

Youth and Humanitarian Action: Open Mapping Partnerships for Disaster Response and the SDGs

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Abstract

Use of data and digital technologies has dramatically changed the look, feel, and efficacy of humanitarian action over the past decade. Partnerships among data producers and data users in all sectors have increased access to and sharing of data across agencies and responders, and thus amplified the impact of youth in this domain. At the heart of those partnerships are young people, often university students, especially those who make up the YouthMappers network. Our close partnership between YouthMappers and the Humanitarian OpenStreetMap Team has not only advanced the global goals for disaster response and for development in their future workplaces and innovations, but also for global goals to enable better alliances across public, private, and nonprofit partnerships.

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1 The Need for Digital Mapping in Humanitarian Response

In disasters, crises, and other complex emergencies, humanitarian responders often need to answer a basic set of questions: where did the event occur, which people were affected and where, and what critical needs are emerging? Since the early years of international humanitarian action, answering these questions has required

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basic information on people and places to respond effectively and prioritize aid. This information often arrives in the form of a map.

Since the international response to the 2010 Haiti earthquake, these maps are increasingly derived from digital map data, based on the world's free and open map source, OpenStreetMap (OSM). The organization providing tools that enable the creation of this base map data, and provide it to the humanitarian community is the Humanitarian OpenStreetMap Team (HOT).

2 Early Precedents for Student Engagement in "Crisis" Mapping

In January 2010, Patrick Meier launched the Ushahidi Crisis Map for Haiti. In February that same year, the Ushahidi Crisis Map for Chile was launched after a severe earthquake off the coast. University students at the Tufts University Fletcher School and Columbia's School of International and Public Affairs formed the backbone of what was then called "crisis mapping." At the time, Meier (2010) imagined a network of students at 12 universities around the world. While this vision for mobilization advocated for honoring the incredible energy of youth around the world, the reality of systematically tapping this energy for the "near real time" needs of humanitarian action required investment and strategic design, not only within university systems but also across the landscape of agencies working together on disaster responses to effectively utilize that energy in real-world response contexts. Students work at an academic pace with class loads and exam schedules that may be at odds with the real-time rush of data needs during disasters. They need specialized training and interface support, especially in the face of consequential humanitarian decisions in the fast-moving professional space of humanitarian agencies. Still, the experiences of the early generation of Crisis Mappers made the first case for how universities could be key to the future of humanitarian action.

Over the past decade, use of data and digital technologies has dramatically changed the look, feel, and efficacy of humanitarian action – in ways that have benefited not only the communities served but also in ways that enable youth engagement. Partnerships between data producers and data users have made this possible, especially in increasing access to and sharing of data across agencies. The most successful partnerships that HOT has developed have nearly always involved students as data producers. At the heart of those partnerships with young people are often university students. Since 2014, when the network was launched, this has included students that make up the YouthMappers network.

3 HOT Partnerships Engaging YouthMappers Students

From the early days of OpenStreetMap it was anticipated that open, free map data would be a tremendous benefit for humanitarian aid and economic development. The idea was proven during the Haiti earthquake in 2010. HOT was incorporated in the immediate aftermath, in August 2010, as a U.S. nonprofit, and then became a registered 501(c)3 charitable organization in 2013. HOT is the main connecting point between humanitarian actors and open mapping communities, welcoming anyone to contribute to its mission in line with its code of conduct. The HOT community has grown exponentially and is made up of volunteers, local community leaders, and professionals committed to the mission of helping reach those in need through maps. This diverse group includes dedicated voting members, staff, contractors, volunteers, interns, and board members. And of course, students.

Often, a government agency working in public health, disaster or emergency management, or statistics will identify a data gap. Working in OpenStreetMap, HOT volunteers, including YouthMappers, use satellite imagery and their knowledge of specific locations to add knowledge to OpenStreetMap to fill that gap. During disasters and crises, data produced by

YouthMappers and other volunteers in OpenStreetMap in the morning is exported by HOT to the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) Humanitarian Data Exchange later that same day. This partnership makes young people a critical component of disaster and emergency response.

3.1 Data to Inform Both Humanitarian Action and the SDGs

Data created for immediate disaster needs are also used long beyond an immediate response effort into early recovery and towards the achievement of the SDGs. Today, open mapping has become a global movement to create free and open geographic data for impact. The movement relies on a complex ecosystem of partnerships across government, civil society, academia, and the private sector, which come together to collaboratively create this critical data resource for the SDGs – involving many of the same organizations as response teams.

Data created through open mapping supports monitoring SDG progress by making available fundamental, detailed, and timely information on the natural and built environment, including facilities, services, infrastructure, human settlements, and land use. The process through which data is produced, which often includes partnering with young people, involving women and girls in acquiring marketable technology skills, and directly engaging disaster survivors and those experiencing multidimensional poverty helps, in itself, to advance SDG targets such as those related to employment, gender equality, and disaster resilience.

Furthermore, open mapping is transforming how governments and citizens – often youth – can collaborate by allowing them to co-create and support critical government functions through maps and data. Free and open digital tools with low barriers to entry enable almost anyone with geographic knowledge, whether an individual

enthusiast or a professional from a public or private sector institution, to contribute map data. The community openly designs schemas for mapping features as they are encountered in the world, develops new workflows and applications to contribute as technology advances, applies spatial data for an ever-growing array of uses, and supports and advocates for a growing, open collaboration across sectors.

3.2 Relationships to Enhance Citizen Generated Data in Vulnerable Places

The open mapping community is one that cares deeply about the quality and use of geographic data and includes people from all parts of society and across the globe, from experts in geospatial technologies to those in their own neighborhoods. It is hugely powerful for people from around the globe to work in the same database. To date, more than 8 million people are registered on OpenStreetMap, and approximately 50,000–60,000 make contributions – in the form of edits – during any given month.

This collaborative approach has been phenomenally successful at creating maps in under-mapped and under-served places, addressing critical needs, as seen in responses ranging from the Nepal earthquake and flooding in Bangladesh to mapping local schools and health care services in informal settlements. Through excellence in (open) data, many OpenStreetMap participants have gone on to become more engaged citizens. As confirmed by Lämmerhirt et al. (2018), as valuable as data itself may be, how open data seeds new relationships and becomes the center of partnerships is critical for joint action: “Citizen Generated Data initiatives open up new types of relationships between individuals, civil society and public institutions. This includes local development and educational programmes, community outreach, and collaborative strategies for monitoring, auditing, planning and decision-making.”

4 Cases of HOT Partnerships Engaging YouthMappers Students

This chapter explores real-world cases in which partnerships facilitated by HOT among government, humanitarian agencies, and YouthMappers were not only beneficial to meet the immediate purpose of the data but also resulted in supporting a foundational data framework necessary for long-term systemic change that will ultimately enable achievement of the SDGs.

In these examples, we contemplate the unique barriers, challenges, and struggles that humanitarian action entails – especially such action that engages youth. We reflect upon the unique commitments that both HOT and YouthMappers innovated in order to overcome or simply acknowledge them as learning opportunities. In many ways, this is an ongoing experiment in order to tangibly realize the vision that many within the open mapping community have long held about tapping into the talents and energy of students – doing so in ways that meet the humanitarian needs of local communities and the agencies that serve them in disaster contexts. As such, the idea that youth already comprise part of the communities where they live, where humanitarian action is needed, needs to constantly be balanced with the idea that youth can be responders and partners within the humanitarian realm, alongside agencies. This remains an ongoing point for reflection and future innovation around both disaster response and the SDGs. The following cases share our experiences together with mapping for critical infrastructure in Indonesia, urban flooding in Tanzania, malaria elimination across sub-Saharan Africa, and disaster preparedness in Peru.

4.1 Indonesia: Supporting Disaster Risk Management and Contingency Planning

Humanitarian OpenStreetMap Team (HOT) began activities in Indonesia in 2012 in collaboration with the local Disaster Management Agency (BPBD) DKI Jakarta under the Jakarta

Mapping Program. This program aimed to map critical infrastructure to support flood contingency planning, and was funded by Australian Aid (AusAID) through the Australia-Indonesia Facility for Disaster Reduction (AIFDR). As part of that program, HOT started its first university engagement with the Geography Department of the University of Indonesia. Students were taught about OpenStreetMap and how to contribute to it through a program where they worked with village representatives to add critical infrastructure location and information as part of a flood contingency planning assessment in Jakarta. In three months, they completely mapped the area. Along with newer OSM users registered from the university students, contributions from universities have steadily been increasing through today.

Since the successful collaboration with the university in mapping Jakarta, HOT and Perkumpulan OpenStreetMap Indonesia (POI), a national partner of HOT in the country, have been involving local universities in most activities. Moreover, academic institutions have become one of the main partners of HOT and POI in establishing and building OSM communities in the country. The involvement of universities in HOT and POI programs has covered various activities from data collection, capacity building, data quality assurance, community engagement, and technology innovation.

In the latter part of the decade, additional disaster management projects in Indonesia continued to demonstrate the importance of university and student participation. Starting in 2016, the United States Agency for International Development (USAID) funded the Pacific Disaster Center (PDC) and HOT under the InAWARE project which focused on collecting critical lifeline infrastructure in three of Indonesia's major metropolitan areas.

The first phase of the project ran from 2016 to 2018 to map three cities: Surabaya, Jakarta, and Semarang. The data from the mapping activity was uploaded into OSM and also integrated into InAWARE, a disaster monitoring platform created by PDC, and used by the National Disaster Management Agency (BNPB) to monitor and create the disaster management policy in priority

areas. When conducting the mapping activity, HOT and POI collaborated with local universities in each city to conduct mapathons, mapping events where the participants remotely map the priority areas together at the same period of time, with the aim to complement initial data on building footprints and existing roads. Moreover, when conducting field surveys, HOT Indonesia worked together with some of the students to collect information from priority facilities and critical infrastructure. Their local knowledge and a better understanding of the mapping area contributed significantly to the accuracy and detail of the collected data.

Furthermore, students from the University of Gadjah Mada exchanged knowledge and methods with visiting student YouthMappers from co-founding university Texas Tech University around the HOT tasks to map areas around Mount Sinabung together, an active stratovolcano in Indonesia's North Sumatra Province. USAID GeoCenter and the Office of Foreign Disaster Assistance were working to improve existing infrastructure data in the area; particularly build-

ings, roads, and inland water features (Ituarte-Arreola and Thomas 2017). These features were important as they depict areas subject to volcanic and seismic activity which can be catastrophic in neighboring villages.

After mapping each city, the project aimed to transfer the knowledge from HOT and POI to the local community including universities not only in the priority cities that HOT mapped but also in other areas in the country. Several activities were conducted such as mapping and data collection workshops, public webinars, and mapping design competition. These activities aimed not only to develop the capacity of the participants but also to make sure they could contribute to wider society (Figs. 31.1 and 31.2).

In 2021, HOT, through POI, extended their collaboration with universities through the University Roadshow Program, a collaboration with Amazon Web Services (AWS), to promote digital information technologies including open digital mapping to university students, as well as to map poorly mapped areas in Indonesia. This initiative emerged from the fact that there are



Fig. 31.1 Geography students at Semarang State University work with HOT Indonesia to build capacity and engagement

Fig. 31.2 Students in Yogyakarta participate in a mapathon to trace building data for tasks around Mount Sinabung, an active stratovolcano in Indonesia's North Sumatra Province, for USAID GeoCenter and the Office of Foreign Disaster Assistance. (Credit: J. Ituarte-Arreola and R. Thomas, Texas Tech University)



many areas in the country that had still not been mapped, particularly those whose location falls outside Java and Bali islands. The program has two main activities which are training and a mapping competition. Students map their local area, while POI promotes digital information technologies including OSM to the academic institutions and builds relationships for future collaboration in disaster management. These activities are focused on mapping the highest disaster risk areas, particularly in Sumatra and Kalimantan islands where the availability of exposure data is still low.

There are several ways in which universities – and YouthMappers students – have become centered in disaster management projects in Indonesia with the support of HOT. First, effective disaster management relies upon timely data and technology innovations to make that data available to decision-makers. Universities are frequently compelled towards innovation and enlist relatively high engagement of students and faculty in activities that are urgent and cutting edge. Moreover, university students can be seen as flexible agents of change in communities that may otherwise be resistant to new tools. Students are perceived to be keen to learn new technologies which not only could help them thrive but also make a contribution to society on large scale. While in reality, they may need guidance, their eagerness to learn and apply new technology bodes well for introducing tools such as open mapping.

The retention rate of university students is relatively high in the context of contribution to mapping. Students participate not because they are paid to do so but because they want to do so as a voluntary act – they seek meaningful applications of what they are learning. In HOT projects, students are likely to continue to map in OSM even when the projects they were involved with are finished. Thus, even if not all students continue, more student mappers lead to more volunteer contributors in the long run. Their contributions on the whole are relatively sustainable for long-term partnerships. Although individuals may leave when they graduate, the chapter-based structure of YouthMappers as a group activity encourages the long-term engagement of students in HOT projects.

Lastly, data generated from the collaboration can produce practical products in various forms such as digital maps, infographics, pilot project learnings, and research to analyze and solve many development challenges and problems. These often end up becoming an inspiration for student theses or dissertations – serving both to expand formal knowledge but also apply to the needs for knowledge of local organizations that are created from the data.

The more that HOT and POI collaborate with universities, the more we realize that there are some things that need to be improved in the future such as creating long-lasting partnerships. Most HOT and POI partnerships with universi-

ties rely on particular donor-funded projects to sustain mapping efforts in a geographic area. Thus, after the project is completed, frequently the partnership struggles to find resources to keep going. Therefore, an emerging practice is to follow up collaboration by establishing Memoranda of Understanding (MoU) with universities instead of particular individuals (or the chapter groups) to formalize and hopefully solidify long term partnerships to make programs more sustainable and regularized as well as provide more opportunities for university students to be involved and contribute in future cohorts.

Collaboration with university students and YouthMappers chapters has been expanding to support the government, particularly the National Disaster Management Agency (BNPB) and the local disaster management agency (BPBD), in several areas from remote mapping, to field survey and technical support. YouthMappers sponsored a Regional Ambassador to support this and other work with HOT in Indonesia to build upon these experiences. This collaboration can reduce the dependency of the government on HOT and POI and instead build and activate the resources of the community youth in local areas.

4.2 Tanzania: Flood Resilience Through Open Map Data

Using OpenStreetMap to enable community mapping in Dar es Salaam has its roots in a 2011 pilot project in the Tandale ward, known as “Ramani Tandale.” The project demonstrated that a few dedicated individuals – including university students and Tandale community members – could generate and manage data about their community well beyond what was previously available to any “expert” inside or outside Tanzania. It was unclear at the time what the future would bring. With Africa being the fastest urbanizing continent on earth, and Dar es Salaam its fastest-growing city, new and innovative partnerships would be needed for urban planning and disaster management data to keep pace.

The kick-off of the Dar Ramani Huria (meaning “open mapping” in Swahili) project took

place in early 2015. Over the years, Ramani Huria has been groundbreaking in many ways. It has expanded on the Tandale pilot to include more than 1000 dedicated university students and over 3000 community members not at a cursory level, but truly relying upon their skills to carry out the mapping process. The project has moved from mapping one ward to comprehensively mapping 78 out of 95 wards by 2020 and covering an area home to an estimated 4 million people. It has incorporated Unmanned Aerial Vehicles (UAVs), a street-view mapping bajaj (tricycle / tuk tuk), and Real-Time Kinematics (RTK) to increase mapping precision. It is the largest and most complex urban mapping project in East Africa while being driven almost entirely by students including from YouthMappers chapters, and community members serving as HOT staff and volunteers (Dar Ramani Huria 2018).

Each team member’s desire to put the city or neighborhood they call home “on the map” was multifaceted. One important, yet little-publicized motivating factor was that several HOT team members and YouthMappers students in Tanzania are disaster survivors themselves, having been severely affected by flooding in their own homes. Working to map their city was a powerful way to make the invisible visible and contribute real data for government-led urban planning and disaster management. Dar Ramani Huria not only generated near real-time, comprehensive, and detailed flood data and maps. It also transformed residents from victims of disaster to survivors having the capacity and ability to advocate for and effect positive social change.

Moving forward, an incredible wealth of data now exists in some of the previously least-mapped areas in the country. This data has incredible potential to be used not only for improved urban planning and disaster risk reduction but also to contribute to achieving some of the Sustainable Development Goals. Each day, Dar Ramani Huria team members work to update OSM with water, sanitation, and hygiene-related map features and add data for more sectors, such as bicycle routes and other sustainable transportation.

To date, HOT, in collaboration with its local partner OpenMap Development Tanzania (OMDTZ), has engaged a total of six universities in projects and mapping activities that have contributed greatly to OSM. Through these collaborations, YouthMappers chapters have been formed and some that were inactive have been revived to rejuvenate the continual coming and going of students. Most of these partnerships, however, rely on projects that are being implemented in a specific region and the consent or readiness of a university to work with HOT. They wrestle with the natural cycle of student life – graduating and renewing participation – but as alumni leave the university, they assume at best a place for ongoing support, and at least a knowledgeable citizen about the power of mapping.

Through microgrant programs, more YouthMappers chapters have been provided with funds to conduct projects that are solving issues in their communities while also contributing to OSM. This has proven to be an effective way to keep chapters churning and act as a catalyst to have more contributors on the map – during and beyond their studies. The Ramani Huria project not only engaged university students as part of their student internship and industrial training, but it also increased students' knowledge of open-source technology and increased the students' marketability for employment.

4.3 Malaria Elimination Mapping Campaign

Malaria is a preventable and treatable infectious disease transmitted by mosquitoes that kills more than one million people each year, most of them in sub-Saharan Africa, where malaria is the leading cause of death for children under five. According to the World Malaria Report (WHO 2020), in 2019 alone, there were 229 million new cases of malaria and 409,000 deaths. One child dies from malaria every two minutes. Because malaria is a global emergency that affects mostly poor women and children, malaria perpetuates a vicious cycle of poverty in the developing world.

Malaria related-illnesses and mortality cost Africa's economy USD 12 billion per year.

To combat the spread and occurrence of malaria, one needs to disrupt the transmission cycle of malaria parasites. This can be done by preventing mosquito bites, reducing the number of mosquitos, and by decreasing the prevalence rate of malaria parasites in both mosquitos and people. Aside from trying not to get bitten, this can be accomplished by interventions such as Indoor Residual Spraying (IRS), bed net distribution, and enabling better and faster diagnosis and treatment. All of these interventions imply knowing *where* transmissions are happening.

In 2016 and 2017, the HOT community, in partnership with Maxar (then DigitalGlobe), mapped an area of interest covering over 560,000 square kilometers in Southern Africa (Botswana, Zambia, Zimbabwe), Southeast Asia (Cambodia, Laos), and Central America (Guatemala, Honduras) to support the Clinton Health Access Initiative (CHAI) Malaria Program and Program for Appropriate Technology in Health (PATH) Visualize No Malaria campaign. In this partnership, Maxar provided satellite imagery, HOT coordinated volunteer contributors including YouthMappers, and CHAI supported government agencies in actually using the data in each country for IRS campaigns.

The first part of the mapping was remote mapping, where over 5000 mappers, mostly YouthMappers from different countries, were engaged in tracing over 3.6 million buildings from satellite imagery, resulting in information that is useful to know where people live. Volunteers from private sector organizations joined in by mapping remotely from offices in multiple countries. To engage the university students, online mapping competitions were organized, where the best mappers won individual prizes. There were also university prizes where the best universities for each month won prizes, which encouraged teamwork among the participants.

There were some challenges in engaging YouthMappers. Not everyone who wanted to participate had access to a computer and internet. Some of the participants had to share com-

puters and use them in turns. Also, most of them were full-time students and had to find time for the mapping activities in between attending to their studies. However, mapping was also a learning opportunity for many of them, as it was a new skill they were learning, and opened up new doors for them to explore the world of Geographic Information Systems (GIS) and open mapping. In some universities, HOT conducted training for students on GIS and mapping skills, to make sure students benefited more from the program, beyond just carrying out mapping.

To complement the remote mapping, and to make OSM data more useful, HOT worked with the Ministry of Health and Wellness staff in Botswana and the National Malaria Program (NMP) to enhance and expand on the available data in Botswana for use in Malaria interventions by conducting field surveys collecting information such as types/use of buildings, building and roofing materials and road conditions in six malaria-endemic regions in Botswana. This data was used in supporting malaria elimination interventions including IRS, bed net distribution, and enabling better (faster) diagnosis and treatment.

Using this data, spraying teams were able to get a full overview of the buildings they

needed to cover, especially those away from the known population and built-up areas, and plan for the needed supplies to cover all the residential buildings in the targeted areas. Though the primary use of the data was for the Malaria elimination campaign, the data is still openly available in OSM and can be used by other organizations including governments in different countries. In some cases, students also used the data for their own research as well. The YouthMappers program was able to leverage this joint HOT partnership as a model for future multi-country campaigns (Solís et al. 2018) (Fig. 31.3).

Through programs like this, and partnerships between governments, international organizations, the private sector, and volunteer groups like YouthMappers and HOT, youth in different countries are able to become active agents of change by providing data that is critical in solving big challenges like malaria that affect growth and development in their countries. They can share these experiences through global HOT teams and other chapters in the YouthMappers network. Using technology to decentralize humanitarian and development work ensures local ownership and impact but also promises to extend those impacts to become global in reach.

Fig. 31.3 Health workers spray for mosquitos outside a building in Botswana to prevent the spread of malaria, utilizing OpenStreetMap data on buildings and roads. (Credit: N. de Gier, PMI AIRS)



4.4 Peru: Collaboration Among Government, Academia, and the Regional Group of Earth Observations (AmeriGEO)

Engaging local students in community events and cross-sector collaborations has been critical in capturing local knowledge and ensuring participants understand local challenges for disaster preparedness. For example, in June 2021, HOT participated in an engagement with AmeriGEO (a consortium of Earth Observation government agencies on the continent), where CONIDA and CENEPRED organized a mapathon event to celebrate the bicentennial of Peru's independence. This focused on showcasing and democratizing local capabilities for Earth Observation through Peru's National Satellite. By convening a diverse group of over 150 students, local government representatives, and GIS professionals, and providing access to recent satellite imagery, valuable open data was created and used to generate products such as risk management tools and maps that could help in disaster preparedness and policymaking.

Education programs in the Americas region have seen a recent uptake of GIS courses and constant updates on new available technologies. As student mappers graduate, they integrate as professionals into the workforce of their countries and positions within public administration that will allow them to access state-of-the-art technologies to improve their decision-making processes. Early introduction to open data projects like OpenStreetMap through HOT events and YouthMappers chapters have enabled them to have a wider set of tools at their disposal to support their agencies in meeting and monitoring the SDGs.

With all volunteering initiatives, a leader or group of leaders to take ownership and drive an initiative forward and develop a strong value proposition or reason for volunteers to engage is critical. In 2019, HOT's Women Connect project (in partnership with YouthMappers and supported by USAID) founded the first formal official Peruvian YouthMappers chapter at UNSAAC

university in Cusco. During the COVID-19 pandemic, HOT and GAL Group supported public health officials at all levels of government to plan how to support communities by mapping rural and vulnerable populations in the Cusco region (Firth 2021). Students supported the mapping of large projects to generate critical geospatial data at scale, and also used OSM data in their Masters projects for mapping investigations into challenges including solid waste management, sustainable transport (bicycles), agriculture and irrigation, and access to labor markets for people with physical disabilities.

5 Looking Forward: Youth Leading on Sustainable Action in Their Communities Towards the SDGs

Looking ahead, we will continue to innovate around the unique role of youth for the SDGs that the arena for humanitarian mapping presents. The unique, urgent character of disaster response urges innovation, which in turn attracts and benefits from student involvement as seen by the examples of HOT and YouthMappers joint experiences to date. Beyond continuing to advance such areas of fruitful action across the current established stakeholders and processes, we envision that in the future, we will amplify these partnerships in ways that help us respond better. To this end, private sector corporations that prioritize youth action have become an important ally in partnering for the SDGs. HOT has supported more than 25 corporate organizations to participate in mapping as a virtual volunteering opportunity, many supported the remote mapping of places most at risk during the Covid-19 response activation.

Youth skills development is a priority for many private sector organizations and a focus of their Corporate Social Responsibility strategies, given their interest in cultivating talent for future workforce pipelines. We are excited to go deeper and further than virtual volunteering with these corporate partners, for example, by leveraging the YouthMappers network and connecting local

youth with cross-sector organizations so organizations can contribute their skills and expertise to support youth-led community projects. This opportunity includes the professional capacity of HOT as an organization itself. Since the beginning of the HOT-YouthMappers partnership, a number of alumni have emerged as leaders to join HOT as voting members and employees.

Institutions across sectors should seek partnerships for the SDGs that are community-driven, that is, community needs and priorities drive who and how we partner for impact. There are a plethora of ways young people are leading, collaborating, and contributing to local initiatives that are important to them and support the SDGs. This is because they are already part of that community. One way to enable this vision is through the opportunity that YouthMappers creates for students to use spatial data to explore and create solutions to social problems – and their partnership with HOT, which enables deeper local engagement while strengthening global relationships. These students may become future leaders in various sectors, from public and private to non-profit, which means an understanding of open tools, technical know-how, and the power of open community projects experienced together can be taken forward to future workplaces and innovations.

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