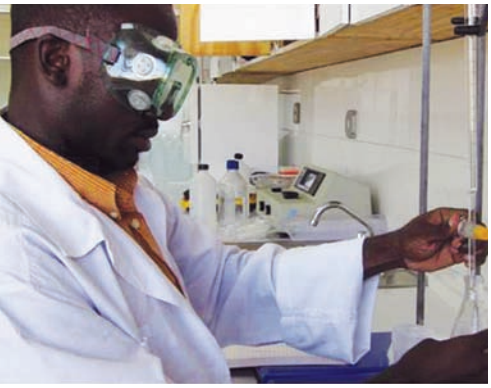
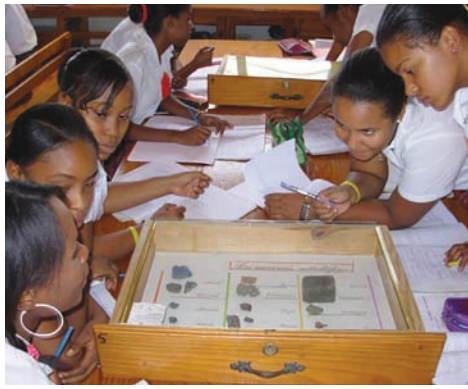
SCIENCE FOR HAITI





A Report on Advancing Haitian Science and Science Education Capacity

June 2011

AAAS
ADVANCING SCIENCE, SERVING SOCIETY

Message from AAAS CEO, Alan I. Leshner

In July 2010, exactly six months after Haiti was devastated by a tragic earthquake, a small group of scientists, engineers and educators from that nation traveled to Puerto Rico for a meeting with colleagues from the Caribbean, the United States, Africa and the Haitian diaspora. There they began a remarkable project: Over two days, they identified what Haiti would need to build scientific strength that could help speed recovery from the quake and support long-term, sustainable human and economic development.

Today, after further meetings in Haiti and an intensive process of review and refinement, that international group has completed its study. This is an important, ambitious document. The authors have recognized that science, engineering, and education are crucial to the future of Haiti, and that building science capacity will require a lasting nationwide commitment.

The document is important as well for what it says about science in the 21st century—not just in Haiti, but globally. Nations such as Rwanda and Vietnam, which have endured historic disasters, have made focused investment in science and education and today are achieving remarkable advances. And because many of our most pressing challenges in public health, food security and environmental protection are regional, it is essential that we establish partnerships and work together to address them.

For that reason, this report offers an important model for the world. Haitian scientists, teachers, and policy leaders took the lead in defining their nation's science-related needs and goals. Their international colleagues brought their own perspectives and energy to support the effort. Through this collaboration, they have developed a roadmap for building Haiti's prosperity and improving the lives of its people.

We are hopeful that the governments of Haiti, the United States and other nations, along with relevant scientific, development and aid organizations throughout the world, will recognize the skill and commitment of the Haitian science community and give the closest consideration to these recommendations.

Sincerely,

Alan I. Leshner
Chief Executive Officer, AAAS
Executive Publisher, Science

Science for Haiti: A Report on Advancing Haitian Science and Science Education Capacity

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June 2011

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Special thanks to all of our colleagues, and particularly our Haitian colleagues, for taking the time to so enthusiastically participate in the workshops and review and comment on earlier drafts of this report. We thank Patrick Attié of *Ecole Supérieure d'Infotronique d'Haïti* for his translation of the Executive Summary into French. Finally, we acknowledge with gratitude Guy Etienne, director of *Collège Catts Pressoir*, for his translation of the Executive Summary into Creole and allowing the organizing committee to attend *Collège Catts Pressoir's* high school graduation ceremony. It was a living and inspiring demonstration of the resilience of the Haitian people and their strong desire for education, even under the most challenging circumstances.

Photo Credits: Nancy Casey, Edward Lempinen, Guy Etienne, Jean McKendry

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INTRODUCTION

The 12 January 2010 earthquake that struck Haiti devastated much of the infrastructure, social institutions, economy, and environmental services of the nation. The scale and scope of the disaster were unprecedented in Haiti's history. In a population of 9.7 million people, 222,570 people died and 300,572 were injured. Widespread destruction in Port-au-Prince left 1.5 million persons homeless and living in over 1,300 camps and settlement sites. A global relief and recovery assistance effort is underway with initial commitments of $9.9 billion by governments and multi-lateral institutions.

Rebuilding Haiti for long-term sustainable development and an improved life for all Haitians requires both science and science education. Science is an essential foundation for Haiti's future, and advancing science and science education capacity in Haiti is the subject of this report.

ADVANCING SCIENCE IN HAITI

Scientific capacity is required for advancing Haitian technological innovation and economic opportunities, improving medicine and health care, creating access to clean water, improving disaster preparedness and mitigation, developing sustainable agriculture and reducing hunger, sustainably managing natural resources, educating citizens, and advancing human rights. This is the responsibility of the Haitian scientific community, government, private sector, and educational and research institutions. Haitian science must be Haitian-led and directed. The international scientific community can provide valuable assistance. An important step is to develop a set of well-founded strategies, policy recommendations, and proposed actions that can help guide the development of Haitian science capacity, prioritize national programs, and target international assistance.

Toward that end, a group of Haitian scientists and educators have been working with colleagues from the Haitian diaspora, the Caribbean, the United States, and Africa to develop goals and a plan of action. In the months immediately following the earthquake, the American Association for the Advancement of Science (AAAS) and other sponsors organized a series of workshops to focus on advancing Haiti's science capacity. This report describes the results of the workshops and can serve as a general "road map" for progress.

ABOUT THE WORKSHOPS

The objectives of the workshops were to: 1) gather scientists, science educators, and policy experts representing diverse fields of science, with representation from Haiti, the Haitian diaspo-ra, and the international community; 2) engage the participants in an intensive dialogue on advancing Haitian science and science education; and 3) prepare a set of strategies, policy recommendations, and proposed actions directed at the Haitian government, the US government, the scientific community, and development, donor, and aid organizations.

Participants included science and science educators from Haiti, members of the Haitian diaspora, US scientists, international science policy experts, and representatives from AAAS and the AAAS

Caribbean Division. The first workshop was held in San Juan, Puerto Rico from 10-12 July 2010; 21 individuals participated. Sessions were organized into three tracks: 1) science, 2) science education, and 3) governance. The second workshop was held in Port-au-Prince, Haiti on 16 July 2010. Approximately 40 Haitian scientists and science educators participated. A third workshop was held with 30 high school principals, directors, and science educators in Port-au-Prince on 17 July 2010. In addition, members of the organizing committee met with two key Haitian governmental commissions on 16 July 2010: the Presidential Commission on Education and the Presidential Commission on Information and Communication Technology.

STRATEGIC GOALS

Workshop participants developed seven general strategic goals for advancing science and science education in Haiti.

1. Advance Haiti's scientific capacity to link Haitian scientific expertise to Haiti's development objectives.
2. Invest in science education, research, and technological innovation to generate sustainable development and prosperity for Haiti.
3. Develop Haitian scientific capacity and expertise to promote scientific management and sustainability of Haiti's natural resources.
4. Support existing scientific and educational organizations and institutions, and if needed, establish new ones to promote the role of science in Haitian society.
5. Promote the integration of Haitian science and scientists into the global scientific community, for the benefit of Haiti and the world.
6. Increase the connection of science to broader Haitian society through formal and informal education, so that all Haitian citizens have knowledge and understanding of science and its uses.
7. Educate Haiti's leaders in government, business, religion, and culture, so that they better understand and value the role of science in Haiti's economic and cultural development.

To support achievement of the strategic goals, participants identified numerous recommendations, policies, and actions to advance science in Haiti. The specific recommendations are organized by three themes: science, science education, and governance.

RECOMMENDATIONS FOR ADVANCING SCIENCE CAPACITY

Participants considered a wide range of policy and action proposals related to advancing science capacity, and focused on those efforts that would have long-term value to the Haitian scientific community and the nation. These initiatives include broad but essential policy efforts, such as establishing a national science and technology policy; conducting specific human capital studies, including inventories of existing and/or needed scientific expertise; and developing creative approaches to increase recognition of science within Haitian society, including national awards for outstanding Haitian scientists and science students. The report includes 17 recommendations for advancing science capacity linked to specific strategic goals.

RECOMMENDATIONS FOR ADVANCING SCIENCE EDUCATION CAPACITY

Participants stressed that science education, both formal and informal, is essential at all levels of Haitian society – preschool, K-13, higher education, and among adults. Rebuilding and recovery efforts underway in Haiti provide extraordinary opportunities to advance science education. These opportunities range from constructing regional "learning laboratories" and community gathering places to training more teachers and faculty to provide quality science instruction. The report includes 15 recommendations for advancing science education linked to specific strategic goals.

RECOMMENDATIONS FOR ADVANCING SCIENCE GOVERNANCE CAPACITY

For science and science education in Haiti to advance, there is a critical need for sound supporting governance. This includes clear and constructive science policies (and where necessary, rules and procedures), effective governing bodies, well-supported institutions of higher education and research, and organizations to provide Haitian scientists with research opportunities, scientific interchange, and recognition. Participants emphasized the need for the Haitian government to increase its level of support for science and science education, and urged the international scientific community to provide encouragement and assistance in developing "good governance" institutions for science. The report includes 11 recommendations for advancing science governance linked to specific strategic goals.

CONCLUSION

Science can and must play an integral role in the rebuilding, recovery, and progress of Haiti. Rather than an isolated or independent activity, the task of increasing science capacity must be integrated into the full range of local, regional, and national efforts to rebuild the nation. *Science for Haiti*, developed by a collaboration of Haitian and international scientists, provides an initial "road map" for progress, identifying key strategic goals and specific recommendations for action.

EXECUTIVE SUMMARY (FRENCH)

Résumé Sommaire

INTRODUCTION

Le séisme qui a frappé Haïti le 12 janvier 2010 a provoqué la destruction massive de nombreux infrastructures et services des institutions sociales, de l'économie et de l'environnement de cette nation. Les proportions et les dégâts occasionnés par le désastre sont sans précédents. On dénombre plus de 222.570 morts et 300.572 personnes blessées. Les destructions occasionnées à Port-au-Prince ont laissé 1.5 million de sans abris, contraints de vivre dans plus de 1.300 camps et espaces d'habitation provisoires. Un effort d'aide et d'assistance planétaire est en cours et les promesses initiales des états et agences multilatérales se chiffrent à 9.9 milliards de dollars.

Les efforts à consentir pour la reconstruction d'Haïti et pour assurer, à terme, son développement durable et améliorer les conditions de vie de tous les haïtiens, exigent, tous les deux, l'apport de la science et de l'enseignement scientifique. La science constitue un élément fondamental de l'avenir d'Haïti, et l'avancement de la science et des capacités de l'enseignement scientifique en Haïti même font l'objet de ce rapport.

L'AVANCEMENT DE LA SCIENCE EN HAÏTI

Il faut incontestablement renforcer les capacités de la recherche Scientifique en Haïti pour le développement de l'innovation technologique, saisir les opportunités économiques, améliorer les services médicaux et les soins de santé, assurer l'accès à l'eau potable, accroître la gestion des risques et réduire leur impact, venir en appui au développement d'une agriculture durable et la lutte contre la faim, tout en gérant de manière durable les ressources naturelles, en éduquant les citoyens et en faisant la promotion des droits de l'Homme. Cette responsabilité échoit à la communauté scientifique, au Gouvernement, au secteur privé et aux institutions d'enseignement et de recherche haïtiens. La recherche scientifique haïtienne doit être haïtienne et doit être menée par les haïtiens et se placer sous leur supervision. La communauté scientifique internationale peut fournir une assistance appréciable. Une étape importante consiste à élaborer un ensemble de stratégies pertinentes, à formuler des recommandations et des propositions d'orientations argumentées, ainsi que des stratégies et plans d'actions pertinentes susceptibles d'orienter le développement des capacités scientifiques locales, de prioriser les programmes nationaux et de cibler l'aide internationale requise.

C'est dans cette perspective qu'un groupe de scientifiques et d'éducateurs haïtiens ont travaillé de concert avec des collègues de la diaspora haïtienne, de la Caraïbe, des Etats-Unis d'Amérique et d'Afrique afin de formuler des objectifs et un plan d'action. Dans les mois qui ont suivi le tremblement de terre, l'Association Américaine pour l'Avancement de la Science (American Association for the Advancement of Science - AAAS) et d'autres sponsors, ont organisé une série d'ateliers pour se pencher sur la problématique de l'avancement de la Science et des capacités scientifiques en Haïti. Ce rapport fait état des résultats de ces ateliers et peut faire office de « feuille de route » pour la poursuite des travaux à entreprendre.

A PROPOS DES ATELIERS

Les ateliers ont eu pour objectif: 1) de rassembler les scientifiques, les éducateurs de disciplines scientifiques, et les experts en politique de plusieurs domaines scientifique, représentants en provenance d'Haïti, de la *diaspora haïtienne*, et de la communauté internationale; 2) susciter au sein des participants un dialogue constructif portant sur l'avancement de la Science et de l'enseignement scientifique en Haïti; et 3) formuler un ensemble de propositions de stratégies, de recommandations et de mesures à l'intention du Gouvernement haïtien, du Gouvernement américain, de la communauté scientifique, des bailleurs de fonds et des agences d'aide au développement internationales.

Parmi les participants, on comptait des scientifiques et des enseignants de disciplines scientifiques haïtiens, des membres de la diaspora haïtienne, des scientifiques américains, des spécialistes en politiques scientifique de renommée internationale, des représentants de l'AAAS et de la Division Caribéenne de l'AAAS. Le premier atelier s'est déroulé à San Juan, Porto Rico, du 10 au 12 juillet 2010; 21 personnalités y ont pris part. Les séances de travail étaient organisées pour couvrir trois champs: 1) la Science, 2) l'enseignement scientifique et 3) la gouvernance. Le deuxième atelier s'est tenu à Port-au-Prince, en Haïti le 16 juillet 2010. Près de 40 scientifiques et enseignants de matières scientifiques y ont participé. Un troisième atelier, regroupant 30 chefs d'établissements du secondaire, de directeurs d'écoles et d'enseignants a été organisé à Port-au-Prince le 17 juillet 2010. De plus, en date du 16 juillet, les membres du comité organisateur ont eu des rencontres avec deux importantes commissions haïtiennes, la Commission Présidentielle sur l'Education et la Commission Présidentielle sur les Technologies de l'Information et de la Communication.

OBJECTIFS STRATÉGIQUES

Les participants aux ateliers ont formulé sept objectifs stratégiques généraux pour l'avancement de la science et de l'enseignement scientifique en Haïti.

1. Promouvoir l'avancement de la recherche scientifique en Haïti dans le but d'assurer l'adéquation des ressources humaines scientifiques haïtiennes aux objectifs de développement d'Haïti.
2. Investir dans l'enseignement scientifique, la recherche et l'innovation technologique afin de faciliter le développement durable et la prospérité en Haïti.
3. Développer les capacités et l'expertise scientifique haïtiennes afin de promouvoir la gestion scientifique et le renouvellement des ressources naturelles d'Haïti.
4. Appuyer les organismes et institutions scientifiques existants, et, le cas échéant, en créer de nouveaux pour promouvoir le rôle de la science au sein de la société haïtienne.
5. Promouvoir l'intégration de la science et des scientifiques haïtiens au sein de la communauté scientifique mondiale, au profit d'Haïti et du reste du monde.
6. Multiplier les passerelles entre la science et la société haïtienne à travers des campagnes d'éducation formelles et informelles afin que l'ensemble des citoyens haïtiens soient informés et comprennent l'importance de la science et de ses applications.
7. Eduquer les dirigeants politiques, économiques, religieux et culturels haïtiens afin qu'ils comprennent et valorisent d'avantage le rôle qui échoit à la science haïtienne en matière de développement économique et culturel d'Haïti.

Outre ces objectifs stratégiques, les participants ont identifié des recommandations, des politiques et des mesures spécifiques susceptibles de faciliter l'avancement de la Science en Haïti. Ces recommandations spécifiques sont regroupées sous trois chapitres distincts: science, enseignement scientifique et gouvernance.

RECOMMANDATIONS POUR L'AVANCEMENT DE LA RECHERCHE SCIENTIFIQUE EN HAÏTI

Les participants ont examiné un éventail assez large d'actions à mettre en œuvre et de propositions, puis ils se sont concentrés sur les actions qui auraient un impact durable en faveur de la communauté scientifique et la nation haïtiennes. Ces initiatives se déclinent en politiques fondamentales à large spectre, telles que la définition d'une politique nationale de la Science et la technologie; aussi bien que la conduite d'études plus spécifiques portant sur le capital humain, y compris l'inventaire des ressources scientifiques existantes et/ou nécessaires, et l'élaboration d'approches originales visant à asseoir la reconnaissance de la science au sein de la société haïtienne, comme la création de prix et récompenses décernés à d'illustres scientifiques et étudiants haïtiens. Ce rapport comporte 17 recommandations pour la promotion de la science et de l'enseignement scientifique assorties d'objectifs stratégiques spécifiques.

RECOMMANDATIONS POUR L'AVANCEMENT DE L'ENSEIGNEMENT SCIENTIFIQUE EN HAÏTI

Les participants ont mis en évidence l'importance de l'éducation, formelle et informelle, essentielle à tous les niveaux de la société haïtienne – préscolaire, K-13, enseignement supérieur et formation pour les adultes et formation continue. Les efforts de reconstruction et de reprise des activités en cours actuellement en Haïti représentent une occasion inespérée pour faire avancer l'enseignement scientifique. Les opportunités qu'ils offrent vont de la création de "laboratoires

d'apprentissage" régionaux et d'espaces communautaires, à la nécessité de former d'avantage d'instituteurs et d'enseignants pour dispenser un enseignement scientifique de qualité. Le rapport contient 15 recommandations visant à l'avancement de l'enseignement scientifique liées à des objectifs stratégiques spécifiques.

RECOMMENDATIONS POUR L'AVANCEMENT DE LA GOUVERNANCE DE LA SCIENCE EN HAÏTI

Pour que la Science et l'enseignement scientifique avancent en Haïti, il lui faut impérativement un solide système de gouvernance. Ceci implique l'énoncé de politiques scientifiques claires et constructives (et des règles et des procédures, le cas échéant), des organes de régulation efficaces, des institutions d'enseignement supérieur et des centres de recherche bien encadrés, et des institutions aptes à offrir aux scientifiques haïtiens des opportunités d'effectuer des travaux de recherche, des échanges à caractère scientifique et des récompenses. Les participants ont souligné l'importance pour le Gouvernement haïtien d'accroître son appui à la Science et à l'enseignement scientifique et ont exhorté la communauté scientifique internationale à l'encourager, à lui fournir de l'assistance technique et à faire valoir auprès du gouvernement haïtien l'importance de mettre en place des institutions de « bonne gouvernance » pour la Science. Le rapport comporte 11 recommandations pour l'avancement de la gouvernance scientifique assorties d'objectifs stratégiques spécifiques.

CONCLUSION

La Science peut et doit jouer un rôle primordial dans le processus de reconstruction, de relance et de développement d'Haïti. L'effort visant à accroître les capacités scientifiques devrait s'intégrer à l'ensemble des mesures et actions de reconstruction de la Nation haïtienne entreprises au niveau local, régional et national, et non point demeurer une activité isolée ou autonome. La *Science pour Haïti*, fruit du travail conjoint de scientifiques haïtiens et étrangers, représente une ébauche de « feuille de route » qui permet d'aller de l'avant, en ayant identifié des objectifs stratégiques spécifiques-clé et formulé des recommandations-clé pour l'adoption de mesures immédiates.

EXECUTIVE SUMMARY (CREOLE)

Rapó final

ENTWODIKSYON

Tranblemanntè 12 janvye ki te frape Ayiti a pote ale anpil konstriksyon, enstitisyon sosyal, ekonomik, ak sèvis ki okipe kesyon anviwónman nasyon an. Istwa peyi d'Ayiti pa janm konnen nivo ak gwosè dezas konsa. Nan yon popilasyon ki genyen 9.7 milyon moun, 222,570 mouri e 300,572 te blese. Anplè destriksyon an nan Pòtoprens kite 1.5 milyon moun san kay epi y ap viv nan plis pase 1,300 kan ak abri pwovizwa. Èd entènasyonal ak asistans pou efò rekonstriksyon an deja kòmanse ak pwomès gouvènman ak plizyè enstitisyon miltilateral fè ki rive 9.9 bilyon dola ameriken.

Rekonstriksyon Ayiti sou yon tan ki long pou yon devlòpman dirab ak pou amelyore kondisyon lavi tout ayisyen mande alafwa syans ak edikasyon. Syans fondamantal pou demen Ayiti, yon syans an pwogrè ak yon edikasyon djanm an Ayiti se sijè rapò sa a.

AVANSMAN SYANS AN AYITI

Konpetans syantifik se yon nesesite pou fè avanse an Ayiti nouvote teknolojik ak posiblite ekonomik, amelyore medsin ak swen sante, kreye mwayen pou trete dlo, amelyore kapasite pou prepare nou kont dezas epi redui risk yo, devlope yon agrikilti ki djanm epi redui lafen, jesyon responsab resous natirèl yo, edikasyon sitwayen yo, ak pou avansman dwa moun. Sa se reponsablite kominote syantifik peyi d'Ayiti, gouvènman, sektè prive ak enstitisyon k ap travay nan domèn rechèh ak edikasyon. Syans Ayisyen an dwe yon demach ayisyen epi se ayisyen ki dwe mennen li. Kominote syantifik entènasyonal la kapab bay yon bon koutmen (asistans). Yon etap enpòtan se devlope yon seri bon estrateji, gid rekòmandasyon, epi pwopoze aksyon ki kapab gide devlòpman kapasite syantifik ayisyen an, bay pwogram nasyonal yo premye plas, epi chèche èd entènasyonal.

Nan menm lojik sa a, yon gwoup syantifik ak edikatè ayisyen te travay avèk kòlèg nan dyaspora Ayisyen, nan Karayib, ozetazini, ak Afrik pou devlope objektif ak yon plan aksyon. Nan mwa ki suiv tousuit tranblemanntè a, Asosyasyon Ameriken pou Avansman Syans (AAAS) ak lòt sponsò te òganize yon seri atelye pou analize avansman konpetans syantifik an Ayiti. Rapò sa a prezante rezilta atelye yo e kapab sèvi yon fason jeneral kòm 'wout ki ta dwe suiv'' pou avanse.

KONSÈNAN ATELYE YO

Objektif atelye yo se te: 1) reyini syantifik yo, edikatè yo ak ekspè nan politik ki reprezante divès domèn lasyans ak reprezantan ki soti Ayiti, nan dyaspora ayisyen an, ak nan kominote entènasyonal la; 2) mete patisipan yo nan yon dyalòg san kanpe sou avansman syans ak Edikasyon an Ayiti; 3) prepare yon seri estrateji, gid pwopozisyon, epi pwopoze aksyon dirèktememan bay gouvènman ayisyen an, gouvènman ameriken, kominote syantifik la, bayè yo ak òganizasyon ki ap bay èd yo.

Pami patisipan yo te genyen syantifik ak edikatè ki sòti an Ayiti, manm dyaspora ayisyen an, syantifik ameriken, ekspè entènasyonal nan syans politik, ak reprezantan AAAS ak manm AAAS branch karayib la. Premye atelye a te fèt nan San Juan, Pòtoriko 10-12 jiyè 2010; 21 moun te patisipe. Sesyon yo te òganize an twa pati 1) syans, 2) Syans edikasyon 3) gouvènans. Dezyèm atelye a te òganize nan Pòtoprens, Ayiti 16 jiyè 2010. Apeprè 40 syantifik ak edikatè ayisyen te patisipe. Twazyèm atelye a te fèt ak 30 responsab lekòl segondè, direktè, ak espesyalis nan edikasyon nan Pòtoprens nan dat 17 Jiyè 2010. An plis, manm komite òganizasyon an te rankontre de komisyon kle gouvènman ayisyen an nan dat 16 jiyè 2010: Komisyon prezidansyèl sou edikasyon epi komisyon prezidansyèl sou Enfòmasyon, Teknonoloji, ak Kominikasyon.

OBJEKTIF ESTRATEJIK

Patisipan nan atelye yo te devlope sèt objektif estratejik pou avansman syans ak syans edikasyon an Ayiti.

1. Ranfòse kapasite syantifik an Ayiti an pou makònen konpetans syantifik ayisyen an ak objektif devlopman peyi d'Ayiti.
2. Envesti nan syans edikasyon, rechèch, ak nouvote teknolojik pou rekòlte devlòpman dirab ak pwosperite pou Ayiti.
3. Devlope kapasite syantifik ak ladrès syantifik an Ayiti pou ankouraje jesyon syantifik k ap pèmèt resous natirèl yo dire plis.
4. Sipòte òganizasyon ak enstitisyon ki deja la k'ap travay nan domèn syantifik ak edikasyon, si sa ta neseè, kreye lòt tou nèf pou ranfòse wòl syans nan sosyete ayisyen an.

5. Ankouraje syans an Ayiti, epi ankouraje syantifik ayisyen yo rantre nan kominote syantifik mondyal la, nan benefis Ayiti ak monn nan.
6. Pèmèt plis moun nan sosyete ayisyen genyen rapò ak syans nan edikasyon fòmèl oswa enfòmèl, konsa tout ayisyen ap genyen konesans sou syans epi konprann itilite li.
7. Edike lidè ayisyen ki nan gouvènman, biznis, relijyon ak kilti, pou kapab konprann pi byen enpòtans ak wòl syans nan devlòpman ekonomik ak kiltirèl Ayiti.

Pou ede rive nan objektif estratejik sa yo, patisipan yo te idantifye divès rekòmandasyon, desizyon ak aksyon pou avansman syans an Ayiti. Rekòmandasyon espesifik sa yo te òganize selon 3 tèm: Syans, syans edikasyon ak gouvènans.

REKÒMANDASYON POU RANFÒSE KAPASITE SYANTIFIK

Patisipan yo konsidere yon bon valè desizyon ak pwopozisyon aksyon ki gen rapò ak avansman kapasite syantifik, kontinye efò sa yo sou yon tan ki long, ap bay kominote syantifik la ak nasyon an valè. Demach sa yo mande anpil, men efò politik la esansyèl, tankou tabli yon politik nasyonal sou syans ak teknoloji; mennen etid espesifik sou valè moun nou genyen (resous), plis envantè sou domèn syantifik ki egziste e / oubyen nou bezwen; epi devlope apwòch ki ap pèmèt syantifik ayisyen yo jwenn rekonesans nan mitan moun nan sosyete ayisyen an, plis ankò rekonesans pou meyè syantifik ayisyen ak etidyan nan domèn syans. Rapò a genyen 17 rekòmandasyon pou ranfòse kapasite syantifik ki mache ak objektif espesifik yo.

REKÒMANDASYON POU RANFÒSE KAPASITE SYANS EDIKASYON

Patisipan yo te mete aksan sou syans edikasyon, alafwa fòmèl ak enfòmèl, li enpòtan nan tout nivo sosyete ayisyen an- preskolè (jadendanfan), primè ak segondè (K-13, sistèm ameriken), edikasyon siperyè, epi pami granmoun yo. Rekonstriksyon ak efò pou relanse Ayiti ki kòmanse la a se yon okazyon san parèy pou fè syans edikasyon avanse. Opòtinite sa yo mache ak konstriksyon rejyonal laboratwa pou fè etid epi jwenn espas nan kominote a pou fòme plis pwofesè ak fakilte pou bay bonjan fòmasyon syantifik. Rapò a genyen 15 rekòmandasyon pou avansman syans edikasyon ki mache ak objektif estratejik espesifik yo.

REKÒMANDASYON POU RANFÒSE GOUVÈNANS

Pou syans ak syans edikasyon avanse an Ayiti, genyen yon gran bezwen pou bay gouvènans lan yon gwo sipò. Sa mande yon politik nan domèn syantifik ki klè e ki byen òganize (e kote sa nesesè, mete règleman ak demach ki dwe suiv), bonjan konsèy administrasyon, enstitisyon siperyè ak rechèch jwenn bon sipò, epi òganizasyon k ap bay syantifik ayisyen yo posiblite pou fè rechèh, echanj syantifik ak rekonesans. Patisipan yo te mete aksan sou nesesite pou gouvènman ayisyen an ogmante nivo èd li bay syans ak syans edikasyon, epi priye kominote syantifik entènasyonal la pou ankouraje epi ede nan devlòpman enstitisyon nan domèn syans ki genyen ‘’bon gouvènans’’. Rapò sa a genyen 11 rekòmandasyon pou avansman gouvènans ki mache ak objektif estratejik espesifik yo.

KONKLIZYON

Syans kapab jwe e dwe jwe yon wòl total kapital nan rekonstriksyon, refondasyon, ak pwogrè Ayiti. Olye se yon aktivite sou kote oswa endepandan, travay pou ogmante kapasite syantifik la dwe rantre nan gwo efò lokal, rejyonal epi nasyonal pou rekonstwi nasyon an. Syans pou Ayiti, ki devlope nan kolaborasyon ant syantifik ayisyen ak syantifik entènasyonal, bay pou kòmanse "wout ki ta dwe suiv la" pou avanse, pandan l'ap idantifye objektif estratejik ki pi enpòtan yo ak rekòmandasyon espesifk pou aksyon.

EXECUTIVE SUMMARY (SPANISH)

Resumen Ejecutivo

INTRODUCCIÓN

El terremoto del 12 de enero de 2010 que azotó a Haití devastó gran parte de la infraestructura, las instituciones sociales, la economía y los servicios ambientales de la nación. La escala y el alcance del desastre no tenían precedentes en la historia de Haití. En una población de 9.7 millones de personas, 222,570 personas murieron y 300,572 resultaron heridas. La destrucción generalizada en Port-au-Prince dejó a 1.5 millones de personas sin hogar y viviendo en más de 1,300 campamentos y lugares de asentamiento. Un esfuerzo global de ayuda humanitaria y asistencia para la recuperación está en marcha con compromisos iniciales de $9.9 mil millones por instituciones gubernamentales y multilaterales.

La reconstrucción de Haití para el desarrollo sustentable a largo plazo y una vida mejor para todos los haitianos requiere tanto de la ciencia como de la educación científica. La ciencia es una base esencial para el futuro de Haití, y avanzar la capacidad en ciencia y educación científica en Haití es el objeto de este informe.

EL AVANCE DE LA CIENCIA EN HAITÍ

La capacidad científica se requiere para avanzar la innovación tecnológica y las oportunidades económicas haitianas, mejorar la medicina y el cuidado de la salud, crear acceso a agua potable, mejorar la preparación para desastres y su mitigación, desarrollar la agricultura sustentable y reducir el hambre, manejar sustentablemente los recursos naturales, educar los ciudadanos, y promover los derechos humanos. Esto es responsabilidad de la comunidad científica, del gobierno, el sector privado y las instituciones educativas y de investigación haitianas. La ciencia haitiana debe ser liderada y dirigida por haitianos. La comunidad científica internacional puede brindar asistencia valiosa. Un paso importante es desarrollar un conjunto de estrategias bien fundadas, recomendaciones de políticas y acciones propuestas que pueden ayudar a guiar el desarrollo de la capacidad científica haitiana, dar prioridad a programas nacionales, y dirigir la asistencia internacional.

Hacia ese fin, un grupo de científicos y educadores haitianos han estado trabajando con colegas de la diáspora haitiana, el Caribe, los Estados Unidos, y Africa en desarrollar metas y un plan de acción. En los meses inmediatamente después del terremoto, la Asociación Americana para el Avance de la Ciencia (AAAS por sus siglas en inglés) y otros auspiciadores organizaron una serie de talleres enfocados en avanzar la capacidad científica de Haití. Este informe describe los resultados de los talleres y puede servir como una "hoja de ruta" para el progreso.

ACERCA DE LOS TALLERES

Los objetivos de los talleres fueron: 1) reunir a científicos, educadores en ciencias, y expertos en política que representaran los diversos campos de la ciencia, con representantes de Haití, la diáspora haitiana, y la comunidad internacional; 2) involucrar a los participantes en un diálogo intenso sobre el avance de la capacidad para la ciencia y la educación científica haitiana; y 3) preparar un conjunto de estrategias, recomendaciones y acciones propuestas dirigidas al gobierno de Haití, el gobierno de los EE.UU., la comunidad científica y las organizaciones de desarrollo, donantes y de ayuda.

Entre los participantes había científicos y educadores en ciencias de Haití, miembros de la diáspora haitiana, científicos de EE.UU., expertos internacionales en política científica, y representantes del AAAS y la División del Caribe del AAAS. El primer taller se llevó a cabo en San Juan, Puerto Rico del 10 al 12 de julio de 2010; participaron 21 personas. Las sesiones se organizaron en tres temas: 1) ciencia, 2) educación científica, y 3) gobernanza. El segundo taller se celebró en Port-au-Prince, Haití el 16 de julio de 2010. Aproximadamente 40 científicos y educadores en ciencias haitianos participaron. Un tercer taller se llevó a cabo con 30 principales de escuelas secundarias haitianos, directores y educadores de ciencias en Port-au-Prince el 17 de julio de 2010. Además, miembros del comité organizador se reunieron con dos importantes comisiones gubernamentales de Haití el 16 de julio de 2010: la Comisión Presidencial sobre Educación y la Comisión Presidencial de Tecnologías de la Información y la Communicación.

OBJETIVOS ESTRATÉGICOS

Los participantes del taller desarrollaron siete objetivos estratégicos para avanzar la ciencia y la educación científica en Haití.

1. Avanzar la capacidad científica haitiana para vincular los conocimientos científicos haitianos a los objetivos de desarrollo de Haití.
2. Invertir en la educación científica, la investigación y la innovación tecnológica para generar desarrollo sustentable y prosperidad para Haití.
3. Desarrollar la capacidad y el peritaje científico haitiano para promover el manejo científico y la sustentabilidad de los recursos naturales de Haití.
4. Apoyar a las organizaciones e instituciones científicas y educativas existentes, y de ser necesario, establecer otras nuevas para promover el papel de la ciencia en la sociedad haitiana.
5. Promover la integración de la ciencia y los científicos haitianos en la comunidad científica global, para beneficio de Haití y del mundo.
6. Incrementar la conexión de la ciencia a la sociedad haitiana en general a través de la educación formal e informal, de modo que todos los ciudadanos haitianos tengan el conocimiento y la comprensión de la ciencia y sus usos.
7. Educar a los líderes de Haití en el gobierno, los negocios, la religión y la cultura, de modo que puedan entender mejor y valorar el papel de la ciencia en el desarrollo económico y cultural de Haití.

Para apoyar el logro de los objetivos estratégicos, los participantes identificaron recomendaciones específicas, políticas y acciones para avanzar la ciencia en Haití. Las recomendaciones específicas están organizadas en tres temas: la ciencia, la educación científica y la gobernanza.

RECOMENDACIONES PARA AVANZAR LA CAPACIDAD CIENTÍFICA

Los participantes consideraron una amplia gama de propuestas de políticas y de acción relacionadas a avanzar la capacidad científica, y se enfocaron en aquellos esfuerzos que pudieran tener un valor a largo plazo para la comunidad científica haitiana y la nación. Estas iniciativas incluyen esfuerzos generales pero esenciales de política, tal como el establecimiento de una política nacional de ciencia y tecnología; llevar a cabo estudios específicos de capital humano, incluyendo inventarios de peritaje científico existente y/o necesario; y desarrollar enfoques creativos para aumentar el reconocimiento de la ciencia en la sociedad haitiana, incluyendo premios nacionales de reconocimiento para científicos destacados y estudiantes de ciencias haitianos. El informe incluye 17 recomendaciones para avanzar la capacidad científica vinculados a determinados objetivos estratégicos.

RECOMENDACIONES PARA AVANZAR LA CAPACIDAD EN EDUCACIÓN CIENTÍFICA

Los participantes hicieron hincapié en que la educación científica, tanto formal como informal, es esencial a todos los niveles de la sociedad haitiana—preescolar, K-13, educación superior, y entre adultos. Los esfuerzos de reconstrucción y recuperación en marcha en Haití proveen oportunidades extraordinarias para avanzar la educación científica. Estas oportunidades van desde la construcción de "laboratorios de aprendizaje" regionales y lugares de reunión de la comunidad entrenar más maestros y profesores para impartir instrucción científica de calidad. El informe incluye 15 recomendaciones para avanzar la educación científica vinculados a determinados objetivos estratégicos.

RECOMENDACIONES PARA AVANZAR LA CAPACIDAD EN GOBERNANZA CIENTÍFICA

Para que pueda avanzar la ciencia y la educación científica en Haití, hay una necesidad crítica de buena gobernanza de apoyo. Esto incluye políticas claras y constructivas de ciencia (y cuando proceda, normas y procedimientos), organismos gubernamentales efectivos, instituciones de educación superior e investigación bien apoyadas y organizaciones para proporcionar a los científicos haitianos con las oportunidades de investigación, intercambio científico y reconocimiento. Los participantes subrayaron la necesidad de que el gobierno haitiano aumente su nivel de apoyo a la ciencia y la educación científica, e instó a la comunidad científica internacional a que preste apoyo y asistencia en el desarrollo de instituciones de "buena gobernanza" para la ciencia. El informe incluye 11 recomendaciones para el avance de la gobernanza en ciencia vinculados a determinados objetivos estratégicos.

CONCLUSIÓN

La ciencia puede y debe desempeñar un papel integral en la reconstrucción, la recuperación y el progreso de Haití. En lugar de una actividad aislada o independiente, la tarea de aumentar la capacidad científica debe ser integrada en toda la gama de esfuerzos locales, regionales y nacionales para reconstruir la nación. *Ciencia para Haití*, desarrollado mediante una colaboración de científicos haitianos e internacionales, provee una "hoja de ruta" inicial para el progreso, identificando los principales objetivos estratégicos y recomendaciones específicas para la acción.

The daunting task of rebuilding Haiti for long-term sustainable development and an improved life for all Haitians requires both science and science education.

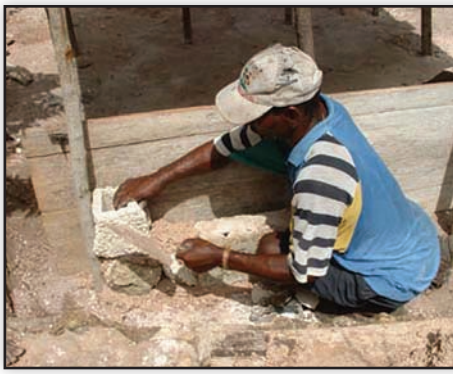
Introduction

The 12 January 2010 earthquake centered near Port-au-Prince, Haiti devastated the nation's infrastructure, social institutions, economy, and environmental resources. Also damaged were Haitian education and research institutions, as well as the nation's science and science education capacity. The daunting task of rebuilding Haiti for long-term sustainable development and an improved life for all Haitians requires both science and science education. Advancing science and science education capacity in Haiti is the subject of this report.

The 7.0 magnitude quake directly affected Port-au-Prince, Léogane, Petit-Goave and Grand-Goave, and Jacmel. There were 59 aftershocks of magnitude 4.5 or greater; 16 of the aftershocks were magnitude 5.0 or greater (USGS 2010). While statistics on damage and casualties have inherent uncertainties, the scale and scope of the disaster were unprecedented for Haiti. According to the United Nations Office for Coordination of Humanitarian Affairs, there were over 222,570 deaths and 300,572 persons with injuries. Widespread destruction in Port-au-Prince left over 1.5 million persons homeless and living in over 1,300 camps and settlement sites; an estimated 660,000 people fled the capital. Thirty hospitals were damaged or destroyed, including the only teaching hospital in Haiti. Close to 5,000 schools were affected by the quake, with over 80% of the schools in Port-au-Prince damaged or destroyed. Between 10 million and 11 million cubic meters of rubble were created by the earthquake (UN 2011a). Additional assessments suggest that 60% of the government, administrative and economic infrastructure in Port-au-Prince was destroyed, and 52% of households were left food-insecure (World Vision 2011). A cholera epidemic (not directly resulting from the earthquake) has resulted in an estimated 261,985 cases and 4,737 deaths (UN 2011b).

In the face of this extraordinary tragedy, a global relief and recovery assistance effort is underway, engaging governments, NGOs, and businesses from over 100 countries. Initial commitments of $9.9 billion, primarily by governments and multilateral institutions were made at a 31 March 2010 international donor's conference. Charitable fundraising for recovery activities over 12 months totaled $1.4 billion. As of 31 December 2010, governments and multilateral institutions have disbursed 28.7% of funds pledged for 2010-2011.

As of early 2011, conditions reflect modest progress in reconstruction and recovery: homeless persons in settlement sites have declined 46%, yet less than 31,000 transitional shelters have been constructed. While over 2,000 schools have been cleared of debris, only 10-15% of all rubble has been effectively removed or managed. Importantly, 90% of internally displaced persons within Haiti now have access to health clinics (UN 2011a).



Before the earthquake, Haiti had a National Strategy for Growth and Poverty Reduction. This 2007-2010 strategy was in progress and included a focus on science, technology, and innovation (Margesson and Taft-Morales 2010). As post-earthquake assistance has moved from emergency response to planning for long-term recovery, a large number of reports, documents, and plans have been prepared by the Haitian government, the donor community, international organizations, and others (see Appendix I). A review of these reports suggests that recognition of the essential role of science and science education in Haiti's recovery has been sporadic and modest. The lack of consistent attention to science and science education was a compelling reason for the preparation of this report.

Advancing Science in Haiti

While science is only occasionally mentioned in current planning for Haiti's future, it is an essential element of development in the 21st century. Scientific capacity is required for advancing technological innovation and economic opportunities, improving medicine and health care, creating access to clean water, improving disaster preparedness and mitigation, developing sustainable agriculture and reducing hunger, sustainably managing natural resources, educating citizens, and advancing human rights. For developing nations, science and science education are a necessary and fundamental tool for progress (Malcom et al. 2002). A large literature documents the linkage between science and technology capac-

ity and sustainable growth and poverty reduction (Watkins and Ehst 2008). The UN Millennium Project has 10 goals related to development; "science, technology, and innovation underpin *every one* of the goals" (Juma and Yee-Cheong 2005:16, emphasis added).

Hence, science must play an integral role in the rebuilding, recovery, and progress of Haiti as a nation. Advancing science and science capacity in Haiti is the responsibility of the Haitian scientific community, government, private sector, and educational and research institutions. Haitian science must be Haitian-led and directed. The international scientific community—particularly in fields relevant to the immediate and near-term needs of rebuilding Haiti—can provide valuable assistance to the Haitian government, scientific community, and people. Scientific and educational collaborations can help advance Haitian scientific capacity and integrate Haitian science into the global scientific community, benefiting both. A critical and needed element is a set of well-founded strategies, policy recommendations, and proposed actions that can help guide the development of Haitian science capacity and prioritize national programs and international assistance.

The American Association for the Advancement of Science (AAAS), with its mission of "advancing science, serving society", global network of affiliate scientific organizations, and international membership is well-poised to facilitate this important activity, along with other sponsors. An organizing committee of AAAS member-volunteers was established. As a first step in what must be a long-term dialogue between the international and Haitian scientific communities, a series of workshops was held to advance science for Haiti. *Science for Haiti* describes the results and can serve as a general "road map" for progress, identifying key strategic goals and specific recommendations for action.

Advancing science and science capacity in Haiti is the responsibility of the Haitian scientific community, government, private sector, and educational and research institutions. Haitian science must be Haitian-led and directed.

About the Workshops

The objectives of the workshops were to: 1) gather a group of scientists, science educators, and policy experts representing diverse fields of science, with representation from Haiti, the Haitian diaspora, and the international community; 2) engage the participants in an intensive dialogue on advancing capacity for Haitian science and science education; and 3) prepare a set of strategies, policy recommendations, and proposed actions directed at the Haitian government, the US government, the scientific community, and development, donor, and aid organizations.

Participants included scientists and science educators from Haiti, members of the Haitian diaspora, US scientists, international science policy experts, and representatives of the AAAS. [A full list of participants in each of the workshops is included in Appendix II.]

The first workshop was held in San Juan, Puerto Rico from 10-12 July 2010; 21 individuals participated. Introductory sessions focused on: 1) history, scope and culture of Haitian science and science education; 2) the impact, consequences, and near-term cascading effects of the earthquake on Haiti, its people and environment, and Haitian science and science education; and 3) current post-earthquake responses by the Haitian government, relief organizations, and the international community. Two relevant case studies from other locations were presented: rebuilding science capacity in Rwanda in the aftermath of the 1994 genocide and advancing the environmental sciences in Puerto Rico.

General discussions were followed by several formal sessions to develop strategies, policy recommendations, and action proposals. These sessions were organized into three tracks: 1) science; 2) science education; and 3) governance. Participants divided into three groups and met separately for in-depth discussions related to each track. Preliminary ideas

were presented for revision and refinement by the entire group, and the workshop concluded with a general discussion of the recommendations and next steps.

The second workshop was held in Port-au-Prince on 16 July 2010. Participants included the organizing committee; several Haitian scientists that attended the first workshop; and Haitian scientists associated with government agencies, NGOs, and public and private higher education institutions. Approximately 40 individuals participated. Again, a broad range of scientific disciplines were represented. Introductory sessions presented the results of the first workshop, and the assembled group divided into the three tracks of science, science education, and governance. The track groups, led by Haitian representatives, discussed, revised, refined, and added to the recommendations developed in San Juan. A concluding session presented the results to the group and identified next steps.

A third workshop was held with high school principals, directors, and science educators in Port-au-Prince on 17 July 2010. The workshop was led by members of the organizing committee; approximately 30 individuals participated. This workshop focused on science education and provided an opportunity for Haitian educators to discuss, refine, and add to the recommendations related to science education.

In addition, members of the organizing committee met with two key Haitian governmental commissions on 16 July 2010: the Presidential Commission on Education and the Presidential Commission on Information and Communication Technology. These meetings included presentation of the draft workshop results, discussion of on-going planning and development of higher education policy in Haiti, and an opportunity for these two high-level commissions to discuss, comment on, and add to the recommendations from the workshops.

Strategic Goals

Extraordinary challenges confront Haiti in the aftermath of the 2010 earthquake, along with a wide range of urgent and long-term demands for relief, reconstruction, and restoration. For that reason, it is imperative that advancing science in Haiti be guided by a strong set of strategic goals. These goals provide both a vision statement for the role of science in Haiti's future development, and a set of strategies to organize and evaluate specific policy and action proposals. Workshop participants developed seven strategic goals for advancing science and science education in Haiti.

STRATEGIC GOALS FOR ADVANCING SCIENCE AND SCIENCE EDUCATION IN HAITI

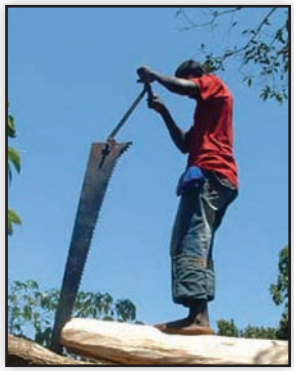
1. Advance Haiti's scientific capacity to link Haitian scientific expertise to Haiti's development objectives.
2. Invest in science education, research, and technological innovation to generate sustainable development and prosperity for Haiti.
3. Develop Haitian scientific capacity and expertise to promote scientific management and sustainability of Haiti's natural resources.
4. Support existing scientific and educational organizations and institutions, and if needed, establish new ones to promote the role of science in Haitian society.
5. Promote the integration of Haitian science and scientists into the global scientific community, for the benefit of Haiti and the world.
6. Increase the connection of science to broader Haitian society through formal and informal education, so that all Haitian citizens have knowledge and understanding of science and its uses.
7. Educate Haiti's leaders in government, business, religion, and culture, so that they better understand and value the role of science in Haiti's economic and cultural development.

Each of the goals is discussed below.

1. Advance Haiti's scientific capacity to link Haitian scientific expertise to Haiti's development objectives.

Haiti has a substantial institutional foundation from which to advance its scientific capacity. This includes such national organizations as the Ministry of Education and the Université d'Etat d'Haïti (UEH), and international organizations such as the Agence Universitaire de la Francophonie (AUF), the Caribbean Educational Knowledge and Research Network (C@RIBNET) and the American Association for the Advancement of Science (AAAS) Caribbean Division. [For a selected list of over 20 science and/or science organizations in Haiti, see Appendix III.] Haitian scientists are individually engaged in discovery, research, scholarship, technological innovation, and science education. Some Haitian scientists also participate in research projects with colleagues from the global scientific community.





Post-earthquake, it is imperative that Haiti's scientific expertise, along with the broader scientific community, expand and respond to the needs of Haiti's development objectives. Haiti is ranked 145th of 192 countries on the UN's Human Development Index (UN 2010), and sustainable development will require that the international human right to "enjoy the benefits of scientific progress and its applications" be a key element of Haitian development strategies. In practical terms, this means that: 1) specific development objectives during the mid-term and long-term recovery be identified by Haitians and Haitian institutions, and 2) given limited resources and significant needs, growth in Haitian science capacity be focused on those scientific fields most relevant to national development objectives.

2. *Invest in science education, research, and technological innovation to generate sustainable development and prosperity for Haiti.*

There is compelling evidence from throughout the developing world that building science and technology capacity is a prerequisite for sustainable development, economic growth, and job creation (see for example Watson et al. 2003; Juma and Yee-Cheong 2005; Murenzi 2009). For Haiti, building science capacity will require increasing annual expenditures on science education, research, and technological innovation. These investments must be targeted to build long-term capacity, generate sustainable development, engage traditionally marginalized groups, and transform Haiti into a knowledge-based society. National strategic plans, recovery planning, and investment strategies must set science and science education as priorities. To do so, it will be essential that the Haitian government establish a national science and technology policy, and apply this policy to its investment decisions.

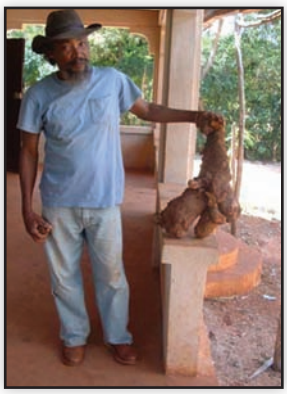
3. *Develop Haitian scientific capacity and expertise to promote scientific management and sustainability of Haiti's natural resources.*

Haiti's natural resources reflect an environment under extreme stress, with severely degraded landscapes, declining forest cover, impaired water quality, accelerating biodiversity loss, significant soil erosion, and severely disrupted ecosystem services. Yet sustainable, science-based management of Haiti's natural resources is a key element of mid- and long-term economic development. For example, healthy forests support clean water resources and improved animal and human health, both prerequisites of prosperity and progress. It is therefore essential that Haiti develop targeted scientific capacity and expertise in scientific fields such as agronomy, fisheries, environmental science, forestry, hydrology, remote sensing and related geographical sciences, soil science, conservation biology, animal husbandry, and other relevant disciplines. Critical capacities include teaching infrastructure, research facilities (field stations and laboratories), geospatial technologies for inventory and monitoring, research administration, database and project management, and library resources. Necessary expertise includes skills in research (both field studies and laboratory work), adaptive management (where scientific findings drive resource decision-making with results feeding additional research), technology transfer, and resource sciences education.

4. *Support existing scientific and educational organizations and institutions, and if needed, establish new ones to promote the role of science in Haitian society.*

Haiti's existing scientific and educational organizations are primarily located within higher education institutions, and Haitian higher education is fragmented, largely unregulated, varied in quality, with state and private institutions competing for limited resources. Several reports, such as that by the Interuniversity Institute for Research and Development in 2010 and the report being finalized by the Presidential Commission on Higher Education, have identified numerous challenges facing higher education in Haiti. It is essential that scientific training and research opportunities be integrated into higher education reform at the local, regional, and national level. In addition, there is a compelling need for new institutions to help advance science capacity in Haiti; these include both a national level body to help guide science and technology policy, and a professional society for Haitian scientists to develop collaborative relationships, share information, provide recognition, and advance the agenda of citizen-scientists within the country.





5. *Promote the integration of Haitian science and scientists into the global scientific community, for the benefit of Haiti and the world.*

Twenty-first century science is globally connected science. For Haitian science to advance and Haitian scientists to flourish, connections with the international scientific community must be strengthened, expanded, and sustained. Integration can range from access to electronic libraries and databases, to scientific exchanges, participation in international scientific meetings, and collaborative research projects and programs. This is more than simply bringing the Haitian scientific community into increased contact with international colleagues; integration includes active engagement of the Haitian diaspora, sustained collaborative research conducted in Haiti, and leveraging international funding to develop mid- and long-term research opportunities for Haitian scientists and graduate students. Importantly, the benefits of connecting Haitian scientists to the global scientific community flow to both communities, and Haitian science stands to contribute (particularly in fields specific to Haitian needs) to general scientific progress.

6. *Increase the connection of science to broader Haitian society through formal and informal education, so that all Haitian citizens have knowledge and understanding of science and its uses.*

As with other developing nations, science in Haiti cannot advance effectively if isolated and independent of the broader Haitian society. The challenges of disaster preparedness and mitigation, environmental stress, reconstruction, and restoration all require science to connect with the lives of Haitian citizens. Knowledge of basic earth science, sustainable resources use, medical response, water and waste management are all more than science literacy—they are civic engagement and survival skills. Science plays an integral role in the protection of human rights, by providing information, technology, and guidance on rights related to: 1) physical security and integrity, 2) basic necessities of life, 3) economic, social

and cultural needs, and 4) civil and political protection needs (Wyndham 2010). Science education—both formal and informal—can empower citizens, increase community engagement, support social development, and help create new economic opportunities for the Haitian people.

7. *Educate Haiti's leaders in government, business, religion, and culture, so that they better understand and value the role of science in Haiti's economic and cultural development.*

While advancing science is critical to Haiti's sustainable development and long-term future, this does not mean Haitian leaders fully understand its important role. A concerted and organized effort to explain the need for and advantages of investing in science capacity is an important strategy for advancing science within Haitian society. This includes not only leaders in government, but those in business, religion, and culture. The delivery may vary depending upon the leader (from personal appeals to targeted educational materials); Haitian scientists should be engaged in this effort. The message must be clear and concise: science is vital to Haiti's economic and cultural development.

These seven strategic goals provide a vision statement for the role of science in Haiti's development, and can serve as an organizing framework for specific policy and action proposals. In the following sections, specific recommendations developed during the workshops are presented. Each recommendation is linked to one or more of the strategic goals, and presented (not in any priority order) as developed by the workshop participants.

Recommendations for Advancing Science Capacity

As described earlier in this report, advancing science capacity in Haiti is a necessary foundation for sustainable development and economic prosperity. Workshop participants considered a wide range of policy and action proposals, and focused on those efforts that would have long-term value to the Haitian scientific community and the nation. These initiatives include broad but essential policy efforts, such as establishing a national science and technology policy; conducting specific human capital studies, such as inventories of existing and/or needed expertise; and developing creative approaches to increase recognition of science within Haitian society, including national awards for outstanding Haitian scientists and science students. Each recommendation is linked to specific strategic goals for advancing science and science education capacity in Haiti.

1. Establish a Haitian national policy to promote the growth, development and support of Haitian science capacity as an integral element of social and economic development *(Goals 1, 2, and 7)*.
2. Strengthen the relationship between the Haitian scientific community, Haitian universities, and the private sector to advance science, technology, and innovation *(Goals 1, 2, and 7)*.
3. Inventory current scientific expertise and competencies in Haiti, as well as within the Haitian diaspora, and use this inventory to guide collaborative scientific activities and educational planning *(Goals 1 and 5)*.
4. Conduct a national survey of future public and private sector manpower needs in science and technology, to provide guidance in the development of university science curricula and programs *(Goals 1, 2, and 6)*.
5. Increase the number of Haitian scientists in key disciplines, in order to create a "critical mass" for these disciplines to advance within Haiti *(Goals 1, 2, and 3)*.
6. Establish internationally funded, multi-year research programs in key disciplines that enable Haitian scientists and international colleagues to conduct collaborative research in Haiti, create career opportunities for Haitian scientists, and support Haitian graduate students *(Goals 1, 3, and 5)*.
7. Update and expand national inventories of key natural resources and land use in Haiti, and use this information to guide interdisciplinary research that advances sustainable resource management and development *(Goals 1 and 3)*.
8. Establish a Haitian national policy to promote and support international engagement of Haitian scientists and graduate students *(Goal 5)*.
9. Promote collaboration between Haitian and international scientists, and create programs that can assist scientists in identifying potential collaborators *(Goals 1 and 5)*.
10. Encourage and support the formation of Haitian professional societies to advance science capacity and professional development *(Goal 4)*.
11. Support and conduct research on the value and economic impact of science in Haiti, and share the results with Haitian leaders and policy makers *(Goals 1, 2, and 7)*.
12. Encourage key leaders in science, business, government, and culture from developed countries to communicate the importance of science to their Haitian counterparts *(Goal 7)*.

13. Engage members of the Haitian diaspora in collaborative science activities through the use of international programs such as the *Transfer of Knowledge Through Expatriate Nationals* of the United Nations Development Program *(Goals 1 and 5)*.
14. Create a network of regionally distributed extension institutes to advance technology transfer from the scientific community to local communities *(Goals 1, 2, 3, 4, and 6)*.
15. Encourage regional and international scientific meetings to be held in Haiti to promote engagement and collaboration with the Haitian scientific community *(Goal 5)*.
16. Increase access for Haitian scientists to international scientific journals and electronic databases *(Goals 2 and 5)*.
17. Establish national recognition awards for outstanding Haitian scientists and graduate students, and create regional and national science fairs (with prizes) to encourage youth interest and engagement in science *(Goals 2, 4, and 6)*.

Recommendations for Advancing Science Education Capacity

Advancing science capacity in Haiti requires a substantial long-term commitment to and investment in education. Workshop participants emphasized the importance of education to the future development, governance, and sustainability of Haiti. They stressed that science education, using formal and informal approaches, is needed at all levels of society – preschool, K-13, higher education, and adult learners – for Haiti to emerge as a modern society.

Rebuilding and recovery efforts underway in Haiti provide extraordinary opportunities to advance science education. As Maguire notes, "Haitians have demonstrated time and again…how they are *swaf* (thirsty) for education" (Maguire 2010). In collaboration with the Haitian scientific community, the international community and the Haitian diaspora, these opportunities range from constructing regional "learning laboratories" and community gathering places to training more teachers and faculty to provide quality science instruction. Participants in the working groups dealing with science education developed policy and action recommendations during the workshops. Each recommendation is linked to specific strategic goals for advancing science education capacity in Haiti.

1. Target educational opportunities to three distinct audiences – preschool and K-13, higher education, and adult learners *(Goals 2, 6, and 7)*.
2. Make higher education a Haitian national priority and allocate more resources to support science in higher education *(Goals 1, 2, 3, and 5)*.

3. Make science education a priority of the proposed National Council of Higher Education and Research *(Goals 2 and 4)*.
4. Meet the nutrition, wellness, and security needs of Haitian students (from preschool through university) so they can learn effectively, including science *(Goals 2, 6, and 7)*.
5. Hire and train additional teachers to meet the need to provide quality instruction for science education, and recruit retired teachers in Haiti and from the Haitian diaspora to assist *(Goals 2 and 4)*.
6. Update textbooks and materials for teaching science *(Goals 2, 3, 4, and 5)*.
7. Develop selected curriculum materials in Creole to expand the reach of science education in preschool and K-13 *(Goals 2, 3, and 6)*.
8. Establish national recognition awards for excellence in science teaching *(Goals 2, 4, and 6)*.
9. Provide spaces for community activities in the design of new and rebuilt schools and universities, and creatively use existing schools to engage parents and children in formal and informal learning, including science *(Goal 6)*.
10. Incorporate renewable energy design in rebuilt schools, use this feature for science education, and provide hands-on activities related to the environment *(Goals 2, 3, and 6)*.
11. Increase involvement of Haitian scientists and scientific associations with schools and the community *(Goals 4 and 6)*.
12. Create opportunities for students who excel in science to enhance their education, including internships with universities, the private sector, and government *(Goals 2 and 4)*.
13. Create opportunities that specifically encourage girls and young women to become interested in science and science education *(Goals 2, 5, and 6)*.
14. Establish regional laboratories to serve multiple schools as an interim step towards providing every school with access to a scientific laboratory, and ensure that classrooms and laboratories contain adequate equipment and materials to support teaching of science *(Goal 2)*.
15. Develop programming to educate the public about science through radio, TV, Internet and other popular forms of communication *(Goals 2 and 6)*.

Recommendations for Advancing Science Governance Capacity

For science and science education in Haiti to advance, there is a critical need for sound supporting governance. This includes clear and constructive science policies (and where necessary, rules and procedures), effective governing bodies, well-supported institutions of higher education and research, and organizations to provide Haitian scientists with research opportunities, scientific interchange, and recognition. Participants in the working groups dealing with science governance insisted on the need for the Haitian government to increase its level of support for science and science education, and urged the international scientific community to provide encouragement and assistance in developing "good governance" institutions for science. Each recommendation is linked to specific strategic goals for advancing science governance capacity in Haiti.

1. Establish a national science, technology, and innovation (STI) policy which will lead to the creation of a new legal framework for governing and promoting science, science education, research and innovation *(Goals 1-7)*.
2. Establish an independent Haitian Academy of Science to inform and advise STI policy *(Goals 4, 5, and 7)*.
3. Assign the responsibility for development of a national science agenda for Haiti to an existing and/or emerging national institution, such as the proposed National Council of Higher Education and Research *(Goals 1 and 4)*.
4. Establish a National Council of Higher Education and Research (CONAESR) with leadership sensitive to science, technology and innovation *(Goals 1, 2, 3, and 7)*.
5. Assign CONAESR the responsibility to establish standards and accreditation for higher education *(Goals 1, 2, and 3)*.
6. Establish a system of accreditation that can be used to improve the quality of schools, and enforce established and new quality control standards *(Goals 2 and 4)*.
7. Create a new national scientific institution for medical, biophysical, and socioeconomic disciplines, with the responsibility for distributing/managing research funding and promoting research and technology transfer in Haiti *(Goals 1, 2, and 4)*.
8. Update current needs assessments on science infrastructure as a guide to reconstruction *(Goals 3 and 4)*.
9. Appropriately rebuild science and science education infrastructures *(Goals 1 and 2)*.

10. Install integrated information systems to assist higher education administration *(Goal 2)*.
11. Strengthen relationships among the Haitian diaspora and scientists in Haiti *(Goals 1, 4, 5, and 6)*.

Conclusion

Haiti is at a crossroads. The January 2010 earthquake that devastated the nation has resulted in an unprecedented set of social, political, environmental, and economic challenges. Emergency relief operations (particularly shelter and health services) continue while mid-term reconstruction and long-term planning have started. Haitian civil institutions are slowly re-emerging, and in-country relief organizations are active throughout much of the country. The international community has and continues to respond with relief aid, technical expertise, and proposals for Haiti's future.

Science can and must play an integral role in the rebuilding, recovery, and progress of Haiti as a nation. Hence, advancing Haitian science and science education capacity is an essential element of Haitian social and economic development. *Science for Haiti*, developed by a collaboration of Haitian and international scientists, provides an initial "road map" for progress, identifying key strategic goals and specific recommendations for action.

Rather than an isolated or independent activity, the task of increasing science capacity must be integrated into the full range of local, regional, and national efforts to rebuild Haiti. The strategies and proposals in *Science for Haiti* provide the Haitian government and educational institutions, the international aid and donor community, Haitian and international scientists, and others with a carefully developed list of ambitious goals and practical actions for advancing the science capacity. Progress is a shared responsibility and collective opportunity, as science contributes to the future of Haiti and its people.

Progress is a shared responsibility and collective opportunity, as science contributes to the future of Haiti and its people.

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APPENDIX I. Selected Plans and Proposals for Post-Earthquake Recovery

Name of Report	Source	Date
The 12 January 2010 Haiti Earthquake: Emerging Research Needs and Opportunities	US Earthquake Engineering Research Institute	2010
A Voice for the Voiceless	United Nations Development Programme	2010
Action Plan for National Recovery and Development of Haiti: Immediate Key Initiatives for the Future	Government of the Republic of Haiti	2010
Anticipating the Future: Children and Young People's Voices in Haiti's Post Disaster Needs Assessment (PDNA)	Plan International and United Nations Children's Fund (UNICEF)	2010
Building a More Resilient Haitian State	RAND Corporation	Undated
The Challenge for Haitian Higher Education	Interuniversity Institute for Research and Development (INURED)	2010
The Challenge of Economic Reconstruction in Haiti: Integrated Strategic Framework for the Short, Medium, and Long Term	Republic of Haiti Ministry of Economy and Finance	2010
Children of Haiti: Milestones and Looking Forward at Six Months	United Nations Children's Fund (UNICEF)	2010
Education and Conflict in Haiti	United States Institute of Peace	2010
Ensuring Haitian Women's Participation and Leadership in All Stages of National Relief and Reconstruction	Women's UN Report Network	Undated
European Conference for Development NGOs on the Reconstruction of Haiti	European Commission for Development	2010
GEO Haiti 2010 State of the Environment Report 2010	United Nations Environmental Programme	2010
Global Leadership for Haiti's Reconstruction	Club de Madrid	2010
Haiti After the Earthquake	Progressio (United Kingdom)	2010
Haiti at a Crossroads	US Senate Foreign Relations Committee	2010
Haiti Earthquake Post Disaster Needs Assessment: Assessment of Damage, Losses, General and Sectoral Needs	Government of the Republic of Haiti	2010
Haiti Earthquake Reconstruction: Knowledge Notes from DRM Global Expert Team for the Government of Haiti	The World Bank, The Government of Haiti, and Global Facility for Disaster Reduction and Recovery	Undated
Haiti Earthquake: Breaking New Ground in the Humanitarian Information Landscape	US Department of State Humanitarian Information Unit	2010
Haiti Earthquake: Crisis and Response	US Congressional Research Service	2010
Haiti Reconstruction Fund	Government of the Republic of Haiti	Undated

APPENDIX I (continued). Selected Plans and Proposals for Post-Earthquake Recovery

Name of Report	Source	Date
Haiti: From Natural Catastrophe to Economic Security	UN Office of the Special Envoy for Haiti	2010
Haiti: Stabilisation and Reconstruction After the Quake	International Crisis Group	2010
Haitian Diaspora Forum: Contributing to a Strategic Plan for Reconstruction and Development in Haiti	Haitian Diaspora and Organization of American States (OAS)	2010
Helping Haiti Rebuild its AIDS Response	Joint United Nations Programme on HIV/AIDS (UNAIDS)	2010
Helping to Rebuild Haiti: Report on Relief Efforts to Date	US Direct Relief International	Undated
How Science, Engineering can Inform Haiti's Reconstruction: Key Findings to Rebuild Haiti, March 31 International Donors' Conference	US Department of State	2010
The Impact of U.S. Food Aid on Human Rights in Haiti	Center for Human Rights and Global Justice (CHR&GJ), Global Justice Clinic (GJC), Partners in Health (PIH), Robert F Kennedy Center for Justice & Human Rights (RFK Center)	Undated
Planting Now: Agricultural Challenges and Opportunities for Haiti's Reconstruction	Oxfam	2010
Rapid Environmental Impact Assessment: Haiti Earthquake – January 12, 2010	United States Agency for International Development (USAID)	2010
Rebuilding for Resilience: How Science and Engineering can Inform Haiti's Reconstruction	UN International Strategy for Disaster Reduction	Undated
The Reconstruction of Haiti: Taking Stock of the Situation on the Ground: MINUSTAH's Role in the International Response after the Earthquake in Haiti	UN Stabilization Mission in Haiti (MINUSTAH)	2010
Report of the Secretary-General on the UN Stabilization Mission in Haiti	UN Security Council	2010
Support for Educational Reform in Haiti	Haitian Presidential Commission on Education and Inter-American Development Bank (IDB)	2010
Transcending the Past to Build Haiti's Future	United States Institute of Peace	2010
Trustee Report on the Financial Status of the Haiti Reconstruction Fund (HRF)	The World Bank	2010
USAID, NSF, and Science and Technology in Haiti	United States Agency for International Development (USAID), US National Science Foundation (NSF)	2010

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Appendix III. Selected Organizations Currently Involved in Advancing Science and Science Education in Haiti

HAITIAN

Ministry of Education
Presidential Commission on Education (GTEF)
Presidential Commission on ICT (GTIC)
Université d'Etat d'Haïti (UEH)*
Université Notre Dame d'Haïti (UNDH)*
Université Caraïbe (UNICAR)*
Université Quisqueya*
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Centers GHESKIO
Institut de la Fracophonie pour la Gestion dans la Caraibe (IFGCar)
Centre National de l'Information Géo-Spatiale (CNIGS)
Zanmi Lasante

INTERNATIONAL (UNITED NATIONS)

Transfer of Knowledge Through Expatriate Nationals (TOKTEN) Initiative (UNDP)

INTERNATIONAL (FRANCE)

Agence Inter-établissements de recherché pour le développement (AIRD)
AUF (Agence Universitaire de la Francophonie)

INTERNATIONAL (USA)

US Agency for International Development (USAID)
American Association for the Advancement of Science (AAAS)
Association of American Geographers (AAG)
Partners in Health

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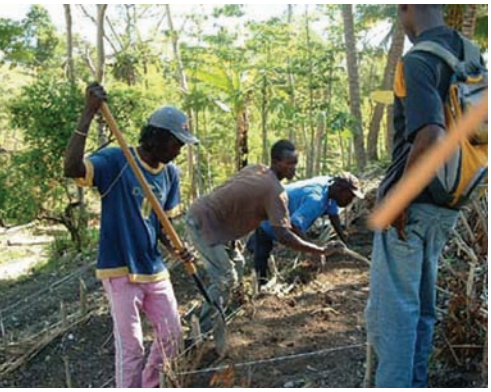

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