



CHAPTER 5

Community engagement

Introduction

Most colleges and universities have a commitment to engaging communities, be they the communities where the higher education institutions are located or the broader regional, national, or even global communities of which they—and almost everyone else—are a part. Geospatial tools—GIS—offer a way to engage and empower these communities: to help them see what’s happening around them and enable them to envision a better future for themselves. Maps help communities make sense of the world and, at the same time, give them hope.

Institutions of higher education approach community engagement in different ways. Some coordinate it centrally, with a community engagement office that connects faculty, staff, and students to opportunities, often in the neighborhoods close to campus or at a location with some connection to the institution. Others take a more decentralized approach, encouraging individual faculty members or research center directors to take the lead with community engagement, whether locally, nationally, or internationally, depending on the funding of the work or the goals of a course.

In all cases, GIS offers a useful tool in understanding communities. Its ability to juxtapose diverse datasets to see unseen relationships and draw unexpected conclusions makes it an excellent way of helping community members and their partners see their places in new ways. GIS also allows us to do asset mapping, allowing community members to identify the elements of a place that matter the most to them, letting them secure the future they want. Maps become a way of helping neighbors, despite their differences, recognize what they have in common and what goals they share.

The following examples describe what that engagement looks like at a variety of scales. These maps and case studies indicate the depth and breadth of higher education’s involvement in communities of all kinds, near and far. We have sorted these projects according to their scale, starting with examples addressing global communities, followed by those at a national, regional, and local scale. There are more of the

latter because a lot of the available data underpinning these maps exists at the local and regional scale, in the databases of city, county, or state or provincial governments. Nevertheless, through maps, communities at all scales make major contributions to our understanding of the world. This introduction provides an overview of the case studies that follow, each of which discusses in greater detail how GIS is being used in communities at a range of scales.

Global communities

Global communities may be the hardest to define, considering their enormous scope and diversity, but they may also be the most important ones, considering the global ecological challenges that humanity now faces. Researchers at Esri and the United States Geological Survey (USGS), along with a World Terrestrial Ecosystems app developed at the University of Minnesota, have mapped the globe's ecosystems, defining the planet not by national boundaries but by ecosystems we share. We also share the oceanic areas, which make up more than 70 percent of the planet's surface and contain more than 50 percent of life on earth. And unlike the most threatened terrestrial ecosystems, the marine-based ecosystems in need of protection are unevenly distributed, with coastal areas and large patches in the middle of oceans as the most imperiled.

Maps can sometimes document themes or trends that apply across the globe. Mapping the news, for instance, may address issues that apply in many places, having to do with conflicts among nation-states, impacts of public policies, and changes to the global climate or challenges to public health. Some global maps may also not have a geographic character at all. Knowledge maps, such as a map showing clusters of professionals who engage in participatory planning and the influence of some planners on others, indicate the strength and scope of interactions among people or things, regardless of their physical location. These intellectual geographies help us not only visualize the often-invisible nature of human connections but also imagine relationships free of the boundaries that often impede professional or personal relationships.

National communities

Some communities include professional collaborations, such as the International Geodesign Collaboration, a network of more than 240 universities that has produced numerous maps, including a climate action map of Portugal. Maps can build communities among those who make maps. They can also reveal the connections among people at a national level, as described by the case study of citizen scientists and their work in European countries or the one that locates GIS programs in the United States. Sometimes the best work within nations arises from a comparison with others, which maps allow.

Climate change, however, may present the greatest challenge for nations, driven by the accumulation of atmospheric carbon. The study of how England might deal with that challenge shows that it demands a variety of strategies involving several sectors,

from agriculture and forestry to transportation and energy production. And in parts of the world, water scarcity may present an even greater challenge. The case study of water scarcity in South Africa describes how nations need to address inequities within their borders, including where they can sustain their populations and where they can't. All of this demands political will, something that election maps of the United States reveal when a country becomes so divided that making progress on addressing climate change can present a problem.

Regional communities

In such cases, the greatest progress may happen at the regional scale, within subnational governments or local landscapes. Election redistricting can reduce political division or, as the redistricting study of Washington state suggests, make those divisions more pronounced. Maps can also reveal the impact of inaction, as the study of how development in Connecticut has swallowed up prime agricultural land reveals, leading to needed policy discussions. Also, the more closely a map focuses on our own regions, the harder it is to avoid responsibility, as the study of responsible land management of the Winooski River watershed in Vermont describes.

Maps not only show us where to go; they also show us why we might want to go in one direction or another. The description of COVID-19 risks in Vancouver shows where we need to be better prepared in case of a future pandemic, and the description of opioid abuse in Tennessee indicates where we need to focus our attention in curbing drug addiction. Maps can also help us predict future problems, as the case of greater-than-expected water demand around Chicago indicates. Effective maps elicit not just an "oh" but an "uh-oh," and the best maps remind us of what we have lost, eliciting an "oh no." The study of the Indigenous landscape of the Los Angeles basin shows how native populations saw landscapes as a whole, rather than divided into private properties, and the map of the Indigenous landscape in northern Minnesota shows how human settlements and travel paths once had—and could have again—a minimal impact on the land.

Minimizing human impacts is especially pertinent on islands, which often have unique ecologies because of their isolation from the mainland and greater exposure than most of the mainland to rising sea levels. The study of how the island of Sardinia might respond to climate change demonstrates how island communities can sometimes collaborate in ways that some mainland decision-makers do not, looking at how every part of the island plays a part in the solution. Meanwhile, Harvard's study of the island of Puerto Rico validates the role that higher education institutions can play in generating innovative responses to climate change.

Local communities

Universities, however, present problems as well as solutions, evident in the case of the University of Georgia's displacement of a Black community to build dormitories many

decades ago. At the same time, universities can reveal the inequities within the communities around them, as the maps of the impact of racial and ethnic redlining in California's Inland Empire reveal. Owning up to past prejudices is key to mapping a more equitable future.

One way to achieve greater equity is by engaging citizens in the making of maps. The studies of how the greening of vacant sites in Philadelphia has improved adjacent land value or how diverse populations do not feel welcome in the open spaces of Copenhagen's Amager district involved a lot of public participation. And citizen science drove the documentation of feral plant life in Dublin and air quality in London, showing how GIS technology has enabled people to help make maps as never before.

The threats of climate change can engage the public in new ways, whether it's the study of the damage of coastal flooding in Winneba, Ghana, or the risk of a tsunami in coastal Washington state. The goal of economic prosperity can also attract public participation. The study of how to balance the economy and ecology of Huzhou, China, offers one example of that, and the study of how to balance vehicular and pedestrian access in Tempe, Arizona, offers another. In the following examples, mapping becomes a way to build, reveal, and improve communities.

Global community examples

Mapping the news

DISCIPLINE Journalism

INDUSTRY Business

ORGANIZATION University of Wisconsin—Milwaukee

LOCATION Global

Print media have long used maps to convey the news in a visually and geographically compelling way, and universities often have some of the largest collections of such maps. The University of Wisconsin-Milwaukee's American Geographical Society Library is an example. Its 2024 installment of the *Maps and America* exhibit included a lecture by Tim Wallace, the senior editor for geography at the *New York Times*, titled "Newsroom Cartography," and a story map that looked at how print media has used maps over the last century or more to convey the news related to world affairs, wars, elections, local interests, and climate change. "Newsroom Cartography" has told stories in colorful and compelling ways, sometimes sacrificing the accuracy of the geography to say what needs to be said about a topic. In print media, it's the point rather than the preciseness of the map that matters most.

Mapping world ecosystems

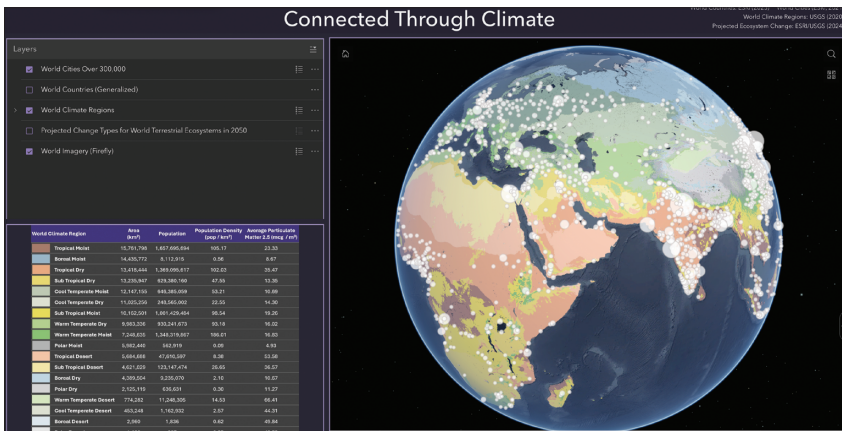
DISCIPLINE Ecology

INDUSTRY Sustainable Development

ORGANIZATION University of Minnesota
GeoCommunities

LOCATION Global

We have become so accustomed to seeing the world in terms of national and continental boundaries that we often forget the ecosystems that support us and all the other living organisms on the planet. The Connected Through Climate app seeks to change how we think about the earth. Developed by GeoCommunities at the University of Minnesota and using the *World Terrestrial Ecosystems* map created by Esri and the USGS, the app lists the world's 18 climate-based ecosystems, arranged by size, and it maps those ecosystems on an interactive globe. The app allows users to turn on or off individual ecosystems, as well as cities and national borders, and it shows how ecosystems will change between now and 2050 in terms of heat, aridity, and land cover. Dashboards for each of the ecosystems allow communities occupying the same ecosystem to share information and best practices, regardless of their political differences. And dashboards allow an analysis of public policies in various countries, which can have dramatically different effects on ecosystems. You could call it an apt app.



This map of world terrestrial ecosystems by the University of Minnesota shows how ecosystems vary widely while also connecting disparate parts of the world. *Courtesy of Esri, USGS, U-Spatial at the University of Minnesota.*

Protecting ocean biodiversity

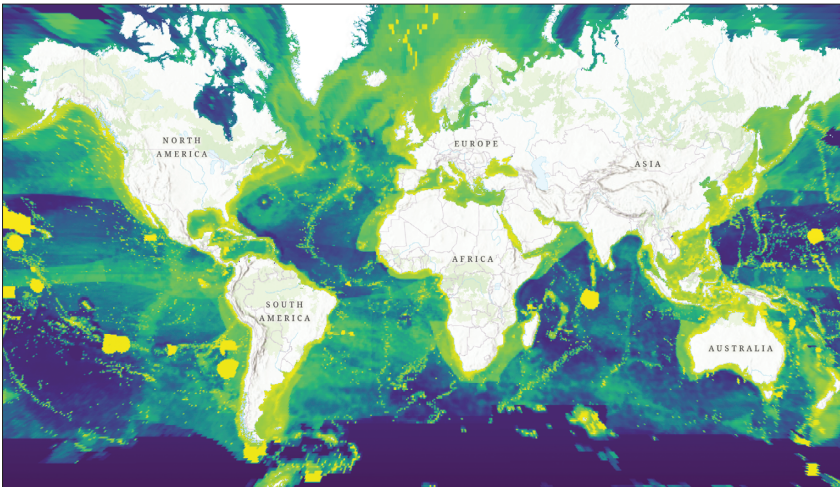
DISCIPLINE Oceanography

INDUSTRY Science

ORGANIZATION National Geographic Society

LOCATION Global

The oceans occupy more than 70 percent of the earth's surface and contain more than 50 percent of its living matter, and yet these bodies of water often get less attention than the land when it comes to the protection of biodiversity. This map of the world's oceans highlights in gradations of color, from the lowest-priority areas in blue to higher-priority areas in increasing shades of yellow, where the greatest oceanic biodiversity exists and where we need to focus our protection efforts. Based on the research of faculty from a number of universities, including Oregon State and the University of California, Santa Cruz, and coordinated by the National Geographic Society, the map locates the Marine Protected Areas (MPAs), most of which exist along developed coastlines and in large patches in the Pacific, Indian, and Arctic Oceans. The MPAs show where altering "abatable impacts" by human life would lead to marginal gains in the persistence of biodiversity in the world's oceans. This fixes our sights on what we need to do in that highly fluid world.



This map shows where oceanic biodiversity is most threatened and where protective measures are most needed. *Courtesy of ArcGIS Living Atlas of the World.*