

# **Disaster Management Systems: Building Capacity for Developing Countries and the Most Vulnerable Among Us**

**Connie White**  
**University of Southern Mississippi, USA**  
**connie.m.white@gmail.com**

*If capacity is the means to plan and achieve,  
then capacity development describes the way to those means.*  
UNDP

## **ABSTRACT**

Some societies are more disaster prone than others due to their geographic location and the benefits provided by it. Man has co-existed in this sort of high risk/high return relationship with mother nature throughout history. Poorer societies tend to pay a higher price both in lives taken and damage – left with many secondary and equally devastating disasters that are sure to come. We know that for every \$1 USD put into preventative measures, we save ~\$7 that would have gone into post-disaster recovery and rebuilding efforts. There are many international agencies working to support a variety of needs in these grief stricken areas to help them build capacity and to help these societies better prepare for and respond to the disasters they will face. These efforts are guided by the Millennium Project Goals outlined in 2000. A lot has changed since then with respect to technology, mobile devices and humanitarianism. The objective of this paper is exploit how current efforts are creating capacity on the individual, organizational and 'enabling environment' levels. This paper explores the notion that a more concerted effort can be made at building Information and Communication Disaster Management Capacity in developing countries who are most susceptible due to proximity and to a lack of funds. A 'proof of concept' is provided.

**Keywords: Millennium Development Goals, capacity, hFOSS, Sahana, DRR, HFA**

## **1.0 INTRODUCTION**

In 2000, world leaders gathered at the United Nations headquarters with the shared goal to eradicate extreme poverty around the world, and hence, the United Nations Millennium Declaration (UNMD) was drafted and unanimously embraced (United Nations). The UNMD consists of a framework which identified 8 overall goals referred to as the Millennium Development Goals (MDG). Each one of the goals has targets with technical indicators described in order to help measure progress over time (United Nations).

Goal 8 in the MDG is to 'Develop a Global Partnership for Development.' The emphasis of this paper will merge two target areas described under this goal by addressing the needs of the 'Least Developed Countries' [Target #13] while increasing the use of information and communication technologies [Target #18].

Society has a long history of living in vulnerable areas due to the corresponding benefits – volcanoes have fertile fields below, seismic events and tsunamis can occur in water front areas rich with fish and vegetation. Whether a society decides to reside permanently next to a threat can be as simple as weighing out the number of times the threat occurs, how bad the consequences are and if the population can adapt to living in the environment. While some groups can move to safer areas if they want to, others may not be so fortunate to have that luxury. The land can be too small or environmental changes from global warming can change the environment without providing any viable alternatives and worse, global warming is increasing the frequency of natural and man-made disasters in these vulnerable areas – with their vulnerable populations endangering isolated populations increasing at risk (Allen, 2006; Schipper and Pelling, 2006).

While some societies may be disaster prone due to geographic proximity, others may suffer due to harsh economic realities. The most vulnerable are those who suffer from both. Although the ramifications are difficult on those who endure such extreme and reoccurring events, there is an additional and expensive economic toll with a ripple effect across both neighboring countries and international organizations who aid in global response/recovery efforts and the countries who support them. As Benjamin Franklin said, “An ounce of prevention is worth a pound of cure,” Why not commit to putting more effort into building capacity before a disaster strikes and on an ongoing basis, versus putting such an enormous amount of effort and expense at response/recovery/rebuilding efforts (Drager and Robertson, 2014). This is a well supported notion and is being implemented by many and on many levels (UN's Office for Disaster Risk Reduction, <http://www.unisdr.org/>).

One additional area of particular interest was mentioned in Drager and Robertson's paper in stating that more focus was needed “Exploit(ing) technologies that support collaboration, such as the Disaster Management Information System (DMIS) (Sahana, 2013) software that has been deployed in response to disasters around the world...” (Drager and Robertson, 2014). That is one of the objectives of this paper as mentioned earlier supporting the Target #18 (increasing use of information and communication technologies), but in particular, will focus on humanitarian efforts supporting Target #13 (Least Developed Countries). Groups presently working on all levels of capacity building in the information and communication technology for disaster management support will be used demonstrating what can be done for capacity building in the effort to further support MDG #8 to *Develop a Global Partnership for Development* supporting emergency management information and communication needs.

Managing disasters relies on communications and information be it before, during or after an event has occurred. While most of the time, communications are the first thing lost after a disaster, technologies to manage information can be put in place beforehand and managed locally offline and online by others throughout the world. And while the Internet will not be accessible for those in the impact zone, there is a global response team who are located throughout the world providing a community who can collaborate 24 hours per day, 7 days a week in order to support disastrous or catastrophic events. Many humanitarian groups exist within this technological framework providing low cost solutions for many information needs that arise commonly post disaster (de Silva, 2010).

Disasters tear at our souls and being able to offer compassion in any form is fulfilling, even if it's on the end of a computer. Google People Finder is a present solution that offers solace to those who have lost

family members and has become commonplace since the Haitian Earthquake. It's these sorts of cost effective solutions that can be implemented and maintained on the local level, creating new and building upon existing 'Information and Communication Disaster Management Capacity' (ICDMC).

The United Nations Development Program (UNDP) “understands capacity development as a locally-driven, society-wide transformation, and recognizes that capable individuals, organizations and societies play an indispensable role in the successful reduction and management of disaster risks” (UNDP). This paper will demonstrate how Information and Communication Disaster Management Capacity (ICDMC) building techniques exists and aligns with existing MDG, UNDP, Hyogo Framework for Action (HFA), and other international frameworks.

An objective of this paper is to showcase how various humanitarian information and communication technology products and groups of individuals, organizations, virtual communities and societies can help build upon existing solutions and identify and develop cohesive framework in order to build ICDMC. This will be attempted by exploiting and bringing together many existing real world efforts in hopes that they will trigger the develop a framework that can help others achieve the ICDMC desired. One real world group in particular, the Sahana Software Foundation (<http://sahanafoundation.org/>), will be used throughout the paper, as an example of how a group is both influenced by the 'enabling environment' and how it directly effects it on the organizational level, down to methods used to build individual capacity.

The remainder of this paper is as follows: first, a background section will be provided briefly covering present international efforts. Capacity will be defined and numerous efforts will be covered briefing details of each and ongoing efforts. Next, building ICDMC will be described. Numerous real world examples will be provided and aligned with ongoing international efforts supporting the formal concepts, frameworks and actions for measurement. By bringing together many ongoing real-world efforts, a 'proof of concept' will be provided fitting capacity building on all three levels: individual, organizational and 'enabling environment.' Finally, the paper closes with a discussion addressing problem issues along with the numerous points of light. It is hoped that this will stimulate discussion and further development of a dynamic framework that can be implemented to help those most vulnerable create and build ICDMC.

## **2.0 BACKGROUND**

Many of the ongoing efforts directly related to the work of this paper are seeded from the Millennium Development Project (MDP) and are initiatives from this endeavor. Disaster Risk Reduction (DRR), the United Nation Development Program (UNDP), and Hyogo Framework for Action (HFA) are directly related or are a result of the MDP so this Background section will brief the core foundations that this work aims to support and help accomplish.

## 2.1 Ongoing Efforts

### 2.1.1 Year 2000: Millennium Development Project

The Millennium Project began in the year 2000, with goals to have been reached by 2015, a 6 month's deadline from the time of this writing.

The United Nations Millennium Project consists of 8 goals (<http://www.un.org/millenniumgoals/>):

1. Eradicate Extreme Hunger and Poverty
2. Achieve Universal Primary Education
3. Promote Gender Equality and Empower Women
4. Reduce Child Mortality
5. Improve Maternal Health
6. Combat HIV/AIDS, Malaria and other diseases
7. Ensure Environmental Sustainability
8. Develop a Global Partnership for Development

The focus of this paper supports Goal #8. In particular,

- Target 13: Address the special needs of the Least Developed Countries (includes tariff and quota-free access for Least Developed Countries, exports, enhanced program of debt relief for heavily indebted poor countries [HIPC] and cancellation of official bilateral debt, and more generous official development assistance for countries committed to poverty reduction)
- Target 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communication technologies. (<http://www.unmillenniumproject.org/goals/gti.htm#goal8>)

Other goals are also supported as a result of the efforts described in this paper like 'Empowering Women' and 'Ensuring Environmental Sustainability, but more as an additional benefit.

In 2005, The UN General Assembly High-Level Meeting took place to review progress. “The meeting identified that public sector capacity is lagging behind all of other MDG indicators, underscoring the fact that *capacity development* is one of the key challenges facing low-income countries and their external partners” (Bureau for Crisis Prevention and Recovery).

### 2.1.2 Year 2005: Hyogo Framework for Action (HFA)

During the World Conference for Disaster Reduction, 168 countries drafted and embraced the Hyogo Framework for Action (HFA). This is a time based framework lasting 10 years, with the end date the same as the MDP. The HFA shows how there is a direct relationship between the goals of the MDP and disaster preparedness.

“The HFA aims to mobilize stakeholders at all levels to pay increasing attention to DRR as part of their wider development agendas, and crucially, recognizes the cross-cutting and central role of *capacity development* in that task” (CaDRi). The five HFA Priorities are as follows:

- HFA Priority 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
- HFA Priority 2: Identify assess, and monitor disaster risks and enhance early warning.
- HFA Priority 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
- HFA Priority 4: Reduce the underlying risk factors
- HFA Priority 5: Strengthen disaster preparedness for effective response at all levels.

“The HFA underscores the relationship between reducing disaster risk and achieving the MDGs“ (UNDP).

### **2.1.3 Year 2005: United Nations Disaster Preparedness (UNDP) – Disaster Risk Reduction (DRR)**

For UNDP, developing sustainable DRR capacity at national and local level is based on the following assumptions:

- Locally generated, owned and sustained capacity is essential to the success of any DRR enterprise
- The development of DRR capacity is the concern of an entire society, rather than any single agency, professional discipline, or stake holder group.
- The development of technical capacities associated with professional disciplines or functions – such as environmental management or land-use management – needs to be combined with other types of capacity development that include the promotion of leadership and other managerial capacities and performance-enhancing measures.
- An enabling environment—i.e. Strong political ownership and commitment at the highest levels of authority, extensive participation, transparency and clear public accountability – is essential for translating capacity into performance (UNPD).

### **2.1.4 Year 2007: Capacity for Disaster Reduction Initiative (CADRI)**

The UNDP supports the global Capacity for Disaster Reduction Initiative (CADRI), with the purpose of “advancing the generation of knowledge and related experiences pertinent to developing sustainable capacity for DRR and aligned with the HFA priorities. CADRI was created in Jan 2007 as an inter-agency programme of UNDP/BCPR, the UN Office for the Coordination of Humanitarian Affairs and the ISRDR secretariat. It supports the three organizations to respond to the UN general commitment to 'Deliver as One.' “

Numerous organizations and initiatives exist that can be associated and align with ITCDMC, only a few were covered due to the scope of this paper.

## **2.2 Capacity-building**

### **2.2.1 Defined**

UNDP defines capacity development as “the process through which individuals, organizations and societies obtain, strengthen, and maintain the capabilities to set and achieve their own development objectives over time.”

Resilience is another term used often when referring to communities but is defined as 'bouncing back to a prior state.' After a catastrophic event has occurred, most often the landscape and population have both changed to the point where they can never be back where they once were and most likely – given the past vulnerability experienced, they don't want to be back where they were before, but stronger and more secure. This approach implies more of a community being able to survive because it adapts to the new environment, 'adaptive capacity' (Paton, D., 2006). After a disaster has occurred, new opportunities arise where emerging methods and ideas can be implemented (de Silva, 2010; Paton, D., 2006). Given how there is an ever changing global landscape, new opportunities emerge often.

Another initiative by the United Nation's Office for Disaster Risk Reduction. In 2009, they defined Disaster Risk Reduction as: “The concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events” (CADRI).

### **2.2.2 Levels of Capacity**

There are three levels of capacity identified within the review literature: (1) individual (2) organizational and (3) enabling environment. This is also within the definition provided by the UNPD where they use 'society' as the 3<sup>rd</sup> level, but it holds the same meaning.

Building capacity on the individual level includes people learning new skills through training, new behaviors responding to and thinking about risk, as well as knowledge sharing. Organizational capacity building includes “taking measures to improve the overall functioning and performance of an organization.” This is a major influence on how individuals develop, grow and interact with others challenging their individual capacity building efforts. The organization can be a great facilitator of aiding in capacity building on the individual level. The third level is 'enabling environment.' or 'society.' We will use 'enabling environment' throughout this paper. This is where there are components available – structures/governments/policies that are conducive to support positive components enabling the overall organizations and people to work.

## **2.3 Information and Communication Technology In Humanitarianism Align with Capacity Building Frameworks**

Humanitarianism is a component of the individual, organizational and enabling environment related to disaster management. Humanitarians have a set of goals coinciding with disaster management which

are meant “to help save lives and alleviate human suffering in responding to:

1. rapid-onset natural disasters, such as tsunamis, earthquakes, and pandemics;
2. slow-onset natural disasters, such as global warming, droughts, and famine; and
3. human-instigated disasters, such as civil wars” (de Silva, 2010).

The advances in recent years have made it such that digital volunteers can now be a part of the humanitarian community. Given they are dispersed geographically, this provides support on an ongoing 24 hour, 7 days per week basis if needed. Virtual communities exist online providing more opportunity for 'engineers without border' type groups to contribute support. This is an especially beneficial group in that they can work in the comfort of their homes, with working technology and the Internet/communications not disrupted, in order to help those in impact zones who need it most. In the digital world, one needn't be in the geographic proximity to provide aid.

### **2.3.1 Open Source Alignment to Levels**

A different component than one might expect is the idea based off of Free and Open Source, Software and Communities in this case. This is basically where software is free for others to download, modify and use anyway they so desire. Many virtual communities have been created around this. The Open Source ideology has played a large role in events that unfolded over the last decade which pertain to the heart of this paper, building ICDMC. The Open Source philosophy aligns with many of the humanitarian codes of conduct. These align directly with the various levels of building capacity.

1. *Local/Individual Empowerment (1-4)*No discrimination on access
2. *Organizational* Ability to leave technology behind
3. *Individual* Empowering local capacity
4. *Enabling Environment* Lower cost
5. *Organizational* Transparency and neutrality. Software has no specific alignment to a particular political agenda.
6. *Organizational* Rapid localization and adaptability: no two nations handle the humanitarian response in the same manner. Free access to the code and the freedom to modify it are essential benefits provided by FOSS.
7. *Enabling Environment* Open standards and data exchanges: with open standards from TCP/IP and it helps promote the spread and implementation of open standards.
8. *Enabling Environment* Shared inter-organizational development: NGOs and humanitarian relief groups all need software tools to be effective and competition is not as rife as in other industries. Sharing development of their IT infrastructure is a natural way to reduce costs and promote integrated response efforts(de Silva, 2010).

## **3.0 BUILDING INFORMATION TECHNOLOGY CAPACITY ACTIVITIES**

*As much as food, shelter, medical aid and security are important for the affected victims in a disaster, so too is the information needed to identify those needs in the first place and create the essential connections for recovery. Correct and timely information is critical to effective response, especially during the first three days following an event, when there is an opportunity to save lives with timely action (de Silva, 2010).*

A surprising larger number of groups providing ICDMC building activities and functions are working in cyberspace. Social media recently emerged and has proven to be very powerful, and quickly evolving, both in the technology sector as well as society-wide. The enabling environment FOSS has provided ITC for disaster management is no different. Not only is ITC represented on all capacity building levels but also, cuts across sectors along the same level. Not only do humanitarian groups consist of these levels in place but have a corresponding 'real-world' outcome that demonstrates that the activities are being implemented. This all in turn, builds capacity and is steadily growing with its use.

Capacity building activities easily transfer to the ICDMC domain. Consultants suggest activities as such (Authenticity Consulting, LLC):

- providing access to repositories of information and resources (databases, libraries and web sites)
- Publications
- Trainings (public, customized or on-line)
- Consultation (coaching, facilitating, expert advice, and conducting research)
- coordinating alliances

These activities, in turn, are all supported by hFOSS communities. For example, the Sahana Disaster Management System & Community:

- has documentation in the form of free eBooks, blogs, video tutorials, and web sites
- has published training manuals, workshop materials, conference articles, and is featured in books
- webinars are offered often, SahanaCamps, workshops, hackathons and challenges are the norm
- a strong online community exists with ongoing discussions through email list, IRC, face-to-face on location deployments as well as private consultants
- work with many other groups like Google and Ushahidi

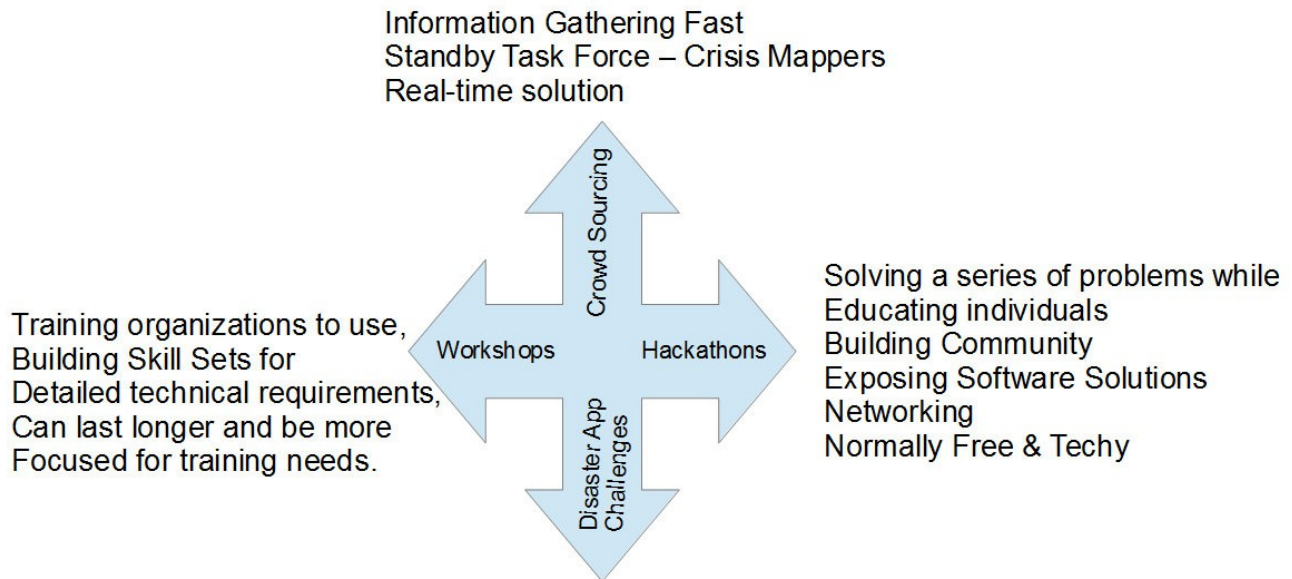
### **3.1 Individual**

There are numerous efforts that build individual capacity. With humanitarian Free and Open Source communities providing Hackathons, Workshops, Webinars, Disaster Challenges and such, individuals have the opportunity to learn new skills for free most of the time, make new connections, network internationally, and share information. For example, the Sahana Software Foundation provides many of the aforementioned opportunities such as SahanaCamp, CrisisMappers trains a Standby Task Force, and Google Summer of Code challenges students with pay as an incentive, to further develop their skill sets utilizing FOSS. “There is an enormous amount of activity in the area of free and open source tools and systems for humanitarian disaster response” (Disaster 2.0).

Figure 1.0 describes some of the methods used and corresponding functionality to build individual capacity for ICDM.



# Building Capacity, Building Communities, Techniques



Specific Solutions Sought -  
A type of crowd sourcing, can be open to all or restricted.  
With a minimal reward, great ideas and solutions can be generated.  
Can stimulate individuals to learn and develop skill set.

Figure 1.0

A *hackathon* is an event where a group of collectives is challenged with a problem(s) to solve. Lots of times these are ad hoc groups who gather for a day or two in hopes of solving a computer programming problem, meeting other people (networking), gaining new skills and learning more information through interactions and knowledge sharing between group members. The event is normally promoted, organized and managed in an online environment with freely available tools and social networks.

*Crowdsourcing* is a method of bringing people together, with a variety of skill sets, to solve an immediate 'pending' problem. In disaster management, this can be asking for people all over the world to map a certain region of the world that has just been devastated by a disaster. This is an online effort and can prove very powerful given people can work together 24 hours a day providing fast and accurate results.

*Disaster challenges* of various types of application problems that groups want solved. They are distributed in online forums and can pay a nice wage. This is a method that can be used to ensure, not only that ideas on 'how to solve' the problem surface, but guarantee the development of a project.

Traditional methods of training are used. Hands-on workshops, university classes and tutorial sessions are held in face-to-face environments. This can be taken online in the form of webinars and video tutorials too. There are many other methods that organizations can use to build ICDMC on the individual level, only a few were listed here.

### 3.2 Organizational

“This dimension has a direct impact on how individuals within the organization develop their competencies and use their capabilities. The organizational level impacts individuals directly by increasing their capabilities through training and management. It helps increase the members competencies by expanding their knowledge base and networking.

“Organizational level capacities help develop and apply internal policies, arrangements, procedures and frameworks, which is necessary to deliver the organization's mandate” (UNPD). A disaster management agency on this level is desired to create a common operating picture and collaborative effort in an organized manner. By bringing together many different communities, this can be achieved.

Further, this can be achieved on the organization level as demonstrated in Figure 2.0. This shows where the Sahana Software Foundation capacity building efforts are on all levels and map over to all levels of a real world situation. The International Federation of the Red Cross used Sahana prior to the recent Philippine event. A few more organizations implemented instances of Sahana after the event too. Once the software is implemented and used, the opportunity to further build capacity is open.

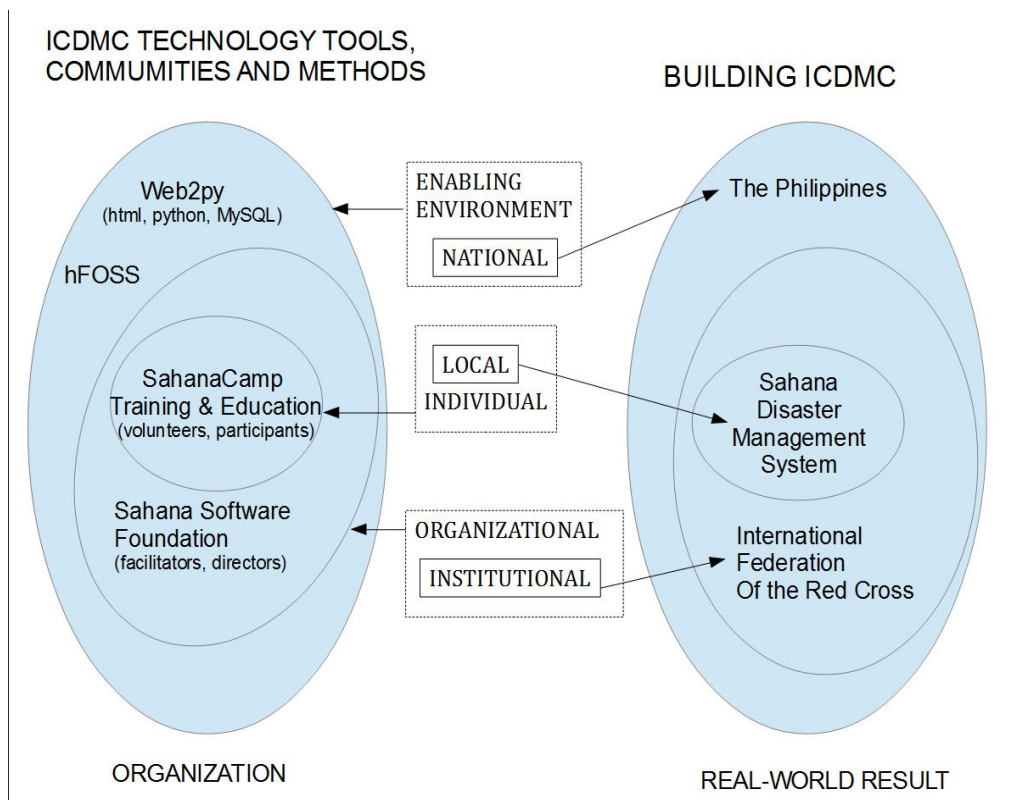


Figure 2.0

## **SAHANA & Emergency Management Information System Characteristics Align with HFA**

What the HFA lists about Capacity can further be supported with a technical information system (CADRI). Many of these requirements are common to those identified for developing emergency response management information systems (Turoff, Chumar, de Walle, Yao, 2004).

- The availability and use the data being crucial to hazard, vulnerability and comprehensive risk assessments, with particular emphasis given to both the technical and human aspects of monitoring disaster risk factors and early warning activities.
- Development of human resources through knowledge, education, training and the transfer of experience by means of information, networking and advocacy.
- Specific technical applications such as those identified with the development and use of building codes, protection of health facilities, the particular requirements of small island developing states, disaster recovery initiatives, and other examples of specific technical abilities or development subject interests.
- Improved disaster response, including specific areas of technical expertise such as urban search and rescue, the incorporation of risk reduction approaches into response management and recovery planning, local level partnerships, etc.

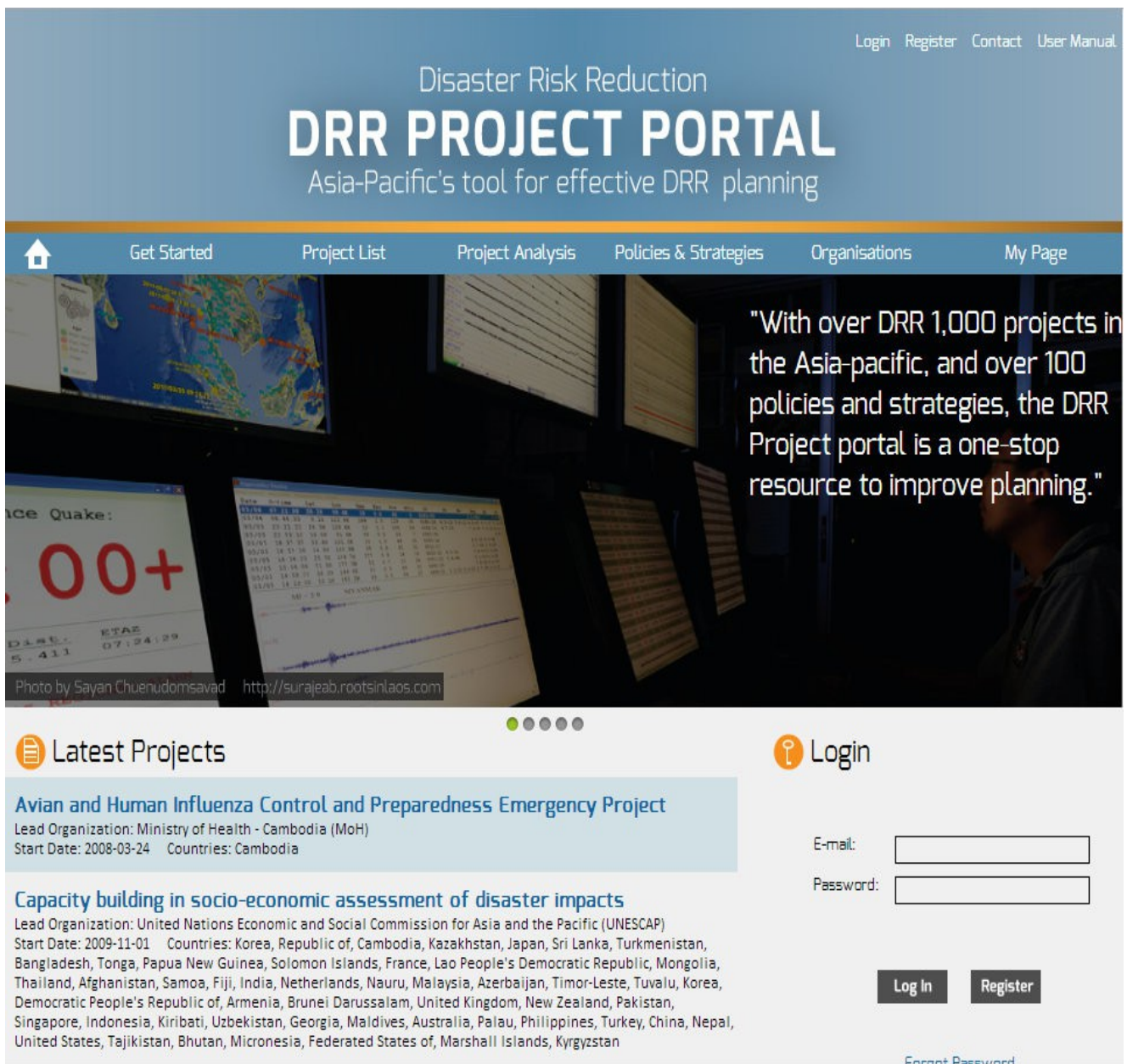
Sahana Map Layers and functionality align with HFA Priority 4: Reduce the underlying risk factors  
Decentralized infrastructure-building activities, such as:

- a) conducting training with emergency management committees at district and village levels in accurate warning, shelter management, damage assessments for early recovery and response and coordination of relief materials during times of crisis;
- b) developing community-based contingency planning with mechanisms to ensure adequate representation of women at the community level and
- c) supporting the establishment of local emergency management ad information centers to support effective communication and coordination (sahana).

An example Screenshot 1.0, of how one system created from an hFOSS concept and community can fulfill many of the requirements listed in HFA and DRR so much so, that DRR uses the Sahana Disaster Management needs for a lot more than 'just' managing disasters.

Examples on ongoing projects utilizing the system can be noted on the homepage, <http://www.drrprojects.net/>. They are as follows:

- Avian and Human Influenza Control and Preparedness Emergency Project
- Capacity building in socio-economic assessment of disaster impacts
- Building resilience of vulnerable communities living in Disasters prone communes of Ha Tinh province



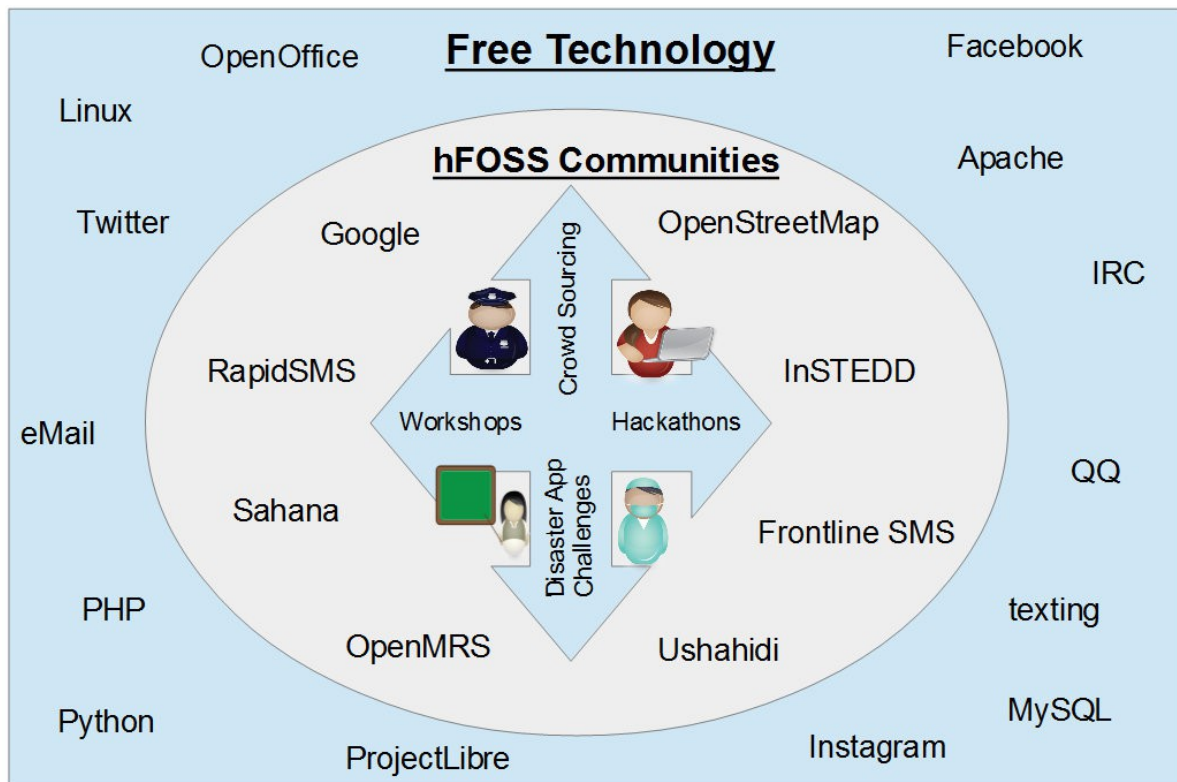
Screenshot 1.0 Sahana DRR Project Portal

### 3.3 Enabling Environment

hFOSS, Social Media and Mobile Devices have created an enabling environment.

Many products such as Sahana , “ depend on open source platforms built from open source components such as Apache, Linux, PHP, Python, MySQL, and these projects in turn have become inadvertent donors towards the goal of delivering these essential software public goods” (de Silva, 2010).

Social media and other web 2.0 technology have provided free or low cost ways of disseminating information, connecting people and providing 2 way communication (White, 2011). Mobile devices and the networks to support them have evened out the playing field for developing countries, bringing their communication and information systems above and beyond those with 'grandfathered' systems in place. These components together leverage the 'digital' society and provide an enabling environment.



### Leveraging Low Cost Solutions for Building Capacity

Figure 3.0

Figure 3.0 is a culmination of all three levels together and some groups who exist at present in order to form a 'proof of concept' that a capacity building framework to develop emergency management technology exists.

The individual level shows the methods used to build individual capacity. This can be for many different groups of people from users to developers. The organizational level shows groups who are presently working together, creating products, responding to events, and doing other tasks to help leverage their goals. Many of these groups function together and respond in a unified manner. Since these humanitarian organizations are not competing against one another, as in a commercial setting, but are humanitarian FOSS groups, they work together to make processes seamless (de Silva, 2010). The enabling environment consists of programming languages, browsers, free applications that help share

information, free communication software, social media and other platforms that are conducive to support the needs of the organizations and it's members.

### 3.4 Building ICDMC supports the HFA

One of the objectives of this paper was to align present frameworks with the idea that building ICDMC would have corresponding end results that would help make things like the HFA realize its goals. Some of the HFA priorities are satisfied a number of ways as Table 1.0 outlines.

HFA Priority	Information & Communication Disaster Management Capacity Building
<b>2:</b> <i>Identify, assess and monitor disaster risks and early warning</i>	<ul style="list-style-type: none"> <li>• Disasters can be monitored by using DMIS;</li> <li>• layers of data provide common operating picture for decision support;</li> <li>• information dissemination</li> <li>• More accurate, timely information</li> </ul>
<b>3:</b> <i>Use knowledge, innovation and education to build a culture of safety and resilience at all levels</i>	<ul style="list-style-type: none"> <li>• Online Communities exist for each software solution</li> <li>• Workshops</li> <li>• Hackathons</li> <li>• Challenges</li> <li>• Webinars</li> <li>• Conferences</li> <li>• University classes</li> </ul>
<b>4:</b> Reduce the underlying risk factors	<ul style="list-style-type: none"> <li>• Integrate all systems into training exercises with emergency management officials and locals</li> <li>• Establish policies and implement technology for best warning systems</li> </ul>
<b>5:</b> Strengthen disaster preparedness for effective response at all levels.	<ul style="list-style-type: none"> <li>• Use systems for organization integration on information sharing</li> <li>• requirements</li> <li>• decision support</li> <li>• information dissemination</li> <li>• incident reports</li> <li>• logistics</li> <li>• tracking,</li> <li>• training,</li> <li>• building community of practice</li> </ul>

Table 1.0 ICDMC Supporting HFA Priorities

## 4.0 CONCLUSION

In 2000, social media was very new and hardly known, the Twitterverse was unheard of – in 2005, the USA experienced the devastation of Katrina and still yet, sharing information, tweeting, crowdsourcing, online collaboration and collective intelligence was hardly tapped. It has been demonstrated in this paper that a framework for building ICDMC can exist and needs to be further

developed and hopefully utilized in a more collective manner. Unified efforts and joint forces fulfilling the needs of each unique situation is possible. We will need to work towards an effort that will expose technology in order to better help the MDG be obtained.

Future steps need to include a concerted effort in formalizing a dynamic framework in this capacity. The surface has only been scratched here but the information put forth supports that the method exists and works, it just needs to be implemented strategically. Other steps should include methods of implementation and evaluation so that success/failure can be calculated for feedback.

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