
Belt and Road Green Finance (Investment) Index

BRI thematic report



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Abstract

Based on the comprehensive collection and collation of data, this paper constructed a ground breaking Belt and Road Green Finance (BRGF) Investment Index. The BRGF index measures the green economic performance and green development capability of 79 countries along the Belt and Road. The results show that there is a tremendous variation in green performance and capacities between countries along the Belt and Road. Pressure on the environment and resources for future growth is particularly significant.

In order to cope with the above challenges, this report recommends countries along the Belt and Road to tailor individual green development strategies according to the country's own resource endowment and capacities for future development. Financial institutions should actively develop green concepts, responsible investments, and lead capital flow towards green industries and green projects through innovation.

Keywords: Belt and Road, Green Finance, Index

1. The Belt and Road Green Finance (BRGF) Investment Index

1.1 Purpose of establishing the BRGF Index

Climate change and the future availability of natural resources have become critical global topics. The implementations of the UN's '2030 Sustainable Development Goals' and the 'Paris Agreement' are now top priorities for governments and shared responsibilities for our society. While Belt and Road Initiative (BRI) presents new opportunities in infrastructure construction, urban development, industrial and energy sector upgrades, the reality of resource constraints is a fundamental challenge to be addressed. In a nutshell, sustainable development is one of the core principles of the BRI. As a result, finding ways to cooperate on sustainable financing and construction of BRI projects has become a new challenge for all its stakeholders.

As a pioneer in the field of green finance, ICBC initiated the 'Belt and Road Bankers' Roundtable' (BRBR mechanism)¹ in 2017 to jointly promote a greener "Belt and Road" with financial institutions both from China and other countries. This study is a beneficial attempt to complement and cooperate among members. In an effort to provide a quantitative-based approach, ICBC has initiated a joint research project with Oxford Economics to develop the Belt and Road Green Finance (Investment) Index (BRGF Index). On the basis of a comprehensive collection and organisation of data, this research gained the support of European bank for Reconstruction and Development (EBRD) and endorsements of three members under BRBR mechanism during the establishment of the Index, which include Mizuho Bank (Japan), Credit Agricole Corporate and Investment Bank (France) and Unicredit Bank (Italy). This Index is designed to help global policy makers and investors to evaluate green investment opportunities and environmental challenges that may arise. It also seeks to identify potential partners and financing towards the green economy, and in turn contribute towards sustainable economic and social development amongst countries active in the BRI.

The BRGF Index was pre-released at the second BRBR conference on April 24, 2019, which was unanimously welcomed and praised by member institutions under BRBR mechanism. It was also included in the official list of outcome of the Second Belt and Road Forum for International Cooperation. For this extended version, it could also be

¹ During the first Belt and Road Forum for International Cooperation in 2017, ICBC successfully held the first meeting of 'Belt and Road Bankers' Roundtable'. At this forum, ICBC advocated to establish a formal mechanism in the name of 'Belt and Road Bankers' Roundtable'. This mechanism is aimed to establish a platform for financial institution from all around the world under the spirit of openness, inclusiveness, mutual benefit and business principles, which helps to promote the construction of greening "Belt and Road", to exploit the advantages of forward-looking research, scientific and technological application, production capacity cooperation and financing channels among all members.

referred to as a good practice guided by the spirit of “Extensive consultation, joint contribution and shared benefits” – an implementation of outcome from the Belt and Road Forum, which fully reflects the importance of the BRBR mechanism in promoting international cooperation on green investment and financing along the Belt and Road.

1.2 Significance of the BRGF Index

Overall, the Index has made new breakthroughs in researching and developing quantitative tools for the green developments along BRI. Understanding the green transformation of countries along the Belt and Road is vital to exploring opportunities in green investments as well as providing practical guidance for future policymaking.

First, the BRGF index can help investors to unlock potential green investments and improve international cooperation. Although there are high yielding investment opportunities, investors are still struggling to take associated environmental risks into account due to long investment periods, asymmetric information, and the lack of effective tools to identify environmental risk. In turn, BRGF index provides a holistic approach and quantitative framework to measure green performance and green growth capacity of countries along Belt and Road. As such, it aims to help investors to further explore green investment opportunities while encouraging policymaking institutions to establish global joint efforts in green development.

Second, the methodology of our index is benchmarked against global standards. We collected over 100 relevant indicators from 17 databases such as the International Monetary Fund (IMF), World Bank, Oxford Economics, and the Environmental Performance Index (EPI). Taking the credibility, geographical coverage and frequency of available data into account, 17 key indicators were used in the index. Meanwhile, in order to scientifically determine index weights, the research team followed the principles of 'cross-validation' by adapting two channels of expert review and econometric evidence. Our research results show that the selected indicators have a large coefficient of variation, indicating a high degree of sensitivity and variety of indicators selected for the index. The range of indicators also helps to distinguish a full scope of green financial development in different countries, which better reflects the respective green investment opportunities along Belt and Road countries.

Third, expertise from both ICBC and Oxford Economics ensured the Index incorporates both theoretical and practical considerations. ICBC and Oxford Economics contributed different perspectives during the modelling of the Index. While Oxford Economics provided advanced research methods, ICBC – as a global commercial bank – took the interests of international investors into account, and integrated its practical experience in many BRI countries. In addition, this research has also received support from European Bank for Reconstruction and Development, and endorsements of three members under the BRBR mechanism, which includes Mizuho Bank, Crédit Agricole Corporate

and Investment Bank and UniCredit Bank. All member institutions leveraged their strengths, and contributed to this cross-boundary cooperation. Therefore, the results of the Index not only reflect forward-looking insights, but also meet practical needs of financial institutions to explore synergies generated by the cooperation between different stakeholders under the BRBR mechanism.

2. Analysis Framework of the BRGF Index

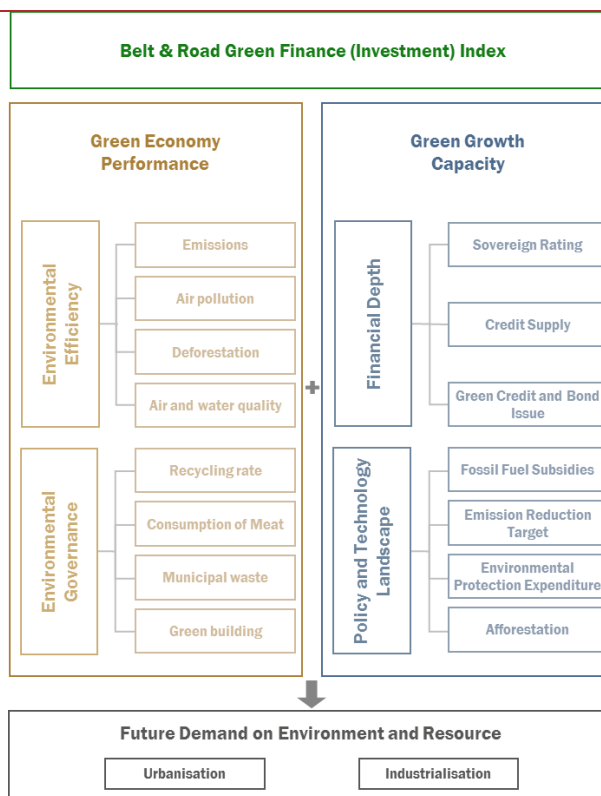
2.1 Sample selection

Belt and Road Initiative covers a variety of geographies. BRI stretches from Asia, Europe, and across to Africa and their nearby island territories. To enhance the credibility and robustness of the Index, the research team has selected 79 countries along the Belt and Road. According to the World Bank’s classification by per capita GNP, 19 are high-income countries, 29 are middle- and high-income countries, and 31 are low- and middle-income or low-income countries. These sample countries cover the majority of BRI countries, representative of the countries actively involved.

2.2 Indicators

The BRGF Index has two dimensions. The first – Green economy performance (GEP) – aims to give an indication of the current green development of BRI countries. The second – Green Growth Capacity (GGC) – assesses the policy, technological landscape and financial depth of countries in our sample. These two dimensions in aggregate give a comprehensive perspective on the future demand on the environment and resources. See [Figure 1](#) for a summary of the overall Index structure.

Figure 1: Overall framework of the BRGF Index



Source: Oxford Economics, ICBC

2.2.1 Green Economy Performance (GEP)

The 'Green Economy Performance' measures the environmental performance in the context of economic growth within a country. Higher scores indicate that countries are better placed to promote green development in the future all else equal. Details include the following two aspects:

1. Environmental Efficiency: It includes seven sub-indicators: Carbon dioxide emissions, methane emissions, oxynitride emissions, air pollution, air quality, deforestation and wastewater treatment. Among them, the first three sub-indicators are greenhouse gases as defined in the Kyoto Protocol. Particularly, the carbon dioxide emissions have the largest weight of 32.6% and other factors have weights lower than 7%.

2. Environmental Governance: A series of behaviours conducted by enterprises, families and governments that may alleviate the impact of economic growth on the environment, such as waste recycling and formulation of green building criteria are tracked.

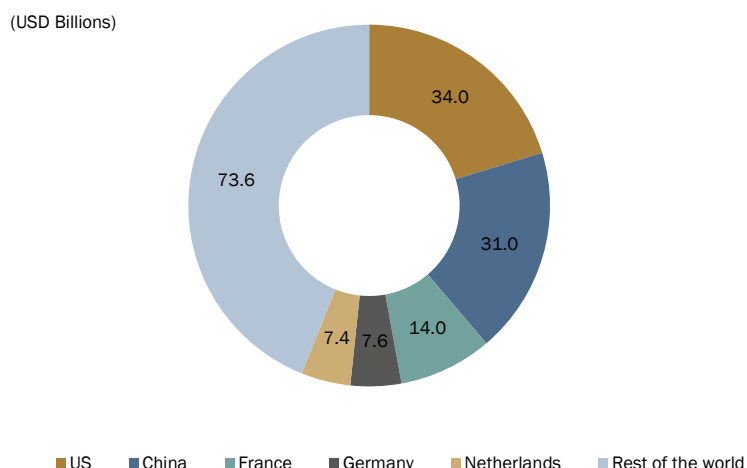
2.2.2 Green Growth Capacity (GGC)

The 'Green Growth Capacity' measures the ability of a country to maintain or improve green development performance. Higher scores indicate that countries have stronger abilities to improve and promote green development in the future. Details include the following two aspects:

1. Financial Depth: The sovereign credit rating of countries covered in this index is used to assess the overall financial depth and credit status of a country, and the total amount of credit extended by the financial sectors to the private sectors is adopted to measure the financial ability of a country to support the real economy.

For the time being, due to country data deficiency, we are only able to measure Green Growth Capacity against one indicator of credit supply: the total amount of credit financing a country has done. However, it is worth mentioning that in recent years, the green bond market of countries along Belt and Road has become an importance driver for local green investments. According to the data of the Climate Bonds Initiative (CBI) and Moody's, in 2018, there were USD167.6 billion green bonds in the world ([Figure 2](#)), a continuous increase compared with those in 2017. In 2019, green bonds issuance hit a new global record of USD 250 billion. Despite the fact that Mainland China and the US are still the largest two green bond issuers; the issuance of green bonds by countries along Belt and Road has grown rapidly in recent years. In 2018, countries along Belt and Road, such as Indonesia, Thailand, Seychelles and Lebanon, issued green bonds for the first time. As relevant data is more abundant and sound, the research team will gradually include the above-mentioned indicators in the scope of consideration.

Figure 2: Issuance of green bonds by country (2018, USD bn)



Source: Climate Bonds Initiative

2. Policy and Technology Landscape: This aspect of the index reflects whether the green development policy of a country is well-developed and whether the relevant technology R&D strength is adequate. Specific indicators include executions of the emission reduction goals, environmental protection expenditures of public sectors and production of renewable energy.

2.2.3 Challenges in environment and resources that come with the sustainable energy developments

The Green Economy Performance (GEP) and Green Growth Capacity (GGC) dimensions are designed to measure current sustainable development of an economy, without considering the **possible pressures on the environment and resources due to future economic development in a holistic way**. To analyse the sustainable development of countries along Belt and Road more comprehensively, the report uses forecasts of future urbanisation and industrialization of economies along the Belt and Road by Oxford Economics. This calculated scoring represents the possible pressure on the environment due to future economic development of countries. By comparing it with GEP and GGC separately, the report has proposed policy recommendations on green development of countries along the Belt and Road.

The reason why urbanisation and industrialisation are selected as the entry points to measure the pressure on the environment due to future economic development is that two factors are the most important sources that result in these environment pressures during economic development of countries. During urbanisation, public infrastructure and building related industries have driven energy consumption; agglomeration effect of population increases consumption levels and purchases of industrial products such as automobiles, which increases emissions of greenhouse gas and waste. Industrialisation brings pressure on the environment and resources more directly. The development of some energy-intensive manufacturing industries will increase the resource consumption and environmental pollution on a national-wide scale.

2.3 Methodology

The research team has gathered from international experience, weighted and incorporated all variables via the scoring card, to obtain the scores of the 'Green Economy Performance' and the 'Green Growth Capacity' (see Appendix II for methodology). The main scoring methodology is as follows:

- 1 Standardising all indicators to eliminate differences in variable dimensions. The final index score is a value in the interval [0, 100], where 100 represents the highest score.
- 2 Determining the weight according to the importance and update frequency of indicators. First, the research team determined the approximate range of weights of each indicator according to the coefficient of variation of indicators and the results of principal component analysis (PCA). Second, the team determined the weights of each indicator in the baseline situation according to the green rating experience of internationally renowned financial institutions. Third, the team conducted weighted incorporation of all indicators according to the weights to obtain the scores of the two indices 'Green Economy Performance' and the 'Green Growth Capacity' of each sample country. It should be noted that the settings of indicator weights are inevitably impacted by some subjective factors, which would have certain influence on the final scores of indices.
- 3 For the sake of international comparison, the research team also selected nine developed economies (Denmark, Germany, France, Iceland, Norway, Sweden, Switzerland, the UK and the US) as the control group, employing the above-mentioned methodology for assessing and comparing the results with those selected countries along the Belt and Road.

3. Analysis of the Green Economy Performance (GEP) Index

Based on the methodology discussed in the previous section, this section provides analysis of the Green Economy Performance Index for the selected countries along the Belt and Road. Higher scores suggest, at least for the time being, that countries have better green performance relative to others in the research sample.

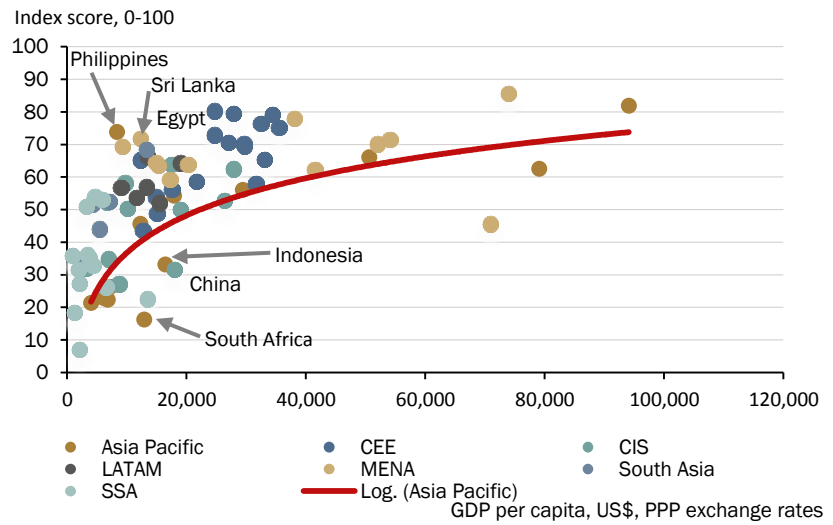
3.1 GEP Index Scores

Overall, the average score of the 'Green Economy Performance' of sample countries is 53.6. From a regional perspective, economies in Central and Eastern Europe and some Asian countries have outstanding green performance. Two possible explanations for those countries that have high GEP scores are as the following: first, a great proportion are developed economies with higher per capita income and much well-developed environmental protection policies; second, heavy industries and chemical industries feature less in these economies, indicating less potential pressure on environmental pollution.

By country, there are similarities and differences as to why some countries have higher scores. One of the similarities is that these countries have less greenhouse gas emissions, which is the indicator with the largest weight for measuring the GEP. One of the differences is that they have different reasons of low emissions. For example, the economic activity of Latvia is not that strong. Singapore's economic structure heavily relies on its service industry. It is also a developed economy that has strict environment policies. Qatar mainly relies on its resource export, and it has a small number of local enterprises with heavy and chemical industries, which explains low emissions per unit GDP.

According to the results in [Figure 3](#), there is a positive correlation between the GEP score and the per capita income of a country. Higher per capita income of a country usually indicates a higher score of GEP. There are two key reasons: Judging from the supply side, income improvement has provided more space for industrial upgrading and the application of green technology; from the demand side, this correlation shows that the environmental protection awareness of the mass population is enhanced with income growth.

Figure 3: Positive correlation between the 'Green Economy Performance' scores and per capita income of sample country



Source: Oxford Economics

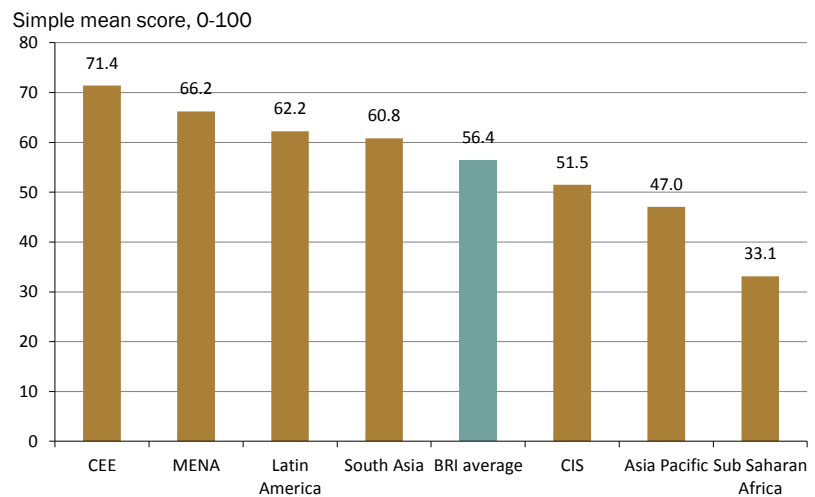
3.2 GEP Sub-index Scores: Climate Change and Environmental Efficiency

By regions, Central and Eastern European countries scored higher in the 'Climate Change and Environmental Efficiency' overall. Three out of those top four are from Central and Eastern Europe. This region also covers half of the top 10 scores.

Although economies in the Middle East and North Africa as a whole have high scores, it is worth noting that this might be related to the high resource endowments and unique economic structures. In some countries, exports of natural resources account for over 40% of their GDPs. The resource extraction industry has far less greenhouse gas emissions than that in resource utilisation and processing industries. Therefore, these economies achieved higher scores.

Figure 4 shows that countries in Sub-Saharan Africa have the lowest scores on 'Environmental Efficiency'. Here, Environmental Efficiency scores are approximately 23 points less than those of other countries along Belt and Road. Among the ten countries with the lowest scores, four of them are in this region.

Figure 4: Average scores of 'Environmental Efficiency' by region

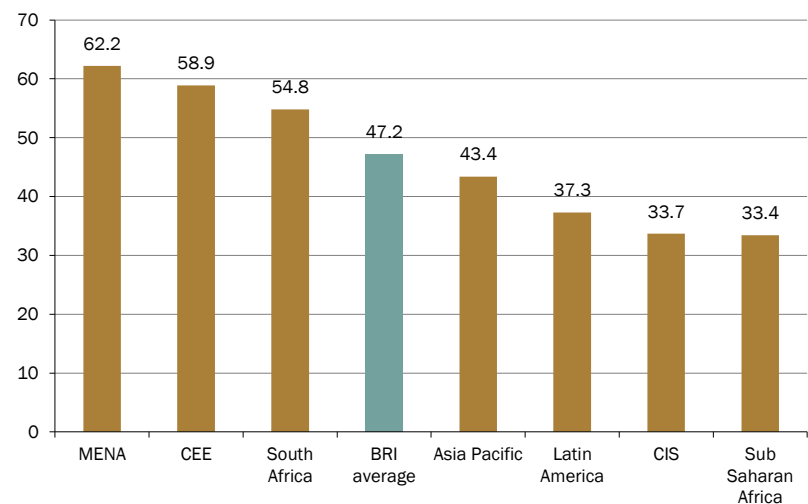


Source: Oxford Economics

3.3 GEP Sub-index Scores: Environmental Governance

A similar regional pattern can be observed in the performances of 'Environmental Governance', whose deviation is less than that of the 'Environmental Efficiency' indicator.

Figure 5: Average scores of the 'Environmental Governance' by region



Source: Oxford Economics

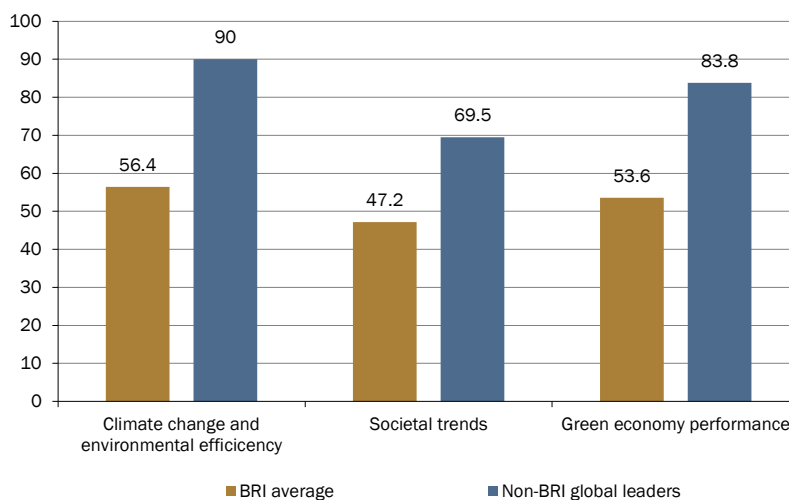
As shown in Figure 5, economies in Central and Eastern Europe also have the highest average score in 'Environmental Governance', mainly benefiting from their compliance with EU standards in relevant

fields.² Scores of Asia-Pacific countries are in the mid to upper range among countries along the Belt and Road without much variation in scores; Sub-Saharan Africa again has low scores on the whole, yet some countries in the region were exceptions. For instance, over 20% of domestic sewage was disposed of properly in Ghana and Mozambique. Similarly, Cameroon and Kenya both have good performance in the certification of green buildings.

3.4 Benchmarking against a group of developed countries as a control group

Overall, the average score of the 'Green Economy Performance' of the sample countries in our research is 53.6, which is 30.2 lower than that of those nine developed economies in the control group (Figure 6). However, it is worth mentioning that the average score of top ten countries along Belt and Road is 82.1, basically the same as that of developed economies in the control group. Judging from the trend in recent years, the gap in 'GEP' between countries along Belt and Road and developed countries has been narrowing, reflecting a change in focus to environmental protection for countries along Belt and Road and their willingness to cope with environmental challenges.

Figure 6: Scores of the 'Green Economy Performance' of countries along the Belt and Road and developed countries in the control group



Source: Oxford Economics

² For instance, as early as February 2003, the European Union Council approved the Waste Electrical and Electronic Equipment Directive (WEEE Directive) and the Restriction of Hazardous Substances Directive (RoHS). In 2005, it issued the Eco-Design of Energy Using Products (EUP), specifying the obligations and standards of member countries for environmental protection from the perspective of law.

4. Analysis of the Green Growth Capacity (GGC) Index

The GGC Index measures the ability of a country to maintain or improve green development performance. Higher scores indicate that countries are more capable of improving and promoting green development in the future. Specifically, it includes two parameters, Financial Depth and the Policy and Technology Landscape.

4.1 Overall scores of GGC

Asia-Pacific countries and those in Central and Eastern Europe deliver the best results. Among them, Australia and Mainland China rank first and second respectively in terms of GGC, followed by countries in Central and Eastern Europe (five of the top ten countries). Kuwait, UAE, and other countries in the Middle East have good rankings in the GGC, which can be a reflection of sound fiscal performances. However, countries in South Asia, sub-Saharan Africa, Latin America, and countries in the Commonwealth of Independent States have relatively low scores.

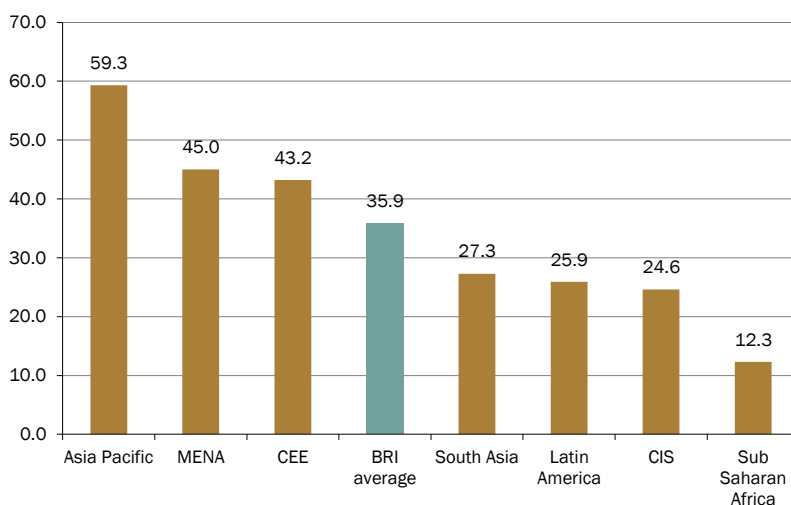
4.2 GGC Sub-index Scores: Financial Depth

The 'Financial Depth' mainly measures the ability of public and private sectors to fund the green economic developments within their jurisdictions. According to results shown in [Figure 7](#), there are major differences between countries along Belt and Road in terms of their Financial Depth.

Asia-Pacific countries have strong Financial Depth. Among the six countries along Belt and Road with the highest scores, five of them are Asia-Pacific countries. Singapore, Australia and Mainland China have high rankings, all of which benefit from good sovereign credit ratings and developed financial markets. In other words, efficient financial markets will improve the availability of investments in economic activities related to energy-saving and environmental protection.

Some developing countries relying on resource export have low scores. As their economic and fiscal income rely heavily on resource export, the fiscal status of some of these countries deteriorated rapidly after the global financial crisis in 2008, and their sovereign bond ratings declined greatly, causing a dive in their Financial Depth scores.

Figure 7: Average scores of 'Financial Depth' by region

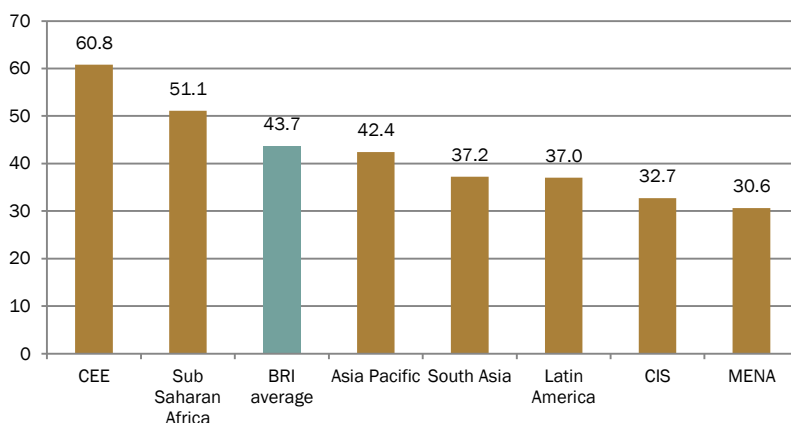


Source: Oxford Economics

4.3 GGC Sub-index Scores: Policy and Technology Landscape

Overall, the scores of Policy and Technology Landscape of countries along Belt and Road (Figure 8) are more evenly distributed than those of the 'Financial Depth'. There are potentially two reasons: First, guided by a series of global initiatives and objectives such as the UN's '2030 Sustainable Development Goals' and Paris Agreement, the idea of sustainable development has been recognised and implemented by more and more countries. At present, most countries along Belt and Road have developed clear objectives of energy saving and emission reduction. Second, green technology innovation has seen a rapid rise in R&D, and now starting to become employed commercially. This process has lowered the cost of production for renewable energy. In recent years, the total power generation of renewable energy of countries along Belt and Road has substantially increased.

Figure 8: Average scores of the 'Policy and Technology Landscape' by Region



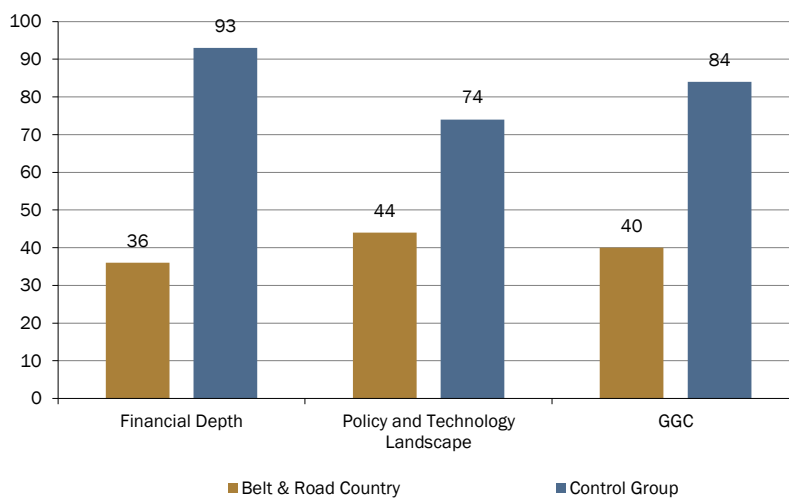
Source: Oxford Economics

4.4 Benchmarking against control groups from developed countries

The average GGC score of countries along Belt and Road is 40, 44 scores below that of the control group (Figure 9). Furthermore, the average score of 'Financial Depth' of countries along Belt and Road is 36, 57 scores less than that of the control groups. The average score of 'Policy and Technology Landscape' of sample countries is 43. 32 scores less than that of the control group.

The large gap may reflect the sheer range of country scores along the Belt and Road. For example, the average score of top ten countries in terms of GGC is 66.5, no major difference compare to developed countries. The score of the last ten countries with the lowest scores of the GGC is only 17.7, negatively impacting the overall performance of countries along Belt and Road. Such difference constitutes the basis for the green development cooperation between countries along Belt and Road. By sharing experience in green development, creating opportunities for green finance, and leveraging the comparative advantages, countries along Belt and Road are likely to become leaders in the global green finance development in the future.

Figure 9: Comparison of average values in 'Green Growth Capacity' of sample Belt and Road countries and developed countries in the control group



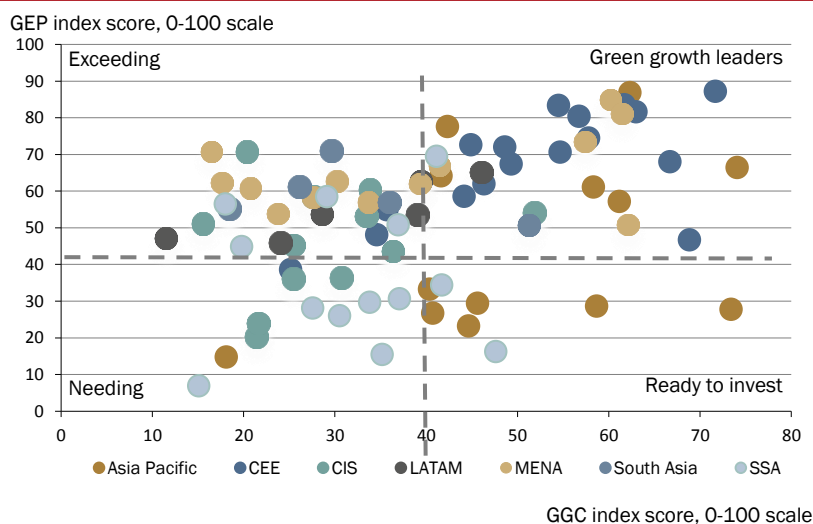
Source: Oxford Economics

5. Green Economy Performance, Green Growth Capacity, and Future Environmental Pressure

5.1 Green Economy Performance and Green Growth Capacity of countries along Belt and Road

To analyse the environmental pressure of sample countries in more detail, we use the vertical axis to represent the scores of 'GEP and the horizontal axis to represent the 'GGC, and divide sample countries into four quadrants (Figure 10).

Figure 10: Classification of sample countries by scores of 'Green Economy Performance' and 'Green Growth Capacity'



Source: Oxford Economics

Countries in the top-right quadrant: This category of countries rank top both in terms of the Green Economy Performance and the Green Growth Capacity among countries along Belt and Road, accounting for 33.45% among sample countries, with Singapore being an example. Their characteristics are that the economy is mainly based on the export of resources or services, the fiscal revenue is relatively stable, and the policies and technologies in the field of environmental protection are in a leading position. This category of countries can provide strong support for the green development of other countries along Belt and Road via financing and technology supply.

Countries in the top-left quadrant: Their scores of the Green Economy Performance are above the average level, but they struggle with the development of sustainable energy, accounting for 21.2% among sample countries. Most countries are at the early stage of industrialisation. Despite signs of limited pressure on resources and the environment, there are large fluctuations in fiscal income and inadequate external Financial Depth, indicating weak momentum for

green economic development. In anticipation of future strains on the environment and resources, these countries need to act in advance. Within the cooperation framework of Belt and Road Initiative, they can seek for cooperation with governments and institutions vigorously and achieve the goals of green sustainable development by introducing environmental protection technology and upgrading industrial technology.

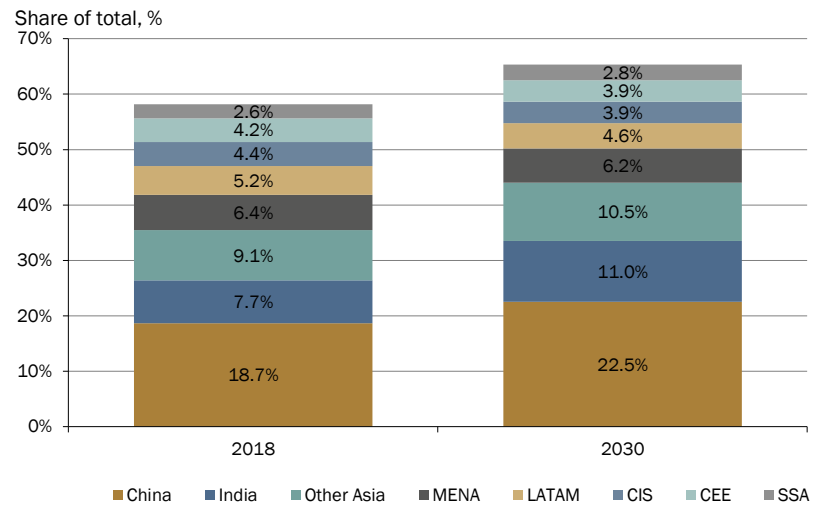
Countries in the bottom-left quadrant: Countries in this quadrant are at a lower level than the average level of the Green Economy Performance and the Green Growth Capacity, accounting for 36.25% among sample countries. They are mostly low-income or low- and medium-income countries. They generally lack momentum for local economic development. Furthermore, the environmental factors negatively impact economic growth. These countries are in desperate need of external aid in terms of sustainable development.

Countries in the bottom-right quadrant: These countries are higher than average in Green Growth Capacity, but their performance in terms of Green Economy Performance is not satisfactory, accounting for 9.1% among total samples. Most of them are equipped with certain industrial capacity, stable sources of fiscal income, and certain technology advantages in environmental protection. However, they have already accumulated environmental problems at the early stage of industrialisation and urbanisation. In the future, they should promote green upgrading of industries, invest more funds in environmental protection, and meanwhile, leverage their technology advantages to seek for cooperation opportunities for green projects and green investments with countries along Belt and Road.

5.2 Environmental and resource pressures linked to economic growth along the Belt and Road

The countries along Belt and Road are amongst the most dynamic regions in the world, which includes most of the economies with the fastest growth. In aggregate, the GDP of countries along Belt and Road accounted for 58% of the global GDP in 2018. It is expected that within the next ten years, the GDP of countries along Belt and Road will grow at a rate of over 4% every year on average. By 2030, the shares of economies along Belt and Road will account for nearly two thirds of the global GDP ([Figure 11](#)).

Figure 11: Forecast in GDP contribution by countries along Belt and Road to Global GDP³

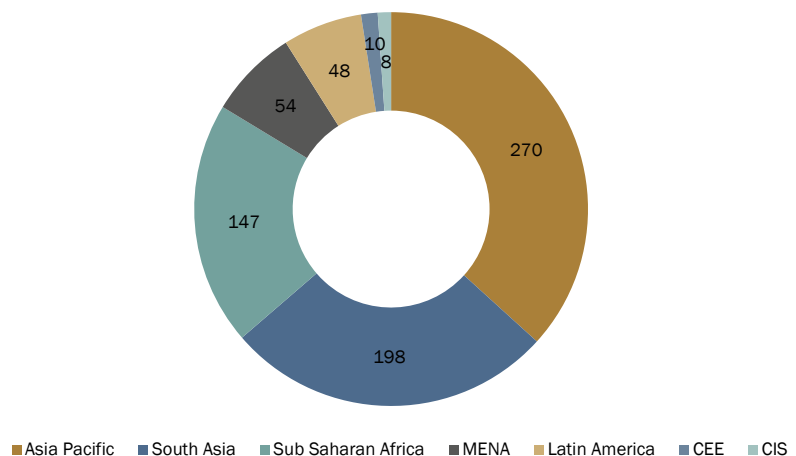


Source: Oxford Economics forecasts

Rapid economic development will greatly accelerate urbanisation and industrialisation. **From the perspective of urbanisation**, it is expected that during the period from 2018 to 2030, there will be 840 million people in countries along Belt and Road migrating from rural areas to urban areas (Figure 12). Among them, 84% of the migration will happen in Asia and Sub-Saharan Africa. By country, the urbanization of India and Mainland China will account for nearly half of the above-mentioned migration. Meanwhile, the number of urbanized population in Nigeria, Indonesia and Pakistan will also rank top.

Figure 12: Prediction of Urban Population Growth in Regions along Belt and Road (2018-2030, unit: 1 million)

Billions people

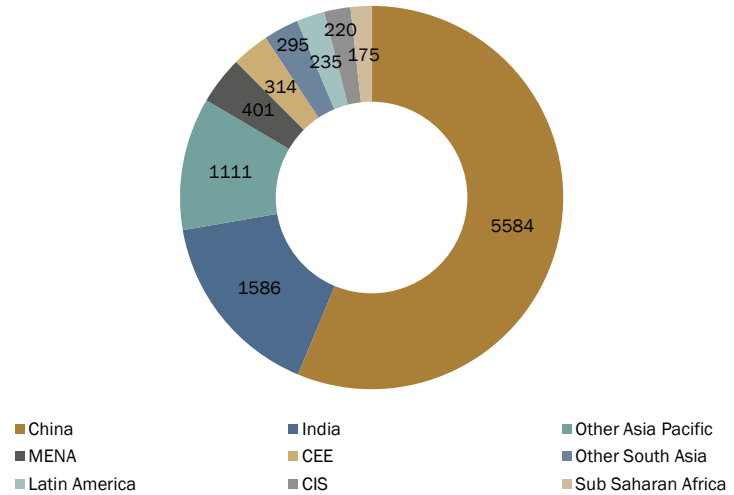


Source: UN forecasts, OE calculations

³ The calculation is based on the constant USD GDP as calculated at the exchange rate after the adjustment to the purchasing power parity (PPP). It includes all the 88 countries along the Belt and Road defined in our “Belt and Road China Connectivity Index” whitepaper published in 2018.

From the perspective of industrial development, the industrial sectors of countries along Belt and Road will become a significant driver of GDP growth. According to Oxford Economics forecasts, during the period from 2018 to 2030, the industrial value-add of countries along Belt and Road will grow by USD9.9 trillion (Figure 13).

Figure 13: Growth in industrial added value of countries along the Belt and Road (2018-2030, USD1 billion, PPP constant price)



Source: Oxford Economics

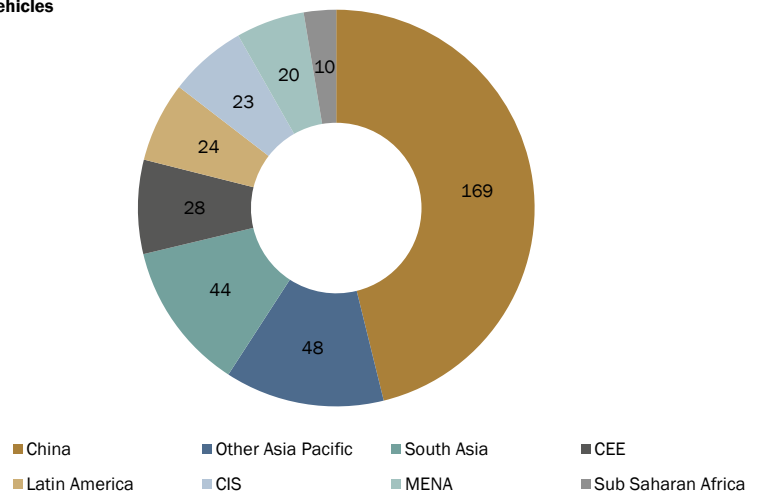
Rapid urbanisation and industrialisation will make significant contribution to global economic growth, but also raise considerable requirements for sustainable development capabilities of countries. First, rapid industrialization will increase greenhouse gas emissions. As Figure 14 shows, currently industrial sectors account for half of the global energy consumption, among which the energy consumption of manufacturing is the main factor. According Oxford Economics forecasts, during the period from 2018 to 2030, the value add of manufacturing sector of countries along Belt and Road will be USD9.9 trillion in total, indicating huge demands for resources and energy. Meanwhile, with the continuous flow of rural labour to cities, mechanisation and industrialisation of agricultural sectors will accelerate greenhouse gas emissions.

Second, the increase in the car ownership (Figure 14) will exacerbate greenhouse gas emissions. Transportation is a key sector that consumes fossil fuels and gas. Its emission accounts for approximately 11% of global emissions. According to Oxford Economics forecasts, during the period from 2018 to 2030, the increase in car ownership of countries along Belt and Road will have exceeded 370 million vehicles. The increase in car ownership in Mainland China, South Asia and Central and Eastern Europe cannot be underestimated. Such increase will inevitably add greenhouse gas emissions, and exert significant pressures on environment. However, it is worth mentioning that despite rapid growth in car ownership, Mainland China has taken a leading position in electric vehicles (EV) technology and in the process of promoting such technology globally,

which will be of great help to Belt and Road countries when it comes to emission reduction.

Figure 14: Growth of car ownership in regions along the Belt and Road

Millions vehicles



Source: Oxford Economics forecast

6. Conclusions and Policy Recommendations

6.1 Conclusions

First, the BRGF Index provides a useful framework in terms of assessing the extent of green development of countries along Belt and Road, facilitating the exploration into green investment opportunities and providing a ground-breaking quantitative tool.

Second, there are great disparities in green development among countries along Belt and Road. There is also still a significant gap between developing countries and developed countries overall. However, this presents new green investment opportunities.

Third, there might be huge pressure from environment and resource in the future economic growth along Belt and Road. As the fastest-growing region in the next decades, countries along Belt and Road will also be under great pressure from environment and resources.

Fourth, the main purpose of this study is to provide a framework for analysing the green development along the Belt and Road. Subject to the availability of data, we restrict our analysis to only 79 countries and using only 17 variables to establish the index. In the future, there is still room for improvement. For example, as we lack quantitative indicators for environment pollution caused by the extractive industry, countries relying on resource export such as fossil energy generally have high scores in the Green Economy Performance. In the next phase, the research team will expand the scope of data collection, and improve the index measurement methods, in order to align the index to reflect the green development status of countries and regions along Belt and Road more comprehensively and provide more accurate guidance and support for investors seeking green investment opportunities.

6.2 Policy recommendations

As the results of the study suggests, Belt and Road countries need to initiate a proactive yet dynamic approach to green development.

First, there is a need to strengthen cooperation between countries along BRI and economies elsewhere, with the goal of enhancing the degree of green development by green technology exportation, green finance and green project cooperation. Second, there is a need to strengthen cooperation among countries along BRI. For countries with strong green economy performance and green growth capacity, it is recommended to encourage export of green technologies related to energy conservation and market-based emission reduction mechanism. This will help countries along Belt and Road enhance their capability in resource and environmental risk management. For countries with strong green growth capacity and poor green economy performance, it is recommended to improve their green investment

and financing policy environment through encouraging the implementation of principle of sustainable investment. Third, the unique role of the BRBR mechanism in promoting green financial capacity, collaborating on green innovation and developing green financial tools should be maximised. BRBR mechanism will enhance the communication and cooperation between members on green policy alignment, green technology innovation, and green finance. Pilot projects for green investment and financing will leverage the strengths of BRBR members and create synergies.

It is recommended that all participants in the Belt and Road Initiative actively develop quantitative tools and innovatively lead the flow of funds to green industries and green projects. First, it is recommended that enterprises and financial institutions further strengthen environmental information disclosure. Second, it is recommended to build a big data platform that collects, organises, inquires and applies environmental information along Belt and Road, so as to provide information for investors, lenders, financiers and other related parties along Belt and Road. Third, it is recommended that various institutions continue to innovate and develop quantitative tools for regions, industries, customers and projects to help them understand their potential to contribute towards green development.

It is recommended that financial institutions practice the concept of green and responsible investment in the development of Belt and Road. First, it is recommended that financial institutions further accept responsibility for the environmental and sustainability impacts of projects they finance. Secondly, it is recommended that financial institutions establish environmental, social and governance (ESG) risk assessment methods. Environmental factors should be included in Belt and Road investment and financing decisions, and the green concept should be integrated with the whole process of project development, product innovation and risk management. Third, there is a need to establish an institution to guarantee green investment and financing along the Belt and Road, with participation from the countries along the Belt and Road. This institution will provide the necessary guarantee and share the risks related to the investment and financing of projects such as energy conservation and emission reduction amongst participants. It will also encourage more private sector funds to enter the green financial system.

Appendix I: Indicators of the BRGF Index

	Indicator name	Unit
Green Economy Performance	Environmental Efficiency	
	Carbon dioxide emissions	GDP ratio (%)
	Methane emissions	GDP ratio (%)
	Oxynitride emissions	GDP ratio (%)
	Air pollution	GDP ratio (%)
	Deforestation	%
	Air quality	PM2.5 level
	Wastewater treatment	Ratio of wastewater discharge (%)
	Environmental Governance	
	Resource reuse ratio	Percentage (%)
	Meat consumption	Ratio of consumption per USD100
	Urban garbage disposal	Kg/person/day
	Certification of green buildings	Per million urban population
	Green Growth Capacity	Financing Capacity
Sovereign credit rating		Normalization score (AAA = 20)
Credit extension to private sectors		GDP ratio (%)
Policy and Technology Landscape		
Fossil energy subsidies		GDP ratio (%)
Execution of emission reduction goals		Target
Environmental protection expenditure of public sectors		GDP ratio (%)
Production of renewable energy	Ratio to total electricity consumption (%)	
Environment and Resource Pressure	Urbanized population (2018 - 2030)	1 million people
	Industrial added value (2018 - 2030)	USD1 billion

Appendix II: Methodology for establishing the BRGF Index

I. Method for Indicator Processing

After obtaining the raw data, the research team processed the data in accordance with the following standards.

- 1 Processing of abnormal values of indicators. The research team restricted the outliers to ensure that the extreme yet valid data points would not exert too much impact on the average value of samples.
- 2 Normalization processing of indicators. Following the standardization process of the standard 'z score', the research team deducted the average value of samples from the real value of every indicator of each country, and made the result multiplied by the sample standard deviation. The formula is as follows:

$$z = \frac{x - \mu}{\sigma}$$

Specifically, x refers to the scores of countries in indicators, μ refers to the average value of all countries in the indicator, and σ , standard deviation, refers to the indicator of all countries.

- 3 Standardization processing. The research team converted the z score of each indicator of each country to the values corresponding to the standard normal cumulative distribution function.

II. Index Establishment

The scores in the Green Economy Performance, Green Growth Capacity and the Future Environmental Pressure were obtained via weighted incorporation of all indicators. In detail, the scores were obtained via weighted aggregate of processed indicators and then converted to 0-100.

Specifically, weights were set as follows:

Green Economy Performance: The weight of environmental performance is 70%, among which the weight of emissions is 60% and that of other related indicators is 40%; and Environmental Governance has a weight of 30%.

Green Growth Capacity: The weights of the Financial Depth and the Policy and Technology Landscape are 50% respectively. In the former, the weights of sovereign credit rating and credit extension are 50% respectively. In the latter, the weights of three policy-related indicators are 60% in total and the remaining 40% weight is allocated to policies on renewable energy.

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