Chapter 16
Communicating Science for Informed Decision-Making

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16.1   Introduction

SERVIR's primary objective is to use Earth observation (EO) information and geospatial information technologies (GIT) to address challenges in areas of societal concern such as food security, land use and land cover, water resources, weather, and natural disasters. With a tagline of "connecting space to village", SERVIR-HKH aims to build the capacities of people and institutions in the HKH region to integrate science and technology into the decision-making processes. To achieve these broad and ambitious objectives, SERVIR-HKH provides scientific information to a wide range of audiences with different societal contexts (Chap. 1). A picture is worth a thousand words, they say; EO satellites provide pictures of the Earth surface which help scientists to understand the dynamics of natural and anthropogenic processes. Similarly, GIT tools enable analysis and visualization of data, not only for scientific exploration but also to help communicate the information to the intended users in the form of maps and charts. The cartographic principles applied during the map-making process ensure that the scientific information undergoes minimum distortion while communicating to the target audiences.

People, typically, consider their own needs, knowledge and skills, values and beliefs as well as scientific information while making decisions. Therefore, they will make choices consistent with scientific evidence only if the science is

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communicated effectively (NASEM 2017). Different or contradictory messages conveyed by multiple sources often generate uncertainty in the science or its implications, and usually do not aid informed decisions (Burns et al. 2003). Therefore, SERVIR must ensure that the information and knowledge are shared and delivered to people through relevant channels in appropriate formats, and at appropriate timings, to enable them to make informed decisions. This requires an effective communication system aimed at helping people understand the science relevant to a decision while also recognizing that other factors will affect their actions (NASEM 2017).

The recent technological advancements have also brought about enormous opportunities in scientific communication. The advent of mobile devices and smartphones and wider penetration of the internet ensures that a wider audience has access to the scientific information that is being disseminated through a wide variety of media such as web portals, blogs, videos, and social media. Current technological advancements have also made it possible to develop customized information services for the targeted users; they have also enabled and facilitated user feedback and aided in gauging the social impact of the information services.

In the context of SERVIR, the communication means help in raising awareness about its applications and services; they enable the sharing of information generated by these applications with the targeted users, thereby aiding the decision-making process; they also open up many platforms to generate and receive feedback. As the users are central to SERVIR's service planning approach (Chap. 2), communication is an integral part of user engagement for the development of constructive, collaborative, and enduring stakeholder relationships (UNGGIM 2020). Communication plays a fundamental role in fostering social awareness and in facilitating public democratic dialogue, thereby building a shared understanding and contributing to evidence-based policy (Hovland 2005). Here, we present the approaches and practices adopted by SERVIR-HKH for effective communication and sharing of its products and services, and our learnings from the HKH region.

16.2 Knowledge Management and Communication Strategy

A strategic communication framework is important for successful exposure and branding, user engagement and for the effective delivery of data, information, and knowledge products and services. As SERVIR-HKH primarily deals with geospatial information and modeled data, it needs to follow appropriate mapping conventions for effective visualization of data and analyses. Therefore, the proper identification of the target audiences and their access to various media platforms are fundamental considerations while designing an effective knowledge management and communication strategy. While ICIMOD has its knowledge management and communication strategy and institutional branding policies in place, SERVIR-HKH

also needs to account for the co-branding requirements (USAID 2016) as part of a global network led by USAID and NASA. In this context, while the visual branding requirements of the host and donor organizations set precedence, SERVIR-HKH also needs to ensure scientific accuracy and relevance in the knowledge it generates and the messaging it carries out. The marketing collateral that is produced also needs to portray the positive connection between satellites and people and connect with a regional audience.

Taking these requirements into account, SERVIR-HKH developed a Knowledge Management and Communication (KMC) Strategy to guide targeted communications, sharing, and dissemination of its information and knowledge for greater impact, better and broader outreach, and efficient internal communications. The strategy aims to support the uptake of its services, products, and applications by the target audiences in order to bring about behavioral change, thereby influencing positive policy and development outcomes. The different target audiences, their

Table 16.1 Communication strategy for different audience type adapted from ICIMOD (2013 and 2018).

SERVIR audience type	Why is it important?	Communication channels	Activities	Goals
Implementing partners National government ministries/departments or subnational offices, universities/research centres	Directly associated with research or training, sharing of data and information	Knowledge products – reports, handbooks, information sheets Events – national/regional meetings, workshops, knowledge forums, joint organization of/participation in international conferences, targeted events	Generation of knowledge products/training materials Joint workshops, training, outreach events Reports, peer-reviewed articles, books	Build capacities so that partners are more capable and better able to use Earth observation and geospatial information Common goals of raising awareness, complementing each other
	Adoption of services, lobbying for policies	Digital engagement–website, science applications Personal/official communications	Advocacy, policy dialogues	Adopt right technologies and methods to support informed decision-making, promote SERVIR-HKH and its work
Intermediaries National government ministries/departments or subnational offices, extension agents, NGOs, media, relevant donor-funded projects, associations/cooperatives (e.g. of business, industry, farming), private sector	Contribute to research, data and information sharing	Information exchange, participation in events Personal/official communications	Workshops, trainings, outreach events	Gain information on needs and priorities in related service areas
	Raising awareness, information exchange, promoting and supporting SERVIR's work and Earth observation/GIT agenda	Website, interviews/surveys, press events and releases to provide information	Surveys, consultations, dissemination workshops	Promote SERVIR and its work, and the societal benefits of Earth observation/geospatial information technology
Other partners Development agencies, donors (including USAID)	Financial contributions, project support	Personal/official communications, knowledge products	Timely reports, updates	Inform, assure, and comply with donor demands
	Cooperation, joint projects, information sharing	Annual report, international and regional conferences, meetings, website	Reports, events, project activities and updates	Effectively plan and implement joint projects, find potential donors/partners
Beneficiaries Farmers, communities, private-sector service providers, universities/research centres	Inform, advise, support Raise awareness Selection of important partners for private–public cooperation	Trainings, media, knowledge products, newsletters, website, case studies, success stories	Awareness campaigns, meetings, seminars, study tours, visits	Build capacities, promote SERVIR and its work, and the societal benefits of Earth observation/geospatial information technology Establish greater private–public cooperation and joint projects

importance, the adopted communications channels, activities, and the end goals identified in the strategy are presented in Table 16.1.

16.3 When Communication has a Key Role to Play?

Communication plays an important role in all aspects of SERVIR-HKH's program design and implementation. More specifically, communication plays a critical role in the areas identified below

- User engagement during needs assessment and user consultations
- Dissemination of scientific data and information through the SERVIR-HKH services
- Capacity-building activities
- Promoting SERVIR-HKH on the web, social media, and other platforms
- Documenting use—use cases to capture how a service is used
- Regional knowledge forums and global outreach.

The design and development of knowledge products and marketing collateral need specific considerations for each of the aforementioned areas.

16.4 User Engagement During Needs Assessment and User Consultations

As part of the service planning process (Chap. 2), SERVIR-HKH identifies its users and engages with them further to assess their needs. It organizes consultation workshops at the national and regional levels with the key stakeholders working in the SERVIR-HKH's service areas to carry out a thorough needs assessment of user requirements (Chap. 3). Effective two-way communication plays a crucial role here to help understand the users' needs and priorities, and also to express the capability to address the needs through the existing EO data, GIT infrastructure, and scientific methods, as well as through other available resources.

Such workshops are designed with two-way communication in mind—both listening to and learning from the invited stakeholders and sharing information on SERVIR's capabilities and available resources. These consultations begin with a session focusing on information exchange where the participating institutions highlight their mandates, priorities, and relevant work activities through short presentations at the plenary. This learning and sharing process ensures that all the participants are well informed and helps explore areas of commonality or overlap. The sessions that follow focus on collective thinking on problems and opportunities. As for the facilitated group activities, they discuss challenges, identify opportunities and connections, set priorities, and leverage the collective

expertise and points of view of the attending quorum to set a course for relevant, demand-driven activities.

The needs assessments process at user consultations help identify the key partners in the co-development of services. The follow-up meetings with the identified partners help to develop work plans, find agreement on the methodologies and data-sharing arrangements, and enable the calibration and validation of components as part of the co-development process. The organization of regular face-to-face and virtual meetings with the identified national partners also helps in reviewing progress and communicating updates.

During the service development cycle, national outreach and dissemination workshops are conducted in collaboration with the national partners to help communicate the programmatic developments and to solicit feedback from the relevant stakeholders. These national outreach workshops are carried out in SERVIR-HKH's focus countries—Afghanistan, Bangladesh, Myanmar, Nepal, and Pakistan—and are often delivered in the vernacular language and led by the national partner wherein SERVIR-HKH provides technical oversight.

For example, organizing dissemination workshops for flood-prone areas in Bangladesh in partnership with the Bangladesh Water Development Board (BWDB)/Flood Forecasting and Warning Centre (FFWC) was instrumental in reaching out to the relevant stakeholders and in informing them about assistance from SERVIR-HKH in developing appropriate flood warnings. Similarly, Afghanistan's first comprehensive glacier database was launched at a dissemination workshop organized at the Ministry of Energy and Water's campus in Kabul. These events served to showcase services and launch joint knowledge products while soliciting and strengthening further partnerships and collaborations.

16.5   Dissemination of Scientific Data and Information

SERVIR-HKH's core objective is to generate scientific information to support informed decision-making. Under the four priority service areas identified for SERVIR-HKH (Chap. 1), several services have been developed which produce information products in the form of maps, charts, and expert interpretations. These services include web-based applications, also referred to as science applications, and are designed to help the users address specific problems under the designated service area.

All the science applications developed under SERVIR-HKH follow a particular schema that defines the placement of different components and controls so as to enable the users to know intuitively where a component is placed. All these applications implement a responsive design, use the approved color palette, and include an acknowledgement/additional information section to provide more information about a particular application. Each science application has a specific URL, follows a common nomenclature for easy reference, and is linked to the science applications page on the SERVIR-HKH website.

VISUALIZATION OF DROUGHT OUTLOOK AT THE SUB-BASIN LEVEL FOR THE KOSHI SUB BASIN
http://tethys.icimod.org/apps/regionaldrought/
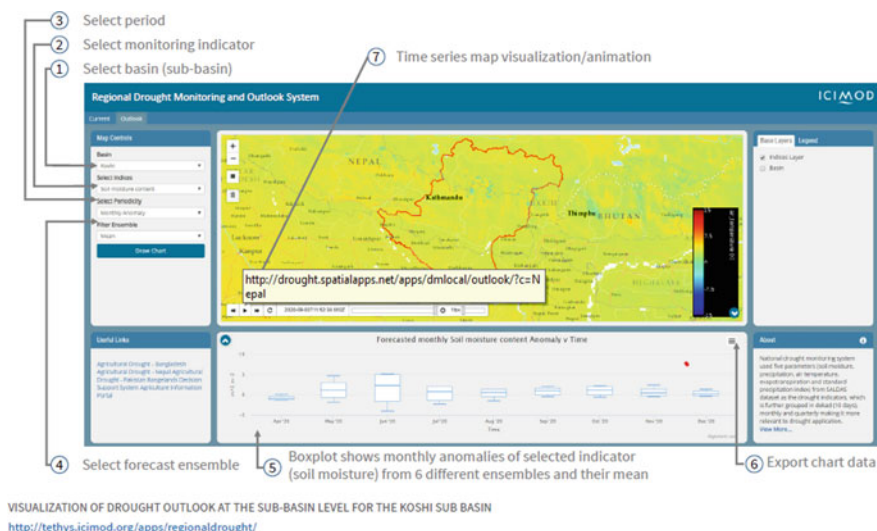
Fig. 16.1 An example of science application for scientific data visualization and dissemination

For example, the Regional Drought Monitoring and Outlook System (RDMOS) for South Asia (Chap. 4) is an operational service that produces reliable drought indicators for the HKH region and also provides seasonal outlooks at four-month intervals to support drought management and its preparatory processes (Fig. 16.1). The system generates data in the form of raster grids that show anomalies against long-term average values. A web-based graphical user interface helps translate this data as scalable color-coded maps and interactive charts, which provide a user-friendly means to analyze drought indices across river basins, national administrative boundaries, or a predefined area of interest, and to aggregate results in terms of cropping seasons. The system aids the agriculture extension workers and professionals involved in agro-advisory services who can use the information and couple it with their expert knowledge.

16.6   Capacity Building

Training and capacity-building activities are integral parts of SERVIR-HKH (Chap. 14). Announcements around capacity-building events and the opportunities specific to SERVIR-HKH are made available on the website and shared through ICIMOD's monthly news digest, social media feeds, and mass emails, as applicable, in order to facilitate competitive placement opportunities for women and disadvantaged groups (Fig. 16.2).

The capacity building activities entail preparation of training manuals with maps, illustrations, and guided walk-throughs to handhold the trainees through theoretical

Fig. 16.2 Illustration for use in email campaigns and social media during the open call for application

concepts and hands-on exercises (Fig. 16.3). There are also customized training manuals for training on applications of EO and GIT in the different service areas; these consider the level of the targeted trainees, ranging from beginners to advanced users. As for event-specific materials—background notes, agenda, training materials, tutorials, and resource books—they undergo edits for consistency of language and to ensure the use of gender-aware language. Then there are the marketing collaterals developed for flagship training events which take into consideration regional sensitivities in the imagery and the illustrations that are used.

Post-event communication materials in the form of news, video clips, testimonials from participants who have benefitted from a particular training, and success stories highlighting how certain users have gained from the adoption of a product or service are important in telling the SERVIR-HKH story.

As an example of the broad range of events organized by SERVIR-HKH, a list of consultations and training workshops on the flood early warning system for Bangladesh is presented in Table 16.2.

16.7 Promoting SERVIR-HKH on the Web, Social Media, and other platforms

Promoting SERVIR-HKH for visibility at local, national, regional, and global levels is a major objective of the SERVIR-HKH KMC strategy. This entails a coordinated effort in creating and retaining a brand image, and in the timely communication of SERVIR-HKH's achievements and impacts. The major activities involve:
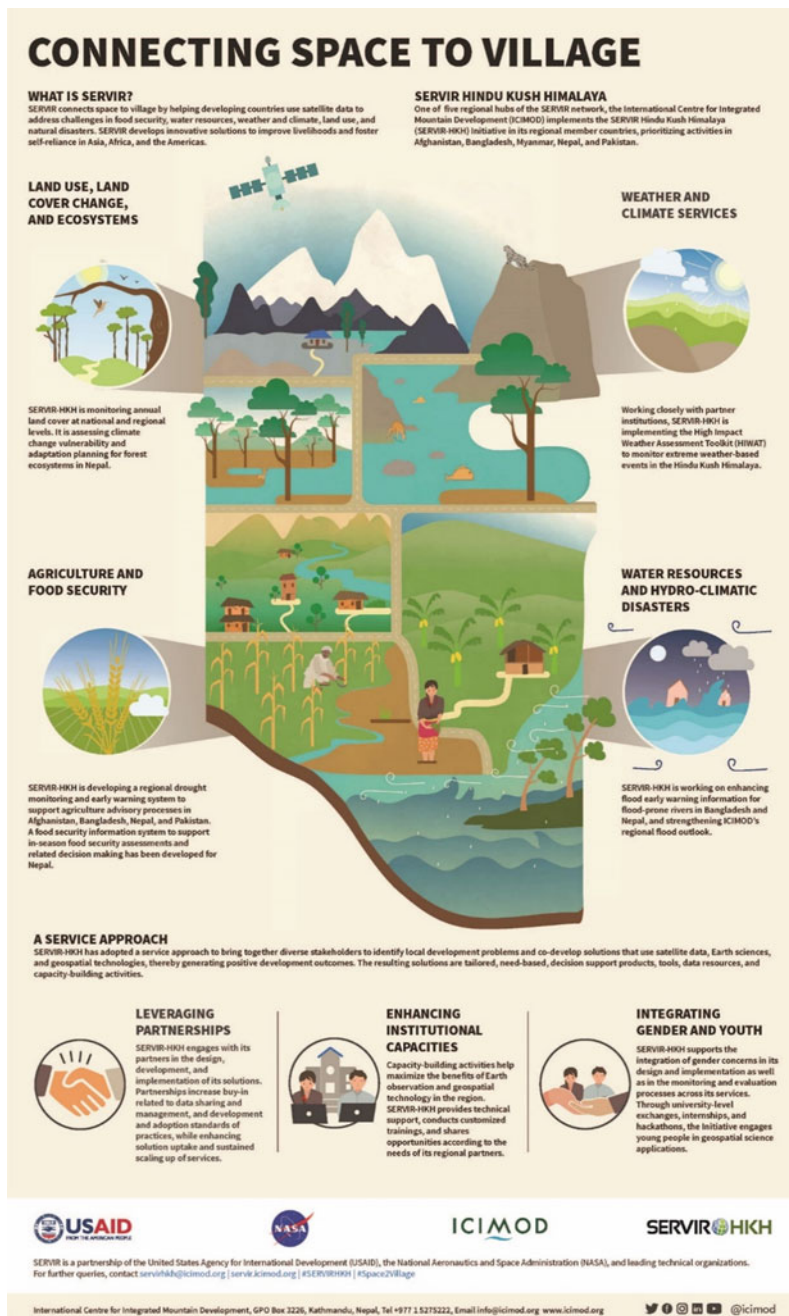
Fig. 16.3 The "connecting space to village" poster designed as a giveaway for a schoolteacher training programme (https://lib.icimod.org/record/34552)

Table 16.2 List of SERVIR-HKH events focused on the thematic area on water resources and hydro-climatic disasters in Bangladesh

Dates	Title
26 January 2016	National consultation workshop on "Needs Assessment for SERVIR-HKH" in Bangladesh
11–15 July 2016	Regional workshop on Impact Pathway, Partnership & Communication Strategy
19–22 September 2016	Training on SRTM-2 digital elevation model (DEM) applications
20–21 April 2017	SERVIR HKH Applied Science Team stakeholder workshop
25–26 April 2018	Training on Transboundary Streamflow Forecasting Tools
25 February 2019	Stakeholder consultation workshop on "Preparation for 2019 flood: expectations & suggestions", in Sirojgunj
26 February 2019	Stakeholder consultation workshop on `Preparation for 2019 flood: expectations & suggestions", in Bogura
5 March 2019	Stakeholder consultation workshop on "Preparation for 2019 flood: expectations & suggestions", Motijheel, Dhaka
6–7 March 2019	Introductory training on Hydrostats
13–14 May 2019	Training workshop on Applied Science Team (AST) forecasting tools
5–9 July 2019	Training workshop on Google Earth Engine, Bangladesh
22–23 October 2019	Regional Knowledge Forum on Early Warning for Floods and High-Impact Weather Events
24 October 2019	Stakeholder consultation on "SERVIR-HKH flood and extreme weather early warning systems: achievements and way forward"

- Branding strategy and marking plan
- Knowledge products and marketing collaterals
- Digital platforms
- Engagement with the media
- Social media presence.

16.7.1   *Branding Strategy and Marking Plan*

A brand identity helps communicate the strategic point of view of an institution or an initiative, thereby creating values and cultures that circulate in society as conventional stories (Holt 2003). A Branding Strategy and Marking Plan included in the KMC strategy ensured the consistent usage of the visual brand identity and brand narrative for SERVIR-HKH across all knowledge products and marketing collaterals. The visual identity, brand elements, and key messages from the SERVIR Global Program were adapted for a regional focus, building on ICIMOD's regional presence while capitalizing on the internationally adopted brand identities of NASA and USAID.
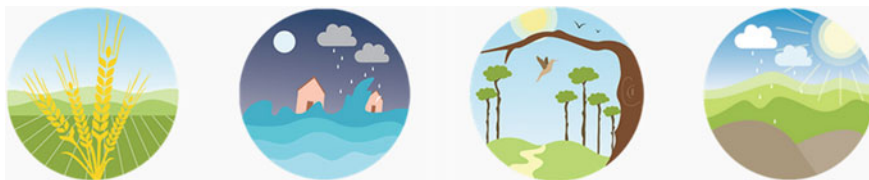
Fig. 16.4 Brand elements around the four thematic priorities developed for usage as marketing collateral

The three institutional logos—USAID's, NASA's, and ICIMOD's—and the SERVIR-HKH logo formed the primary visual identity of SERVIR-HKH, supported by iconography representing the four key service areas: agriculture and food security; land cover and land-use change and ecosystems; water resources and hydro-climatic disasters; and weather and climate services (Fig. 16.4). The SERVIR logo depicts a human figure at the centre of the Earth and represents a user-centric approach. These brand elements were reproduced across all knowledge products, ranging from the website to printed materials—information sheets, posters, and branded marketing collaterals—for a consistent look and feel across all products. The brand elements communicate the essence of the science applications being presented, while also making them visually appealing.

16.7.2 Knowledge Products and Marketing Collaterals

SERVIR-HKH commissioned and updated brochures, factsheets, information sheets, posters, and infographics in local languages (as needed) for dissemination to the target audiences (Table 16.1). Editorial photographs from the region and bespoke illustrations help convey the connection between space to village, and the severity of natural disaster situations like droughts and extreme weather events. The use of such materials helped provide the context for the marketing collaterals developed for different outreach events—such as consultation workshops, country-specific fairs, and exhibitions and conferences. The marketing collaterals developed for country-specific fairs and exhibitions (Fig. 16.5) made SERVIR science more accessible and comprehensible to visitors.

While participating in the regional and country-specific fairs and exhibitions, and during the celebration of international days—GIS Day, Earth Day—that highlighted the contributions of EO and GIT to societal welfare, such collaterals provided good outreach opportunities for SERVIR while also helping it spread awareness on and spike interest in EO and GIT.

SERVIR-HKH also developed training manuals and video walk-throughs for relevant science applications, and short multimedia primers around the thematic topics and/or products and services. The training materials—presentations, exercises, and workbooks developed for different training—are available for free

Fig. 16.5 SERVIR-HKH/ICIMOD's poster display at the Geospatial World Forum 2018 held in Hyderabad, India (15–19 January 2018). Photo by Utsav Maden

download from its website. These manuals and walk-throughs were especially helpful during the hands-on exercises and guided the demonstrations for trainees, participants, and visitors, and have a life span beyond the training event as well.

16.7.3 Digital Platforms

A dedicated SERVIR-HKH website—servir.icimod.org—has been set up under a separate subdomain within ICIMOD's main domain. The website provides a one-stop gateway for access to information and data products specific to SERVIR-HKH. It serves as a landing page for the announcements, events, news, and success stories stemming from work under SERVIR-HKH across the four thematic areas and for activities specific to Afghanistan. Besides, various science applications, story maps, data sets, and knowledge products—information sheets, training reports, and manuals—specific to SERVIR-HKH have been collated from different in-house services and made available through the website. The site serves as a clearinghouse mechanism for services and knowledge products specific to SERVIR-HKH. The site has also been integrated with ICIMOD's institutional systems to provide the following:

- **Regional Database System (RDS) portal** <rds.icimod.org>: The data sets page on the website provides a dynamic list of data sets specific to SERVIR-HKH hosted on the RDS portal, ICIMOD's institutional repository, and clearinghouse for data.
- **Mountain Geoportal** <geoportal.icimod.org>: The science applications page provides a dynamic list of SERVIR-HKH-specific science applications hosted on ICIMOD's designated space for EO and geospatial applications.
- **Himaldoc** <lib.icimod.org>: The publications page provides a dynamic list of the knowledge products produced under SERVIR-HKH hosted on Himaldoc, ICIMOD's central document repository, and online digital library.

Further, an active events calendar provides information on upcoming and past events under SERVIR-HKH, while success stories and post-event communication keeps the users engaged. Updates on SERVIR-HKH's website are communicated across the wider SERVIR network during the monthly hub meetings.

The website also hosts a separate section on story maps. Story maps harness the power of maps and geography to tell stories, give the narrative a stronger sense of place, illustrate spatial relationships, and add visual appeal and credibility.
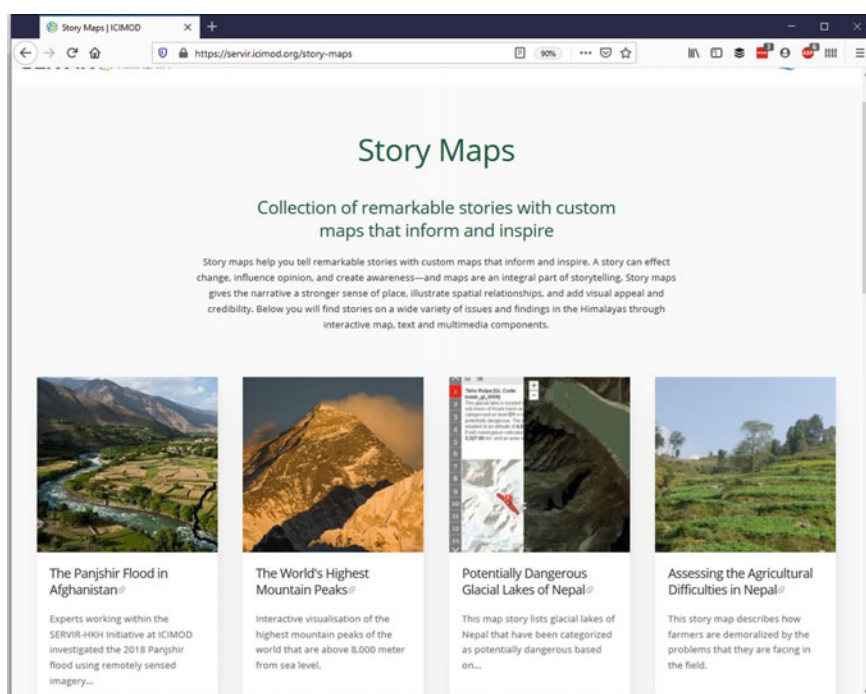
Fig. 16.6 SERVIR-HKH has published several story maps on a wide variety of issues and findings in the HKH by combining authoritative maps with narrative text, images, and multimedia content (https://servir.icimod.org/story-maps)

SERVIR-HKH has published several story maps on a wide variety of issues and findings in the HKH by combining authoritative maps with narrative text, images, and multimedia content (Fig. 16.6). These story maps serve as an important tool for public engagement and have been made available on the SERVIR-HKH website. These maps are also periodically shared via the institutional social media handles.

The underpinning of SERVIR-HKH's digital presence requires dedicated and skilled human resources conversant in knowledge management and communication, web development and standards, and also in geospatial information and standards. Besides, an editorial calendar, regular internal communication, and standardized operating procedures in-house and across the network, as well as monitoring and regular follow-ups ensure uptime and synchronize updates between the different systems.

16.7.4 Engagement with the Media

Often, the media does not fully appreciate the inherent importance of science due to inadequate scientific education and tends to misrepresent or obstruct rather than facilitate communication between scientists and the public. Close cooperation between scientists and journalists is important to fulfil the media's social responsibility to inform and educate the public (Fjæstad 2007). Engaged appropriately, the media can act as an intermediary and help translate our science into more accessible forms and relay it to a general audience. The media can help amplify our reach and help us with quality assurance by letting us know if our messaging needs to be simplified or fine-tuned. SERVIR-HKH releases press statements and media briefs around major regional and national outreach events and product launches. It also works closely with ICIMOD's media unit to identify relevant journalists to participate and contribute to outreach events. This engagement with the media has resulted in positive outcomes and reportage of SERVIR's work in major national and vernacular outlets in SERVIR-HKH's focus countries. Also, the links to media reports about SERVIR-HKH's work are routinely captured and made available as "media coverage" on its website.

Inviting journalists to national outreach and dissemination workshops as well as to regional knowledge forums were especially helpful in getting the message out on SERVIR-HKH's work in the region, while also educating the mediapersons on the ongoing work and capabilities of EO and GIT applications. In this regard, partnerships and engagement with the media through media-centric training workshops, editorial and knowledge partnerships, and story grants could help us in promoting and translating SERVIR-HKH's science, while also making it more accessible to a wider audience.

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16.7.5 Social Media Presence

The evolution of social media platforms and their growing use by all sectors of the society provide unprecedented opportunities to reach large audiences, thereby enabling active engagement through online two-way communication (Third Wave 2013). Social media makes it possible to share and participate in a variety of activities and represent an increasingly important way for brands to communicate with the attractive audience segments (Ashley and Tuten 2015). These platforms are especially effective in real-time information dissemination, strategic communication, research, user relationship management, and brand promotion. SERVIR-HKH made use of ICIMOD's institutional social media handles on multiple platforms such as Facebook, Instagram, LinkedIn, and Twitter to engage with its audiences. #SERVIRHKH, #space2village #Data2Action were used as the hashtag to distinguish posts specific to SERVIR-HKH (Fig. 16.7). Its social media presence was actively supported by daily media monitoring and social listening to capture instances of SERVIR-HKH's work being featured in the media and social media. A dedicated social media calendar made optimal use of international days and major events to create campaigns for greater visibility and reach for SERVIR-HKH's services. SERVIR-HKH also supported the resharing of posts related to activities of other SERVIR hubs and the SERVIR Global Program.

Our social media campaigns have provided much-needed visibility to our work and directed traffic to the SERVIR-HKH website. For instance, when we collaborated with the SERVIR Global Program's social media campaign revolving the International Women's Day in 2018, it helped promote and highlight women's role within the SERVIR Global network. We believe that dedicated social media campaigns around outreach events and product launches will definitely help in creating a better profile for SERVIR among the public. Despite an overall spurt in the use of social media by individuals, the use of this platform and the web is still at a nascent stage as far as the governments and institutions of the HKH are concerned.

16.8 Documentation: Use Cases to Capture How a Service Is Used

Use cases help illustrate how SERVIR-HKH services—tools, products, data, training, etc.—are being applied in the real world. These use cases help capture the actual use by a particular user and document how a user interfaced with SERVIR-HKH and how its service was utilized, which then leads to tangible, positive outcomes. They help tell the story of a service, its application, and where the impact was either realized or expected, or both. A SERVIR-HKH application/service can have multiple instances of use, and so multiple use cases per institution or user. Use cases are periodically developed in coordination with the users, the
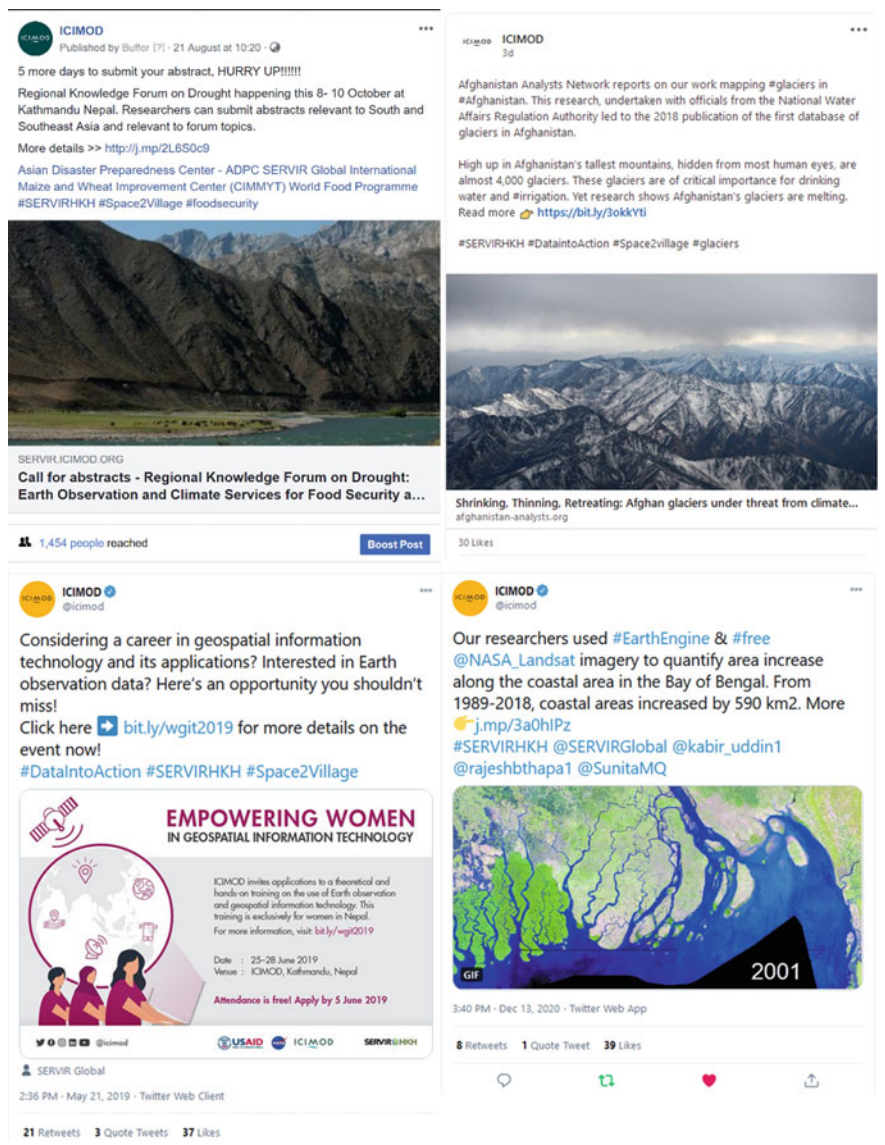
Fig. 16.7 SERVIR-HKH in social media

SERVIR Support team, and the SERVIR Science Coordination Office, and published on the SERVIR Global website and service catalogue. For instance, the use cases of the FFWC in Bangladesh and the Department of Hydrology and Meteorology (DHM) in Nepal have been published, which documented how the two institutions availed of the Streamflow Prediction Tools (Fig. 16.8).

Fig. 16.8 Capturing how the FFWC, Bangladesh uses the Streamflow Prediction Tool to improve upon the accuracy of its flood-forecasting models (https://www.servirglobal.net/Multimedia/Use-Cases/Use-Case_FFWC)

16.9 Regional Knowledge Forums and Global Outreach

A considerable amount of research is being carried out in the HKH region to generate easily accessible, timely, and actionable scientific information to address the adverse impacts of floods, drought, and high-impact weather events. While SERVIR-HKH has been primarily working on developing the applications and services prioritized by its users, other initiatives with a similar mission have been generating a large amount of data and information, and these can complement each other. SERVIR-HKH has realized that when regional platforms review and assess ongoing regional and national practices and policies, it helps in cross-learning and building synergies within and across ICIMOD's regional member countries. In this context, regional knowledge forums and outreach events, organized at yearly intervals, brought together stakeholders from the region and beyond, and held discussions on current developments and challenges in a particular theme of interest; for example, the use of EO information to ameliorate the impacts of drought and water, and weather-induced disasters. These events also served to review the current status of science in the domain.

Some of these events include a "Regional Knowledge Forum on Drought: Earth Observation and Climate Services for Food Security and Agricultural Decision-Making in South Asia and Southeast Asia", organized from 8–10 October 2018 in Kathmandu jointly with the Asian Disaster Preparedness Center (ADPC)/

SERVIR-Mekong and the International Maize and Wheat Improvement Center (CIMMYT); this forum established an expert working group, comprising of representatives from different institutions working on drought early warning systems and agricultural advisory services, to foster regional cooperation on agriculture, drought monitoring, and management. Another was a regional workshop in August 2019 where the RDMOS was unveiled; this was organized by ICIMOD, CIMMYT, and the South Asian Association for Regional Cooperation's (SAARC's) Agriculture Centre in Islamabad, and was attended by policymakers, scientists, and government officials. Similarly, a "Regional Knowledge Forum on Early Warning for Flood and High Impact Weather Events" was organized in October 2019 in Kathmandu to showcase developments in the Streamflow Prediction Tool and the High-Impact Weather Assessment Toolkit (HIWAT); this provided a platform to discuss the challenges associated with the development, implementation, dissemination, and sustained use of information services for water and weather-induced disasters. Besides, SERVIR-HKH, together with SERVIR-Mekong and the NASA SERVIR Science Coordination Office, have regularly organized sessions on EO applications in South and Southeast Asia during the Annual American Geophysical Union (AGU) fall meetings. The AGU event promotes discoveries in Earth and space science that have benefited humanity, and is the biggest gathering of scientists across the globe. It provides a unique opportunity for scientists to present their work and network with the global community. SERVIR-HKH has also been regularly participating in the Group on Earth Observation (GEO) Summit and in the Geospatial World Forum which are global platforms to promote activities on EO/GIT, network with professionals and policymakers, and develop deeper collaborations. Dedicated SERVIR exhibits at these events have been useful in reaching out to larger audiences. SERVIR-HKH has also collaborated with other regional and international initiatives like Asia-Oceania GEO, Global Forest Observations Initiative (GFOI), and SIlvaCarbon, among others, to carry out more

Table 16.3 Key global and regional events organized/participated by SERVIR-HKH to showcase its work

Date/venue	Events
October 2018/ Kathmandu	Regional Knowledge Forum on Drought: Earth Observation and Climate Services for Food Security and Agricultural Decision-making in South Asia and Southeast Asia
October 2019/ Kathmandu	Regional Knowledge Forum on Early Warning for Floods and High-Impact Weather Events
Annual/Different countries	Group on Earth Observation (GEO) Summit
Annual/Different countries	Asia-Oceania GEO Symposium
Annual/Different countries	Geospatial World Forum
Annual/USA	American Geophysical Union (AGU) fall meetings

capacity-building activities in the HKH region. The key global and regional events organized by SERVIR-HKH and those in which it participates regularly are listed in Table 16.3.

16.10   Experiences and Way Forward

The diversity of SERVIR-HKH's user base and the nature of information and services it generates demand a comprehensive communications approach. The Service Planning Toolkit and SERVIR-HKH's KMC Strategy have guided the design of outreach activities and the development of knowledge products and marketing collaterals. Though the strategy provides a broader overview, the knowledge products, and marketing collaterals need to be customized to suit users' needs and contexts which vary at national and local levels.

After receiving comprehensive feedback from the users, the design and implementation of the SERVIR-HKH applications and services underwent changes and were further refined during the development process. We also recognized that marketing collaterals have to be updated frequently to account for these changes. Knowledge products and marketing collaterals undergo a rigorous review process in-house by designers, editors, and country focal persons before being released to the public. The wider SERVIR network, comprising five hubs across the world, have lauded our approach—of bespoke illustrations, success stories, and story maps —at virtual and in-person meetings.

The primary user base of SERVIR-HKH's services consists of information producers and decision makers. We have carried out language localization for some of our services; we also work with our partners to organize consultations, trainings, and outreach events in the vernacular language, and translate the knowledge products into the vernacular language when required. These efforts could be maximized to widen our user base and reach out to more beneficiaries.

While we do invite media persons and agencies to our outreach events and regional fora and pen op-eds in the newspapers, there's a lot more to be done to educate the media in becoming better science communicators and knowledge intermediaries. The decision makers too have to be familiarized with the ways of scientific communication.

Most SERVIR-HKH staff have academic backgrounds in science, technology, engineering, and mathematics (STEM), and their writing style is oriented towards scientific conferences and forums. Therefore, we also prepare posters and social media graphics using simplified infographics to cater to general audiences. However, given the scientific nature of SERVIR-HKH's work, it is difficult to capture and translate the scientific messages accurately to a lay audience.

SERVIR-HKH's digital presence is underpinned through a dedicated SERVIR-HKH website, which serves as the primary channel for data, information, and science applications, as well as for updates on training events and meetings. The news and stories posted on the website help in conveying information to the

general public in a timely manner. Ensuring that the information on different science applications are up to date is important as disruptions in data links, server, and core software updates, and internet outages can affect uptime and the functioning of the science applications. User complaints received via the feedback form listed on the SERVIR-HKH website and through conventional emails often alert the team of such problems. Additionally, information about the science applications needs to be periodically updated to account for changes in the focus and scope of these applications. Assigning dedicated human resources to monitor uptime, information accuracy, and relevance, and periodic calendared health checks and information appraisals can be helpful in taking the appropriate measures.

A basic metric of digital engagement is the number of visitors to the website and the number of downloads. We would experience a surge in the number of visitors when a major outreach event is around the corner or when there's an open call for applications, and this number would drop in the weeks that follow. Regular promotional campaigns—via email, social media, and in-person—are important to draw and sustain the attention of more users.

Social media presence is characterized by continuity and a focus on dialogue with the users. Timing and dialogue are important considerations to understand which messaging strategies are most effective in achieving user engagement. The social media landscape is constantly evolving, and brands and institutions are constantly vying to increase their social media presence. However, complying with protocols for institutional clearance while engaging with the media and social media affect timeliness and relevance. What's required is a clear strategy and process for engaging the media and also to respond to comments and feedback on social media.

Information about the actual impact of science communication on policy decisions is rather sparse as it is difficult to study, assess, and attribute how policymakers are affected by scientific information and how they use it. It is almost impossible to know with any certainty that a specific decision made by an individual or a group resulted from a specific encounter with a relevant piece of information (NASEM 2017). SERVIR-HKH has been documenting all references on the use of its data or publications by national governments in their reporting or policy documents. While counting the number of website visits and engagement rates on social media do provide good proxy measures, more robust monitoring and evaluation tools are needed to capture outcomes and impacts. Now, with the Covid-19 pandemic in place and the resultant restrictions on travel and face-to-face meetings, user engagement has shifted more towards virtual engagement, adopting asynchronous modes of communication, and the need to over-communicate. This also means there's a need to reassess the existing modes of knowledge sharing and outreach, as well as user engagement, and that there's an opportunity to invent and adopt new modalities of communication. Ultimately, SERVIR's goal of "Connecting Space to Village" can only be achieved through effective and efficient communication.

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