

# Geoscientists across borders

Geoscience relies on cross-border research and collaborations that are fragile to geopolitical instability. Tackling human-induced environmental change will require resilience in the face of human-induced adversity.

Geoscientists must grapple with the complexity of the Earth system in order to better understand global environmental and climatic challenges. The underlying processes span boundaries in space and time, with lessons to be learned from intervals in the ancient past with geographies wholly unlike those of today. Natural geographic boundaries like coastlines, mountain ranges, and rivers have been forged by geologic forces. Imprinted upon these are the political geographies of a modern world that shape and sometimes limit our ability to study Earth's systems. Russia's invasion of Ukraine, condemned by the [global research community](#) and [Springer Nature](#), has exposed the fragility of collaboration in the geosciences as well as resiliency of the geoscience community.

In a world in which humans are a major geologic force<sup>1</sup>, political boundaries and decisions can impact the function of the Earth system. For example, hydroelectric projects like the Grand Ethiopian Renaissance Dam may benefit one country, while disrupting water and sediment supplies downstream<sup>2</sup>. Similarly, the outsourcing of manufacturing expands CO<sub>2</sub> emissions, pollution and environmental degradation elsewhere<sup>3</sup>.

Political boundaries also affect how we study the Earth system. The geosciences have long been inextricably linked to national interests, as demonstrated by the interweaving of the broader governmental goals with those of geological surveys<sup>4</sup>, as well as environmental agencies and the funding bodies that finance most geoscience research. Water from the Himalaya is relied upon by billions of people, but the research and management of these vital hydrological resources are complicated by political borders that don't match natural catchment boundaries<sup>5</sup>. Volcanic eruptions can represent a hazard far beyond their



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immediate surroundings, but volcanic hazard detection infrastructure is lacking in some regions, sometimes due to a lack of access caused by political strain<sup>6</sup>.

Conflicts can bring the influence of political boundaries on the geosciences in to stark relief. As a consequence of the invasion of Ukraine, the ExoMars mission to Mars, which relies on cooperation between the European Space Agency and Roscosmos, was recently [suspended](#) due to geopolitical tensions and government-imposed sanctions — just one example of a research collaborations with Russia being [severed](#). Conflict can prevent researchers inside affected areas from participating in international scientific discourse or conducting science at all, and external researchers from conducting fieldwork and establishing collaborations with local scientists. Sanctions, which may be well justified for humanitarian and ethical reasons, can disrupt the funding of international research projects and [monitoring infrastructure](#).

Earth science societies play a key role in facilitating international collaboration, and many have not been silent on the war in Ukraine, with the [European Geosciences Union](#) and the [American Geophysical Union](#) putting out statements condemning the Russian invasion.

Scientists and academic institutions are working to support scientists affected by war and political instability. There are programmes focussed on connecting displaced scholars with research positions, including those run by [The European Commission](#) and [The Institute of International Education's Scholar Rescue Fund](#). The success of these efforts depends on consistent, long-term support to meet the needs and aspirations of the displaced scientists. The international community must act to support, not abandon, scientists remaining in areas of conflict as well, as demonstrated by the plight of researchers in [Syria and Yemen](#) as well as [Afghanistan](#).

Tackling the world's environmental challenges will require continued efforts at cross-border [collaboration](#), though conflict can sometimes make this untenable. More important is solidarity and support between colleagues, transcending routine considerations of research projects and manuscripts, that will maintain resilient networks of geoscientific knowledge that can overcome the walls that nations build. □

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