the Colombian government through a comprehensive Analysis of Disaster Risk Management in Colombia in 2012, the OpenDRI team engaged directly with civil society and other international organizations to better understand their challenges and their potential to improve resilience to disasters.

This initiative is aligned with Colombia's recently ratified Disaster Risk Management Law of April 2012, which ascertains that the country's citizens share responsibility in promoting effective risk management. In practice, however, there is a lack of data access which could be used by civil society to strengthen public action in this area.

In June 2011, a GeoNode deployment for flood response was launched for the volunteer community in partnership with the OpenStreetMap Colombia project and the United Nation's Office for the Coordination of Humanitarian Affairs (OCHA). The platform is being used to digitize imagery and identify

buildings and other assets in flood affected areas. In addition, it also facilitates ground truthing to improve the accuracy of the flood extent maps by permitting the comparison of information gathered by volunteers with GPS devices against flood maps produced by the Disaster Charter.

Furthermore, the platform is also proving invaluable to other important spatial data collection and use related efforts. For example, OCHA sponsors a vibrant multi-institutional community of practice, the *Sala de Situación Humanitaria* (SIDIH 2.0), which discusses top humanitarian

issues in Colombia and utilizes the GeoNode as a fundamental data-sharing and collaborative platform. The platform is being actively used to collect and host common operational datasets for preparedness and other activities like GPS track uploads for tracing primary and secondary roads.

LAC OpenDRI At-A-Glance

LAC Countries	OpenDRI Program Highlights (activities and outreach)	Geospatial System(s) and mapping software
Bolivia	<ul style="list-style-type: none"> VIDECI is leading the national strategic agenda for Disaster Risk Assessment and Reduction to promote educational and capacity building strategies on risk reduction. 	<ul style="list-style-type: none"> In November 2012, OpenDRI imparted advanced training to 40 geospatial Admins for the usage and construction of their GeoSINAGER platform. Plans to expand into more platforms throughout federal and local governments. http://geosinager.defensacivil.gob.bo/
Colombia	<ul style="list-style-type: none"> OpenDRI has started working with international orgs and civil society in support of Colombia's national mapping agency, a promising opportunity to deepen information flow and sharing. 	<ul style="list-style-type: none"> Colombia's geospatial platform launched in June 2011. The system is used for tracing imagery to identify constructions in flood prone areas, and to serve as a base for inundation layers. http://geonode.openstreetmap.com http://inundaciones.colombiassh.org

The Caribbean Region

The Caribbean region, defined by Haiti, Belize, Guyana and the Eastern Caribbean States (Dominica, Grenada, Saint Kitts, Saint Lucia, Saint Vincent & Grenadines), is rapidly embracing the pursuit of OpenDRI principles and technologies. These small countries are equally committed to the development, implementation and maintenance of open source

geospatial information platforms to enable local and regional collaboration, data sharing to support evidence-based disaster risk decision-making.

Apart from Haiti, eight of the Caribbean countries have either deployed or updated data sharing platforms during the last quarter of 2012: Saint Lucia, Saint Vincent and the Grenadines, Grenada, Dominica, and Trinidad & Tobago and Jamaica,

both under the auspices of the University of West Indies (UWI). Saint Kitts and Nevis is currently testing and preparing for GeoNode implementation at the end of 2013; Guyana has deployed a pilot GeoNode with the help of the World Bank.

In October 2011, the Eastern Caribbean region came together in a two-day data management workshop to discuss the importance

of data using the GeoNode site. Each country shared the status of their respective spatial data infrastructures and lessons learned. A follow-up workshop took place in February 2012 where participants discussed the importance of spatial data inputs for disaster hazard and risk models for the Caribbean region and additional training on GeoNode software.

Most recently, an advanced Spatial Data Management Training took place in February 2013 at the UWI in Trinidad and Tobago. The one-week training provided an in-depth understanding of spatial data management and fostered knowledge and technical

skills to effectively use national and regional data management practices. The trainees also participated in International Open Data Day. This is the first time that OpenDRI counterparts in the Caribbean region participated in this global event, and was timely due to national and regional advancements in geospatial data management using open-source software tools and platforms such as GeoNode, OSM and InaSafe. This will help support users of the GeoNode platform to manage, share, and increase the use of geospatial data to improve decision-making processes for disaster risk reduction measures

in their respective countries and agencies. The training sponsors were the University of West Indies (UWI) - Trinidad and Tobago, the GFDRR and the World Bank's Latin America and Caribbean region Disaster Risk Management and Urban Development (LCSDU) Unit.

Haiti

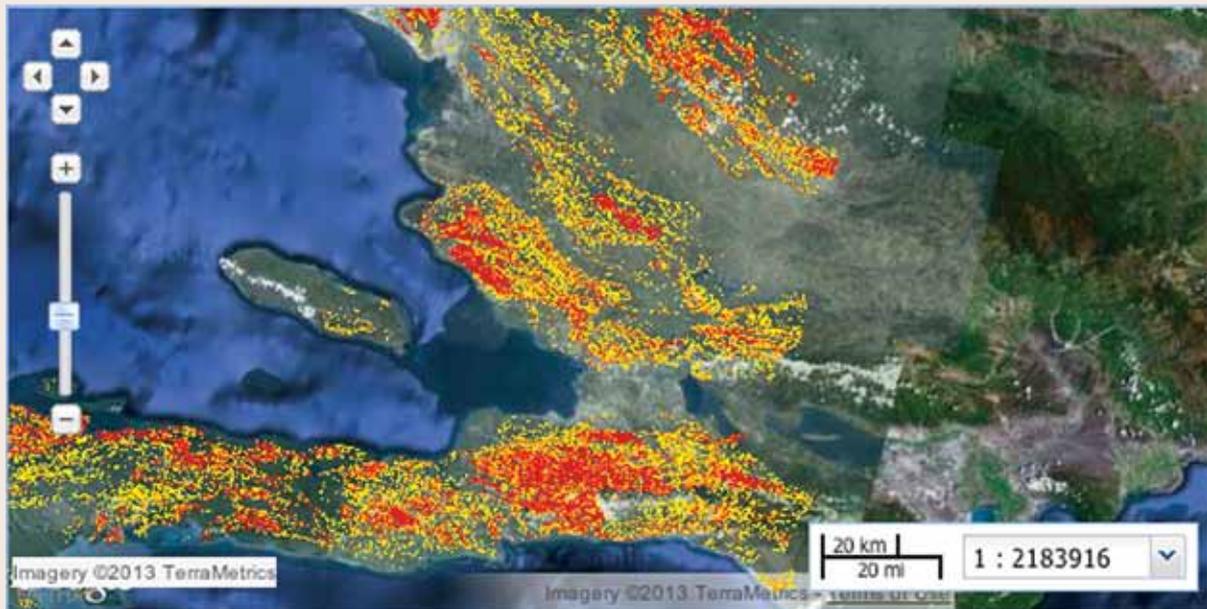
Haiti's development challenges are compounded by repeated and devastating impacts of natural disasters. Hurricanes and tropical storms routinely strike Haiti, causing massive flooding and deadly landslides. In January 2010, an unprecedented earthquake of



TRINIDAD AND TOBAGO Classroom at the Advanced Training on Spatial Data Management at UWI. Courtesy of Bradley Lyon, World Bank.

GeoNode

www.geonode.org



GeoNode is a web-based open source platform that facilitates the creation, sharing, management, publication and collaborative use of geospatial data. It brings together mature and stable open-source software projects under a consistent and easy-to-use interface allowing users, with little training, to quickly and easily share data and create interactive maps. It is used in many OpenDRI projects to help governments share spatial data related to hazard, exposure, and risk. Some of the functionalities of GeoNode include: A built-in map composer and viewer; analysis and reporting tools, geospatial data storage and data mixing and maps creation with popular base layers.

magnitude 7.0 decimated Port-au-Prince, affecting 3.5 million and leaving more than 200,000 dead. Furthermore, growth pressure has led to extreme environmental degradation, with an estimated 98% of forests cleared for charcoal production. These destabilizing forces, as well as settlement in zones with high levels of natural hazard and poor construction practices, have left most Haitians extremely vulnerable to natural disasters.

In 2010 and 2011, as part of

the Multi-hazard Assessment project (NATHAT), the World Bank supported a number of studies describing hazard, exposure, and risk information in Haiti. OpenDRI, the Humanitarian OpenStreetMap Team and OpenGeo partnered with the World Bank's LAC DRM team to help solve the problem around access to geospatial data for disaster management. HaitiData.org was launched in June 2011. The platform contains one of the most comprehensive hazard and risk

data containing almost 100 spatial data layers. The Humanitarian OpenStreetMap Team and other groups on the ground accessed flood prone area information and digital elevation models during Hurricane Isaac in 2012 (Dubovsky, September 12, 2012).

Haiti's GeoNode site, Haitidata.org, facilitates access to important disaster planning data to emergency response teams and other key institutions and international agencies. For instance, UNOCHA

and the Humanitarian OpenStreetMap Team can now access flood information and other critical geospatial data, and the Haitian government can provide their practitioners and decision-makers access to reliable information to understand the potential impacts of both impending and potential disasters. More reliable emergency preparedness and

response operations plans are now being developed based on accurate data.

The platform is currently being transferred to the national mapping agency, Centre National de L'Information Géo-Spatiale (CNIGS) - Haiti. A re-launch is being planned for June 2013 with updated data from NATHAT and newly assessed technical needs able to support the necessary

users and other ongoing DRM activities in the country. Other partners interested in data-sharing have been identified to join the project. OpenDRI will be collaborating with the *Ayiti Living Labs* to foster the local open data community and to ensure the data contained in the platform reaches Haitian universities and software developers to benefit their own initiatives. www.haitidata.org

Advanced Training on Spatial Data Management



TRINIDAD AND TOBAGO University of the West Indies. Caribbean participants at the Advanced Training on Spatial Data Management. Courtesy of Bradley Lyon, World Bank.

In 2013, the Eastern Caribbean countries hosted an Advanced GeoNode Training designed to meet the capacity needs for two main user groups: the spatial data managers and information technology specialist/software developers, in order to improve implementation and use of the tool in the region. The advanced training focused on advanced theory and practice of the platform to enhance GIS data use. The training is structured on ten technical components of spatial data management including Common GIS analysis and practices, advanced GeoNode configuration and use, GeoNode integration into other existing workflow, OpenStreetMap and advanced cartography among other topics.

Trainees, upon returning to their respective countries are expected to implement and improve upon spatial data management practices, implement GeoNode customizations and effectively help maximize national and regional spatial data sharing and management. Furthermore, trainees will be able to develop a geospatial platform rollout and community-mapping strategy and cascade train other data management GIS users and spatial data managers.

Caribbean Region OpenDRI At-A-Glance

Belize	<ul style="list-style-type: none"> As part of Belize's commitment to implement their national spatial data infrastructure, the World Bank is providing technical support to its GeoNode installation, spatial data management related activities, and data/metadata quality assurance and control. The World Bank conducted training on spatial data management for 25 participants in January 28 - February 1, 2013. Belize has deployed an open data platform and is currently uploading data in anticipation of a public launch in the near future.
Dominica	<ul style="list-style-type: none"> Dominica recently created a comprehensive spatial data inventory which identified several data and resource gaps. A pilot community-mapping-process with students from Dominica State College mapped all schools on the island in October 2012. A GeoNode deployment for sharing existing data launched in November 2012. A full OpenDRI platform implementation has been planned for 2013.
Grenada	<ul style="list-style-type: none"> Grenada's GeoNode instance was deployed in mid-2011 with plans to migrate to an Internet version. Grenada also hosted the first Data Management workshop and plans to conduct an OpenStreetMap exposure collection pilot project by the end of 2013.
Guyana	<ul style="list-style-type: none"> Guyana is in its early stages of creating its National Spatial Data Infrastructure (NSDI). A draft NSDI policy has been developed. This, along with the NSDI implementation and GeoNode deployment, are being discussed with the World Bank. A few NSDI members have started test-driving GeoNode with local datasets.
Haiti	<ul style="list-style-type: none"> In 2010 and 2011, the World Bank supported studies describing hazard, exposure, and risk information in Haiti. OpenDRI, in partnership with others, helped solve the problem around geospatial distribution for disaster management. The partnership resulted in the launch of Haiti's geospatial platform in June 2011. It facilitates access to important disaster planning data to emergency response teams and has served for data-sharing purposes in natural disasters since. A re-launch of the geospatial platform is planned for June 2013 to support the necessary users and other ongoing DRM activities in the country; other partners are currently being identified. www.haitidata.org
Saint Kitts and Nevis	<ul style="list-style-type: none"> The current GeoNode instance in Saint Kitts and Nevis is undergoing testing phase in 2013. A full deployment is expected in close proximity to the release of GeoNode's next version release in summer 2013.
Saint Lucia	<ul style="list-style-type: none"> In February 2012, Saint Lucia launched the Saint Lucia Integrated National GeoNode (SLING). The country is in the process of updating its overall approach to GIS data collection and usage. GeoNode will also be used for their new Land Use Management digital information system. http://sling.gosl.gov.lc
Saint Vincent and the Grenadines	<ul style="list-style-type: none"> Saint Vincent and the Grenadines has the great advantage that it is already a heavy user of open-source software tools; hence, their understanding of the benefits of open data in the geospatial context is significant. The platform is primarily being used by the Ministry of Physical Planning and other government agencies. http://geonode.gov.vc

OpenDRI Team



Abigail Baca

Abigail is part of the East Asia Pacific Disaster Risk Management team. She specializes in the application of probabilistic risk modeling techniques in disaster risk management. Since joining the World Bank-GFDRR in 2010, she has supported multiple projects including the Pacific Catastrophe Risk Assessment and Financing Initiative, Building Urban Resilience in East Asia, and OpenDRI including the InaSAFE partnership with the Australia-Indonesia Facility for Disaster Reduction (AIFDR). She earned a B.S. in Civil and Environmental Engineering from Stanford University and a M.S. in Structural Engineering from University of California, San Diego.

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Ariel M. Nuñez

Ariel is responsible for the development of open source software tools to help with data management and decision making for disaster risk reduction. He is a core developer of GeoNode and Risk in a Box. His work includes providing technical assistance and advanced training to client countries on implementing GeoNode, InaSAFE and other geospatial related tools and plugins for building resilience. A native from Colombia, he holds an Electronic Engineering degree from the Universidad del Norte in Barranquilla, Colombia.

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Bishwa Pandey

Bishwa leads OpenDRI and spatial data management activities in the Latin America and the Caribbean region. His current responsibilities include promoting OpenDRI framework, assisting to establish national spatial data infrastructure (NSDI), analyzing and managing disaster risk assessment and decision analytics based on disaster risk analysis. Bishwa has managed more than 100 GIS implementation projects in the US and South America.

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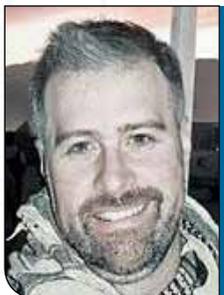
OpenDRI Team



Emma Phillips

Emma works in the Africa Disaster Risk Management (DRM) team and is the focal point for the OpenDRI initiative in the region. She has experience in partnership building, communications, and organizing global networking conferences. She manages the Understanding Risk (UR) Community of Practice, an online community of 2,700 DRM practitioners from more than 130 countries and has organized UR Forums in Washington D.C. and Cape Town. She has a Master's degree in International Relations and Economics from the Johns Hopkins School of Advanced International Studies (SAIS) and is a South African national.

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John Crowley

John joins OpenDRI on an engagement to strengthen the community-building aspect of the work. He is a researcher at the Harvard Humanitarian Initiative who focuses on information sharing and open technology. He curates the Humanitarian Experiments at Camp Roberts, a technology accelerator that enables crisis responders to co-design solutions to shared problems and integrate grassroots voices into decision making. John holds an MPA from Harvard's Kennedy School of Government, where he was the Robert C. Seamans, Jr. Fellow in Science, Technology, and Public Policy. He also holds degrees in the history of ideas and cello performance from Boston University.

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Liana Razafindrazay

Liana works in the East Asia and Pacific DRM team and specializes in open data and Geographic Information Systems in disaster risk management. Prior to joining the Bank, she was a senior staff associate at Center for International Earth Science Information Network (CIESIN) at Columbia University as part of a multidisciplinary science and geospatial specialist team. Prior, Liana supported UNOCHA at the Relief Web Map Center Unit. A native of Madagascar, she holds two Master degrees in Geography and Sustainable Development from Pantheon-Sorbonne University and CERDI Clermont-Ferrand, France.

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OpenDRI Team



Maria L. Madrid

Maria is part of GFDRR and partners with regional teams to develop and disseminate cross-country and cross-sector engagement models in projected implementations, customized knowledge and communications product solutions across OpenDRI's broad divide. A native Honduran, She holds a M.S. degree in Knowledge Management (KM) and Organization Development from George Mason University, an Honor's Diploma in Globalization and Social Policy from Oxford University, England, along with a KM Certification from the International KM Institute. She received specialized training from MIT's Sloan School of Management in business administration, strategy and marketing, and obtained a B.S. Industrial and Systems Engineering, Aerospace Engineering minor from Auburn University, Alabama.

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Robert Soden

Mr. Soden leads the Open Data for Resilience Initiative (OpenDRI) at the Global Facility for Disaster Reduction and Recovery and provides direct support to OpenDRI projects in South Asia, Latin America, and the East Asia-Pacific regions. Prior to joining GFDRR, Robert held research, GIS, and software development positions at Development Seed, the Humanitarian OpenStreetMap Team, and the World Resources Institute. Robert holds a Master's degree in Natural Resources and Sustainable Development from American University.

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Vivien Deparday

Mr. Deparday provides technical and strategic assistance for the implementation and use of the OpenDRI tools. His work includes support and training for the deployment of GeoNode and InaSafe programs in SAR, EAP and LAC regions and the development of community mapping strategies with OpenStreetMap, particularly in Sri Lanka. He also contributes to the development of open source software tools for OpenDRI. A native from France, he holds an Engineering degree at the École Centrale de Lille, France, and a M.S. in Geomatics from the University of Waterloo, Canada.

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OpenDRI Partners

AIFDR – The Australia-Indonesia Facility for Disaster Reduction



The Australia-Indonesia Facility for Disaster Reduction (AIFDR)

is a joint initiative between the governments of Australia and Indonesia through the Indonesia’s Disaster Management Agency (BNPB) to strengthen Indonesia’s ability to reduce the impact of disasters. AIFDR works in close partnership with the Government of Indonesia’s science, technology and disaster management agencies to build national capacity for risk and vulnerability modeling, research and innovation. Since 2010, AIFDR has been a key partner of the World Bank and GFDRR in the development of the InaSafe program, including advocacy and capacity building to apply open source technology and open data to the challenges of disaster risk management. They have also demonstrated leadership in fostering the growth of the OpenStreetMap community in Indonesia.

SOPAC



The Secretariat of the Pacific Community through its Applied Geoscience and Technology

Division (SOPAC) supports Pacific Island Countries by providing technical assistance for a better disaster risk management. Through the OpenDRI partnership, SOPAC is exploring new ways of leveraging open source technology to manage and share risk data in the Pacific. In collaboration with the World Bank and the Asian Development Bank (ADB), SOPAC was a key partner in the implementation of the PCRAFI project including contributions to risk assessment, risk financing, and the customized deployment of a GeoNode. The **Pacific Risk Information System**, including the GeoNode, is the primary mechanism that enables the Pacific Community to access the extensive data and results of the PCRAFI project.

NASA SERVIR



NASA-SERVIR provides critical technical guidance and imagery to the OpenDRI projects related to drought resilience in the Sahel and Horn of Africa. GFDRR is also partnering with NASA-SERVIR hubs in East Africa and South Asia to provide technical support to OpenDRI country programs in the regions.

United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA)



UN-OCHA Increases

access to baseline spatial data in several countries. In Indonesia, OCHA has been a strong supporter of community mapping activities. OpenDRI is also working with the information management team in the OCHA Colombia country office to provide technical support to a web platform for sharing common operational datasets and serving aerial and satellite imagery used for supporting flood response. OCHA has also supported efforts to share datasets through its Geneva office to support drought response in the Horn and Sahel regions of Africa.

The Humanitarian OpenStreetMap Team (HOT)



The Humanitarian OpenStreetMap Team (HOT) supports

open and participatory mapping programs in disaster response and risk reduction activities. OpenDRI has worked with HOT in Haiti, Colombia, Indonesia and elsewhere to facilitate the use of community mapping within GFDRR disaster risk management activities.

The University of the West Indies (UWI)



The University of West Indies has been a critical partner in the launch of OpenDRI activities in the Eastern Caribbean. The Latin America & Caribbean Disaster Risk Management Team is working with UWI to support the development of a community of practice around open data for disaster risk and climate change, provide mapping and data management trainings to governments, and provide technical assistance to disaster risk management activities in the region.

OpenGeo



OpenGeo are the lead developers of the GeoNode software and have also made contributions to the InaSAFE framework. Their technical team has provided training and support to several OpenDRI activities in the LAC and EAP regions and has been a leading advocate for open data practices within the disaster risk and climate change contexts.

The World Food Programme (WFP)/ITHACA



World Food Programme/ ITHACA are important partners in the open data efforts related to drought response

in the Horn and Sahel regions of Africa. Members of the ITHACA team are core committers to the GeoNode software. ITHACA is also providing technical support to the Malawi OpenDRI efforts and participated in the InaSAFE code sprint in November 2012.

Global Earthquake Model (GEM)



GEM is a global collaborative effort with the aim to provide organizations and people with

tools and resources for transparent assessment of earthquake risk anywhere in the world. By pooling data, knowledge and people, GEM acts as an international forum for collaboration and exchange, and leverages the knowledge of leading experts for the benefit of society. GEM has partnered with OpenDRI through collaborative software development and sharing ideas and approaches for the collection of asset and exposure data. In November 2011, GEM hosted the InaSAFE Code Sprint in their offices in Pavia, Italy.

OpenDRI in the News
Videos



Open Data Video The World Bank, Robert Zoellick. OpenDRI builds upon the World Bank's broader Open Data Initiative. OpenDRI is currently implementing these ideas in 25 countries around the world to improve disaster and climate change resilience.

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSDNET/0,,contentMDK:23048822~menuPK:64885113~pagePK:7278667~piPK:64911824~theSitePK:5929282,00.html>

Building Climate Resilience: A Case for Caribbean Collaboration

The video gives an overview of regional collaboration in the Eastern Caribbean, which focuses on improving data sharing and management to inform decision-making processes that reduce disaster risk and build climate resilience.



<http://www.youtube.com/watch?v=uHXbOZk-RxA>

Abbreviations

ADPC	Asian Disaster Preparedness Center
AIFDR	Australia-Indonesia Facility for Disaster Recovery
AMCDRR	Asian Ministerial Conference on Disaster Risk Reduction
BIG	Geospatial Information Agency (Indonesia)(En)/Badan Informasi Geospasial
BMKG	Indonesian Meteorological, Climatological, and Geophysical Agency (BMKG)
BPNB	National Agency for Disaster Management (Indonesia)(En)/Badan Nasional Penanggulangan Bencana
CAPRADE	Comité Andino para la Prevención y Atención de Desastres
CNIGS	Centre de L'Information Géo-Spatiale - Haiti
DILG	Department of the Interior – Philippines
DKI BPBD	Province of Jakarta Disaster Management Agency
EEAIG	AusAID-EAP Infrastructure for Growth Trust Fund
EAP	East Asia and Pacific Region
EU	European Union
GA	Geospatial Australia
GEM	Global Earthquake Model
GeoBOLIVIA	Bolivia's Spatial Data Infrastructure
GeoSINAGER	A GeoNode component of SINAGER
GFDRR	Global Facility for Disaster Reduction and Recover
GIS	Geographic Information System
HOT	Humanitarian OpenStreetMap Team
ICIMOD	International Centre for Integrated Mountain Development
IGAC	Colombia's National Mapping Agency
KDC	Knowledge for Development Center
LGU	Local Government Unit
MASDAP	Malawi's GeoNode
MoHA	Ministry of Home Affairs (Nepal)

Moz-Adapt	Mozambique's GeoNode site
NASA	National Aeronautics and Space Administration
NATHAT	Haiti's Multi-Hazard Assessment Project
NOAH	National Operational Assessment of Hazards
NSET	National Society for Earthquake Technology
OpenDRI	Open Data for Resilience Initiative
OGP	Open Government Partnership
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PDNA	Post Disaster Needs Assessment
POMI	Participatory One Map Initiative – Indonesia
RCMRD	Regional Mapping Center for Mapping Resources
RHOK	Random Hacks of Kindness
SDI	Spatial Data Infrastructure
SINAGER	Bolivia's Integrated DRM Platform
UNDP-Bolivia	United Nations Development Programme – Bolivia
UNGDR	Unidad Nacional para la Gestión de Riesgo
UNHCR	United Nations Refugee Agency
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UPD-GE	University of Philippines Department of Geodetic Engineering
UR	Understanding Risk Forum
UsGeo	Open Source Geospatial Foundation
UWI	University of West Indies
VIDECI	Bolivia's Vice-Ministry of Civil Defense
WB	World Bank
WFP	World Food Programme

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OpenDRI has been highlighted in the recent publication: *Strong, Safe, and Resilient: A Strategic Policy Guide for Disaster Risk Management in East Asia and the Pacific*. Publication Date: March 7, 2013. ISBN-10: 0821398059, ISBN-13: 978-0821398050.

Online References and General Links

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OpenSource.com, Dubovsky, David;
Sep 12, 2012
<http://opensource.com/life/12/9/using-open-source-disaster-response-planning>

Using Open Source Geospatial for Disaster Response Planning [in Haiti]

HaitiData.org; Aug 28, 2012
<http://blog.opengeo.org/2012/08/28/open-source-geospatial-and-disaster-response-plans/>

Better Data Management for Improved Disaster Risk Management in the Caribbean, the World Bank, Nov 11, 2011

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSDNET/0,,contentMDK:23048822~menuPK:64885113~pagePK:7278667~piPK:64911824~theSitePK:5929282,00.html>

Mapping Technology Allows NGOs to Coordinate Disaster Relief in West Africa

<http://techpresident.com/news/wegov/22633/mapping-technology-allows-ngos-coordinate-disaster-relief-west-africa>

Programming Together in Pavia

<http://www.globalquakemodel.org/get-involved/follow/news/openquake/programming-together-pavia/>

How to Create Resilience through Big Data

<http://irevolution.net/2013/01/11/disaster-resilience-2-0/>

General Links

(In listed order)

Global Facility for Disaster Reduction and Recovery (GFDRR)

www.gfdr.org
www.facebook.com/pages/Global-Facility-for-Disaster-Reduction-and-Recovery-GFDRR
www.twitter.com/GFDRR

Open Data for Resilience Initiative

www.gfdr.org/opendri

Open Cities SAR Region

www.opencities.org

Random Hacks of Kindness (RHOK)

www.rhok.org

Nepal OpenStreetMap site

www.osmnepal.org

InaSAFE Code Sprint announcement

<https://www.gfdr.org/node/1454>

Indonesia's InaSAFE Web site

<http://inasafe.org/>

Secretariat of the Pacific Community SPC/SOPAC

<http://paris.sopac.org/>

The Humanitarian OpenStreetMap Team (HOT)

<http://en.openstreetmap.or.id/> and
<http://www.learnosm.org/>



TRINIDAD AND TOBAGO OpenDRI team member Vivien Deparday instructing students at the Advanced Training on Spatial Data Management. University of the West Indies, February, 2013.

Indonesia's Geospatial Information Agency (BIG)/Badan Informasi Geospasial
<http://www.bakosurtanal.go.id>

Indonesia's National Agency for Disaster Management (BNPB)/ Badan Nasional Penanggulangan Bencana
<http://www.bnpb.go.id/>

The Sahel's open source mapping platform
<http://sahelresponse.org/>

The Horn of Africa's open source mapping platform
<http://horn.rcmr.org>

Malawi's OpenDRI platform, the Shire River Basin Management Technical Team and the Department of Disaster Management Affairs' online platform
<http://www.masdap.mw>

Mozambique's GeoNode platform
<http://moz-adapt.org/>

Yemen's data-sharing platform
<http://yemen.rcdrri.org>

Bolivia's GeoNode platform
<http://geosinager.defensacivil.gob.bo/>
Colombia's GeoNode platform
<http://geonode.openstreetmap.com>

Flooding in Colombia
<http://inundaciones.colombiassh.org>

The United Nation's Office for the Coordination for Humanitarian Affairs (UNOCHA)
<http://www.unocha.org>

Haiti's GeoNode platform
<http://haitidata.org>

Saint Lucia's SLING platform
<http://sling.gosl.gov.lc/>

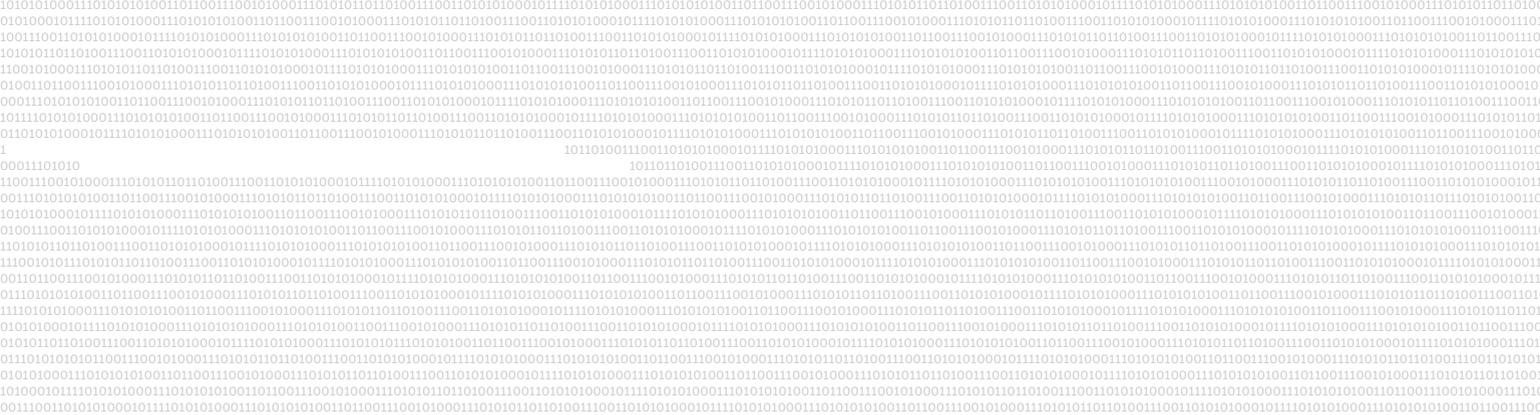
Saint Vincent and the Grenadines' platform
<http://geonode.gov.vc>

Additional Credits

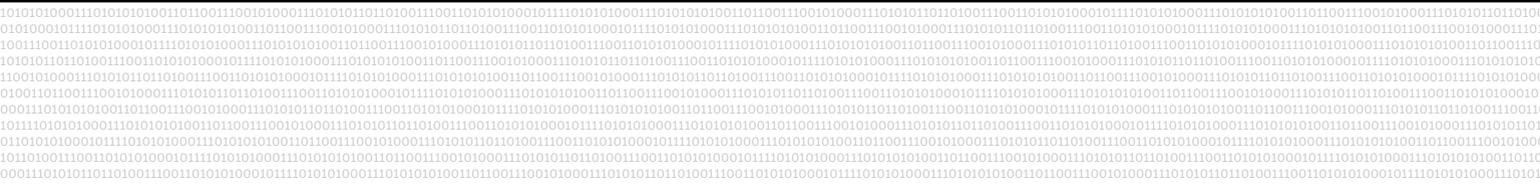
Photos, Images and Videos

The OpenDRI Team profusely thanks all who contributed with photos, images, and videos. Their contributions helped make the narrative come alive.

- Page 10 Community mapping at the village level. Photo taken by World Bank’s DRM Unit Production House, Jakarta, Indonesia. October 23, 2011. Location: (Village) Glagaharjo, (Sub-district) Cangkringan, (District) Sleman, (Province) Yogyakarta. Courtesy of Ruby Mangunsong, World Bank.
- Page 14 Jakarta, Indonesia. Participatory Mapping for flood preparedness led by local government officials. Courtesy of Abigail Baca, World Bank.
- Page 17 Jakarta, Indonesia. Community sharing mapping knowledge. Courtesy of Abigail Baca, World Bank.
- Pages 24-27 Nepal Case Study: photo collection assembled by John Crowley, World Bank.
- Page 28 Indonesia Community Mapping. Photo taken by Suryani Amin during the Mapping DALA Workshop, March 2013. Courtesy of Ruby Mangunsong, World Bank.
- Pages 28-33 Indonesia Case Study. Photo collection assembled by John Crowley and Abigail Baca, World Bank.
- Page 31 Jakarta, Indonesia. Officials from Jakarta’s wards with Indonesian Mappers. Courtesy of Abigail Baca, World Bank.
- Page 33 InaSafe Code Sprint in Pavia, Italy. Courtesy of James Brown, Global Earthquake Model (GEM).
- Page 47 Open Data Video. Courtesy of Robert Soden; Building Climate Resilience—A Case for Caribbean Collaboration Video: Courtesy of Bradley Lyon, World Bank.
- Page 51 Trinidad and Tobago. Advanced Training on Spatial Data Management. University of West Indies- Trinidad and Tobago, February 2013. Courtesy of Bradley Lyon, World Bank.



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