

COVID-19: Ready to Respond

The Role of the Geospatial Community in Responding to COVID-19



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Introduction



2020 was intended to welcome in a new decade of optimism. The ‘decade of action’ to accelerate progress towards achieving the Sustainable Development Goals (SDGs), while celebrating the 75th anniversary of the United Nations, convening the 10th anniversary session of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) and the 6th High Level Forum on UN-GGIM. However, by March 2020, with the arrival of the COVID-19 pandemic, optimism quickly deteriorated into an unprecedented global crisis.

As a consequence, our world is now being forced to rapidly adapt to confronting social and economic changes and challenges, from local to global levels, across all industries and sectors, and in all areas of supply and demand. In the midst of COVID-19, in which a global pandemic has no respect for political borders or physical limitations, no country is left untouched, and governments and all sectors of society are being impacted. Global value chains are being heavily disrupted, production and trade is quickly spilling over into investments and other financial and socio-economic sectors, creating ripple effects and shocks, and potential prolonged economic distress to the global economy. The rapid decline, in fact almost immediate cessation, in tourism and air travel are simple, yet stark, examples.

As it continues, the pandemic has not only exacerbated our world’s vulnerabilities within and among countries, it has reinforced pre-existing obstacles to realizing the SDGs – structural inequalities, socio-economic gaps, and systemic challenges and risks – and a lack of timely fundamental data and enabling technologies to measure and monitor what is happening where, when, and how.

Ironically, the spread and impact of COVID-19 is literally a geospatial problem – including how it is spread from a source – anchored to ‘location’ with spatio-temporal aspects. Understanding how the virus spreads from a location, its transmission tied to proximity between and among people at a place, and spread over space and time, is paramount. Therefore, appropriately responding to and mitigating the pandemic and its ongoing transmission, is also about location – for the majority, staying in one place and sheltering in place – and knowing where the hotspots are, and why.

Viewed through a geospatial lens, the COVID-19 pandemic has reinforced the unprecedented need for data, geospatial information, enabling technologies, and insights for governments and citizens across the globe, to not only enable decision-makers to inform policies and planning, but to also minimize the risk to people, especially the most vulnerable population groups. Suddenly, much of the work and issues addressed by UN-GGIM over several years was coming to the fore. Data availability, core reference data, interoperability, common geographies, integration of statistics and

geography, privacy and confidentiality, the relevance of the Integrated Geospatial Information Framework (IGIF), and so forth.

With this context, and without knowing what the future of the pandemic held, in early April 2020, the UN-GGIM Secretariat in the United Nations Statistics Division (UNSD), along with UN-GGIM colleagues in the United Nations Economic Commission for Africa (UNECA) and the United Nations Economic Commission for Latin America and the Caribbean (UNECLAC), and Esri, initiated an informal discussion group on the topic. At that time, there were more questions than answers. What can geospatial information and all of its enabling technology do to support and assist countries in the midst of this global pandemic? How do we provide those insights? How are geospatial technologies helping the world and decision-makers in understanding the unfolding COVID-19 situation? How do we collaborate, coordinate, engage and communicate to inform what is going on – what patterns are emerging? While capacities in fighting the outbreak across nations vary significantly, all countries need to rely heavily on the availability of geospatial information and geographically disaggregated data in key thematic areas, and for various groups of the population. While a lot of questions unfolded over the coming weeks, the key question that resonated: *“Were we, UN-GGIM, ready to respond to this global challenge with geospatial information?”*

Now some four months later, and with the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) subsequently joining the group, and given the immediate context of COVID-19, this white paper explores how geospatial information has been used to support national response efforts, and the influence and impact of the geospatial data ecosystem in responding to the global COVID-19 pandemic. It identifies resources that can be leveraged to mitigate the impact of the current pandemic and strengthen global efforts to build back better in preparation for the future. However, it does this from a structured and strategic perspective. Through the IGIF and its nine Strategic Pathways, the paper identifies what components are required to respond to the COVID-19 crisis, such as leadership, governance, legal and policy, data and technology, requirements. It provides examples of how a connection to the IGIF will enable countries to respond sooner, rather than later. Finally, the paper is a call-to-action beyond the geospatial community, to the statistical, public health, development communities, and beyond; stressing that to fight the current pandemic and to build back better, understanding ‘where’ is crucial.





Why Location Is Important

UN-GGIM has long recognized that, while geospatial information is able to be presented in many forms and mediums, its main strength is that it provides the integrative platform and ‘glue’ for all digital data that has a location dimension to it. All countries and all sectors have a need for geospatial information for national development, policy and decision-making, and to achieve sustainable social and economic development. Collaborative information systems that are comprehensive, coordinated and integrated, underpinned by geospatial information technologies and applications, are providing the evidence on ‘where’ people interact with their place, cities and environment, and to deliver timely and reliable information necessary for citizens, organizations and governments to build accountable actions and evidenced-based decisions.

As a practical means for all countries to develop, integrate and strengthen national geospatial information management and related infrastructures, the IGIF provides the framework glue and blueprint for why location is important, what happens where, and so that countries are able to take positive action. The IGIF is intended to be a holistic and inclusive Framework, able to be applied to all countries and in all situations. Therefore, it is able to be applied to the global COVID-19 pandemic. Further, understanding and realizing the benefits of the IGIF, including its ‘real world’ outcomes and value proposition, is one of its greatest influencing factors. For example, a tangible benefit identified in the IGIF is disaster response, where data sharing and geospatial information are critical. Being able to share integrated geospatial information in real-time means the ‘same information will be delivered to all agencies at the same time’. Geospatial information is also critical in responding to the aftermath of disasters. What happens next and where actions are needed are made possible by up-to-date geospatial information.

As with the SDGs, the most vulnerable countries continue to face the greatest challenges in collecting, producing, analyzing, and using high-quality, timely, and reliable data, including geospatial information, Earth observations, and other location-based data. The impacts to healthcare and services, hospitals and medical supply chains, and the accompanying economic effects, are categorized using place or location. However, in many countries, while much of the urgently needed data, including fundamental data, *might* exist in some form somewhere, it is often not discoverable, structured, interoperable, or standardized. It cannot be readily accessed, shared, and more importantly, integrated with other data for decision-making.

As a globally unique and consistent event, the COVID-19 pandemic reinforces the applicability of the IGIF as an overarching Framework; the role and contribution of geospatial data, technologies and tools to deliver timely and reliable information—in this case, for public health and safety—in a systematic way across

all countries and regions. In the same way, it also reinforces the importance of data sharing and data integration, and the need for integrated geospatial information as a key component, and an enabler, of an evolving national data ecosystem that is agile, adaptive, and with arrangements, capacities and capabilities that are ready to respond to any emerging public health crisis.

The traditional model of disaster response is normally predicated on the ‘event’ being localised or contained within a certain footprint or impact area, and within a certain event window. Whether a flood, hurricane, earthquake, wildfire or building collapse, the response is broadly contained within certain geographic and time extents. With COVID-19, the citizens of countries are experiencing its impacts at different times, different locations (from a building, to local, national, regional, and global), in unequal amounts, to varying degrees of severity, and based on various demographic factors. This challenges countries in both their preparation and actions regarding their short- and medium-term response, resource allocation and societal needs – *“where are ventilators most needed... which cities/towns should be under lockdown... where are infection/mortality rates exponentially increasing?”*; but also their long-term planning to mitigate the social, economic and potentially environmental impacts *“when is it safe to open up, where?”*.

Countries have been posed with an almost impossible challenge; balancing the immediate societal and health impact of population lockdowns, with the longer-term economic impacts, which in time may well cascade into many other socio-economic areas. Some, predominantly developed, countries are able to provide stimulus measures, but many countries do not have the resources or capacity to do so. They are having to balance the short-term needs of society with the long-term impact of the pandemic on the economy, and with sufficient data to make informed decisions either way. This presents a global problem rarely faced in traditional disaster response and relief, even in previous national and regional level public health issues, such as Ebola or SARS. The COVID-19 pandemic is being experienced concurrently in localised instances in all areas of the world. Additionally, data aggregated at the national level is not sufficiently granular for the needs of decision-makers to make informed and timely local decisions. The available data which can be disaggregated by geography is the critical missing piece for many countries.

But with this global pandemic, and with the uniformity of the crisis for all countries, things are changing. From the early days of the pandemic, countries have been making use of highly visual geospatial data and applications to record and report the virus’ spread – from local to global levels. These geospatial visualizations clearly communicate the situation and guide decision-making, all through location-based data and situational awareness dashboards. In providing the ‘where’ element, geospatial information and its enabling technologies have been at the heart of the numerous dashboards that are now available, including from the WHO, Johns Hopkins University and others. They all demonstrate that when the geographic dimension is considered, information can be conveyed in a clearer, more useful manner than just with statistical data alone. ‘Contact tracing’ applications have demonstrated promise, identifying outbreak hotspots, providing governments with a means to identify, inform and subsequently treat those infected, limiting the spread of the pandemic among the population. Each of these examples requires several key components, including available and accessible geospatial information, which can be integrated with statistics and then disaggregated by age, gender, demography and geography, whether at the local, national, regional or global levels.

Gearing up to Respond

Previous global pandemics, from the bubonic plague to the 1918 flu pandemic, spread over many months and years. The COVID-19 pandemic spread globally in a matter of weeks – from mid-January to March 2020 – enabled in part by the very nature of our interconnected society, with the world subsequently entering an unprecedented global crisis.

To explore the potential of the global geospatial information community to respond to this novel challenge, in April 2020 the UN-GGIM Secretariat, UNECA, UNECLAC, and Esri initiated a series of weekly informal discussions. These informal discussions quickly evolved into a coordination group on the ‘geospatial response to COVID-19’ which UNESCAP later joined. Initial discussions highlighted what actions were being taken, helping identify some of the tools and approaches that Member States and others in the global geospatial community and the broader data ecosystem were using. This included the emergent development of integrated global and national COVID-19 dashboards, and efforts to establish how the pandemic was affecting the ongoing operation of national geospatial information agencies through regional-level assessments. Emanating from these informal discussions and the sharing of experiences at the global and regional level, a common thread emerged. While a lot of questions unfolded over the coming weeks, the key question that resonated was: *“Were we, UN-GGIM, ready to respond to this global challenge with geospatial information?”*

Building on other complementary ongoing regional meetings and consultations, it was clear that the readiness of the response within specific regions and countries varied considerably. The capacity and knowledge regarding appropriate geospatial tools and methodologies to respond to a pandemic such as COVID-19 existed. However, some gaps and challenges were identified regarding interoperability, data access policies, higher levels of disaggregation, capacity building, increased awareness at the level of authorities, and the availability of greater technology and financing, among others. This highlighted that, as a global community, we had developed and had available the appropriate frameworks and technical tools at our fingertips – such as the IGIF. But in a time where national capability needed to be leveraged, the unequal distribution of capacity meant that some Member States were being left behind at a time when geospatial capacity was needed most.

To capitalize on the strengths, address gaps, and achieve a more comprehensive and sustainable geospatial response over time, the decision was taken to engage national representatives from diverse sectors that were contributing in the geospatial response to COVID-19 – National Geospatial Agencies, National Statistical Offices, risk and disaster management organizations, and many other representatives from relevant public, academic and private sector entities.



A concept note was developed to raise awareness, share knowledge and exchange practices and experiences to support Member States in their efforts to effectively respond to the COVID-19 pandemic through their geospatial capacities, products and services. This resulted in a series of UN-GGIM COVID-19 virtual seminars being convened to help initiate a global discussion to explore the influence and impact, and strengthen the response of the geospatial data ecosystem in responding to the global COVID-19 pandemic. A tangible example of this was Esri providing many developing countries with the technology to rapidly establish and deploy interactive COVID-19 visualization and information dashboards to support the measurement and monitoring of the pandemic within countries.

The UN-GGIM COVID-19 virtual seminars covered three regions, Africa, Asia and the Pacific, and the Americas, and highlighted that there are many common and persistent issues arising when in a 'response' mode for many national governments: governance, leadership, institutional arrangements, fundamental data, coordination, data sharing and dissemination, resource mobilization, leveraging enabling technologies, standards and interoperability, data privacy, building capacity and capability, funding, partnerships and the role of the private sector, and communicating the right messages. Crucially, some countries from varying levels of socio-economic development, including Senegal, Chile and Ireland, independently highlighted how these common and persistent issues can start to be resolved through the IGIF. Through the many national experiences of the geospatial response to COVID-19 (provided as an Annex to this white paper), the role and relevance of the IGIF is highlighted.

In perspective, while it may be seen that there are gaps and weaknesses that exist and continually persist, there are new ways and opportunities for the global geospatial community to strengthen its geospatial capabilities and achieve a more comprehensive, sustainable and integrated approach through the implementation of the strategic frameworks and methodologies that have been developed by the Committee of Experts, of which, the IGIF is the anchor.

Each of the challenges of a national response to COVID-19 are able to be captured, at a high-level, within the nine strategic pathways of the IGIF and its Implementation Guide. They also capture the five priorities of the Strategic Framework on Geospatial Information and Services for Disasters and the five principles of the Global Statistical Geospatial Framework. Each of these Frameworks are mutually inclusive and compatible, anchored by the IGIF. Moreover, the IGIF provides a mechanism for countries to enable the implementation of these Frameworks; fundamentally creating and providing the basis for an integrated national data ecosystem that leverages location to understand how the virus is, and has,

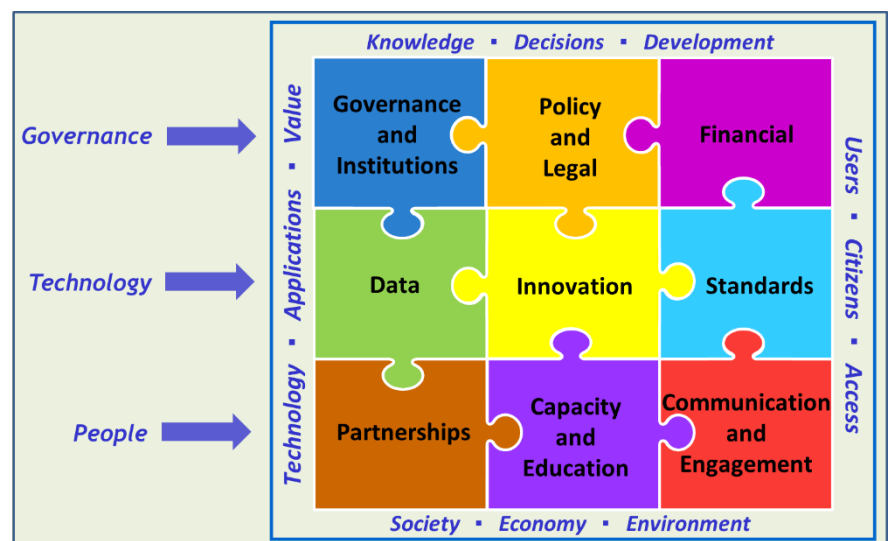
Anchoring the Response to COVID-19



A Basis for Geospatial Information: The Integrated Geospatial Information Framework

spread from a location, identifying clusters of infection, enabling the visualisation, analysis and communication of the virus and its associated impact. A first step to realizing this, has been to develop the dashboards that enable the curation, management and analysis of COVID-19 at national, regional and global levels for decision-makers. Often, it is these dashboards that become the tangible interface for the public and decision-makers to enable informed-decisions, whether it is to stay and shelter in place, or know where the hotspots are, and why.

Importantly, while the IGIF has anchored the geospatial response to COVID-19, it was not developed as a response to COVID-19; it was initially developed as an enabling mechanism to achieve the ambitious targets set by the SDGs. Its versatility has provided countries with a basis for leveraging geospatial information, either to integrate existing capacity, or through developing new capability.



The IGIF focuses on geospatial information that is integrated with any other meaningful data to solve societal and environmental problems, acts as a catalyst for economic growth and opportunity, and to provide understanding and benefit from a country's development priorities and the SDGs. As a basis and guide for developing, integrating, strengthening and maximizing geospatial information management and related resources in all countries, the IGIF, anchored by its nine strategic pathways, has demonstrably enabled countries to determine their national geospatial response to COVID-19. Each of the nine strategic pathways of the IGIF, influenced by Governance, Technology and People, demonstrably interlink and have tangibly enabled countries to leverage geospatial information in their COVID-19 response.

The **Governance and Institutions** pathway helps establish the leadership, governance model and institutional arrangements of a country. In turn, these enable the identification of roles and responsibilities across the differing government ministries and agencies, while sustaining political relevance and endorsement. COVID-19 has demonstrated the integrative nature of geospatial information to enable good governance and cooperation from stakeholders across government, not just from the national geospatial information agency, but also health, education and other ministries and agencies. It cuts across the other strategic pathways, supporting and enabling them, irrespective of the existing national circumstances or arrangements.

The **Policy and Legal** pathway enables navigation through the development of hitherto unfamiliar tools and approaches such as contact tracing, we are leveraging tools and technologies beyond their initial intended use, in domains which do not common deal with the ethical, policy and legal consequences that can result. Establishing a robust policy and legal environment establishes clearly what is acceptable and what is not regarding data privacy and use. This also helps define the role of governments and the private sector in the COVID-19 response and supports closer alignment, collaboration and the sharing of lessons learned and good practices. Pandemics such as COVID-19 do not respect boundaries and geography, but from a legal perspective, jurisdictions do matter.

The **Financial** pathway helps guide decision-makers to immediately capture funding requirements or investment needs in a highly dynamic and uncertain environment. It helps capture and realize benefits, charting the pathway forward for sustainable funding for technology and capacity development. For developing countries establishing a longer-term investment program will enable the response to the evolving societal, environmental and economic demands for integrated geospatial information in a national COVID-19 response, especially if this capacity did not previously exist.

The **Data** pathway helps establish the data acquisition, governance and usage needs. COVID-19 has further illustrated why integrated geospatial information needs to be accessible and usable at relevant levels of geographic and other levels of disaggregation (such as gender) to identify those being left behind and most vulnerable from COVID-19. The data needs of COVID-19 require the integration and development of new data needs, from areas previously thought to be unrelated, but now related and integrated through their geography. The Global Statistical Geospatial Framework (GSGF) is a principles-based framework which supports integration, but it is the IGIF that provides the basis for the implementation of the GSGF. This in turn, will ensure that data from transport, mobility, education, health and other sectors, whether within the auspices of national government or the private sector,



can be integrated and provided at the right level of geography. From this foundation, the platforms and innovations for situational analysis can be developed.

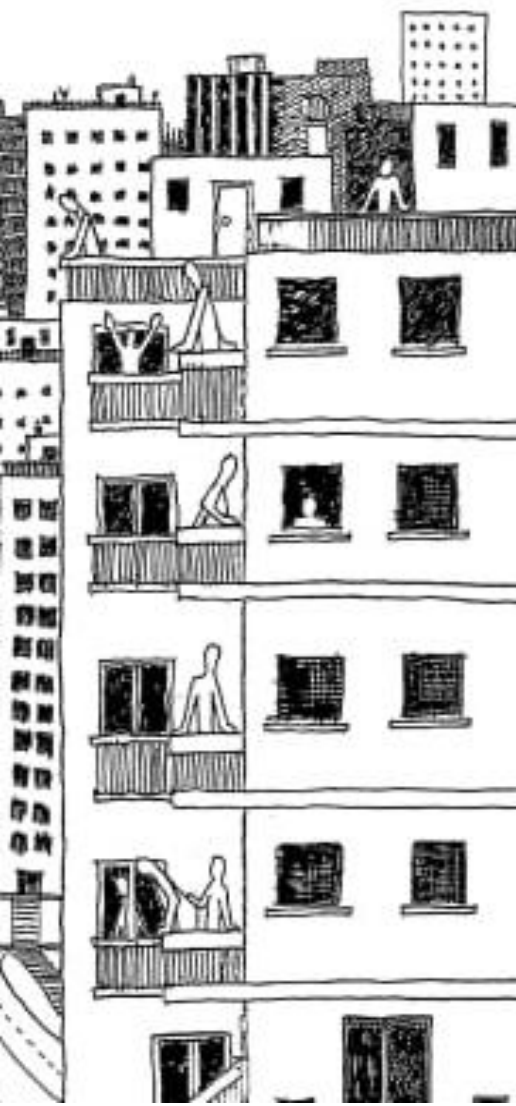
The **Innovation** pathway leverages new methods, technologies and innovation, creating new good practices. COVID-19 has illustrated that innovations such as the national data hubs and dashboards can be rapidly implemented, mainstreamed and scaled in a matter of weeks, instead of years. The result is more informed decisions related to public health and workforce operations by understanding where potential exposures are. While collectively working to manage and control COVID-19, a future of established contact and proximity tracing and smart load balancing to support the safe usage of buildings and transit will become a reality.

The **Standards** pathway ensures data and systems interoperability, enabling the use of data and innovative platforms to be developed in a standardized and interoperable way. At a global level, the DESA Covid-19 StatsHub leverages the approach of the Federated Information System for the SDGs (FIS4SDGs) to COVID-19. Nationally, through countries (including Burkina Faso, Chile, and Ireland) the FIS4SDG approach and systems have been easily repurposed to support the national COVID-19 response. This has ensured that the geospatial information is available to stakeholders in a standardized and clear manner.

The **Partnerships** pathway demonstrates how strategic alliances are critical in responding to dynamic events, such as COVID-19, especially when such events impact all levels of government, industry sectors and the community. Partnerships can also help quickly scale collaboration and data collection workflows by digitizing the data collection process right from the start. For example, the global Johns Hopkins COVID-19 dashboard was established very early in the pandemic. These were subsequently leveraged and repeated nationally.

The **Capacity and Education** pathway helps stakeholders develop knowledge, skills and experience in geo-statistical analysis and other modelling. COVID-19 has illustrated the demand beyond the geospatial community for geospatial capacity and capability, building into health and other sectors.

The **Communication and Engagement** pathway grows awareness and understanding. COVID-19 is a global pandemic, but it is being experienced locally to varying degrees. Ensuring public safety in this situation is key, communicating the challenges and fragility of this evolving situation to the public builds trust, especially when governments are forced to make and communicate decisions that inhibit our daily lives and establish 'the new normal'. Communicating the right messages, at the right time, to the right people is key. This helps establish facts and instigate appropriate action in an environment with many differing perspectives.

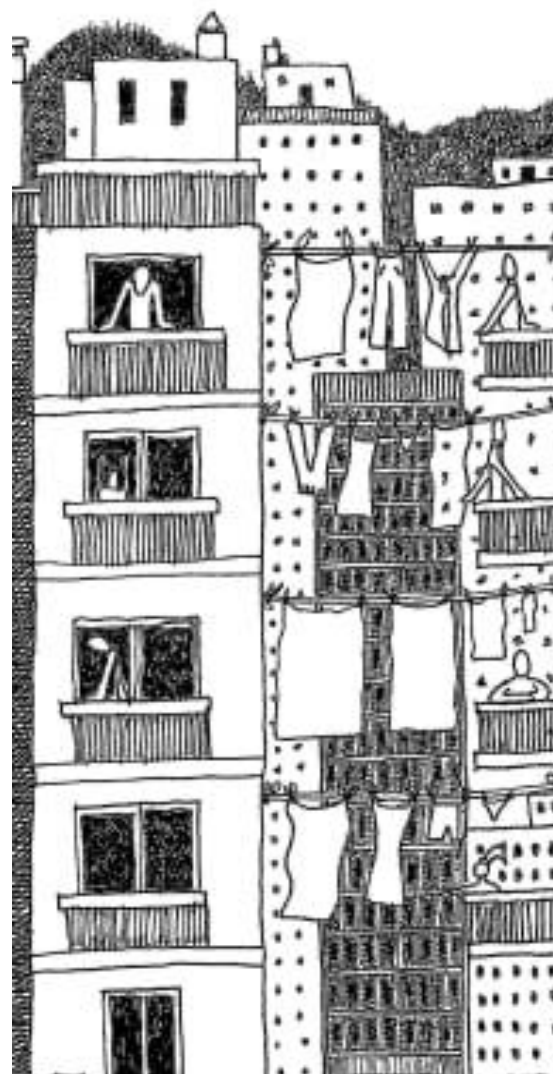


Entering the 'Decade of Action', in early 2020 the UN Secretary-General called for actionⁱ at all levels of our society, to empower individual people, to build fair globalisation and to live in harmony with nature. At a time where bold, critical and urgent action is needed to reduce child mortality, mitigate climate change, eliminate extreme poverty and achieve the ambitious targets of the 2030 Agenda for Sustainable Development, the COVID-19 pandemic has underlined the challenges facing governments from taking the extraordinary steps needed to attain the SDGs.

COVID-19 highlights the critical and urgent need for countries and the multilateral system to mobilize resources to ensure the availability and accessibility of geospatial information, not just for COVID-19 in both the short- and long-term, but for the SDGs as well. The IGIF has provided an anchor for the national response for countries, a first step for many has been to develop dashboards to communicate and visualise the spread of COVID-19.

The global geospatial community, through UN-GGIM, has demonstrated its readiness to respond to the challenge of COVID-19. The pandemic reinforces many of the challenges faced within the SDGs, and the tools that are required to create solutions are the same. While 2020 was intended to be a milestone of optimism in the ambitious march of the 2030 Agenda, COVID-19 has set us back. The 2020 High Level Political Forum noted that *"the multilateral system is under threat at a time when it urgently needs reform and reinvigoration to promote the 2030 Agenda. Even before the COVID-19 created a pandemic that has assailed communities around the world and driven the global economy into a downturn whose long-term effects cannot yet be fully assessed, the collective effort to implement the 2030 Agenda and its SDGs had reached a crossroads"*^{iv}. At this crossroads, it is recognized that the data environment needed for the SDGs provides the same foundation for countries to respond to COVID-19, and vice-versa.

This need for trusted, accurate and reliable geospatial information has also been recognized by the global development agendas, including the 2030 Agenda, the Sendai Framework and others. This is exemplified best in the 2030 Agenda calling for *"data which is high-quality, accessible, timely, reliable and disaggregated by income, sex, age, race, ethnicity, migration status, disability and geographic location and other characteristics relevant in the national contexts"*ⁱⁱⁱ. The foundation of this data environment is geospatial information. Geospatial information is the key integrator that enables informed decision-making, provides the integrator that enables the visualisation and analysis of statistical and non-authoritative information, and is a key mechanism that can





communicate this data to decision-makers and the public. Over the longer-term, we must collectively develop mechanisms, mobilize resources, and strengthen the global capacity of geospatial information. We must be bold and innovative in leveraging the transformational nature of technology to meet the challenges of COVID-19, build back better and meet the needs of the SDGs.

Never before in the history of humanity have we been more able to bring technology and people together for the betterment of society, the economy and the environment. Geospatial information provides the 'glue' to bring these elements together. This is most pertinent in developing countries, which for too long have been left behind; we now have the technology, tools and methods to bring data in all its forms together to understand '*where*'. We must mobilize resources to bridge the geospatial digital divide. It is a bridge that should have been crossed previously, but we are better late than never.

For more information on the Integrated Geospatial Information Framework^{iv}, the tenth session on UN-GGIM^v, and other related COVID-19 resources^{vi}, please visit the websites of UN-GGIM^{vii} and UNSD^{viii}.



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<https://www.un.org/sg/en/content/sg/speeches/2020-01-22/remarks-general-assembly-priorities-for-2020>ⁱ

E/HLPF/2020/4ⁱⁱ

Transforming our world: the 2030 Agenda for Sustainable Development - A/RES/70/1ⁱⁱⁱ

<https://igif.un.org>^{iv}

<http://ggim.un.org/meetings/GGIM-committee/10th-Session>^v

<https://covid-19-response.unstats.un.org>^{vi}

<https://ggim.un.org>^{vii}

<https://unstats.un.org>^{viii}

Annex I

The Role of Geospatial Information in National Responses to COVID-19

The following contributions illustrate the experiences of the geospatial information community in their national response to the COVID-19 public health crisis. They show how and why geospatial information was, and is, being used; underscoring how geospatial information is the glue that provides the integrative platform for all digital data that has a location dimension to it. The following countries contributed their national experiences:

1. Armenia
2. Australia
3. Burkina Faso
4. Chile
5. Dominican Republic
6. Ethiopia
7. Fiji
8. Honduras
9. Ireland
10. Republic of Korea
11. Malaysia
12. Panama
13. Philippines
14. Senegal

Operative and effective response to COVID-19 through geospatial data management at Cadastre Committee of the Republic of Armenia

At the Cadastre Committee of the Republic of Armenia (RA) the response to COVID-19 pandemic was operational and effective. The Committee has participated in establishment of isolated citizens' monitoring/management system to be implemented by the RA Ministry of Health, the RA Ministry of Emergency Situations and the RA Police. In particular, a digital map consisting of 120 management zones with relevant database has been created through application of GIS technologies. The digital map has been used to control the infected and their contact persons in more effective and coordinated way.

According to the RA Government instruction and in collaboration with the RA Police there has been created a digital map as a tool for RA Police to control and manage the situation in case of total Lockdown. This map includes the control posts, streets, residential areas and the relevant database.

The database of created digital maps has been fulfilled by using the attribute data provided by the RA Ministry of Health and the RA Police. This data included information from the RA Police, the departments of the RA Ministry of Emergency Situations, the hospitals and polyclinics, as well as geospatial information.

The digital maps designated to COVID-19 spread and control have been created by using both technical and information resources of the Committee, in particular the cadastre and thematic maps.

The key to the success was existence of digital maps and relevant geospatial information and GIS technology as well as skilled staff of respective departments at the Committee.

Geoscience Australia has been delivering digital mapping tools and technologies for faster, cheaper and smarter decision-making to help save lives and livelihoods during COVID-19.

The COVID-19 pandemic has really reinforced a slogan that Geoscience Australia has been using for a number of years which is: everything happens somewhere.

This slogan is highlighting that location, the place where something happens, is a key piece of information and is often the starting point for a lot of decision makers at all levels. It's also often the 'key' to joining different data together.

Very quickly during the COVID-19 crisis, location was a major focus, with government, business and the community urgently needing to know where COVID-19 cases were happening and the location of medical facilities, supplies and COVID-19 assessments centres.

In Australia, Geoscience Australia was quickly called on to help, given our expertise in delivering digital mapping tools and technologies for faster, cheaper and smarter decision-making to help save lives and livelihoods during COVID-19.

A key piece of work that Geoscience Australia has been involved in from the very beginning of the crisis has been capturing, revising and hosting digital mapping of the location of COVID-19 assessment centres, on behalf of the Department of Health.

The Department of Health approached Geoscience Australia to do this work because Geoscience Australia has many years of experience in updating and delivering digital mapping through ArcGis On-Line (AGOL) technology.

Geoscience Australia also had a digital mapping expert embedded into the Department of Health, in a Liaison Officer role, to help with communication between the two agencies and to make sure Geoscience Australia's support was put where it was most needed.

One example of data demand that Geoscience Australia has experienced during the pandemic has been a surge in requests for exposure information.

Geoscience Australia's Australian Exposure Information Platform (AEIP) is a free, web-based tool, for users to quickly and easily create exposure reports at any scale or extent across Australia. These exposure reports give users the critical information they need to make decisions pre, during and post hazard events, such as a pandemic.

The reports give a detailed statistical summary of exposure: the number of people, dwellings, other buildings, and agricultural and environmental assets that are within a threat area or hazard event that are likely to be impacted.

During COVID-19, Geoscience Australia prepared several customised requests from the AEIP for the Department of Health at three different geographic area aggregation levels.

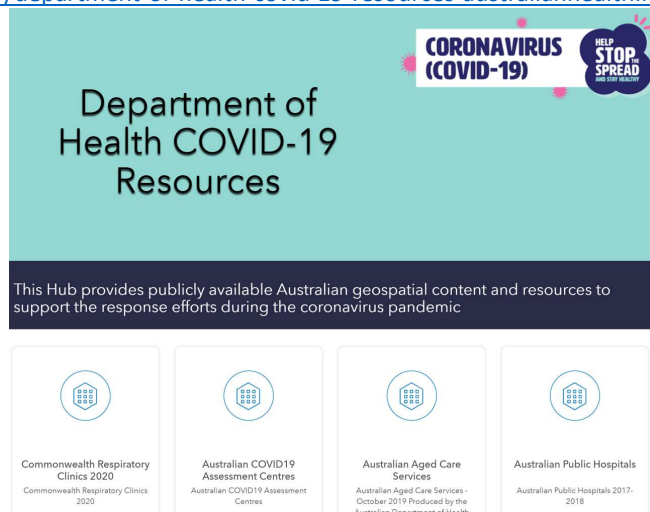
Having this exposure information at these three aggregation scales allowed the Department of Health to compare and integrate with other health data, and report information at the same aggregation.



COVID-19

The Response of the Geospatial Information Management Community

Website: <https://department-of-health-covid-19-resources-australianhealth.hub.arcgis.com/>



With Geoscience Australia's expertise and track-record we have become a trusted advisor to many different areas across the Australian Government on matters where location, through digital mapping, is part of decision-making.

On request, Geoscience Australia helped coordinate and deliver the following national datasets during COVID-19 to a central Department of Health data Hub:

- public hospitals,
- GP practices,
- pathology collection centres,
- respiratory medicine specialists and
- aged care facilities.
- private hospitals,
- intensive care specialists,
- pathology labs,

Before COVID-19, these datasets were not easy for users to find and users could not access them from a single, central, trusted location.

The Department of Health approached Geoscience Australia to help with this work because Geoscience Australia has a long history in coordinating easy to use, fit for purpose and nationally consistent digital mapping for government, business and the community.

Two areas stand out as key to the success of Geoscience Australia's COVID-19 contribution:

Communication

Geoscience Australia had a digital mapping expert embedded into the Department of Health, in a Liaison Officer role. This role has been critical given how fast-paced the COVID-19 work has been, as it has allowed for clear and concise lines of communication between the two agencies on what was needed and by when.

Adaptability

Geoscience Australia's response to the COVID-19 pandemic has been made more challenging because it coincided with the majority of staff working remotely for the first time. Fortunately, the agency had upgraded its ICT not so long ago to Microsoft Office365 in the cloud—making online collaboration much easier with most staff already familiar with the technology.

The move to remote working happened quite quickly at Geoscience Australia, at a time when staff were working closely with the Department of Health, the Department of Prime Minister and Cabinet and other departments on COVID-19 related work. This work was of the highest priority and fast-paced—not the best time to be cleaning out the spare room to set up a home office.

But Geoscience Australia staff have quickly got into their remote working routine and have continued to be very efficient and productive particularly at the height of COVID-19 requests to

Geospatial actors working together in Burkina Faso

As soon as the first few cases of COVID 19 in Burkina appeared, around March 9, 2020, the Government, through its health ministry, set up a response system for the pandemic. From that moment, the Geographic Institute of Burkina (IGB) in concert with Department of Geography, Joseph KI-ZERBO University (Ouagadougou) developed a research protocol (finalized in April 2020) which aimed to understand the spatial distribution of COVID-19 and to provide the authorities with guidelines for effective decision-making in order to break the chain of transmission of this virus. The specific objectives were to geo-reference the sites of confirmed cases and their movements for the 14 days preceding the diagnosis; to create a spatial database allowing real-time monitoring of the evolution of the pandemic; to carry out prospective modeling of the spread of the virus; and to contribute to an appropriate response plan according to the context of each locality. To this end, the group submitted thematic data requests for the realization of project. Unfortunately, this data could not be processed and handed over to the group. Other important parallel actions have been initiated by civil society actors such as Burkina Faso FlyingLabs. Theirs production focused on situation of COVID-19 contamination per day. The municipalities also used geospatial information when it comes to identifying important markets that should be closed in order to limit the massive risks of transmission. Capacity development was offered by Gigahertz, local representative of Esri from May 11 to 12 to IGB. This private company produce also a dashboard which data covered the period from March 09 to April 26, 2020. This important activity allows the ministry in charge of health to visualize the evolution of the pandemic at this time. Unfortunately, from that moment, the data could no longer be available by the ministry in charge of health, and updates made. The COVID-19 situation in Burkina has improved, but efforts must continue, as well as collaboration between actors to avoid new surprises.

The occurrence of COVID 19 has enabled geographic information actors to understand that collaboration between actors is mandatory in order to provide decision-makers with useful information. This pandemic was sudden, the reaction of the geographic information community in Burkina Faso in the processing of the data was moderate.

Geographic Institute of Burkina benefited from the support from Esri's disaster response program and from the training and webinars offered.

Other actors also used Esri's technology and a national geographic database produced by IGB. Platforms like Google Earth and OpenStreetMap were also used.



COVID-19

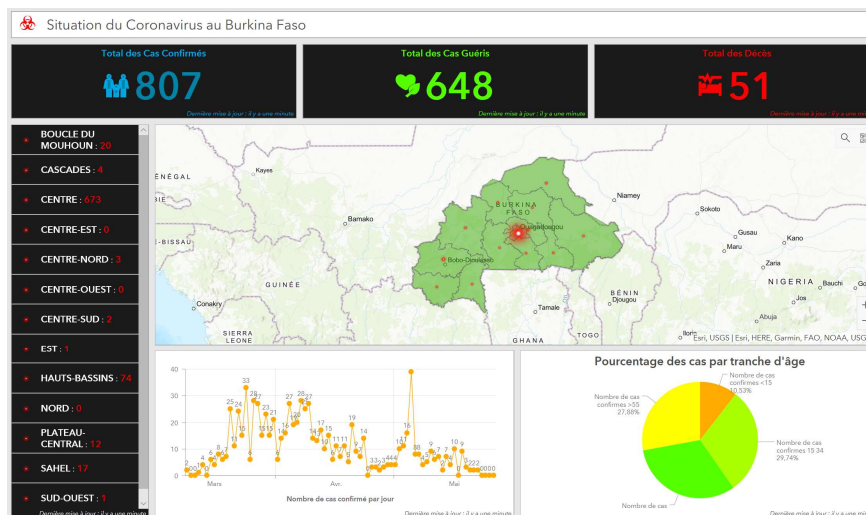
The Response of the Geospatial Information Management Community

The dashboard and website developed for the response to Covid-19 in Burkina Faso by Gigahertz (representative of Esri)

<https://ms-sante-bf.maps.arcgis.com/apps/opsdashboard/index.html#/4db4b8f9af8541f486f623d2a3b848a2>

The geospatial data of the IGB including the National Topographic Data Base with its administrative layers, localities, communication routes, etc. were used by the actors in the production of the maps and for visualization.

The staff also contributed to improving the quality of the documents produced by the various actors.



The dataset used by the different actors were obtained through requests made to owners and producers of the data based on needs. The datasets which has been used by actors in the response are mainly:

- Urban plot data provide by the ministry in charge of Town planning and Housing;
- National topographic data base from Geographic Institute of Burkina;
- GPS point by the stakeholders according to their needs;
- Open sources data like Google Earth, Open Street Map, etc.



COVID-19 TERRITORIAL VIEWER, Ministry of National Assets (IDE Chile)

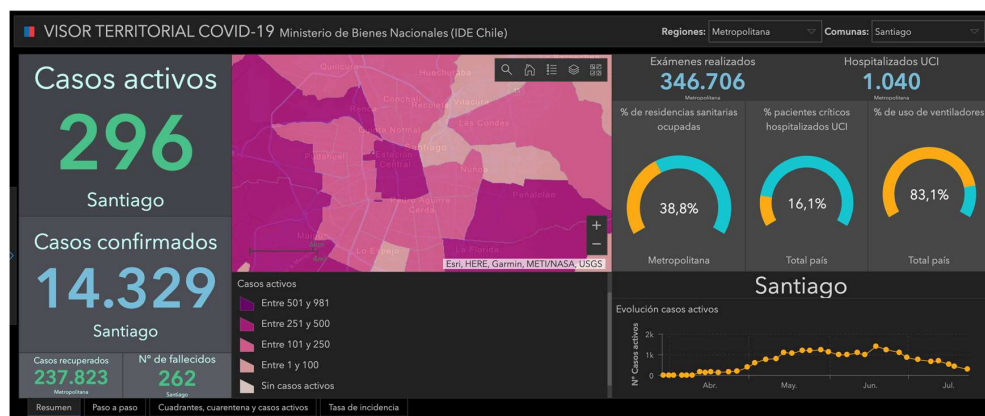
From the Ministry of National Assets, through the Executive Secretariat of the National System for Territorial Information Coordination (SNIT - IDE Chile), the commitment was made to facilitate access to the georeferenced information generated by the Ministry of Health, related to COVID-19. Thus, the COVID-19 Territorial Viewer was conceptualized and developed as a platform open to all citizens, displaying territorial information at the national, regional, communal (municipality) and neighborhood levels, with the aim of providing the community with more information regarding this health emergency and its behavior in the territory. Thanks to the COVID-19 Territorial viewer, people have more information and thus can make better decisions, be more responsible and, ultimately, focus resources where they are most needed.

The Ministry of National Assets has implemented the COVID-19 Territorial Viewer, which contains:

- **Contagion quadrants:** Reported Positive PCR cases and "Probable" cases within a radius of one square kilometer.
- **Tables with statistics of the country and by region:** Data of confirmed total cases, new cases, critical patients, deceased patients, recovered patients and total tests performed.
- **Active cases by commune:** Total number of active infected persons per commune.
- **Communes under quarantine:** Communes that are under quarantine
- **Communes with sanitary coordination:** Communes subject to sanitary coordination.
- **Daily advances:** Daily advances from the statistics mentioned above.
- **Implementation of the Step-by-Step Plan:** Status of the implementation of the Plan at the communal (municipality) level.

In addition, a summary of what people can or cannot do in each of the stages and if they will be moving from one stage to other in the short term.

- Step 1:** Quarantine
- Step 2:** Transition
- Step 3:** Preparation
- Step 4:** Initial opening
- Step 5:** Advanced opening



<https://www.visorterritorial.cl/>

The dynamic viewer incorporates the official data according to the Epidemiological Report of the Ministry of Health:

- Confirmed number of cases georeferenced to quadrants of 1 x 1 square kilometers calculated by the Emergency Territorial Information Management Team of the Department of Risk Management in Emergencies and Disasters of the Ministry of Health.
- Information base georeferenced, coming from the Obligatory Epivigila Notification System of the Epidemiology Department of the Ministry of Health.
- Geospatial Information on the Administrative Political Division of the country, provided by the Under-secretariat for Regional and Administrative Development of the Ministry of the Interior.

The COVID-19 Territorial Viewer of the Ministry of National Assets is used as one of the main platforms for monitoring the pandemic in Chile.

This viewer is a didactic platform that makes data transparent, providing valuable information to citizens. It is also a key tool for decision-makers through the delivery of statistical tables, achieving the dissemination of valuable information in an interactive and simple way.

The COVID-19 Territorial Viewer is a useful tool that has enabled and supported the work of oversight, as well as targeting the measures of the municipalities in the different neighborhoods of the country. This platform has been essential for planning actions in the different territories of the country, to take the necessary measures where there is a greater number of infections and with regard to future actions in the context of this pandemic, and the measures that, as a country, will be implemented, giving a territorial perspective to this phenomenon.

National Geospatial Response to COVID-19 - Dominican Republic

The “José Joaquín Hungría Morell” National Geographic Institute (IGN-JJHM) participates and collaborates in the data management and analysis with its geospatial data and capabilities for the REPORTA.DO platform together with the Emergency Operations Center (COE), Ministry of Public Health (MSP), through the General Direction of Epidemiology (DIGEPI), Ministry of the Presidency, as well as with the Ministry of Defense, NGO ARCOIRIS, among other public and private organizations.

Likewise, work is being done on the systematization of the SINAVE case database and the georeferencing of confirmed cases for the preparation of maps and analysis of the spread of the virus, as well as the updating of approximately 10 platforms for internal use by DIGEPI and the COE. The NGO ARCOIRIS, DIGEPI and the COE intervene in this process.

Since March, when this collaboration began, two (2) public data platforms have been developed and implemented.

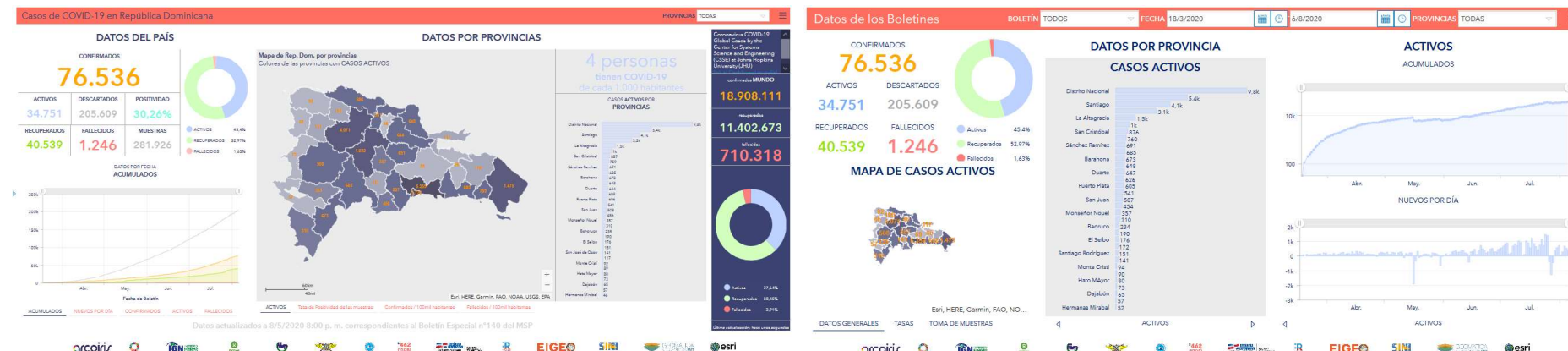
Arcgis Pro has been used for data processing and analysis, while dashboards have been developed using Arcgis Online.

As for datasets used:

- Data from the Bulletins of the Ministry of Public Health.
- Shapefiles of provinces, municipalities, neighborhoods and places (National Statistics Office).
- Data on Hospitals (Ministry of Public Health).

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- **COVID-19 cases platform in Dominican Republic:** <https://arcg.is/1WX8ST> | - **Bulletin's Platform:** <https://arcg.is/v94vr>



The data used for spatial analysis carried out by IGN-JJHM analysts was provided by the National Statistics Office (ONE), the Ministry of Public Health, and the Emergency Operations Center.

The demographic data from the National Population and Housing Census were population, sex, ages, shapefiles of provinces, municipalities, neighborhoods and places.

The data from the Ministry of Public Health used are number of hospitals, available beds, mechanical ventilators, intensive care units, among others.

The contribution of the IGN-JJHM consists of facilitating and providing the technical analysts with the capacities and skills necessary for the different analyzes generated from the demographic, health and response variables to COVID-19, compiled by the country's official organizations. Analysts capabilities are comprised of professionals in the areas of geography, mapping, geomatics and information and communication technologies for data processing.

National geospatial taskforce – leadership and coordination

The geospatial Information Institute has been strategically responding to the COVID-19 pandemic in Ethiopia under the guidance of the national geospatial taskforce that reports to the ministerial committee through the Ministry of Innovation and Technology. The national geospatial taskforce consists of high-ranking government officials including ministers from the first line respondent institutions. The institute has successfully responded to various urgent needs of many sectors. Main focus areas include nationwide mapping of health facilities (isolation, quarantine and treatment centers, hospitals, clinics, pharmacies), catchment areas (schools, hotels, universities), essential items (food banks, cooperative unions, shops, warehouses, food processing factories), illegal border crossing and mobility routes, vulnerable sites, other key infrastructures (road network, water points) as well as spread of the COVID-19 virus.

We also produced various analytical maps to support the national efforts in response to the pandemic. Analytical maps were used for planning, implementation and monitoring purposes such as resource allocation, identification of highly vulnerable segment of the society and sites to the pandemics, controlling of illegal mobility of people across the border areas, trend analysis of the COVID-19. Besides, the Institute also provided various geospatial datasets including administrative boundaries to stakeholders using its geoportal.

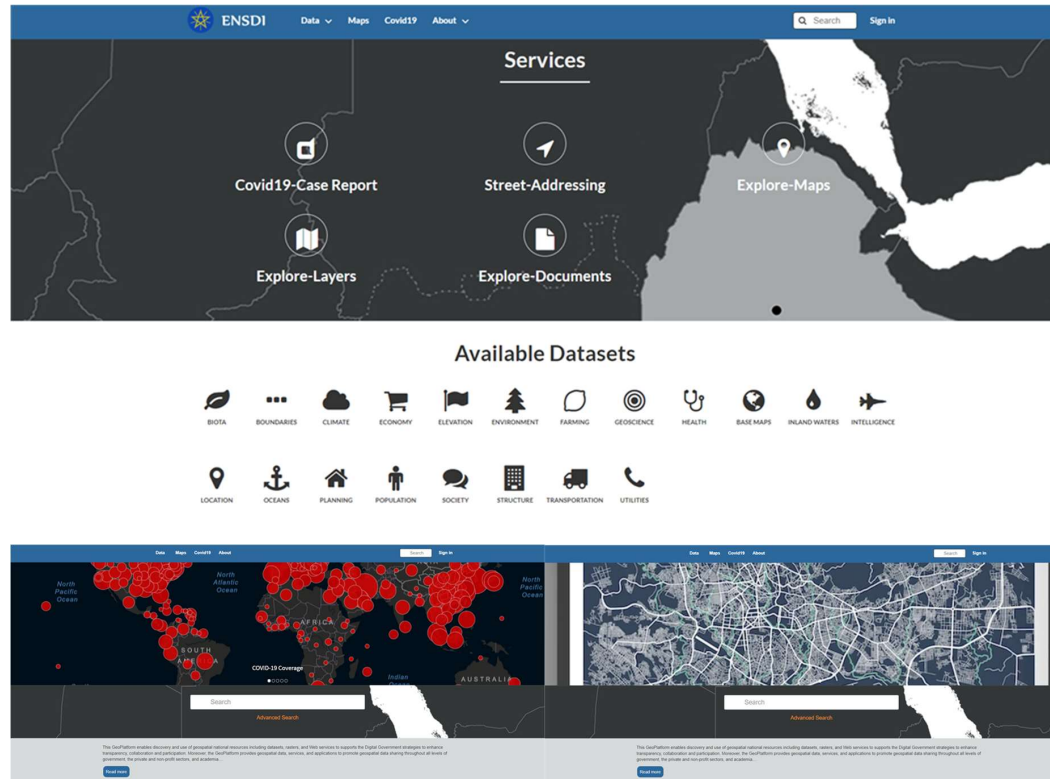
The Institute has completed the development of data sharing platform, and successfully deployed and operationalized the national geoportal to ensure effective sharing of geospatial datasets in order to combat the pandemic. We successfully shared most datasets through the geoportal and contributed to the minimization of the COVID-19 spread by adhering to social distancing measures.

We also developed dashboard for mapping the spread of the pandemic in space and time scales as well as stock management system and basic functionalities of street addressing to enhance resource management and logistical services.

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The Response of the Geospatial Information Management Community

The dashboards, datasets and routing services is available via the NSDI platform: www.ENSIDI.gov.et



National response to the COVID-19 pandemic is well coordinated and led by the ministerial committee. The geospatial response is led by the national geospatial taskforce that constitutes high-ranking government officials from various institutions such as Ministry of Health, Ministry of Peace, Ministry of Agriculture, Ministry of Urban Development and Construction, Ministry of Innovation and Technology, National Disaster Risk Management Agency, Federal Cooperative Union, Federal Transport Authority, City Administrations and Regional States, Central Statistical Agency, Ethiopian Space Science and Technology Institute, Regional Science and Technology Commission, and the Geospatial Information Institute.

The formation of this taskforce has made access to data from multiple sources easier. All respondent institutions have provided us with all necessary datasets that are required for the production of maps and analytical data. About 95% of the datasets used for the response to the pandemic were collected from stakeholders. We established strong cooperation and partnership that can be further strengthen beyond the COVID-19 pandemic.

Our major key success factors include but not limited to the following points.

- i) Shared vision. All government institutions, private sectors, NGOs and citizens share the same vision in responding to the pandemic. This has created strong cooperation and partnership resulting in positive impact in responding to the pandemic.
- ii) Strategic leadership. The national response to the COVID-19 is well coordinated and led. We established strong monitoring and evaluation system.
- iii) Strong guidance and support from the Prime Minister Office, Ministerial committee, national technology and innovation committee and national geospatial taskforce.
- iv) strong institutional leadership and committed staff.

Geospatial Information as a useful tool in responding to CoVID-19 in Fiji

Fiji's Ministry of Lands and Mineral Resources Geospatial Information Management (GIM) team set up the geospatial capability within the Ministry of Health and Medical Services Incident Management Team (IMT) for CoVID-19 one week prior to the first reported case. The GIM team has been working with IMT ever since using ArcGIS and their geospatial datasets, combining data such as contact tracing, fever clinics, isolation facilities, cluster information to provide situation reports to assist with the planning and deployment of resources for the health teams.

Officers seconded from the Ministry of Lands and Mineral Resources were organized in shifts as they worked 24 hours on a daily basis with members of the IMT to provide the necessary geospatial information technical support for planning and for the frontline medical teams dealing with CoVID-19.

The GIM team also worked with Fiji's Military Forces to assist them using their geospatial resources for their forward security planning and relief efforts. Prior to Fiji's CoVID-19 dashboard, the GIM team created a VanuaGIS CoVID-19 app where the information captured was reflected on the app along with the Esri based CoVID-19 Dashboard.

In the middle of the CoVID-19 situation in Fiji, on April 7, Tropical Cyclone Harold devastated parts of Fiji, once again geospatial information proved to be very useful for identifying communities affected and the deployment of relief assistance to these communities.

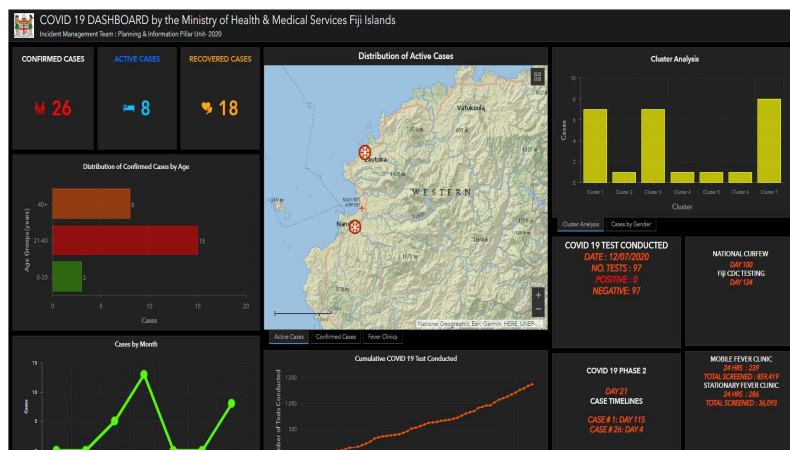
The Geospatial information Management (GIM) Division within the Ministry was approached to provide a team of officers who had mapping and GIS capabilities to be based with the CoVID-19 Incident Management Team (IMT) prior to the first case being detected in Fiji.

Using ArcGIS SDE, the GIM officers were able to use the existing base datasets such as cadastral, hydrographic, transport, infrastructure, population, along with the mapped quarantine and isolation centers, fever clinics, contact tracing, resources and medical supplies to provide a "birds eye" view and a better understanding to senior government and health officials on what was taking place on the ground in regards to the CoVID-19 cases and work carried out by the medical teams.

All this information was also reflected on the Fiji's Esri based VanuaGIS platform and the CoVID-19 Dashboard,



<http://fiji.geospatial.maps.arcgis.com/apps/opsdashboard/index.html#/a099962e2cae4e15b8127d044753723d>



The datasets mentioned below is divided into two categories:

Existing data set and responsible agencies:

- Villages/Settlement – MLMR/Itaukei
- Infrastructure & Transport – MLMR, FRA, CAAF, Navy, NFA, FPF, MEHA
- Administration boundaries - MLMR/Itaukei
- Land Use – MLMR
- Flooding Emergency Response – NDMO
- Census – Bureau of Stats

Newly collected data sets and responsible agencies

- Health Facilities/Quarantine, Isolation, Cases, Fever Clinics, Medical Areas – MOH
- COVID 19 Lockdown – FPF/RFMF
- Contact tracing

There were several factors that were key to the success of the Ministry of Lands and Mineral Resources contribution to the national response to CoVID-19 and these were:

- An established geospatial information data hub that is managed by the Ministry of Lands and Mineral Resources, as part of a national strategic move, where over the years base geospatial information was digitized or captured, stored and accessed by agencies for their own planning and deployment of resources
- The work of the cabinet endorsed Fiji Geospatial Information Management Council to form networks and partnerships that allow for sharing of geospatial datasets between agencies, capacity building and strengthening of capacities among agencies
- The recognition by government on the benefits of geospatial information and the decision to use geospatial information as a tool to respond to CoVID-19
- Investment by government in hardwares and softwares, and the creation of mapping and geospatial specialist positions to carry out the necessary work of setting up the data hub along with the capture, storage and analysis of geospatial information, which in turn was deployed in the response to CoVID-19
- The motivation of the geospatial specialists to serve the nation by working with the IMT to provide the needed geospatial information capability and support on a 24/7 basis for the CoVID-19 response



COVID-19 in Honduras

In the context of the emergency, the National System of Emergencies SINAGER has the responsibility, bringing together three institutions to lead the process of Honduras response to COVID-19 emergency.

PRESIDENCIAL HOUSE -- <https://presidencia.gob.hn/>

HEALTH SECRETARY - <http://www.salud.gob.hn/site/>

MINISTRY OF LABOR - <http://www.trabajo.gob.hn/>

The websites include information on statistics about:

- Infected
- Dead
- Recovered
- In detail at departmental level (second administrative level)

The distribution of these websites is divided into:

Information sharing with:

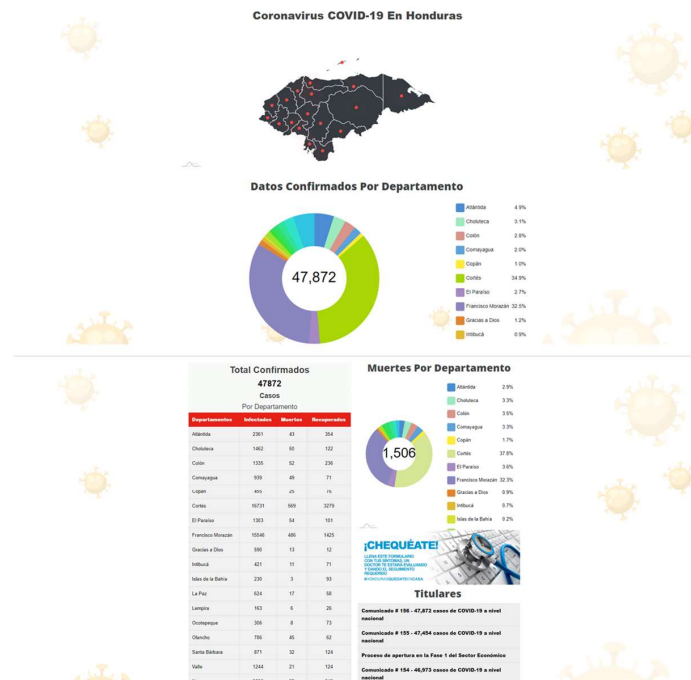
- Map at the Departmental level
- Statistics on gender and ages in charts
- Timelines per day
- Total of confirmed cases by Departments
- Number of deaths by Departments

Section of Messages

- Gallery holders
- National Chains
- Transfer portal
- Advance “Honduras Solidaria”
- Videos about symptoms, prevention and treatments, spreading containment
- Official Tweets

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<https://covid19honduras.org/>



Institutions that are part to the response to the emergency in Honduras:

- National Police
- Armed Forces of Honduras
- Permanent Commission of Contingencies of Honduras
- Social Development Secretary
- Secretary of the Interior, Justice and Decentralization
- Honduras Strategic Investment (INVEST-H)

The PRESIDENTIAL HOUSE coordinated the -

- Provision of basic cartography of Honduras.
- Generation of information on health infrastructure and response attention.
- Collection of information on official statistics and health data.



Ireland's GeoHive COVID-19 Response Coordination Group (GH-COVID19-RCG)

As part of the Government of Ireland's national response to COVID-19, a GeoHive Coordination Response Group was established on 16th March 2020 to coordinate the technical, data, policy, and financial activities related to providing key data and tools, via GeoHive – the State's Geospatial Data Hub.

Membership of this group consists of Ordnance Survey Ireland (OSI), the Central Statistics Office (CSO), the Department of Housing, Planning, and Local Government (DHPLG) and the All-Island Research Observatory (AIRO) with Esri Ireland as technical partners, subcontracted under OSI.

The agreed goals for this group are to:

1. Build a participation network that facilitates the "collect once, use many times" philosophy of the Public Services Data Strategy for geo-statistical data in the response to COVID-19.
2. Introduce geospatial and statistical data governance procedures that focus on reducing/removing data duplication.
3. Maximise the use of the State's geospatial hub (GeoHive) through appropriate data collection and data visualisation.

The Group has established a:

- GeoHive COVID-19 response platform with public, private and secure virtual data room capabilities
- Geo-statistical data governance and management sub-group to provide expertise in support of the Government's COVID-19 response
- GeoHive technical architecture sub-group to provide the expertise in support the Government's COVID-19 response.

A Terms of Reference (TOR), Data Governance and Stakeholder Relationship mapping is in place to manage the governance and co-ordination of the stakeholders involved and communication channels.

A shared programme repository was also established.

The COVID-19 pandemic response in Ireland saw multiple datasets and data sources being integrated and shared at pace. The role and contribution of geospatial data, technologies and tools in public health and safety came to the fore and demonstrated the benefits of real collaboration when authoritative institutional arrangements and partnerships were in place. Data management was, and continues to be, a significant overhead and further supports the benefits of repurpose existing data and the importance of data sharing and data integration. Geospatial information as a key component, and an enabler, of an evolving national data ecosystem for public health and safety. Ireland's geospatial data services, apps and platform have been developed in an agile manner whilst still adhering to high standards of data governance and management.

During the period March - August 2020 the GH-COVID19-RCG have developed a number of geospatial capabilities including data hubs, apps, reports, StoryMaps and dashboards.

These included:

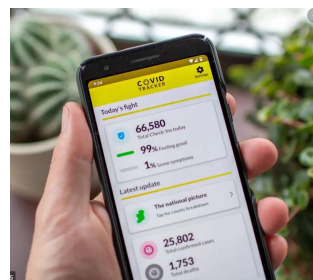
- Secure data hub for Ireland Chief Medical Officer (CMO) and Public Health Emergency Team which is updated daily
- Secure dashboard and business report for Department of An Taoiseach (Ireland's Prime Minister) for recovery phase planning. This visualised the impact of a decision to reopen a particular part of the economy; dashboard with business location data, classified by business type. Included a map-based dashboard that displays business and retail information, showing the classification, density and size of business premises by location
- The National COVID-19 Data Hub as a central location for up-to-date authoritative COVID information, mapping, data and statistics
- Open Data services which are harvested to Ireland's Open Data Platform (data.gov.ie) as 3-star and 5-star linked open data.
- Geo-statistical visualisation of traffic volume data for Ireland's Policing Service - An Garda Síochána (AGS) – with secure access for all Senior Garda Personnel and Garda Control Room
- Sidewalk app for Ireland's National Transport Authority and Local Authority service for Social Distancing in Ireland which includes average width of Sidewalks, Pedestrian Zones and Public Transport
- Local Authority Community Support GeoHive data platform under the Irish Government's "Community Call" initiative
- Authoritative Open Data Services used by National COVID Tracker App and national TV and print media

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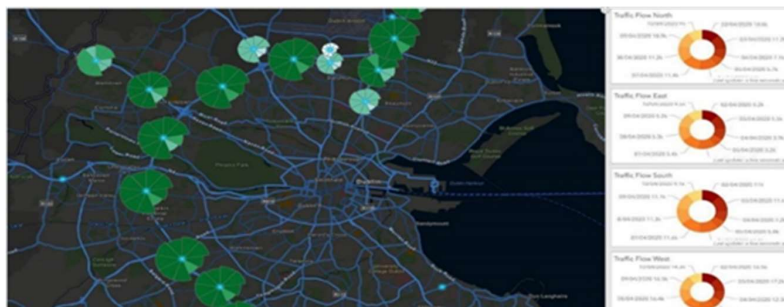
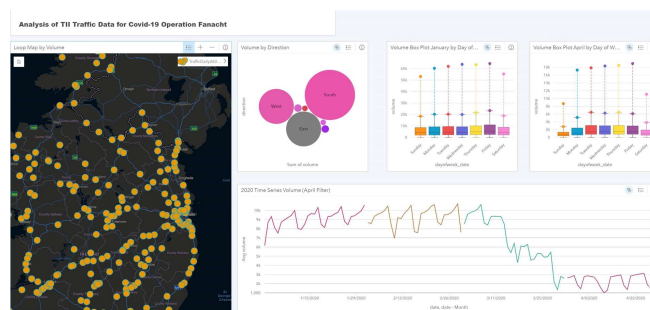
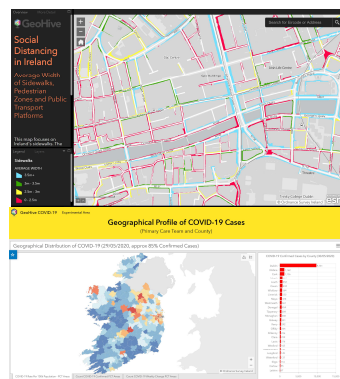
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<https://covid19ireland-geohive.hub.arcgis.com/>

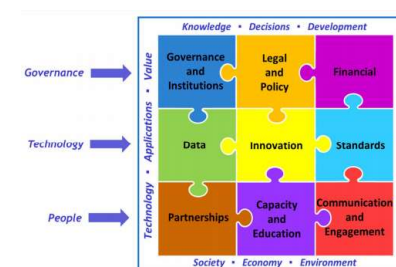


<https://covidtracker.gov.ie/>



The outcomes and deliverables achieved by Ireland's GeoHive Response Coordination Group have been well received and part of the key resources reference by the National Public Health Emergency Team on a daily basis for decision making.

Ireland were able to quickly refocus the resources, infrastructure and governance already in place as part of the United Nations Federated Information System for the Sustainable Development Goals (UN FIS4SDGs) as part of the national COVID response. In addition, the United Nations Integrated Geospatial Information Framework (IGIF) was used as the basis for our programme governance.



Key lessons from Ireland's national geo-statistical response are:

- COVID-19 Pandemic formalized OSI's geospatial data hub, GeoHive, as an authoritative standardized public sector data collaboration platform
- Geospatial data and apps have played a key role in revealing insights, patterns and trends as part of the Ireland's COVID-19 response
- Geospatial and statistical data governance removed duplication and enabled sharing
- Rapid response due to re-use of existing data and platform, however there was still a significant data management overhead due to various standards used across data sources
- Resulted in the real understanding of the value geospatial data and infrastructure plays in enabling data sharing, collaboration and analysis to gain insights and to manage.

Comprehensive Response to COVID-19 through Open Big Data Policy on the basis of Cooperation among the Diverse Organization

- On January 3, 2020, the Korean government issued the national infectious disease risk alert level to Attention, and began to operate the 24/7 monitoring system in emergency operation center under the Korea Centers for Disease Control and Prevention (KCDC), the map shows the occurrence status of each region and the number of confirmed positive cases on the website.
- To respond to COVID-19, the procedure is divided into screening and diagnosis, epidemiological investigation, patient and contact management, and prevention.
 - Among those procedures, testing kits promptly trace and monitor confirmed patients with geospatial information and quickly provide information by open public data while ensuring transparency.
- The COVID-19 Epidemiological Investigation System is a system that automates the process of contact tracing for COVID-19 confirmed cases. The system shows travel routes of confirmed COVID-19 patients on a map that is embedded on the platform, and also provides related statistical information with big data.
- NGII provides the source of map to the government's epidemiological investigation system for being used as background map to show the routes of confirmed cases.
- The COVID-19 Epidemiological Investigation System uses the smart city data hub as an analysis tool.
 - * Smart City Data Hub : An analysis for large-scale city data, it analyzes the big data related to various areas such as transportation, energy, environment, and safety in real time and uses them to realize smart city services.*
- Data such as location of the confirmed patient's routes, building data, hospital information, and status information of the selected clinic are utilized and the system provides the result of analyzed data of the travel routes of confirmed patients and hotspots by processing and analyzing the information input into system.
- The system is successfully being operated by the partnership of different fields, such as the National Police Agency, the Credit Finance Association, 3 mobile carriers and 22 credit card companies.

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• Open portal site



• The COVID-19 Epidemiological Investigation System (only useful through governmental intranet)



- The COVID-19 Epidemiological Investigation System identifies mainly the path of confirmed patients quickly by executing real time big data analysis of the movement history and credit card usage data of the confirmed patients.
- The COVID-19 Epidemiological Investigation System developed by the Ministry of Land, Infrastructure and Transport (hereinafter 'MOLIT') and is being co-operated by MOLIT and Korea Centers for Disease Control & Prevention.
- Also with the partnership of the national police agency, the credit finance association, 3 major mobile carriers, and 22 credit card companies, the system identifies the transmission path and hotspots by analyzing the provided geospatial information.

•[Open Data Policy] NGII mainly contributes to COVID-19 response by open data to the public for free of charge. It helped the private sector making diverse applications promptly and broadly.

•[Data Integration] To create a platform environment focused on sharing, linkage and convergence through the latest ICT technology.

- Improve the level of citizens' technology by continuously improving the quality of geospatial information and providing various map portal services in the private sector.

•[Engagement] The government actively opened public data on people's daily lives including confirmed case of COVID-19 in Korea and overseas(via homepage of local government, public data portal, etc.). Based on this, citizens and companies are generating public data to share it with people.

•[Partnerships] It is establishing a governance system based on horizontal cooperation between governments, telecommunications companies, credit card companies, and citizens.

Geospatial data plays a fundamental role in decisions for life

The Ministry of Health together with the Government Innovation Authority joined forces to implement the monitoring and control of cases for COVID-19 in Panama. Thus, the data center collects information on: tests carried out, cases according to sex, age groups, number of confirmed, recovered and deceased cases, and also provenances and location of cases. The information arranged on a monitoring dashboard provided with graphs and maps, facilitates the understanding of the authorities and citizens, resulting in better decision-making.

The National Geographic Institute supports institutions such as the National Border Service and the Naval Service, as well as the Office of the First Lady in the delivery of medical supplies in areas of difficult access. Cartographic objects such as runways and airports were analyzed to better understand their capacity and utility, and precisely locate collection centers and establish logistical hubs in order to maximize resource mobilization and distribution in what is called "The Plan for Sustaining Logistics and Humanitarian Aid".

Planning is enhanced with geoinformation to support the preparation of maps for the: i) location of hotels for the distribution of food and medicine for those impacted; ii) patrolling quarantine areas by the National Police; and iii) the establishment of new waste collection routes.

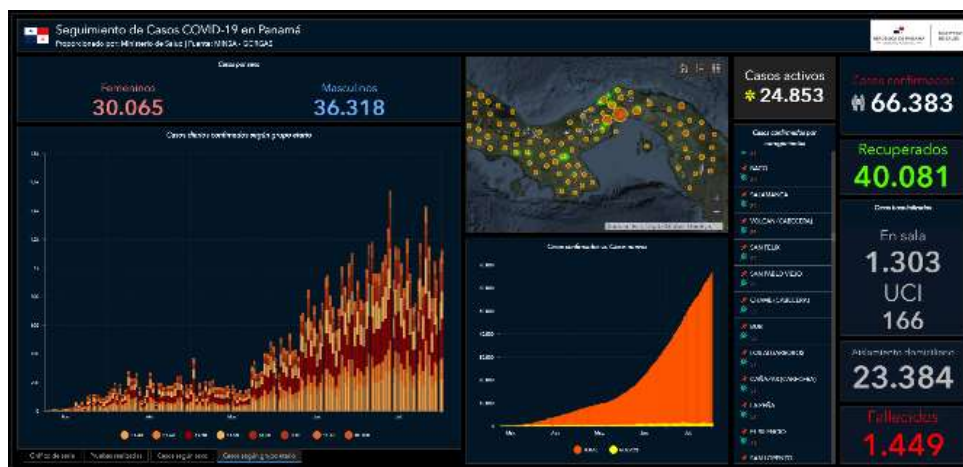
The Emergency Operation Center has implemented traceability centers for which data at a scale of 1: 5 000 has been used, for specific locations of those affected, at the level of neighborhoods and blocks

The geospatial capabilities, datasets and tools deployed for the response include -

1. Information on: number of cases; number of tests; number of deaths; number of isolated cases in homes, hotels, intensive care units and hospitals; location of cases by neighborhoods and townships.
2. For the work of the monitoring panel, the training of personnel for maintenance of daily information has been used.
3. Updating the database of administrative-political boundaries and populated places has been crucial in generating maps for collection centers and logistical support.
4. Other data sets such as: hydrography; relief (Digital Terrain Model); road network and structures; contributed to the integration of logistics routes and reflected in maps.
5. High-precision ortho images, radar images, and digital models further improved the cartographic information.

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<https://geosocial.maps.arcgis.com/apps/opsdashboard/index.html#/2c6e932c690d467b85375af52b614472>

The ability of the National Authority for Land Administration and the Tommy Guardia National Geographic Institute in contributing to Panama's response to Covid-19 -

1. Basic information available through the web, which gives an idea of what can be provided to users, in this case to the security services.
2. Personnel and equipment trained and available to provide quick response.
3. Knowledge of appropriate geospatial technologies, systems and tools that are available to governments.
4. Digital mapping available for generation of other products.
5. Good institutional collaboration.

Other datasets used and integrated for the response -

1. Dataset provided by the Ministry of Education, such as educational centers, where collection centers are generally located.
2. The description of routes for waste collection, provided by the National Cleaning Authority.
3. Field experience of security services personnel contributed to update the databases of populated centers and topographic features such as rivers, roads, etc.
4. Electoral Circuits, provided by the Electoral Tribunal.

COVID-19: Department of Survey and Mapping Malaysia develops applications for the National Security Council (NSC) and the Malaysian Armed Forces (MAF)

On 18 March 2020, Department of Survey and Mapping Malaysia (JUPEM) developed a dashboard application (WebGIS) that provides a Geospatial Common Operating Picture for NSC and MAF on the latest development of COVID-19 which includes reporting of positive cases among people under surveillance (PUS) within the NSC and MAF communities as well as the public. The dashboard is equipped with a display containing the attribute and geospatial information which helps in the development of GIS application for monitoring purposes and overall reporting. The news on this initiative has been published in local online news channel dated 10th April 2020.

<http://english.astroawani.com/malaysia-news/covid-19-ketsa-develops-application-atm-and-mkn-237644>

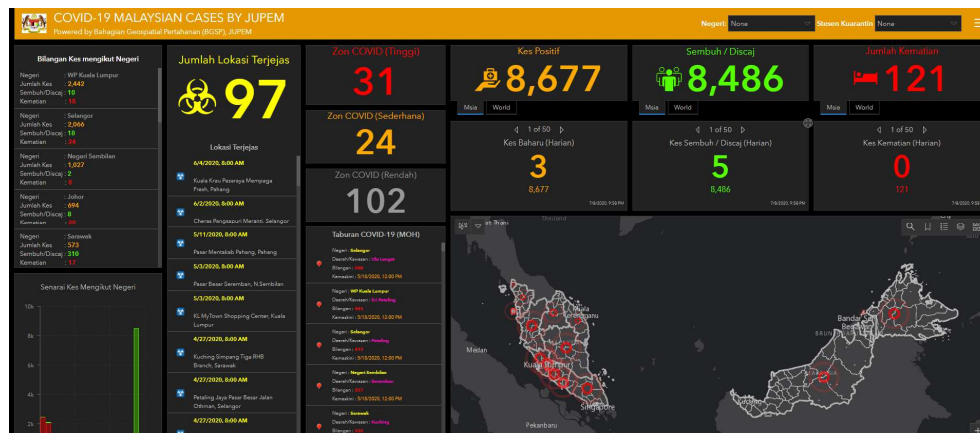
JUPEM developed:

- a) Covid-19 Web Map.
Capable of showing location and information of affected areas, hospitals designated for treatment, quarantine centers, road blocks etc related to pandemic containment exercise.
- b) Covid-19 Dashboard for NSC and MAF
Delivers daily statistics of Covid-19 infection, death, recovery cases by region.

Datasets:

- a) JUPEM's topographic data
- b) Covid-19 daily statistics from the Ministry of Health
- c) Covid-19 daily statistics from the MAF
- d) Demographic data from Department of Statistics
- e) Place of Interest (POI) data from National Geospatial Center

<https://bgp.maps.arcgis.com/apps/opsdashboard/index.html#/58571642da3a4e68b30cfd5e7ca4deb8>



The Dashboard created is used as one of the main monitoring platform of the pandemic in the NSC and by the MAF. It is a key tool to provide insight for the decision makers in timely manner to plan and execute operations under the country's Movement Control Order, and deployment of security forces including for cordoning of affected areas and maintaining roadblocks. It also incorporated the government's analytical tools to empower descriptive, diagnostic, predictive and prescriptive analysis of the outbreak.

The dashboard incorporated data and services from:

- Ministry of Health: Daily statistics (infection, death, recovery cases)
- ESRI Malaysia: Daily statistics (Malaysia's and global statistical services)
- Outbreak Malaysia: Daily statistics (affected areas)
- Malaysia Meteorological Department : Daily weather forecast
- National Geospatial Center: Location of Points of interest

Mapping COVID-19 Cases in the Philippines

The National Mapping and Resource Information Authority (NAMRIA), through the Geospatial Information System Management Branch (GISMB), in collaboration with the Department of Health (DOH) launched the COVID Map App, a collection of up-to-date digital maps on COVID-19 in the Philippines. The maps and the corresponding statistics are updated daily. The COVID Map App features geospatial data on COVID-19 case information on national, regional, provincial, and city/municipal levels; including health status and sex-disaggregated data on patients. The application also features the location of licensed testing laboratories. The COVID-19 maps on Geoportal Philippines can be accessed through the link <http://geoportal.gov.ph/gpapps/covidapp>. Geoportal Philippines is a web mapping portal service that provides a system for sharing of and access to geospatial information using one common multiscale basemaps. The COVID-19 Map App can also be accessed through the DOH official website.

The COVID-19 map application leverages the Geoportal Philippines platform to provide a visualization of COVID-19 cases in the country across different geographic levels. The application besides delivering the basic functionalities in GIS including graphs/charts, offers the users an insight on the spread of cases, i.e. where cases cluster in the regions, provinces, and cities/municipalities, sex-disaggregated information, prevalence of cases by age group, and health status of confirmed cases. Integrating these information with available population data along with information on the location of licensed testing laboratories, offers an empowering perspective that can be used by concerned authorities as bases in formulating plans and instituting measures to combat the spread of the disease.

The key to the success of this initiative can be attributed to the following:

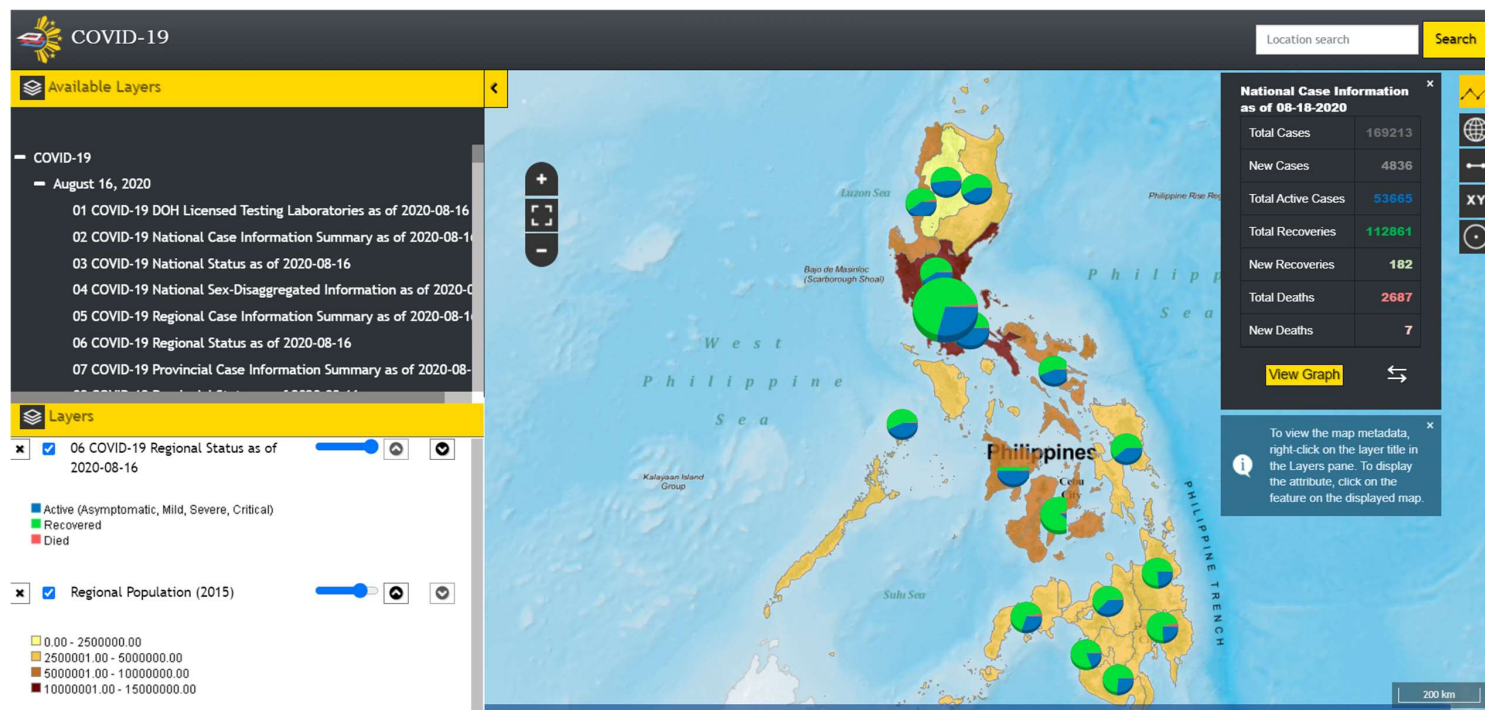
- Strengthened partnership and collaboration with various stakeholders providing data/information that was initiated with the establishment of Geoportal Philippines
- Commitment of the agency/geospatial information community to advance the use of geospatial information and related technologies
- Recognition of the government of the importance of ICT particularly geospatial information and related technologies as bases for effective decision making and planning.



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<http://geoportal.gov.ph/gpapps/covidapp>



The COVID-19 Map App makes use of the daily updates from the DOH COVID-19 data drop and data shared through Geoportal Philippines, as follows:

- 1) COVID-19 Case Information Summary from DOH
- 2) COVID-19 Testing Facilities from DOH
- 3) Population (2015) data from the Philippine Statistics Authority (PSA)
- 4) Administrative boundary (National, Regional, Provincial, Municipality/City) from the Information Management-Technical Working Group, Office of Civil Defense (IM-TWG, OCD)
- 5) NAMRIA Topographic Maps as base map



Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY
www.namria.gov.ph



Fundamental geospatial data for informed rationale

Agence Nationale de l'Aménagement du Territoire (ANAT) of Senegal mandate is to promote and implement government policies in terms of regional planning, national mapping and the improvement of the living environment of its populations. ANAT, under the Ministère des collectivités territoriales, du Développement et de l'Aménagement des Territoires, core functions are to implement initiatives to support the programming of economic activities, to ensure the coherence of the roads, ports and airports facilities and networks; to monitor and promote natural resources, public policy, development areas; to produce and keep up to date basic geospatial datasets (major portion of the fundamental geospatial datasets), to support and federate administration efforts concerning the production and management of fundamental geospatial data.

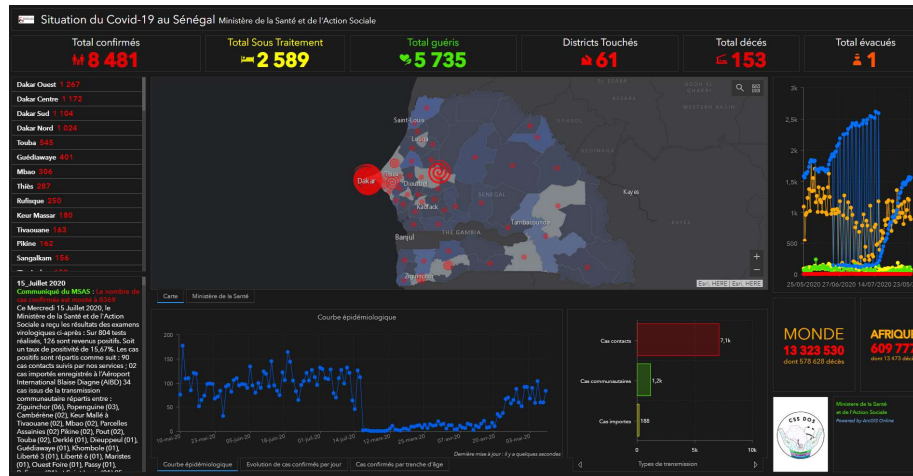
In partnership with the Ministry of Health, ANAT produced a concept note on developing a solution for tracking and monitoring the COVID-19 outbreak in Senegal. The whole concept was based on accessing users' cellphone data from the cellphone service providers, but in the end we were faced with an unsurmountable hurdle caused in part by the personal privacy law in Senegal. Subsequently, using the statistics conveyed daily by the Ministry of Health, ANAT partnered with the Ministry of Interior and Public Security to deploy a web map that monitors the spread of COVID-19, disaggregated to the second level administrative boundaries. This application allows people to see the hardest hit areas in the country and the persistence of the outbreak day after day.

The key to any perceived success of our contribution to the national response was our willingness to push hard to be part of the national digital effort to fight the disease and the obvious fact that we are the sole provider of authoritative fundamental geospatial data (i.e. administrative boundaries data). For example, early on in the outbreak, we contributed only data, which the Ministry of Health used as part of the dashboard that they set up with the help and collaboration of ESRI Senegal (see it in the first screenshot/link below "**Cartosantesen**"). Later on as the country was grappling with the economic fallout caused by the partial lock down and restrictive measures that accompanied it, it wanted an informed rationale on which to base its planned reopening decisions.

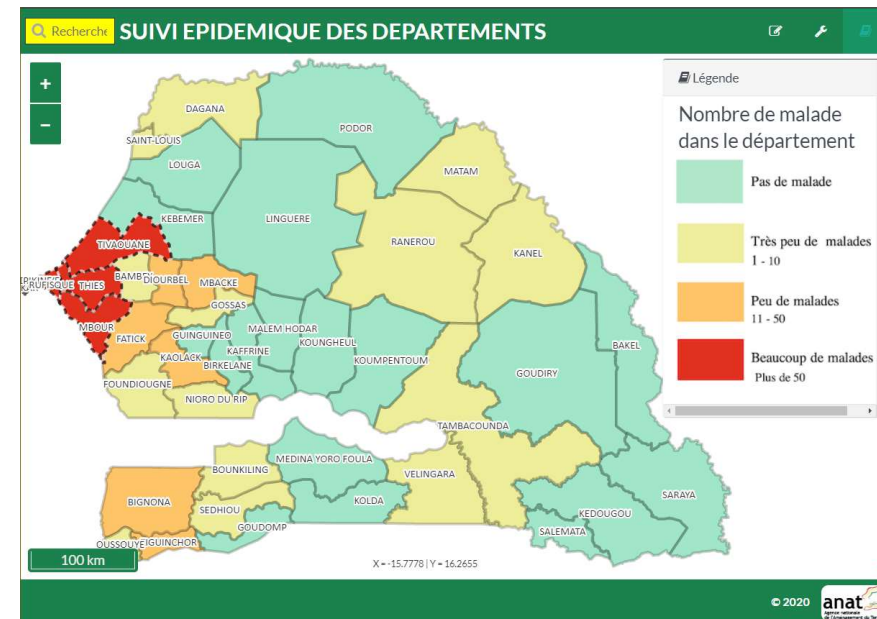
Hence the need expressed at the time by the Ministry of Interior and Public Security to have the outbreak mapped by ANAT according the second level administrative boundaries in a way that highlights the least and most affected areas and those in between. And that was the purpose of applying different restrictive or easing measures to different locations or areas. The result of this request can be seen in the second screenshot/link "**Cartionale-Situation Malade par Departement**".

COVID-19

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<https://cartosantesen.maps.arcgis.com/apps/opsdashboard/index.html#/260c7842a77a48c191bf51c8b0a1d3f6>



<http://cartenationale.gouv.sn/situation-malade-par-departement-suivi-journalier?>

ANAT's fundamental geospatial data combined with daily COVID-19 related data from the Ministry of Health to provide the visualization and the information needed to address the COVID-19 crisis in Senegal.