Science-Based Solutions for a Shared and Sustainable Future in the Belt and Road Initiative

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ABSTRACT

Addressing common challenges for a shared and sustainable future in the Belt and Road region requires significant contributions from science, technology, and innovation. Green technologies, smart energy systems, and sustainable urbanization are among the central points of emphasis in the development plans of China and Turkey. Based on the Beijing Declaration, the Alliance of International Science Organizations was launched to support the region with science-based solutions. This study compares a sample of countries in this alliance based on research capacity as well as selected indicators under the Sustainable Development Goals. An original approach is then developed to compare knowledge production patterns across linkages in the goals based on combined searches that are visualized with chord diagrams. The results indicate the goals that are receiving more focus within knowledge production, including sustainable cities. Expected increases in urbanization are compared leading to the year 2050, and collaborative research projects that are supported by the alliance are discussed in connection with their contributions for sustainable development alongside new scientific interactions. The article concludes with evidence-based observations regarding research capacity in the Belt and Road region and opportunities for further strengthening solutions based on science, technology, and innovation now and in the decades ahead.

Keywords: Belt and Road, science, Sustainable Development Goals, technology, urbanization

SCIENCE, TECHNOLOGY, AND INNOVATION have particular importance for the Belt and Road Initiative and in addressing common challenges for a shared and sustainable future. This context increases the necessity for research collaboration and provides new opportunities for developing solutions towards addressing multiple aspects of energy, environment, health, welfare, and economy simultaneously (BRIQ, 2020) with minimal or no compromise. In such a path, cross-disciplinary cooperation is essential to support a dynamic understanding of socio-ecological systems so that it is possible to navigate, manage and achieve coordination between multiple objectives at the interface of society and nature (Lu et al, 2021). Only through such cooperation will it be possible to support decision-making to ease resource use and climate change impacts while increasing synergies among system objectives for sustainable development, particularly goals for the year 2030 (Lu et al., 2021).

Common Aspirations for a Shared and Sustainable Future

In China, the Fourteenth Five-Year Plan for National Economic and Social Development is covering the years 2021-2025 while supporting longer-term goals for the year 2035. The principles of "innovation, coordination, greenness, openness, and sharing" will have a central role in this path forward (Xinhua News Agency, 2020). The Plan is sustaining and elevating an emphasis on high-quality development with technology self-sufficiency in frontier fields, including advanced manufacturing and integrated circuits (Wong, 2020). Additionally, climate change is becoming a central priority based on green and low-carbon development. Carbon emissions are set to peak before 2030 towards carbon neutrality by 2060 (Xinhua News Agency, 2020), which would support pathways with sustainable development in climate change scenarios.

Energy that is clean, low-carbon, safe, and efficient will take place among important areas that will be supported towards this goal. Moreover, an innovation-driven development strategy is being pursued while strengthening basic research and promoting interdisciplinary integration, including through common technology platforms. Accelerating strategic emerging industries, including new materials, green technologies, and infrastructure for smart energy systems is being targeted. Long-term goals for 2035 include new types of urbanization and green production for more sustainable development towards an ecological civilization that is centered on people and harmonious coexistence with nature. Resource utilization efficiency, as well as high-quality development for the Belt and Road region is further emphasized among the 60 proposed points (Xinhua News Agency, 2020).

Climate change becomes a central priority for the China's 14th Five-Year Plan based on green and low-carbon development. (Zhou Guoqiang/ China Daily)

In Turkey, the Eleventh Development Plan, which covers the years 2019-2023 towards the hundredth year of the foundation of the Republic of Turkey, upholds the vision of "producing more value and sharing more fairly for a stronger and prosperous country" (Presidency of the Republic of Turkey Presidency of Strategy and Budget, 2019a). The five pillars of the plan are based on achieving a strong economy, competitive production and productivity, highly qualified human resources and strong society, livable cities and sustainable environment, and good governance. The pillar of competitive production and productivity includes research, development (R&D) and innovation, critical and emerging technologies, prioritized sectors and development areas as well as directions for the science and technology system. In addition, emphasis is placed on the Belt and Road Initiative, especially the aspect of an active role in logistics.

The emphasis on livable cities and sustainable environment is placed in a way that also considers the continued importance of environmentally aware urbanization, the challenge of climate change, food security, and the efficient utilization of water. In this respect, the Presidency of Turkey has also officially issued the adoption of a national strategy and action plan that supports an integrated perspective towards livable and sustainable cities that add value to human welfare and provide maximum energy efficiency (Presidency of the Republic of Turkey, 2019).

The last pillar on good governance includes an emphasis on the Sustainable Development Goals (SDGs) that is being monitored based on a dedicated mechanism together with all responsible institutions (Presidency of the Republic of Turkey Presidency of Strategy and Budget, 2019b). There is a sound basis for collaboration on common aspirations for a shared and sustainable future, as foreseen for the Belt and Road region.

Directing R&D and Innovation for Sustainable Development

The Beijing Declaration that was adopted by the national scientific organizations of the Belt and Road Initiative has emphasized the role of science, technology, and innovation in leading the way to a shared and sustainable future (CAS, 2016). In this landmark development, the importance of strengthening cooperation, involving young scientists and building long-term cooperation was also seen as vital aspects of this endeavor. Based on the Beijing Declaration, the Alliance of International Science Organizations (ANSO) was established to support science-based solutions to common challenges within the Belt and Road Initiative. As a collaborative effort, ANSO has focused on addressing major challenges through R&D and innovation in multi-disciplinary approaches. The governing board of ANSO currently involves 9 institutions, including the Chinese Academy of Sciences, with 28 founding member institutions, including the Scientific and Technological Research Council of Turkey (ANSO, 2020b).

According to the most recent statistics, R&D personnel in full-time equivalents (FTE) has reached 4.8 million, with R&D as a share of gross domestic product (GDP) 2.23% in China (National Bureau of Statistics of China, 2020). In addition, researchers in FTE per million inhabitants are 1224.8 (UN, 2021). An important aspect of achieving the goals and targets for a shared and sustainable future will be based on directing this significant potential towards sustainability impacts in China and the collaborating countries in the Belt and Road Initiative. In the context of the SDGs, indicators that are being monitored for all countries include the renewable energy share in total final energy consumption (FEC), the energy intensity level of primary energy in megajoules per constant GDP, and indicators for environmental management, including electronic waste recycling (UN, 2021).

TUBITAK joined ANSO in 2018 as a founding member. (Source: TUBITAK website)

Table 1 provides a comparative view of indicators that are related to the R&D capacity for a sample of countries with ANSO member institutions, while Table 2 involves indicators that are related to a renewable and resource-efficient future for the same sample. For the purposes of this manuscript, the ANSO country sample is taken based on countries with the most R&D personnel among countries with governing board institutions in addition to Turkey based on the founding member institution. In total, 7 countries are included in Tables 1 and 2, namely China, Russia, Turkey, Thailand, Pakistan, Hungary, and Kazakhstan in the order of FTE R&D personnel.

Based on Table 1, the countries in the sample involve a total of over 6 million FTE R&D personnel with contributions of between 16,053 and 758,462 R&D personnel from countries other than China (UNESCO, 2021; TÜİK, 2020; National Bureau of Statistics of China, 2020). When scaled according to population, the values range between 335.6 and 2921.5 researchers in FTE per million inhabitants, with 1224.8 and 1379.4 researchers per million inhabitants in China and Turkey, respectively (UN, 2021). When contrasted to the total value of final goods and services, the expenditure on R&D as a share of GDP ranges between 0.12 and 2.23 where the lowest and highest values in the sample represent between a 1.44 and at most an 18 fold difference (UNESCO, 2021; TÜİK, 2020; National Bureau of Statistics of China, 2020). These indicators also support the SDG on industry, innovation, and infrastructure (SDG9).

One of the challenges is to enable R&D and innovation capacity to be mobilized and coordinated to support progress for sustainable development effectively (Kılkış, 2016). For this reason, the purposeful direction of R&D and innovation for a shared and sustainable future is of great importance for the successful mobilization of the available capacity. From the perspective of sustainable development, Table 2 represents the current values for certain indicators that are linked to the SDGs with a particular focus on affordable and clean energy (SDG7) as well as responsible consumption, and production (SDG12). Based on these values, the share of

Table 1. Comparison of Indicators for R&D Capacity.

ANSO Country Sample	SDG9		
	R&D personel (FTE)	Researchers (FTE) per million inhabitants	R&D as a share of GDP (%)
China	4,800,100	1224.8	2.23
Russia	758,462	2821.5	0.99
Turkey	182,847	1379.4	1.06
Thailand	138,644	1350.3	1.00
Pakistan	101,437	335.6	0.24
Hungary	45,566	2921.5	1.55
Kazakhstan	16,053	666.9	0.12

Note: Data are based on (UNESCO, 2021; TÜİK, 2020; National Bureau of Statistics of China, 2020; UN, 2021) for the most recent year.

Table 2. Comparison of Indicators for Various SDGs

ANSO Country Sample	SDG7			SDG12
	Renewable energy in FEC (%)	Renewable energy production (GWh)	Energy intensity (MJ/GDP)	Electronic waste recycling (kg/cap)
China	12.77	1,811,174	6.06	1.14
Russia	3.25	193,392	8.33	0.70
Turkey	11.41	97,771	3.03	1.82
Thailand	22.69	42,667	5.13	N/A
Pakistan	41.40	40,670	4.41	N/A
Hungary	14.33	3,753	4.24	6.98
Kazakhstan	1.62	14,318	8.19	0.56

Note: Data are based on (UN, 2021; IRENA, 2020).

renewable energy in FEC ranges between 1.62% and 41.40%, with 11.41% in Turkey and 12.77% in China (UN, 2021). The total renewable energy production ranges between 3,753 and over 1.8 million gigawatt-hours (IRENA, 2020). The amount of energy that is used to produce a unit of economic value or the energy intensity ranges between 3.03 and 8.33 megajoules per GDP based on the values in Table 2 (UN, 2021). While data is not available for all countries, the amount of electronic waste that is recycled ranges between 0.70 and 6.98 kg per capita (UN, 2021). R&D and innovation that is linked to improving these and other indicators for sustainable development will be instrumental in realizing a shared, sustainable future.

Comparison of Knowledge Production Patterns for the SDGs

Various efforts have been put forth to evaluate progress towards the SDGs, including those with a focus on China. Xu et al. (2020) had focused on determining the change in an SDG Index score during the timeframe of 2000 to 2015 even before the SDGs were adopted. One of the scores with the greatest improvement was determined to be the impressive climb in the values for SDG9 in China. Another study focused on 15 countries along the Belt and Road in Central and Eastern Europe with the advantage of determining the level of coordination across society, economy, environment, implementation, and cooperation (Huan et al., 2021). Among the 15 countries, Tajikistan and Uzbekistan were found to have a higher urgency for progressing towards the SDGs with sustainable progress in comparison to those of the other countries (Huan et al., 2021).

Beyond such analysis, however, any comparison that links knowledge production across the SDGs, which is of utmost importance for directing the R&D and innovation capacity for sustainability, has not been conducted. This manuscript primarily addresses this gap by providing a method to compare knowledge production patterns across the SDGs with a focus on the linkage between SDG9 and the other goals. Similar to the comparisons that are provided above, this analysis is conducted for the representative ANSO country sample with a focus on supporting a shared and sustainable future

across the Belt and Road region as a whole in line with the Beijing Declaration.

The approach that is developed in this study to compare knowledge production patterns in the context of the SDGs is quantified by using combined keyword searches based on the keywords that are identified for 16 of the goals (SCOPUS, 2021). The search results for knowledge production for pairs of SDG9 and each goal are then transferred into chord diagrams for a visual comparison of the knowledge production pattern of each analyzed country. All connections in the chord diagram are sized according to the relative dominance of a given connection. For comparison, the results for the same keyword combinations are analyzed beyond the Belt and Road region for the world.

As already indicated above, SDG9 on industry, innovation, and infrastructure has a direct target for supporting R&D and domestic technology development. Within this target, progress is measured based on expenditure on R&D as a share of GDP and human resources in R&D (UNESCO, 2021). For this reason, the chord diagrams are established based on a combined search for SDG9 and the other SDGs that allow focusing on two SDGs together in each search for every country. Figures 1 and 2 provide the knowledge production patterns across SDG9 and the other SDGs for the world and 7 ANSO countries. In total, the knowledge production of the countries in the sample is estimated to represent at least 21% of the total knowledge production for the SDGs across all countries in the world.

Based on the patterns that take place in the first chord diagram in Figure 1, knowledge production in the world is primarily focused on topics that address both SDG9 and SDG8, the latter of which focuses on decent work and economic growth. Additionally, SDG8 focuses on inclusive and sustainable economic growth with targets and indicators on material footprint. SDG11 on sustainable cities and communities is the next most focused combination with SDG9. These are followed by SDG7 on affordable and clean energy, as well as SDG12 on responsible consumption and production. The top 5 combination of goals with SDG9 based on knowledge production also includes SDG3 on good health and well-being.

Greater R&D and innovation with the cooperation of countries in the Belt and Road can be directed for transforming related advances in knowledge production into solutions for the region.

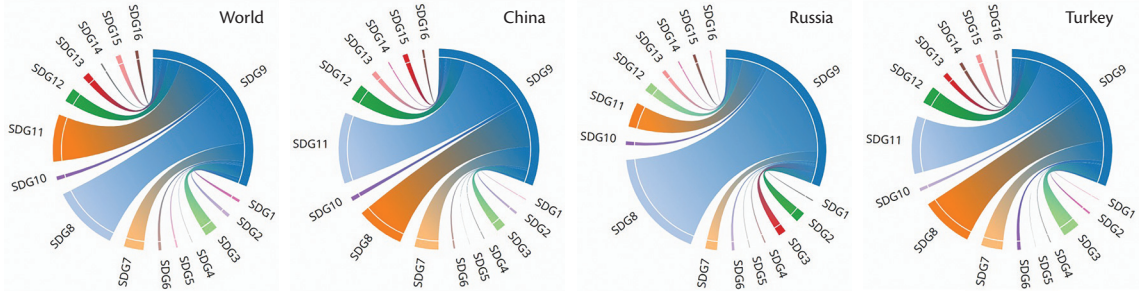
In contrast, the chord diagram for China in Figure 1 indicates that the knowledge production pattern in the context of the SDGs is directly led by the combination of SDG11 and SDG9, which underlines the importance of R&D and innovation for supporting sustainable urban areas in this part of the world with rapid urbanization taking place. This combination has additional importance for China given that the urban population is projected to grow annually by 1.78% and the annual average rate of change in the urban share of the total population is estimated to be 1.58% between the years 2020 and 2025 (UN DESA, 2019). The topics that are the most researched in this linkage include urban transportation, urban planning, and urban

growth. The next combination where knowledge production is focused is at the intersection of SDG9 and SDG8 as also emphasized at the world level. Next, SDG7 and SDG12 that is further important for supplying clean energy to urban areas as well as sustainable consumption and production closely follow by as important areas of knowledge production. In this area, the most researched topics include energy utilization, sustainable manufacturing, and environmental pollutants.

For Russia, the knowledge production pattern is largely dominated by the linkage of SDG9 with SDG8, with the most important topics of research being those that are related to economic development and sustainable development from a management sciences perspective. Linkages between SDG9 and the other goals are relatively less dominant while the knowledge production pattern that represents the linkage of SDG2 on zero hunger and SDG3 on good health and well-being take place at levels that are more similar to SDG7 on affordable and clean energy than those that are observed in other countries.

Knowledge production in Turkey in the context of linkages with SDG9 is led by SDG11 in a way that is similar to the knowledge production pattern of China. The share of the urban population is already 76.1% of the total population and continued increases to the year 2050 are expected (UN DESA, 2019). As already discussed above, one of the pillars of the Eleventh Development Plan is based on livable cities and sustainable environment. The most researched topics in this linkage include urban transport, urban planning, decision making, and geographic information systems. Areas of knowledge production that are also emphasized based on the results of the chord diagram for Turkey in Figure 1 are SDG8 as well as SDG7 and SDG12 that could provide support for enabling an impact toward resource efficiency and renewable energy. Life cycle assessment, renewable energy and recycling take place within the research topics under this linkage. Moreover, SDG3 on good health and well-being is among important areas of knowledge production in combination with SDG9. Based on these results, greater R&D and innovation with the cooperation of countries in the Belt and Road can be directed for transforming related advances in knowledge production into solutions for the region.

Figure 1. Knowledge production patterns across the SDGs for the world, China, Russia, and Turkey.



The knowledge production pattern of Thailand and Pakistan when approached from the linkage of SDG9 with the other SDGs based on the relevant chord diagrams in Figure 2 both lean towards SDG8 that is followed by SDG11, SDG7, and SDG12. In both countries, SDG13 on climate action also has a relatively greater role with topics including greenhouse gases and urbanization. In Hungary, knowledge production in the crossroads of SDG9 and SDG13 is among the prominent areas while those with SDG8, SDG11, SDG12, SDG7, and SDG3 are among other areas with relatively more knowledge production. In comparison to the knowledge production patterns of the other countries, SDG15 on life on land that involves natural habitats receive relatively greater attention. Among the comparisons in Figures 1 and 2, the knowledge production pattern of Kazakhstan when viewed based on the linkage of SDG9 with the other SDGs has a large dominance of SDG8 while SDG2 on zero hunger receives the next highest priority. The topics that are the most researched in this area include agro-industrial complexes and food security.

For additional comparison in the context of SDG11 that is emphasized across multiple countries among the ANSO sample countries, Table 3 provides the percentage of the population residing in urban areas, which are estimated with shares between 37.2% in Pakistan and 76.1% in Turkey in 2020 (UN DESA, 2019). By mid-century, these shares are estimated to increase with a range between 52.2% in Pakistan and 86.0% in Turkey (UN DESA, 2019) with the greatest increases of 18.6% in China and 18.0% in Thailand between 2020 and 2050 based on single projections for each country. Knowledge production which is connected to the linkage of SDG9 and SDG11 for innovative solutions to sustainable urbanization will be an area that requires continued attention given increases in urbanization in all countries. It is foreseen that a shared and sustainable future will be possible through scientific and technological cooperation for sustainable urbanization that is also supported by multiple other goals, including SDG7, SDG12 and SDG13 for clean energy, resource efficiency as well as climate action.

Figure 2. Knowledge production patterns across SDGs for Thailand, Pakistan, Hungary, and Kazakhstan.

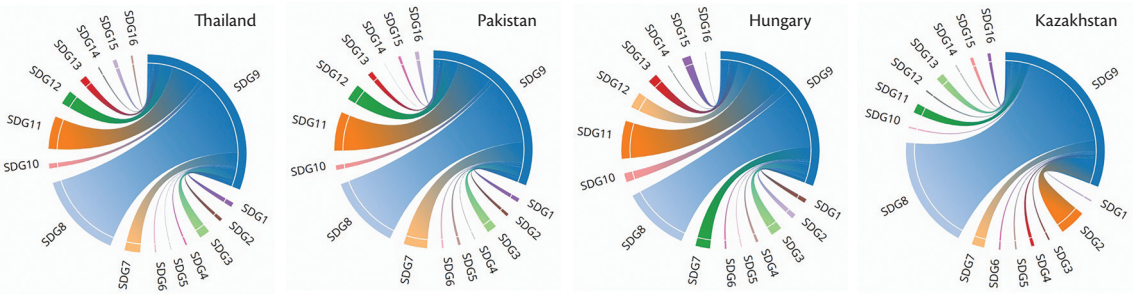


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Table 3. Comparison of Indicators for the Urban Population Share.

ANSO Country Sample	Percentage of the Population Residing in Urban Areas (2020-2050)				
	2020 (%)	2030 (%)	2040 (%)	2050 (%)	Total Change in Share (%)
China	61.4	70.6	76.4	80.0	18.6
Russia	74.8	77.1	80.3	83.3	8.6
Turkey	76.1	80.2	83.4	86.0	9.8
Thailand	51.4	58.4	64.4	69.5	18.0
Pakistan	37.2	40.7	45.9	52.2	15.0
Hungary	71.9	75.1	78.6	81.8	9.9
Kazakhstan	57.7	60.0	64.1	69.1	11.4

Note: Data are based on (UN DESA, 2019).

Collaborative Research and Interactions through ANSO

Existing knowledge production patterns towards sustainable development represent a vast capacity to address common challenges for a shared and sustainable future. In the implementations of the Beijing Declaration, collaborative research that is being supported by ANSO has focused on areas of common challenges such as agriculture and food security, water resource and water security, air pollution and human health, climate change, and others as well as the transformation of science and technology achievements (ANSO, 2020a). The collaborative research areas include both scientific research and human well-being orientations. Special attention is also given during the evaluation of the collaborative research projects for addressing one or more SDGs towards the vision of a shared and sustainable future. The SDGs that are addressed by the collaborative research projects are briefly overviewed to underline the research directions that are currently being pursued.

Based on a focus on safe drinking water to support health and well-being, another project is jointly developing purification technologies for clean drinking water and the removal of pollutants in underground water.

Currently, multiple collaborative research projects have focused on contributing to science-based solutions that advance SDG2 on ending hunger (ANSO, 2020a). One of the collaborative research projects is launched to contribute to this goal through agricultural monitoring that supports food security using such techniques as crop yield modeling and resource mapping. Another project that focuses on SDG2 is developing a system for green cultivation technology based on new carbohydrate formulations to support food security and safety while reducing the use of chemical pesticides and increasing crop yield.

With a focus on health and well-being (SDG3), pre-clinical studies of a new antimalarial drug are the focus of another project in collaboration with partners from China, Sri Lanka, and Kenya. Based on a focus on safe drinking water to support health and well-being, another project is jointly developing purification technologies for clean drinking water and the removal of pollutants in underground water. At the intersection of two SDGs, the project further supports SDG6 on clean water and sanitation. Membrane technologies that are developed in another project are also supporting the same goal for safe and affordable clean drinking water in Belt and Road countries.

Another collaborative research project that is supported by ANSO is advancing the atmosphere observation network for environmental and climate research, while another research team is focusing on promoting low-carbon and sustainable development. Among others, one collaborative research project is exploring sub-seasonal and seasonal weather and climate forecasts to enable pathways for protecting food security, the environment, and human development from natural disasters. In comparison, these projects are increasing knowledge for supporting specific targets within the first three SDGs on reducing poverty, hunger, and improving health and well-being in various ways as well as increasing scientific and technological sup-

A technician inspects solar panels at a photovoltaic farm in Hami, Xinjiang Uygur autonomous region. (Cai Zengle/China Daily, 2021)

port for both SDG11 and SDG13 on sustainable cities, communities, and climate action.

With a focus on terrestrial ecosystems in the scope of SDG15 and its interactions with the other goals, another project is providing approaches for ecological monitoring and conservation while providing recommendations for risk prevention. Another team is advancing the monitoring of agricultural and forestry pests based on DNA barcode technology (ANSO, 2020a). Yet another collaborative project is focusing on minimizing the occurrence and spread of antibiotic resistance genes based on the interaction of water, soil, and plants to protect the environment as well as public health.

As with other collaborative research projects that address multiple SDGs, research teams have been focusing on urban air pollution control technologies based on photocatalytic nanomaterials against haze from biomass burning in rural areas, green chemical products for disinfection against the pandemic, and a multi-global navigation satellite system (GNSS) for autonomous vehicles. One of the collaborative research projects with research partners from China, Turkey, and Belarus focuses on remote sensing satellite image applications to address local development needs. Another collaboration is based on an advanced synchrotron light source facility to support the basic sciences in such research areas as biology, environmental and earth science, physics, chemistry, and material science that supports SDG9.

UN Sustainable Development Goals

As existing and new collaborative research projects are ongoing, it must be emphasized that there is still great potential for establishing additional research collaboration in support of a shared and sustainable future, including through the interaction of young and experienced scientists. The common challenges of the future require unprecedented collaboration. For this purpose, ANSO organized the First Young Scientists Forum and hosted world-renowned scientists in Hangzhou, China with a focus that included green and sustainable development, health and life sciences, and emerging technologies. The forum together with a Science and Technology Cooperation Conference was attended by more than 500 representatives from about 30 countries around the world (ANSO, 2019). The sessions of the First Young Scientists Forum particularly addressed the role of basic sciences for supporting sustainable development as envisioned by ANSO and potentials for the future. The perspectives included those on recent trends in gene discovery and new initiatives for the use of big earth data. This also includes CASEarth to support the SDGs (Guo et al., 2021), particularly SDGs involving food systems, urban systems, and the global environmental commons.

Within the role of basic sciences for sustainable development, the session contributions also included an emphasis on thermodynamic principles for supporting the planning of sustainable communities. An approach for matching renewable energy supply sources with different energy demands based on the useful work potential of energy or exergy was shared with examples from an original net-zero target (Kılkış, 2014). This approach was further applied to a related case study analysis in the Qingshan Lake District in Hangzhou, China (Lu et al., 2014). In the case study, the transition path involved district

China aims for carbon neutrality by 2060. (CGTN, 2021)

energy systems with solar, wind, and bioenergy with varying shares in summer, winter, and mid-seasons. Urban areas involve linkages across the SDGs (Kabisch et al., 2019), and increasing the utilization of renewable energy sources can provide important benefits for the climate (Lin & Zhu, 2019) and urban inhabitants for better air quality. Most recently, research communities are also generating scenarios under localized conditions for the Shared Socioeconomic Pathways, including scenarios for multiple cities in the Beijing-Tianjin-Hebei Region with and without sustainable urbanization conditions (Yang, Yang, & Wang, 2020). Improved urban land use and spatial planning are also recognized for avoiding the conversion of cropland and avoiding the reduction of carbon sinks (Xu, Zheng, & Zheng, 2019).

Science and Technology for a Shared and Sustainable Future

The ability of the research ecosystem to address common needs for sustainable development requires strong research capacity and coordination to provide a purposeful direction towards supporting greater sustainability based on science, technology, and innovation. In the Belt and Road region, such a purposeful direction is being provided based on the science-based initiatives of ANSO to support a shared and sustainable future as emphasized in the Beijing Declaration. The analyses that are provided in this article provide evidence-based observations for an important research capacity that is being mobilized and can even be mobilized more strongly in the future to support the SDGs across the Belt and Road region. The knowledge produc-

tion patterns based on the linkage of SDG9 with the other SDGs as put forth in this study represent original analyses that are visualized with chord diagrams to compare the distribution of research focus across the countries in the sample. Additionally, discussions on the connection between the collaborative research projects of ANSO and the SDGs have represented the ongoing efforts of the research community to support a shared and sustainable future. Potentials for future collaboration opportunities between China, Turkey, and countries in the Belt and Road Region include new collaborative research projects as well as strengthening the interactions between ongoing projects for supporting a common impact towards sustainable development across multiple SDGs.

In the near future, an emphasis on multidisciplinary integration and common platforms in the new timeframe of the Fourteenth Five-Year Plan in China can provide additional opportunities for related developments in the Belt and Road Region. Such a common platform can also support science-based solutions for sustainable urbanization given that significant increases are foreseen for urban areas, including in the countries that are analyzed in this manuscript. In the timeframe of the Fourteenth Five-Year Plan, it is evaluated that emphasis on smart energy systems and peaking of emissions towards climate-neutrality represents a potential for significant support for climate mitigation that can be further strengthened with the collaborative research mobilization of the Belt and Road region. The clear direction of ANSO with an emphasis on science, technology, and innovation in support of the SDGs provides an important basis for collective action now and in the decades ahead for a sustainable future.

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