

REDESIGNING SURVEYING TO SUPPORT A SUSTAINABLE GLOBAL FUTURE

The role of surveyors in building climate resilience



New knowledge and tools are needed if surveyors are to fulfil their critical role along the path to achieving humanity's global climate goals related to land, water and the marine environment. Surveying systems must also be redesigned in several respects: shifting focus from data collection to analysis, integrating geospatial and climate data, designing for climate resilience and for infrastructure, and collaborative solutions.

By 2030, the world is projected to experience significant changes as a result of climate change. Coastal areas will face increasing threats from rising sea levels, leading to the erosion of shorelines and increased flooding during storms. Low-lying coastal cities and island nations are particularly vulnerable, displacing communities and threatening critical infrastructure. Hurricanes, droughts, heatwaves and wildfires will continue and accelerate in frequency, and lead to increased risks to human health and safety. The poor in the Global South will continue to experience the greatest impact, even though they contribute the least to the problem because of their tiny carbon footprints.

Changing weather patterns will disrupt agriculture systems, and crop yields will decrease due to shifting climate conditions, land degradation and desertification. Water scarcity will continue to increase. Biodiversity loss will accelerate. This will all impact on food security and will lead to increased human migration, both within countries and across borders. Surveying and geospatial professionals play a key role in understanding and mitigating these and other impacts of human-induced climate change.

Shifting focus: from data collection to analysis

The geospatial and surveying industry is undergoing a profound transformation, shifting from its traditional emphasis on data collection – which remains fundamental – to an additional new focus on data analysis. Analysing geospatial data is crucial in unravelling the multifaceted impacts of climate change and land degradation. It enables the extraction of meaningful insights from trends, patterns and anomalies in the data, allowing for a deeper understanding of human-induced climate impacts on countries, regions, landscapes, ecosystems and communities, and facilitating data-driven decision-making.



As climate change impacts are felt, floods are becoming more common and more disastrous.

This industry shift signifies a broader recognition of the value of data analysis in climate resilience efforts. It empowers surveying professionals to both collect data and interpret it, ultimately contributing to more effective and evidence-based climate adaptation and

mitigation measures. By morphing into specialized data analysts, surveyors will bring an indispensable skillset to the forefront of the fight against climate change.

Integrating geospatial and climate data for comprehensive analysis

Climate change operates on multiple scales and dimensions – at local, national, regional and the Earth system level. Analysing geospatial data from a diverse array of sources is paramount in comprehending the multifaceted impacts of climate change. It is vital to assess land use changes, track temperature fluctuations, and monitor sea-level rise, changes in forest edges, global food production and unregulated large-scale acquisitions of land belonging to Indigenous peoples and local communities. Geospatial data, collected through satellite imagery, ground-based surveys and remote sensing technologies, provides a comprehensive view of these complex changes.

Scenario simulations, particularly digital twins, can revolutionize decision-making in climate resilience. These models are able to simulate various climate-related scenarios, providing insights into potential vulnerabilities and necessary adaptations. Digital twins enable proactive planning and management and can protect people and the planet from the escalating impacts of climate change.



In the last 12 months, increasingly catastrophic wildfires have occurred around the world.

Redesigning land and water systems for climate action

Climate change, land degradation and desertification are triggering a significant transformation in land use across the globe, redefining agricultural zones, urban planning and natural resource management. These shifts represent some of the most visible and pressing impacts of the changing climate. Geospatial data is a critical enabling factor in adapting to, mitigating and optimizing land use changes, including to enhance food and water security and to protect biodiversity and natural areas in a changing world.

Most natural capital (e.g. forests, grasslands, natural areas) is in the form of common property, which is generally held in some form of state or public land arrangement. Often these parcels are not documented in government land systems. Fit-for-purpose boundary demarcation is essential to manage the resources in these areas efficiently and to safeguard what climate scientists call 'protected areas', such as game parks and forests. Land administration systems as a whole need to be made fit for purpose, efficient and effective to enable the rapid implementation and rollout of security of tenure for the achievement of global climate goals. Without land tenure security, people will continue to 'mine' their resources rather than maintain them. Valuers would argue that establishing property rights and pricing nature's benefits correctly can be an effective approach to maintaining and restoring natural capital. Fit-for-purpose land valuation approaches that include natural capital need to be developed and scaled up.

Ethical and legal dimensions

Geospatial data can contribute to smarter spatial planning to reduce the footprint of agriculture, limit urban sprawl and strengthen spatial planning targeting to protect biodiversity. The ethical and legal dimensions of urban planning take centre stage, as governments grapple with issues like competition over land and property rights, management of informal settlements and flood management.

The shifting landscape of natural resource management necessitates tracking and monitoring, with geospatial data providing real-time insights into land use changes. It can support land governance and the protection of local communities' rights to land and natural resources. It is also vital to help governments protect natural areas such as forests from illegal logging, game parks from cattle incursions, and water towers from human activity. Geospatial data-driven natural resource management underpins ethical and responsible resource extraction and habitat preservation in accordance with the legal aspects of environmental regulations and international treaties.



Small island nations, especially in the Pacific, are already feeling the impacts of rising sea levels impacting land ownership and tenure security.

Marine environments

Climate change is having a major impact on marine environments, fundamentally altering the delicate balance of life beneath the waves. Coastal ecosystems – from mangrove forests to coral reef – are under immense stress. Surveying and geospatial technologies are indispensable tools in monitoring and managing the changes. High-resolution mapping and remote sensing enables scientists and conservationists to track shoreline shifts, assess the health of coral reefs and safeguard marine resources. This also enables the monitoring and enforcement of marine regulations aimed at preserving biodiversity and critical habitats.

Resilient infrastructure

Climate change poses multifaceted challenges to critical infrastructure, spanning transportation, energy and water supply systems. Rising temperatures intensify wear and tear on roads and bridges, while extreme weather events disrupt transportation networks. Energy infrastructure faces increased demand due to climate-induced heatwaves, while water supply systems grapple with shifting precipitation patterns and the threat of prolonged droughts.

Surveying and geospatial expertise stands as a crucial pillar in crafting resilient infrastructure design and adaptation strategies. Surveyors play a pivotal role in collecting precise geospatial data, enabling informed decisions about climate-resilient infrastructure placements and designs. Geospatial insights are essential for identifying vulnerable areas and optimizing resource allocation for climate adaptation. Moreover, community engagement is pivotal in ensuring that infrastructure projects align with local needs, values and long-term sustainability goals, and surveyors often have a unique relationship with local communities.

Collaborative solutions

Successful collaborations between surveying professionals, climate scientists and policymakers have emerged as a potent force in addressing the multifaceted challenges of climate change. Surveying professionals provide essential geospatial data and analysis, offering a comprehensive understanding of climate impacts on land, water, marine and infrastructure environments. Climate scientists and environmental scientists bring their specialized knowledge, conducting research to predict and assess changes in the climate and human-induced environmental impacts. Policymakers translate this information into policies, actionable strategies, legislation and resource allocation to mitigate climate risks and avoid or limit degradation and restore the environment. Surveyors then make some of this happen on the ground.

The integration of geospatial and climate data serves as a cornerstone of evidence-based decision-making. Precise mapping, remote sensing and geographic information systems (GIS) enable stakeholders to visualize climate trends and vulnerabilities, facilitating targeted interventions. This data-driven approach enhances the capacity to adapt to climate change by identifying high-risk areas and optimizing resource allocation.



Climate change is causing wildfires to spread faster and further, and making post-fire recovery harder.

So what can you do?

In an era where our planet faces increasingly complex and unpredictable environmental challenges, surveying brings a vital technical foundation that underpins climate resilience strategies. Precise surveying and geospatial data reveal the changing land use and chart the path toward a more sustainable future. Integrating climate data and geospatial insights into surveying practices and work on the ground is not just a choice; it is an imperative. It is the synergy of these two disciplines that will help our industry maintain and build its relevance, and empower us to work with other sectors to create sustainable solutions.

In a world where climate change poses ever-increasing challenges, it is time for action. Join the movement to safeguard our planet, inform evidence-based decisions and chart a new course towards a sustainable and resilient future for generations to come. Join the FIG Climate Compass Task Force.

Further reading

https://fig.net/organisation/tf/climate_compass/index.asp

<https://bit.ly/FIG-CC-TF>

Support the 'Homeward Bound' Women in STEM climate leadership programme

To support a geospatial climate role model for women of colour in the industry, consider making a small financial contribution to Roshni Sharma's participation in the Women in STEM climate leadership programme. She is one of 80 women selected globally for cohort 5 of the 'Homeward Bound' initiative, and will be travelling to Antarctica in November 2023 to undertake this programme. She plans to use the skills and knowledge from this leadership voyage to support workforce development in the geospatial industry. To achieve this, she has already taken steps to establish herself as an accredited leadership coach, and after her voyage will offer free professional coaching service to help geospatial professionals from marginalized communities to become impactful industry leaders. Donate at <https://bit.ly/roshni-r-sharma>.



Today, remote sensing is invaluable for measuring and monitoring the majority of climatic indicators.

<https://www.gim-international.com/content/article/the-role-of-surveyors-in-building-climate-resilience>
