



Global Sustainable Development Report

Brief

The infrastructure – inequality – resilience nexus

Background

Nexus approaches, which examine sets of issues as a whole and focus on the connections between them, have been one of the lenses through which the Global Sustainable Development Report has approached the Sustainable Development Goals (SDGs). The aim is to strengthen the science-policy interface by showing policymakers how key interlinkages are analyzed by the scientific community, while providing the scientific community with key policy questions and highlighting areas for policy-relevant research.

This year's report examines important interlinkages between infrastructure, inequality and resilience. It highlights main channels of interconnection among these areas and synthesizes the results of scientific analyses of the synergies and trade-offs among them. The chapter was prepared based on a broad call for inputs, reaching out to scientists and experts that have published in peer-reviewed journals on topics related to the nexus, as well as other experts within and outside of the United Nations System. The analysis is not exhaustive but serves to highlight the broad range of research and scientific perspectives that exist in relation to the nexus.

Definitions

The three broad areas included in the nexus may be defined differently by various scientific disciplines. The chapter adopts the following working definitions. Inequality is characterized by discrimination and the disparity in opportunities or outcomes between people or groups of peoples in multiple dimensions (e.g. education, health, nutrition, and income). Infrastructure is composed of basic assets and objects that, in the aggregate, are deemed essential for the functioning of the society and the economy, including those that provide basic services such as water, sanitation and electricity, and connectivity infrastructure such as roads, transport systems, and ICTs. Resilience is an attribute of such complex systems as ecosystems, people's livelihoods, cities and infrastructure, and it is usually defined as the ability of such a system to adapt to a shock and maintain its core functions. In this brief the focus is on the resilience of people as characterized by their ability to adapt to economic, social and environmental shocks so they could continue to lead the life that they have reason to value.

Key interlinkages

Some of the interlinkages in the nexus have received much more attention from scientists than others. Figure 1 summarizes in a simplified way key interlinkages that emerged from the analysis.

Infrastructure affects inequality through three main channels: the provision of basic services such as water, sanitation and

electricity; the increase in productivity that results from infrastructure such as irrigation, electricity, ICT, and roads; and the effects on the access of people to goods, services and job opportunities. In general, the literature has found a positive relationship between infrastructure and reduced inequality. However, the specific channel (or combination thereof) through which this occurs is complex, as shown by a large number of econometric, microeconomic and other empirical studies covering those channels. Inequality is affected by the quality, design, coverage, accessibility and distribution of infrastructure. Key elements are where the infrastructure is placed and to whom it is intended to benefit.

Inequality affects infrastructure through its effect on the balance of political power, which on its turn affects government decisions on the provision of infrastructure. That may result in low share of investment being directed to infrastructure that benefits the most disadvantaged, reinforcing and perpetuating social and spatial inequalities. Breaking that vicious cycle is critical for the implementation of the 2030 Agenda.

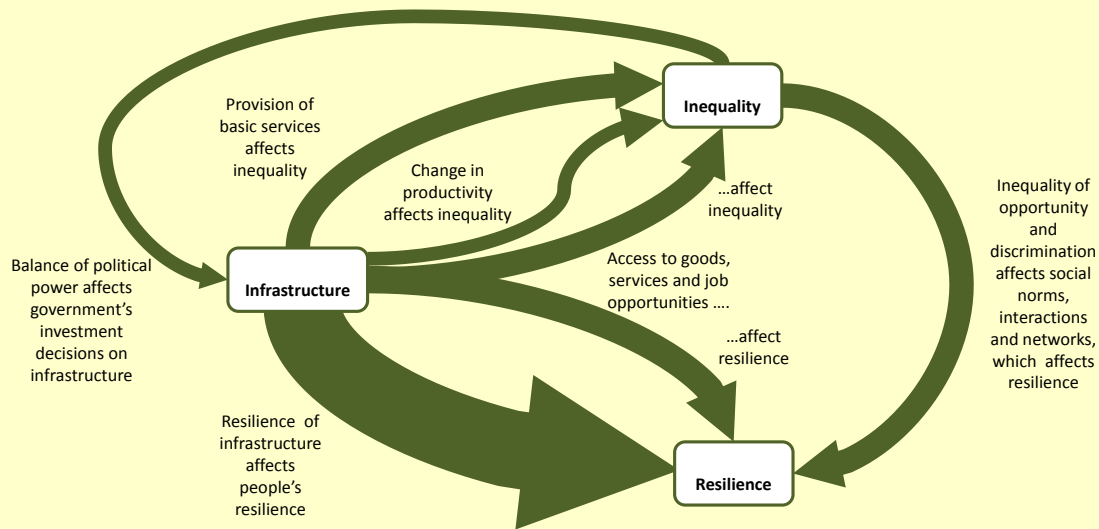
The **effect of infrastructure on resilience** is an area of the nexus that has received much attention by the scientific community. In particular, the literature has focused on how the quality, design, distribution, interrelation and operation of infrastructure affect its resilience to natural disasters, which has an effect of people's resilience to shocks. There is considerable knowledge about resilience to more predictable and lower intensity events, but much less on how to make infrastructure resilient in the case of the more severe disasters. There is also a significant focus of research on critical infrastructure, such as transport networks and electricity infrastructure, which are particularly vulnerable to chain reaction effects during crises.

Inequality of opportunity and discrimination affects resilience through their impacts on social norms, interactions and networks, which have an effect on the ability of people to adapt to shocks. In that context, vulnerable populations are usually the most severely affected. Much of the research focuses on the role of social capital in building resilience. Yet, in general, this interlinkage seems to have received less attention from the scientific community than others in the nexus.

Harnessing synergies and addressing trade-offs

As in any nexus, harnessing synergies and addressing trade-offs is critical for policy-making. In this regard, contributing experts have noted that reducing inequalities in any of its dimensions also contributes to better infrastructure provision and increased resilience by, for example, increasing the likelihood of infrastructure investment that benefit vulnerable groups.

Figure 1. Infrastructure – inequality – resilience nexus



Improvements in infrastructure, in terms of provision of basic services and facilitation of access to goods, services and job opportunities, in general increase the resilience of people to all kinds of shocks; however, the effects of infrastructure on inequality mainly depend on where infrastructure is placed and whom it serves. Reflecting this, contributing experts recommended that infrastructure policy should focus both on efficiency and on equity goals. In that respect, the principle of geographic equity is perceived as important for policy, in order to correct for the disparities in the provision of basic services infrastructure in rural and peri-urban areas. There is recognition that in order to respond to rapid urbanization in developing countries, policies should be in place for the development of inclusive and sustainable infrastructure in urban areas.

In terms of synergies between infrastructure and resilience, contributing experts highlighted three key areas of policy intervention. First, there is a need to make infrastructure resilient to disasters by integrating disaster risk reduction into all phases of the infrastructure life cycle through regulation, norms and standards, urban planning, building codes, etc. Second, to reduce the risk of failure of critical infrastructure such as transport, energy, and telecommunications and its negative social and economic impact, experts highlighted the importance of policy directives on the security and resilience of infrastructure. Damages to infrastructure are sometimes unavoidable and appropriate recovery plans should prioritize infrastructure components that are most critical for affected communities. Third, infrastructure becomes more resilient when funding mechanisms and incentives to reduce risk are in place, for example, through the adoption of resilient-based requirements in the tendering and contracting process.

Contributing experts noted the need to further disaggregate the analysis between rural and urban contexts to be able to provide more specific policy recommendations. In rural areas, infrastructure investments are essential to connect individuals to livelihoods and opportunities and many countries have found important to invest in all-weather roads, trails, trail bridges, etc. Labour-based programs in these types of infrastructure projects

can also expand job opportunities and reduce inequalities. Participatory processes that involve local communities and their various segments could help ensure that economic, social and environmental dimensions are better taken into account when planning for infrastructure investment. Urban areas provide easier connectivity due to concentration, but the challenges are the usually fragmented governance structures, congestion, and higher incidence of poverty in inadequately serviced and disadvantaged informal settlements.

Conclusions

Chapter 4 of the GSDR 2016 illustrates the importance of adopting an integrated approach towards sustainable development, by highlighting some of the main interlinkages between infrastructure, inequality and resilience. Areas that are well covered by scientific research are the links between infrastructure and inequality, and how people's resilience is affected separately by inequality and by the resilience of infrastructure to natural disasters. On the opposite side of the spectrum, although the report consulted with experts from a broad range of disciplines, linkages from resilience to inequality and from resilience to infrastructure were only very marginally or not covered. Further research in these two areas may be needed to document important linkages, synergies and trade-offs.

In terms of policy areas related to the nexus, focus on both efficiency and equity goals is needed to harness the synergies between infrastructure, inequality and resilience.

Further cross-disciplinary collaboration and engagement between researchers, practitioners, decision makers and other stakeholders could be a way of achieving the mutual learning and transfer of information that would enable scientific knowledge to be transformed into practical strategies to harness the synergies and address the trade-offs between the three areas of the nexus.

More information

The GSDR 2016, its Executive Summary and other related briefs and documents are available on the following website: <https://sustainabledevelopment.un.org/globalsdreport>.