

DRAFT white paper on a National Earthquake Risk Reduction Program in Haiti

Goal:

Build and maintain Haiti's capability to reduce earthquake risk by implementing an integrated and sustainable program in earthquake science, engineering, and education that will deliver earthquake safety recommendations for policies on urban and rural development, engineering design, and emergency preparedness. This program will assist the government of Haiti and its partners in the relief, recovery, and adaptation efforts through the provision of technically sound analyses, advice and capacity building in the field of earthquake science and engineering.

Status:

Haiti is exposed to a significant seismic threat: the Mw7.0, January 12, 2010 earthquake was a tragic reminder of that geological reality. This earthquake cost 250,000 lives, destroyed a large part of the infrastructure of Port-au-Prince and surrounding region, and cost an estimated \$7.8 billion: 120% of the country's GDP (PDNA 2010). Some information on the threat level was available before the event, but the overall risk was poorly quantified and not accounted for in building codes, land-use planning, or emergency procedures. Efforts to communicate and mitigate earthquake risk were far from the scale necessary to face the threat. In addition, the educated workforce on earthquake science and engineering in Haiti is small, and earthquake hazard awareness among the public or decision- or policy-makers is low. This program seeks to remedy this situation through a focused effort based on science and engineering, education and communication, and capacity building.

Needs:

- ***Science and engineering foundation:*** Earthquake risk assessment and management for situations as complex as Port-au-Prince and the region need to be based upon solid science. In practical terms, this requires adequate data collection and significant time investments by a team of international and national scientists and engineers, to quantify the hazard level with up-to-date methods, and social scientists to assess and quantify risk.
- ***Communication and education:*** Technical findings must be translated into messages that the population and decision makers can understand and use as a basis for planning and response. In practice this requires a communication and awareness-raising program delivering a variety of outputs for a range of audiences. In the case of Haiti, this will need to include an education component, both to raise awareness and to teach basic earthquake safety and survival skills.

- **Capacity building:** Capacity building for Haitian organizations and individuals needs to be integrated into all activities. However, it also needs a stand-alone investment. The end goal should be an autonomous national institution that both delivers a national seismic program but also is self financing and sustainable. This goal is many years away; in the context of the urgent humanitarian response the focus will be on ensuring Haitian national engagement at all times and leadership wherever possible.

Objectives:

- **Basic science:** develop a detailed understanding of the active-fault architecture and long-term behavior of these faults; understand the Jan 12th 2010 event and the subsequent and ongoing behavior of the fault system and associated plates and plate boundaries;
 - Implement field and marine investigations to map all active faults on-shore and offshore and determine their paleoseismic history.
 - Install an earthquake and ground-motion monitoring network to determine the distribution of seismicity and associate it with mapped active faults.
 - Install a dense geodetic network to determine the strain accumulation rate (or slip rate) on all active faults in Haiti.
 - Investigate archives to revise and refine the historical earthquake catalog.
 - Integrate assessment of Haitian fault activity with regional investigations in Hispaniola and elsewhere along the northern Caribbean plate boundary.
- **Hazards and engineering:** develop realistic probabilistic forecast of ground shaking for future earthquakes and use that product to define earthquake safety standards adapted to Haiti.
 - Calculate and update probabilistic seismic hazard maps for the whole country. This includes using earthquake catalogs to determine the characteristics of potential earthquake sources (M_{min} , M_{max} , M_{char} , a and b values, etc), as well as determining appropriate attenuation relationships and site effects (from mapping soil depth and shear wave velocity in upper 30 meters).
 - Compute earthquake scenarios for fault segments that pose a specific threat to exposed areas.
 - Determine the microzonation of major cities (including detailed geotechnical maps).
 - Develop country-relevant design and building codes for commercial and residential structures, and critical infrastructure, to promote life safety and operational continuity, and integrate with urban and rural development strategies.
 - Develop retrofit strategies for buildings and infrastructure that cannot be replaced quickly.

- **Education and outreach:** provide the public and authorities with accurate information on earthquake hazard and safety and engage the authorities in order to:
 - Implement earthquake science and safety into school curriculums.
 - Develop a university curriculum on earthquake hazards, earthquake engineering, and natural disaster risk more generally.
 - Develop a series of workshops on earthquake hazard and safety for policy- and decision-makers (e.g. city mayors, government and non-government development professionals)
 - Develop and implement a series of simple seminars on earthquake-resistant practice for construction companies and individuals
 - Implement an “earthquake safety” certification for companies and individuals that follow earthquake-resistant practices in construction.
 - Develop community-based education and outreach programs to promote local awareness and preparedness.

- **Advisory and policy development:** deliver earthquake safety recommendations for policies on urban and rural design and planning, engineering design, and emergency preparedness.
 - Provide rapid information to the government and the public on earthquakes felt in Haiti.
 - Provide strategic advice through high level and technical briefings and technical reports focused on the management of earthquake hazard.
 - Assist authorities in developing appropriate building codes adapted to the hazard level.
 - Assist authorities in developing policy, zoning, and preparedness, response, and recovery efforts.
 - Integrate new information on seismic hazard into multi-hazard frameworks for risk reduction concerning floods, soil erosion and landslides.
 - Promote natural disaster resilience as a component of sustainable development and a predicate of nationally emergent economy.

- **Capacity building:** establish an autonomous national institution that delivers a national earthquake program that is self financing and sustainable.
 - Train an educated workforce in scientific and engineering disciplines related to earthquake hazard, mitigation, and policies.
 - Provide scientific and technical expertise to assist Haitian scientists, engineer, and technicians in the development of this program.
 - Coordinate and integrate with other hazard observation programs in the Caribbean to ensure the benefits obtained are sustained in the long term and are shared in the international geo-science arena.

- Promote long-term international collaborations in research, education and training, especially with academic institutions and consortia worldwide.

Program structure

- **Program creation:** this program requires long-term institutional commitment and support from Haiti and should be formally endorsed at the highest level.
- **Program oversight and coordination:** an oversight committee is formed from senior figures representatives of participating Haitian government organizations (e.g., BME, DPC, CNIGS, LNBTP, ONEV, UEH, etc) and private sector (e.g., AGERCA), UN and bilateral agencies, donor governments and the development banks, and international experts.

Coordination is the role of the government; however it will need support to manage the significant and technically demanding ongoing workload. The United Nations has offered to take on the role of long term coordination support for the Government of Haiti. In practical terms this means 1-2 UN appointed or at least mandated international technical professionals would be based in Haiti and work closely with the government, being co-located if possible. One of those would be the international director (see below). This would be a formal continuation and expansion of the support already provided to the government by the UN since January.

- **Program execution:**
 - The products of the program are delivered by a team of international and national earth scientists, engineers, and social scientists. It is critical that the international science and engineering community interested are engaged in this topic via a single portal to coordinate efforts, optimize assistance, and ensure long-term continuity of the program.
 - As the program develops, a national scientific and technical team is built from first principles to eventually run the program independently.
 - An international director (since there is insufficient in-country scientific/technical expertise at this point) is appointed for the first 3-5 years to manage the program. He/she works in close collaboration with a national assistant director to setup and develop the program.
 - A possible program executive structure could involve directors for science, hazard/engineering, capacity building and outreach, engagement and policy development.
 - In parallel, a small full time and part time team is developed, for instance in the US, to provide continuity and a critical mass. They will

convene and facilitate meetings and information exchange and manage the data with copied provided to the government to ensure continuity.

- The program is handed over to Haiti nationals after 3-5 years.
- ***Program funding:*** The program should be fully integrated into the post-earthquake reconstruction effort. It must be considered as a key tool to design a recovery and adaptation strategy for Haiti that will rigorously account for the inexorable seismic that the country must face pro-actively. Hence it should qualify for funding within the government recovery strategy and proposed Multi-Donor Trust Fund. Note that technical assistance in kind from partner organizations will be most welcome however it needs to be aligned with the needs of the country rather than being overly/purely research oriented.

Next Steps

The recommended next steps for the concepts developed in this paper are:

- Debate and agreement by the major national and international stakeholders on the central principle of founding a new multi-lateral long term programme to assist Haiti. In the event that agreement is reached this should be recorded in a conference statement or meeting minutes.
- The Government of Haiti and key international stakeholders should then select a focal point individual and organization to lead a task team to progress the concept further.
- International and bilateral organizations will be invited to provide interim financial, logistical and technical support for up to 6 months to enable development of a robust programme.