comment

Environmental challenges for the Belt and Road Initiative

The Belt and Road Initiative will greatly influence the future of global trade. However, it may also promote permanent environmental degradation. We call for rigorous strategic environmental and social assessments, raising the bar for environmental protection worldwide.

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In 2013, China launched an ambitious foreign policy initiative that will greatly influence the future of global trade, particularly in Asia, Africa and Europe — the Belt and Road Initiative (BRI). This initiative involves a massive development of trade routes between and within these regions, referencing the historic Silk Road, but on a much broader scale. According to the Chinese government, at least 64 other countries are expected to participate, involving roughly two-thirds of the global population and one-third of the global economy[1]. The BRI involves a large-scale expansion of land transportation infrastructure (the Silk Road Economic Belt component), coupled with the development of new ports in the Pacific and Indian oceans (the twenty-first-century Maritime Silk Road component; Fig. 1). These new infrastructures are expected to facilitate regional and intercontinental trade flow, and increase oil and gas supply.

Core projects to connect China with other regions include: oil and gas pipelines to Russia, Kazakhstan and Myanmar; a rail network to the Netherlands; and a high-speed railway to Singapore. Other mega-infrastructure, aiming to connect regions outside China, include: the highway linking Peshawar and Karachi in Pakistan; the recently inaugurated railway between Nairobi and Mombasa; and the first fully electrified railway linking Addis Ababa to Djibouti (Fig. 1). The stated aims of the BRI are to promote peaceful cooperation and common development around the world, where all countries can participate on an equal footing. It claims to target a new system of global economic governance, promoting an efficient flow of materials and in-depth integration of markets, to achieve diversified, independent, balanced and sustainable development[2].

Despite these laudable aims, economic development aspirations under the BRI may clash with environmental sustainability goals given the expansion and upgrading of transportation infrastructure in environmentally sensitive areas, and the large amounts of raw material needed to support that expansion. However, these challenges can be turned into opportunities for environmental stewardship, if China and their partners develop the BRI within the framework of strategic environmental and social assessments with high environmental standards. This could greatly influence the way in which environmental impacts are assessed around the world, thus promoting China's view of ecological societies[3].

Expected problems

New roads and other infrastructures can promote social and economic development, for example, by increasing the access to agricultural supplies and markets, facilitating the transportation of people and goods, and decreasing production costs and crop losses, and therefore should be stimulated when the goal is to connect isolated human settlements. However, when planned and built through areas of high environmental value, they may have significant impacts on biodiversity[4,5]. This is the case for some of the regions crossed by BRI economic corridors, as in parts of Southeast Asia and tropical Africa (Fig. 1).

The negative impacts of roads on biodiversity are well known and include increased wildlife mortality, restrictions of animal movement, pollution (chemicals, noise, light) and the spread of invasive species[6]. In tropical forests, new openings for roads and other linear infrastructure will likely increase illegal logging, poaching and fires, by facilitating access to hitherto remote regions[7]. Furthermore, the hinterland development that will likely result from the building of the dozens of proposed new ports will certainly lead to the construction of additional roads and power lines. Overall, the expansion of transportation networks will increase habitat loss, the overexploitation of resources and the degradation of surrounding landscapes. Such impacts, which are already high in some regions, will degrade ecosystem services, possibly pushing some ecosystems beyond tipping points, where small negative changes can lead to abrupt changes in ecosystem quality and functionality[8].

Recently, the World Wildlife Fund (WWF) carried out an initial spatial analysis of the overlap between the proposed BRI terrestrial corridors and important areas for biodiversity and natural resources[9]. The report shows that those corridors overlap with the range of 265 threatened species, including 39 critically endangered and 81 endangered species. In addition, the corridors overlap with 1,739 Important Bird Areas or Key Biodiversity Areas and 46 biodiversity hotspots or Global 200 ecoregions. The report suggests that BRI corridors will potentially impact all the protected areas they will cover. As a result, there is a clear risk of severe negative environmental impacts from infrastructure development. Moreover, there is the risk of protected areas along the BRI corridors being downgraded, downsized and deprived of legal protection (degazettement), for easing access to and use of natural resources[10,11].

Beyond the impacts described above, BRI infrastructures will boost the extraction and use of raw materials, such as sand and limestone for production of concrete and cement, and fossil fuels. Sand extraction has already exceeded its natural renewal rate, severely affecting river deltas and coastal and marine ecosystems[12]. China is already responsible for one-third of greenhouse gas emissions, and production of cement, largely for road construction, is a significant component of these emissions[13]. Furthermore, the large investment in pipeline infrastructure will increase the rate at which oil and gas reserves are exploited[14], further locking the world into fossil-fuel

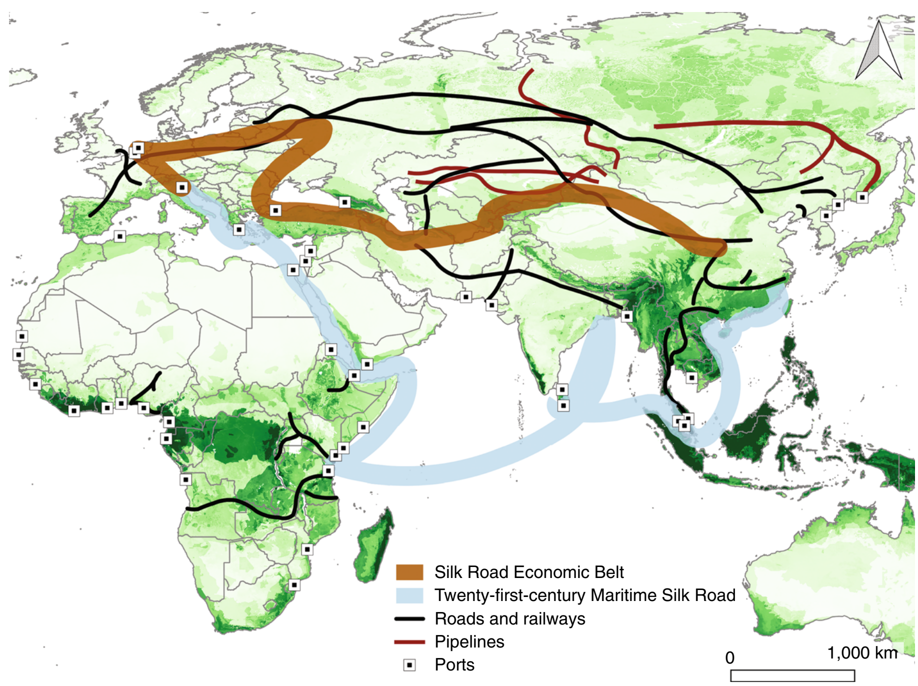

Fig. 1 | Main trade corridors (Silk Road Economic Belt and twenty-first-century Maritime Silk Road) from and to China and some of the most important infrastructure and ports built or planned with Chinese investment in the BRI. Environmental value is shown in green (darker green corresponding to more value), integrating data on terrestrial biodiversity, key habitats, wilderness and environmental services[5]. Infrastructure mapping is based on infographics from the Mercator Institute for China Studies (MERICS).

dependency and high greenhouse gas emissions. The increased shipping associated with the BRI will further contribute to this impact. Despite being the most energy-efficient mode of transportation, shipping is one of the fastest-growing sectors in terms of greenhouse gas emissions[15].

Overall, although the BRI aims to bring benefits to human populations, it risks coming with a high toll for the environment and, in the long run, may jeopardize the benefits of socioeconomic development. In contrast, the underlying premise in development strategies should be to ensure both human and environmental wellbeing — intertwined conditions — over time[16].

Call for SESA

In the past few decades, China has experienced first hand the environmental impacts of rapid development without adequate safeguards, leaving a legacy of air, water and soil pollution and ecosystem degradation, with which it still struggles to cope[17]. In response, China's government has strengthened some of its environmental legislation and national and regional policies, striving for an 'ecological civilization'[18]. Today, China aims to dramatically improve environmental regulations, reduce pollution and transform industries by adopting new green technologies and higher environmental standards. However, for many other developing countries and regions benefiting from the investments of the BRI, raising social and economic standards is a primary goal whereas, as happened in China, the protection of natural resources is not yet a priority.

If not properly addressed, the negative environmental impacts of the BRI are likely to disproportionately affect the world's poor[16,19], hence putting at risk the wellbeing of the very people it aims to help. Success of the BRI therefore depends largely on China and its partners not repeating the mistakes of the past, but instead putting into action China's declared aspirations for sustainable development, as set out in its Ecological and Environmental Cooperation Plan[3]. This plan states that cooperation on environmental protection is a fundamental requirement for the BRI, and that such cooperation is vital for a green transformation of the national and regional economy and a major move to fulfil the 2030 Agenda for Sustainable Development[20].

We suggest a new paradigm whereby BRI-related projects happening outside China comply with the environmental standards China now aspires to at home[3,21]. This calls for Strategic Environmental and Social Assessments (SESAs) of the BRI and along each major economic corridor[22,23]. The SESAs should provide a systematic evaluation of the environmental consequences of proposed policies, plans and programmes, ensuring that they are appropriately addressed at the earliest stage of decision-making, concurrent with the economic and social consequences. SESAs have been regularly applied in China since the 1990s, as they are a legal requirement for major economic development activities[24]. In addition, credible environmental impact assessments (EIAs) of specific projects can prevent irreparable damage and generate substantial conservation and social benefits, such as biodiversity protection, increased carbon storage and improved water quality[5,25–28]. For such environmental assessments to effectively avoid detrimental impacts of the BRI, it is fundamental that China and its partners regard the SESAs not only as a formal requirement, but also as an important step in the process to add value to the projects[29].

There is much to gain from strategically addressing all environmental impacts before projects begin, rather than ignoring and facing them later on, when repairing the damage is either impossible or extremely costly[28,29]. Increasingly, there are examples of well-planned road developments that do not interfere significantly with environmental conservation, have negligible impacts on protected areas, and are better aligned to benefit local communities and agriculture. For example, one alignment of the proposed Serengeti Highway in Tanzania would circumnavigate the national park, while better linking local communities and their businesses to larger cities, and improving access to schools and hospitals[30]. Similarly, an alternative route for the proposed Cross River Superhighway in Nigeria was recently accepted by the state government, entailing far less environmental degradation and providing greater local economic benefit by improving highway access for many existing villages, local government areas and agricultural lands[26]. In another example, the Asian Development Bank recently forced the Bangladesh Railway to fully mitigate the impacts of proposed subregional and trans-Asian railway projects on protected areas, by strengthening elephant population connectivity through the construction of overpasses at five active elephant crossing locations[31].

We acknowledge that EIAs and SESAs can become more complex when infrastructure projects are transboundary and funded by a mix of international,

national and private funds. However, the BRI, like most transboundary infrastructure programmes, will consist of subprojects in different geographies, with varying schedules. Ultimately, national governments will need to have a strong hand in guiding the development to ensure it has minimal ecological and social impacts[29].

Challenges into opportunities

The large number of countries and private or public entities involved in the BRI will likely be a major obstacle to the proposed paradigm shift towards environmentally rigorous and pro-active planning. In particular, the funding entities are highly diverse, including those directly controlled by governments, such as the China Development Bank, the Chinese Import–Export Bank and the Bank of China, but also multilateral and private banks, and private institutional and corporate investors, including the Asian Infrastructure Investment Bank, Commerce International Merchant Bankers in Malaysia and the Deutsche Bank in Germany. Such a diversity of funding sources makes the implementation of SESAs and adoption of consistent environmental protection challenging, at best. We suggest that the main actors in the BRI could take the opportunity to develop rigorous SESA frameworks and guidelines that are flexible enough to accommodate regional idiosyncrasies[29]. Such guidelines should promote an early integration of SESA in the planning and programming processes, the development of a fair and inclusive consultation, the identification of credible alternatives and rigorous monitoring strategies[32]. Ideally this work would be done in close collaboration with environmental and scientific global institutions, such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and the International Association for Impact Assessment. BRI partners could also integrate local conservation initiatives, taking place within each country involved, to promote an inclusive approach to the SESA.

Government agencies and financial institutions involved in the BRI would then be required to follow these SESA frameworks and guidelines, linking each project's funding to environmental sustainability compliance. Where the majority of the financing comes on favourable terms from government-controlled banks, attaching environmental conditions to loans is one possible way of enforcing environmental standards. A good example is the Hanoi Principles, which integrate the value of natural ecosystems or natural capital into national infrastructure development planning, including mapping and valuation of ecosystems. Likewise, the International Finance Corporation (from the World Bank Group) recognizes in their Performance Standard 6 that "protecting and conserving biodiversity, maintaining ecosystem services, and managing living natural resources adequately are fundamental to sustainable development"[33]. Also, the Ecological and Environmental Cooperation Plan[3] calls for an increasing use of green financing instruments to comply with laws and regulations, namely in infrastructure development. Such requirements would certainly have a positive spillover effect on environmental policy and transportation infrastructure planning throughout the globe.

To promptly raise awareness about the possible environmental and social risks of the BRI, there needs to be dialogue among those involved in the decision-making process — governments, financial institutions, developers, non-governmental organizations and local communities — and researchers investigating biodiversity conservation, human health and climate change mitigation. Hence, the SESA process should involve all key actors[29]. Because of the large number of stakeholders involved in the BRI and the scale of the initiative, it will be important to develop an effective communication plan for research results.

The BRI is also an opportunity to channel funding to support research and monitoring of the various environmental effects of such a complex initiative, during both the construction and operation phases. This requires good baseline information collected before construction begins. An important advance is the Digital Silk Road[34], led by the Chinese Academy of Sciences, which aims to share big data from satellite imagery and other Earth observations. However, ground-based information of species likely to be sensitive to BRI impacts is fundamental. Therefore, the BRI could boost environmental research, particularly in remote locations in southeast, central and western Asia, to map areas of high value for biodiversity and carbon storage. Such information, coupled with a range of global change scenarios, would allow BRI planners to avoid placing infrastructure in important conservation areas[5,9,25]. This knowledge could additionally be used to improve the network of protected areas and wildlife ecological corridors bisected by the BRI corridors[30]. At the local scale, research could improve methods for assessing ecological impacts of infrastructure development and monitoring the efficacy and function of measures put in place[35].

China and all the nations involved in the BRI should act as environmental stewards by planning infrastructures within rigorous SESA frameworks, and building it in ways that are responsive to the different natural and socioeconomic contexts, at both local and regional scales. In this way, the BRI can become a unique opportunity to raise the bar, setting higher standards for best practices that link the design and implementation of infrastructure to environmental protection now and in the future. ❐

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