Centrum für Europäische Politik
FREIBURG | BERLIN

cepInput

No. 10 | 2025 29 April 2025

Clean Trade and Investment Partnerships

Streamlining Trade Diplomacy to Secure Europe's Green Value Chains

André Wolf

The EU's new approach to decarbonizing European industries puts strong emphasis on global competitiveness. Through Clean Trade and Investment Partnerships with third countries, the EU aims to secure resources and create new markets for clean technologies made in Europe. Implementing such partnerships will require the EU to streamline its existing bilateral economic and political relations towards green value chains. This cepInput provides a theoretical and empirical analysis of this new instrument, including an overview of cooperation potentials and a proposal for a strategic roadmap.

- The search for an optimal partner portfolio is guided by a trade-off between efficiency-enhancing complementarity and risk-reducing redundancy of partner attributes. This calls for a technology-specific approach to selection strategies, with relatively more emphasis on redundancy of partners in particularly critical technologies.
- Effective cooperation should go well beyond traditional trade policies and include tailor-made use of infrastructure support, channels for regulatory cooperation, platforms for the creation of business networks and joint research and development.
- Partner countries with different strengths also tend to feature different types of cooperation barriers. For example, in partnerships that mainly provide access to natural resources, the EU will often have to overcome obstacles related to weak infrastructure and low institutional quality in partner countries, including targeted funding schemes like Public-Private-Partnerships to fairly allocate project risks.
- To counter the risk of partnerships becoming unstable in the long term, the EU must create long-term growth prospects for its partners. Creating common markets through joint work on technical standards and general policy convergence are important steps in stabilizing partnerships.

Table of contents

1 Background ... 3

2 Economic partnerships for clean technologies ... 4

2.1 Goals ... 4

2.2 Types of agreements ... 4

2.3 Cooperation instruments ... 6

2.4 Partnership economics ... 7

3 Analysis of cooperation potentials and framework conditions ... 8

3.1 Method ... 8

3.1.1 Measurement of capabilities ... 8

3.1.2 Measurement of framework conditions ... 9

3.2 Data ... 11

3.3 Results ... 11

3.3.1 Cooperation potentials ... 11

3.3.2 Status quo of economic cooperation ... 13

4 Recommendations ... 16

4.1 Partner portfolio ... 16

4.2 A strategic roadmap for partnerships ... 17

5 Conclusion ... 19

6 Annex ... 21

6.1 Cooperation indicators and data sources ... 21

6.2 Detailed results cooperation potentials ... 24

6.3 Results gravity estimations ... 26

List of Figures

Figure 1: Scheme of cooperation instruments in Clean Trade and Investment Partnerships ... 7

Figure 2: Structure of methodological approach ... 10

Figure 3: Composition of country clusters ... 13

Figure 4: Comparison of political barriers and strength of current economic ties ... 14

Figure 5: Comparison of infrastructure quality and strength of current economic ties ... 15

Figure 6: Correlation between countries' capabilities and framework conditions ... 16

1 Background

The Commission's Clean Industrial Deal Communication is the most visible sign of a recent paradigm shift in the EU's Green Deal strategy.[1] It puts a new focus on the development of green value chains by supporting lead markets and eliminating barriers to investments in climate-friendly technologies. In this respect, competitiveness of European industry on global markets is a key issue. Due to high energy costs and scarcity of domestic resources, this cannot be achieved via the path of autarky.

For this reason, the Commission has announced Clean Trade and Investment Partnerships with third countries to become an integral part of the Clean Industrial Deal. They focus on improving the management of strategic dependencies and securing Europe's position in global value chains. They will mobilize investment for joint projects, including funds from the Global Gateway Initiative.[2] They shall ensure fair competition in common markets for green products by harmonizing product-related regulations. They shall also support partner countries in their own decarbonization efforts through regulatory cooperation on energy and climate policies.

It remains to be seen how promising such agreements are in the context of systemic competition with countries such as China, and how the portfolio of partners needs to be shaped to strengthen Europe's resilience. This is all the more important in the current global context. Donald Trump's disruptive trade policies have spurred countries around the world to seek partners to diversify their supply chains. To increase the EU's chances in this race, it is necessary to clarify how Europe can use its specific resources (values, technological and regulatory expertise) as a competitive advantage in shaping such partnerships, ensuring reciprocity in the relationship and creating sustainable growth prospects for partners.

This cepInput provides a theoretical and empirical analysis of the concept of Clean Trade and Investment Partnerships and its implementation. It first explains the policy instruments and economic mechanisms related to the concept. It then proposes a framework for assessing currently known resource potentials in third countries and identifies different types of barriers to enhancing economic cooperation. The analysis is not limited to natural resources, but also covers manufacturing capacities, innovation potential and skills. Finally, it develops strategic guidelines for the EU to plan its future partnership portfolio and cooperation priorities.

1 European Commission (2025a). The Clean Industrial Deal: A joint roadmap for competitiveness and decarbonisation. Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM/2025/85 final.

2 European Commission / High Representative of the Union for Foreign Affairs and Security Policy (2021). The Global Gateway. Joint Communication to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank. JOIN(2021) 30 final.

2 Economic partnerships for clean technologies

2.1 Goals

With the Clean Trade and Investment Partnerships, the EU's basic intention is to pool resources to develop new joint value chains for clean technologies with like-minded third countries. This starts with the sourcing of raw materials for industrial equipment and the supply of renewable energy to power it. It also involves the development of manufacturing capacity for the production of equipment and the joint improvement of the supply of workers with specialized skills through investment in training and reskilling. Finally, it goes beyond the pure supply chain approach and includes joint activities to strengthen the innovation capacity of clean technologies, from improving the framework conditions for research and development to overcoming the financing hurdles for the commercialization of inventions. The expected result is a diversification of existing supply channels.

A key immediate objective of diversification efforts is to reduce supply risks. These can be of a direct economic nature, such as the risk of global supply shortages and associated price increases for critical raw materials or components. They can also be political, in the form of the risk of export restrictions by supplier countries. Finally, they can be technical in nature, in the form of short-term capacity bottlenecks in production or failures of cross-border transport infrastructure. Diversification of supply routes does not eliminate these risks, but it can reduce their overall impact on security of supply. This is particularly the case if several alternative sources are established through partnerships to supply certain particularly critical parts of the supply chain.

The formation of partnerships is also coupled with the hope of raising productivity. By pooling capital to expand complementary production capacity, the partners aim to realize macroeconomic productivity gains from vertical specialization. In the case of infant technologies, there is also the prospect of cost reductions through economies of scale. By jointly investing in the development of transport infrastructure (goods, energy, information) for the integration of supply chains, the partners contribute to the cross-process reduction of space overheads. By sharing existing knowledge, they increase the speed of adoption of new technologies. By building joint R&D capacities, they strengthen the innovative capacity of the partners involved. Through regulatory cooperation, they can reduce administrative inefficiencies and non-tariff trade costs.

2.2 Types of agreements

The EU's classic instrument for advancing economic integration with individual third countries is **bilateral trade agreements**. The scope of these agreements has expanded over the decades. Whereas the original aim was to reduce or eliminate customs duties, i.e. to lower the costs of cross-border trade in goods, more recent trade agreements have also included detailed regulations on the elimination of non-tariff barriers to trade (regulatory harmonization), the facilitation of capital movements (cross-border investment) and the cross-border provision of services. The anchoring of common goals and minimum standards beyond trade policy, particularly with regard to environmental protection and human rights, is now also a common component of EU trade agreements.[3]

[3] Bartels, L. (2013). Human rights and sustainable development obligations in EU free trade agreements. Legal Issues of Economic Integration, 40(4).

In its 2020 Action Plan on Critical Raw Materials, the European Commission has introduced a new form of cooperation. As a building block on the way to greater security of supply for mineral raw materials that are essential for the future, such as lithium, cobalt and rare earth metals, it aimed to promote **Strategic Resource Partnerships** between the EU and resource-rich countries. All available instruments of EU foreign policy are to be used for this purpose. The horizon is explicitly global, and both high-income economies with established mining sectors and resource-rich developing countries are mentioned as potential partners. In addition to the elimination of bilateral barriers to trade in raw materials, cooperation is also to include financial and practical support for the development of local production capacities and infrastructure, both in the field of raw materials extraction and processing. In this context, the Commission attaches particular importance to the concept of responsible sourcing, i.e. compliance with environmental and human rights standards. This is to be ensured through intensive cooperation in the area of local governance.[4]

In June 2021, the EU announced a first resource partnership with Canada.[5] In a joint statement by Internal Market Commissioner Thierry Breton and Canadian Resources Minister Seamus O'Regan Jr. a month later, forms of future cooperation were outlined.[6] In the same month, a second partnership was established with the Ukraine. In a memorandum of understanding, the objectives, principles and initial work steps of the cooperation were defined. Envisaged Forms of future cooperation include not only measures to incentivize private investments but also permanent regulatory cooperation, joint research activities and knowledge exchange.[7]

A whole series of additional resource-related partnership agreements were concluded since 2022, adding up to 14 partner countries at the beginning of 2025.[8] In addition, there are resource partnerships beyond minerals. For instance, the agreements with Egypt, Azerbaijan and Morocco relate to the development of supply relationships for **energy sources**, in the case of Egypt specifically renewable hydrogen.[9] In all of these cases, agreements merely took the form of memoranda of understanding outlining the main features of future cooperation.

Moreover, to enhance own innovation capacity, the EU has entered **technology cooperations**. With Japan, the EU has signed a first Science and Technology Cooperation Agreement in 2009 foreseeing exchange of R&D resources and a reciprocal opening of own funding programs.[10] It has set the stage for the comprehensive EU-Japan Strategic Partnership Agreement (SPS) signed in 2019.[11] With South Korea, the EU entered a EU-Republic of Korea Digital Partnership in 2022.[12] With Australia, research

4 European Commission (2020). Critical raw materials resilience: charting a path towards greater security and sustainability. Communication from the European Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions. (2020) 474 final.

5 European Commission (2021). EU and Canada set up a strategic partnership on raw materials. Press Release, 21 June 2021.

6 European Commission / Canada (2021). Joint Statement by European Commissioner for Internal Market and Canada's Minister of Natural Resources. Brussels, 19 July 2021.

7 European Union / Republic of Ukraine (2021). Memorandum of understanding between the European Union and Ukraine on a Strategic Partnership on Raw Materials. Kyiv, 13 July 2021.

8 European Commission (2025b). Raw materials diplomacy.

9 European Union / Arab republic of Egypt (2022). Memorandum of understanding on a strategic partnership on renewable hydrogen between the European Union and the Arab republic of Egypt. Sharm El-Sheikh, 16 November 2022.

10 European Union (2011). Agreement between the European Community and the Government of Japan on cooperation in science and technology.

11 European Union / Japan (2018). Strategic Partnership Agreement between the European Union and its Member States, of the one part, and Japan, of the other part. OJ L 216, 24.8.2018, pp. 4-22.

12 European Council/ Republic of Korea (2022). European Union- Republic of Korea Digital Partnership.

cooperation dates back to a first Agreement on Science and Technology Cooperation in 1994.[13]Promoting joint research is also an integral part of the EU-Australia Framework Agreement from 2017 strengthening the bilateral partnership to tackle global challenges.[14] With Canada, the framework for research cooperation is set by the EU-Canada Strategic Partnership Agreement from 2016.[15]

The legally non-binding nature of many of the agreements to date still guarantees a considerable degree of freedom for the practical shaping of partnerships in the future. For the EU, however, this also means that it still has a long way to go in building stable partnership relations. It must think carefully about which cooperation instruments are suitable in individual cases.

2.3 Cooperation instruments

In many cases, the promotion of joint value chains requires overcoming a multitude of regulatory, economic and technological obstacles. It is very unlikely that a single cooperation instrument can become a silver bullet in this respect. Rather, the first task in each cooperation consists of identifying the necessary bundle of measures to reduce partner-specific barriers, which are then implemented in a step-by-step manner.

In the absence of bilateral trade agreements, this is likely to involve measures to **reduce direct trade barriers**, i.e. barriers that impose limits on joint cross-border trade or make cross-border trade unnecessarily costly. Besides the reduction of tariffs, this can include the dismantling of quantitative import or export restrictions as well as measures to reduce the administrative costs of customs clearance. These measures are supposed to improve cost competitiveness of joint supply chains, both by eliminating direct cost burdens and fostering specialization among partners.

Moreover, partnerships can go beyond reducing direct trade-related costs by addressing more fundamental barriers caused by differences in market regulation. **Enhanced regulatory cooperation** can help creating a fair joint market with partners through levelling the playing field for firms. This does not only support potentially innovating-enhancing competition but can also improve future policy designs by initiating knowledge exchange among regulatory bodies. In the area of clean technologies in particular, it also raises the weight of the EU in enforcing consistent climate policies at the global level.

Reducing direct barriers to economic integration will in many cases not be enough to form competitive joint supply chains. Especially in the cooperation with developing or emerging economies, support in the **development of trade-relevant infrastructure** will have to be an integral part of the cooperation agenda. Given the dependence of advanced clean technologies on access to renewable energy, skills and knowledge, relevant infrastructure is not limited to roads or maritime ports, but also encompasses energy and digital networks as well as research capacities. With the Global Gateway Initiative, the EU has developed a strategy for allocating funds to investments in the infrastructure of countries worldwide.[16]

---

13 Australia / European Union (1994). Agreement relating to scientific and technical cooperation between the European Community and Australia. OJ L 188, 22.7.1994, pp. 18 – 25.

14 Australia / European Union (2017). Framework Agreement between the European Union and its Member States, of the one part, and Australia, of the other part. OJ L 237, 15.9.2017, pp. 7 - 35.

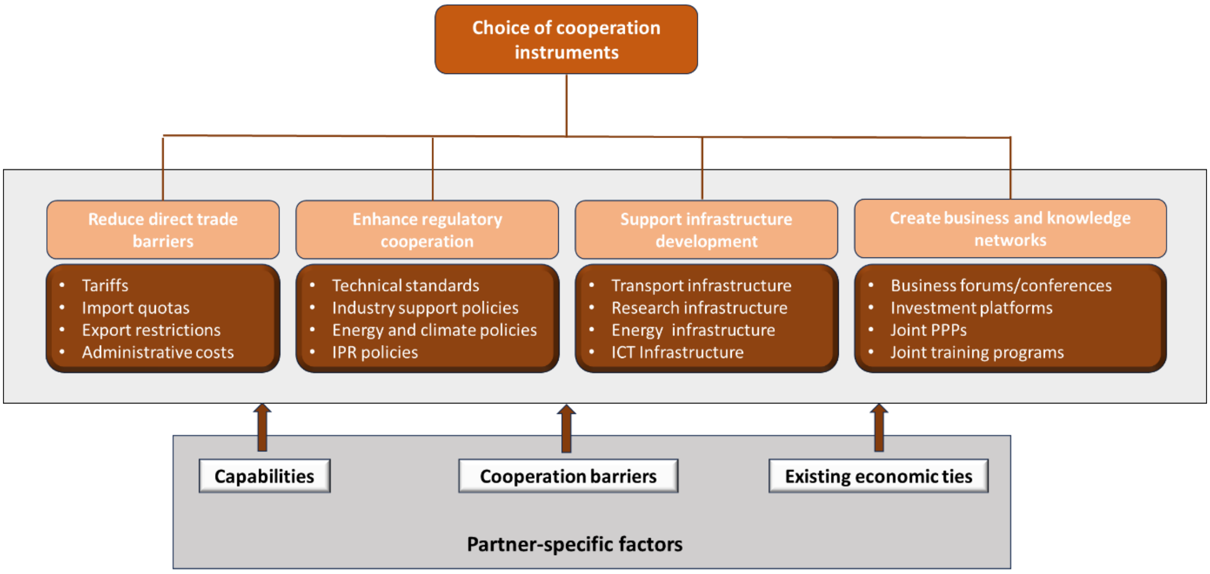
15 Canada / European Union (2016). Strategic Partnership Agreement between the European Union and its Member States, of the one part, and Canada, of the other part. OJ L 329, 03.12.2016, pp. 45 – 65.

16 See European Commission / High Representative of the Union for Foreign Affairs and Security Policy (2021).

Finally, cooperation policies can also support businesses in **creating joint networks** with stakeholders from partner countries. This can take forms of supporting joint investments through direct public capital commitment like Public-Private-Partnerships (PPPs), incentivizing a crowding-in of private capital. On a lower level, it can consist of providing platforms for private economic exchange like regular business forums or dedicated market platforms for bringing investors in clean technologies together.

The appropriate choice of cooperation instruments for a partnership depends not only on the nature of the barriers to cooperation, but also on the specific capabilities of the partners the EU wishes to access, as well as on the strength of current bilateral economic relations.

Figure 1: Scheme of cooperation instruments in Clean Trade and Investment Partnerships



Source: own illustration

2.4 Partnership economics

Clean Trade and Investment Partnerships can only have a lasting economic impact, if, from the point of view of all parties involved, the benefits from maintaining them permanently exceed the costs of the partnership commitment. In determining the optimal design of such arrangements, the question of the concrete form of this benefit is the first essential step. From the perspective of economic club theory, this corresponds to the question of the nature of the club good. This refers to the good that is jointly and exclusively available to the partners vis-à-vis the outside world.[17] It represents the basic motivation for the formation of partnerships as a club of economies. In the clean technology partnerships that are currently forming, the club good is not simply a single (tangible or intangible) product, but consists in the establishment and preservation of entire cross-border value chains. Strengthening and stabilizing the competitiveness of these value chains is the primary motivation of all forms of cooperation agreed upon in the course of the partnerships.

The benefit of this jointly provided club good can be divided into a direct and an indirect effect. Directly, it is a contribution to hedging existing supply chain risks on world markets. In addition to direct

[17] Sandler, T., & Tschirhart, J. T. (1980). The economic theory of clubs: An evaluative survey. Journal of economic literature, 18(4), 1481-1521.

benefits, there is also the prospect of a form of long-term indirect benefit. This will result from the pooling of capital resources in the partnership to strengthen the efficiency and competitiveness of joint value chains. The desired long-term benefit of pooling is thus the creation of new non-rivalrous goods and its resulting macroeconomic growth effects. In any case, stable partnerships require a permanent commitment on the part of the EU. Here, as in other cases, risk reduction does not come for free. Without new hedging mechanisms, the ongoing transformation processes continues to shift the risk profile of global value chains to the detriment of the European industry. Countering this development requires a willingness to share the tangible (capital) and intangible (knowledge, global influence) pillars of European prosperity with the likely beneficiaries of change.

This also means that Europe needs to weigh up the long-term benefits and costs of individual partnerships very carefully. On the one hand, this concerns the assessment of the resource potentials. Given the diversity of clean technologies, the analysis must not be limited to access to individual raw materials or components but must take into account the range of possible technology paths. In addition to critical minerals previously highlighted by the EU, this includes access to renewable energy and skilled labor, as well as the manufacturing and innovation potential resulting from partnerships. At the same time, assessments of cooperation potentials need to be balanced with an honest analysis of existing barriers to cooperation, both at the technological and regulatory level. In the following sections, we take a look at the status quo of potentials and barriers in a cross-country comparison and outline a preliminary analytical framework.

3 Analysis of cooperation potentials and framework conditions

3.1 Method

3.1.1 Measurement of capabilities

To identify country-specific cooperation potentials and barriers, we implement a multi-stage approach. The first step consists of analyzing the specific strengths of potential partner countries in terms of their domestic resource potential. In line with the EU's value-chain-centered Clean Industrial Deal approach, we conceptualize resources in a broad perspective, going beyond tangible goods and considering all adequately measurable location factors for green value chains as indicators. First, this includes primary resources. Green technologies require sufficient access to renewable energy, but also to a range of critical minerals used as raw materials in production. We quantify the potential for renewable energy based on the climate-dependent generation potential of PV and Wind electricity in a country. The potential in the field of critical minerals is quantified based on information about a country's geological raw material reserves, i.e. the amount of minerals that can be extracted at economic conditions. Our approach in identifying the list of critical minerals is to adopt the current list of strategic raw materials identified by the EU in its Critical Raw Materials Act (CRMA)[18] and narrow it those minerals for which country-level data on reserves is available.

In addition, we identify the downstream manufacturing potential based on a country's industrial structure. One part of this potential is a country's ability to become a net exporter of renewable energy

[18] European Union (2024a). Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024 establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020.

through its conversion into a form suitable for international transport. Current analyses see hydrogen (and its derivatives) as key technology for such export activities.[19] By producing hydrogen through electrolysis of water, using electricity gained from renewables as an energy source, a renewable gas is obtained that can be either liquified and directly shipped to other places or first further processed into other derivatives like green methanol or ammonia. To identify these potentials, we account for national production capacities of hydrogen from electrolysis (both existing and currently constructed) as well as national capacities for capturing CO_2, a crucial input in processing hydrogen to goods like synthetic fuels. The second part of the downstream potential considers capacities for producing the equipment and its components necessary for applying clean technologies. Our basis for this is the list of net-zero technologies identified by the EU in its Net-Zero Industry Act (NZIA).[20]

Finally, we consider worker skills and innovation capacities as intangible resource potentials. Skill requirements are highly technology-specific. Skill supply for the wide range of existing clean technologies is thus difficult to quantify at country level. Yet, a commonality of complex (and partly still infant) clean technologies is the specific need for advanced engineering and natural science skills. We cover this in broad terms by considering the prevalence of tertiary education in the worker population and the share of graduates from STEM (Science, Technology, Engineering, Mathematics) fields in total graduates as an indicator of skill specialization. Innovation capacity for clean technologies can be measured in a more specific way by drawing on patent data differentiated by technology class. To identify technology classes, we again make use of the list of net-zero technologies included in the EU NZIA. We consider both a quantity and a quality dimension in patenting, by including the number of patent applications with domestic inventors[21] and the average citation rates of their parents.

The different dimensions of resource potentials are highly complementary. Therefore, aggregating them to single indices is not sensible. Instead, we only aggregate single indicators within each resource category through Principal Component Analysis. The extracted first components of each category then undergo a cluster analysis, allowing to identify clusters of countries that are similar in terms of the specific kinds of resource potentials they would offer as future partners to the EU.

3.1.2 Measurement of framework conditions

The barriers to establishing joint value chains in clean technologies with a partner country are as diverse as the cooperation potentials. We deal with this fact by addressing and weighing different barriers to bilateral trade through a gravity regression approach. In doing so, we explain the volume of bilateral trade between EU Member States and third countries by a range of explanatory factors. Besides standard variables controlling for size (GDP, population), geography (distance, common border) and historical relations (former colonial status), we consider a set of variables reflecting potential political barriers to trade. They include average tariff levels, the existence of bilateral trade agreements

---

19 IEA (2019). The future of hydrogen. International Energy Agency. Study.

20 European Union (2024b). Regulation (EU) 2024/1735 of the European Parliament and of the Council of 13 June 2024 on establishing a framework of measures for strengthening Europe’s net-zero technology manufacturing ecosystem and amending Regulation (EU) 2018/1724.

21 For a country comparison, we must consider that often several people are registered as the inventors of a patent, who may be located in different countries. As is common in the literature, we account for this by applying an equal share for each inventor as a weighting factor. Then, we calculate the total innovation activity of a country in a field as the sum of the shares of inventors residing in the respective country ("inventor counts").

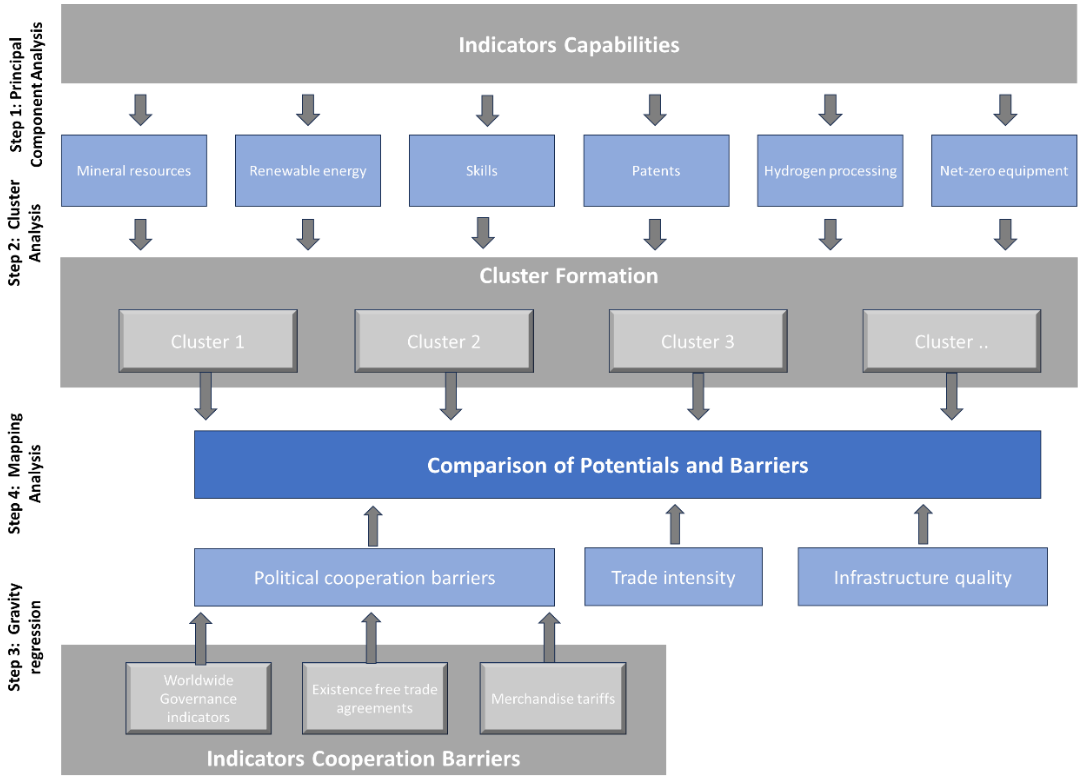
and indicators measuring the general quality of political governance in the trading countries. The results of the gravity regressions are presented in Table A3 in the Annex.

The estimated coefficients (as far as they are statistically significant) obtained from the gravity regression for the policy variables are then used to as weights for aggregating these variables in a subsequent step. The resulting aggregate measure is transformed into a dimensionless index of political trade barriers by applying a standard max-min procedure. For each third country, this is done for both export and import relations with each EU Member State. Finally, the resulting indices are averaged over Member States and trade direction (weighted by trade volumes). For each third country, this produces a single index with a scale from 0 to 1 measuring the overall extent of political barriers to trade with the EU.

To measure the existing degree of economic cooperation between the EU and specific third countries, we again draw on trade volumes. We apply the bilateral trade intensity index used by the World Bank.[22] It measures the relative level of bilateral trade volumes compared to the trading partners overall trade volumes. It thus indicates whether the degree of bilateral trade activity is higher or lower than what should be expected based on the partners' overall participation in international merchandise trade. Finally, to consider the role of infrastructure, we rely on country indices on the overall quality of trade-relevant infrastructure.

The steps of our methodology are summarized in Figure 2.

Figure 2: Structure of methodological approach



Source: own illustration

[22] WITS (2025). Trade outcome indicators. World Bank. World Integrated Trade Solutions.

3.2 Data

To quantify cooperation potentials and barriers at country level, we draw upon indicators from a range of renowned public databases. To ease the identification of cooperation patterns and focus on countries suitable for deepened partnerships, we limit the sample to those third countries that either already have bilateral trade agreements with the EU in place or are in the process of negotiating such agreements. These countries are identified based on the information page of the Commission.[23] Furthermore, we excluded very small countries with less than 1 million inhabitants. These criteria create a sample size of 58 third countries.

Trade flows between Member States and third countries are measured based on data from UN Comtrade.[24] For our gravity analysis, we use panel data on trade volumes over a 20-year-horizon (2004-2023). Indicators measuring cooperation potentials are drawn from category-specific sources. National reserves of mineral resources were obtained from the current mineral yearbook of the U.S. Geological Survey, which contains reserve information on eleven critical raw materials / raw material groups.[25] Data on renewable energy potentials were gathered from the Global Wind Atlas[26] and the Global Solar Atlas[27]. Production capacities for hydrogen[28] as well as capacities for CO_2 capture[29] were drawn from specific databases by the International Energy Agency. In the case of net-zero technology production capacity, missing capacity data was replaced by data on the country's export volumes from UN Comtrade. For cooperation barriers, UNCTAD data on tariffs[30], the trade agreement database by Mario Lahr[31] and the Worldwide Governance Indicators of the World Bank[32] were utilized. Control variables for the gravity regression were drawn from the World Bank[33] and the database of the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).[34] To reflect the quality of trade-related infrastructure in a partner country, the subindex "infrastructure quality" from the most recent version (2023) of the World Bank Logistics Performance Index (LPI)[35] has been used. Table A1 in the Annex summarizes the indicators entering our analysis and their sources.

3.3 Results

3.3.1 Cooperation potentials

The country results for capabilities by resource category obtained from the Principal Component Analysis (PCA) are listed in Table A2 in the Annex. They demonstrate the strong heterogeneity in country profiles. Table 1 presents the communalities between different capabilities in the form of correlation coefficients. Almost across the board the correlation coefficients are small and, in a few cases, even

23 European Commission (2025c). Negotiations and agreements.
24 UN Comtrade (2025). UN Comtrade Database.
25 USGS (2025). Mineral Commodity Summaries 2025. U.S. Geological Survey.
26 DTU (2025). Global Wind Atlas. Danish Energy Agency.
27 World Bank Group (2025). Global Solar Atlas.
28 IEA (2025a). Hydrogen Production Projects Database. International Energy Agency.
29 IEA (2025b). Hydrogen CCUS Projects Database. International Energy Agency.
30 UNCTAD (2025). UNCTAT Trains – Tariff data by country (bulk download). United Nations Conference on Trade and Development.
31 Larch, M. (2023). Regional Trade Agreements Database.
32 World Bank (2025a). Worldwide Governance Indicators.
33 World Bank (2025b). World Development Indicators.
34 CEPII (2024). Data. Centre d'Etudes Prospectives et d'Informations Internationales.
35 World Bank (2025c). Logistics Performance Index.

negative. In particular, bilateral correlations between capabilities reflecting natural resources (minerals, renewables) on the one hand and capabilities reflecting technological advancement (patents, net-zero tech production) on the other hand are very small. This underlines the need for the EU to develop partner-specific cooperation strategies based on a partner's comparative advantages.

Table 1: Correlation matrix of capabilities

	Mineral resources	Renewable energy	Skills	Patents	Hydrogen processing	Net-zero equipment
Mineral resources	-	0.15	0.07	0.14	0.24	0.01
Renewable energy	0.15	-	-0.17	-0.02	-0.11	-0.21
Skills	0.07	-0.17	-	0.47	0.25	0.45
Patents	0.14	-0.02	0.47	-	0.26	0.80
Hydrogen processing	0.24	-0.11	0.25	0.26	-	0.38
Net-zero equipment	0.01	-0.21	0.45	0.80	0.38	-

Source: own calculations

In order to cluster countries according to their specific strengths, the standard method of K-means clustering was applied, which assigns countries to a predetermined number of K different clusters on the basis of multidimensional proximity.[36] To determine an appropriate number of clusters, the elbow method was used, a heuristic measure based on the evolution of explained variation for different numbers of clusters.[37] It suggests that the optimal number is four.

Figure 3 illustrates the allocation of countries to these four clusters according to the K-means analysis. The result has some intuitive appeal. Cluster 1 consists of 24 countries. They share a high level of skill potential, while innovation and renewables potential are at a medium level. The potential in manufacturing and natural resources is relatively low. In addition to a few high-income countries, this group includes many emerging economies in North Africa and West Asia. Cluster 2 comprises only six countries. They share a high level of clean technology sophistication, reflected in high skills and innovation potential, and significant manufacturing capacity for both net-zero equipment and renewable fuels. In contrast, their natural resource potentials in minerals and renewable energy tend to be low. Cluster 3 consists of only three countries. They exhibit high natural resource potentials for both minerals and renewable energy, while innovation and manufacturing capacities are at a medium level. Finally, Cluster 4 comprises the remaining 25 countries. They have a medium level of renewable energy potential, while innovation and manufacturing capacities are low.

The resulting pattern therefore shows a relatively clear divide between potential partnerships by area of cooperation, particularly between natural resource potentials and technology-related capabilities. In comparative advantage terms, Cluster 1 countries can be assessed to have their specific relative strengths in the field of skills, cluster 2 countries in technologies (both development and manufacturing). Cluster 3 countries perform relatively best in their mineral resource potentials, while comparative advantages of cluster 4 countries lie in renewable energies.

36 Likas, A., Vlassis, N., & Verbeek, J. J. (2003). The global k-means clustering algorithm. Pattern recognition, 36(2), 451-461.

37 Cui, M. (2020). Introduction to the k-means clustering algorithm based on the elbow method. Accounting, Auditing and Finance, 1(1), 5-8.

Figure 3: Composition of country clusters

Cluster 1:
High skills potential,
Medium innovation. minerals and renewables potential,
Low manufacturing potential
Albania, Algeria, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Indonesia, Israel, Jordan, Kazakhstan, Lebanon, Macedonia, Mexico, Moldova, New Zealand, Norway, Papua New Guinea, Philippines, Serbia, Switzerland, Tunisia, Türkiye, Ukraine, Vietnam

Cluster 2:
High skills, innovation and manufacturing potential,
Medium renewables potential,
Low minerals potential
Canada, India, Japan, Singapore, South Korea, United Kingdom

Cluster 3:
High minerals and renewables potential,
Medium innovation, skills and manufacturing potential
Australia, Brazil, Chile

Cluster 4:
Medium renewables potential,
Low innovation, skills, manufacturing and minerals potential
Argentina, Botswana, Cote d'Ivoire, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Eswatini, Ghana, Guatemala, Honduras, Kenya, Lesotho, Madagascar, Morocco, Mozambique, Namibia, Nicaragua, Paraguay, Peru, South Africa, Uruguay, Zimbabwe

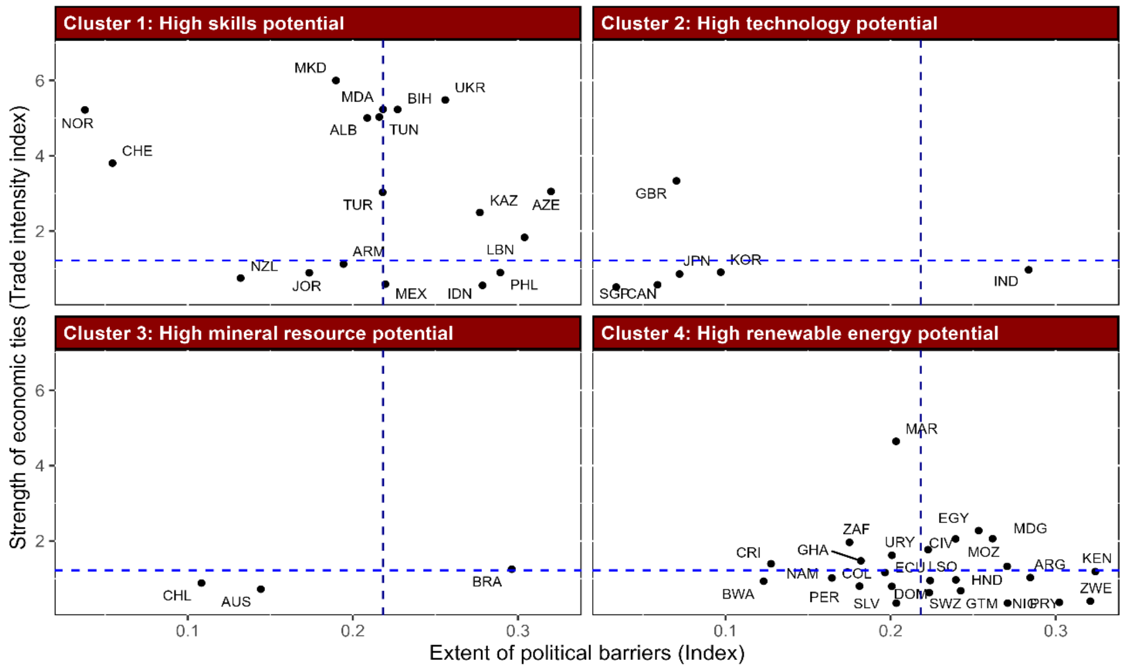
Source: own illustration

3.3.2 Status quo of economic cooperation

Figure 4 illustrates the results for the index of political trade barriers (see subsection 3.1.2) together with current trade intensities, measured for the most recent year for which data was available (in most cases 2023). Cluster 1 (*comparative advantage: high skills potential*) includes a range of countries in the geographical vicinity of the EU, which already exhibit strong economic ties to the EU. The extent of institutional ties, however, differs considerably. Countries like Azerbaijan (AZE) and the Philippines (PHL) already heavily engage in trade with the EU, as the level of mutual trade flows exceeds their overall weight in the global economy (trade intensity index > 1). However, political barriers are still significant and way above the median level among the countries investigated. Countries in Cluster 2 (*comparative advantage: high technology potential*) are mostly characterized by comparatively weak trade links with the EU in relation to their economic size. This is partly explicable by their geographical distance to the EU and their closer proximity to other economic superpowers (China, USA). With the exception of India (IND), barriers at the political level are comparatively small, suggesting to focus steps for deepening the partnerships mostly on the promotion of joint business networks. Countries in Cluster 3 (*comparative advantage: mineral resources)* also exhibit a comparatively low intensity of merchandise trade with the EU, again plausibly explicable by spatial distance. In the case of Brazil (BRA), political barriers are assessed to be high, in the case of Chile (CHL) and Australia (AUS) comparatively low. Finally, Cluster 4 countries (*comparative advantage: renewable resources*) prove to be highly heterogeneous both in terms of their trade intensity and the extent of political trade barriers.

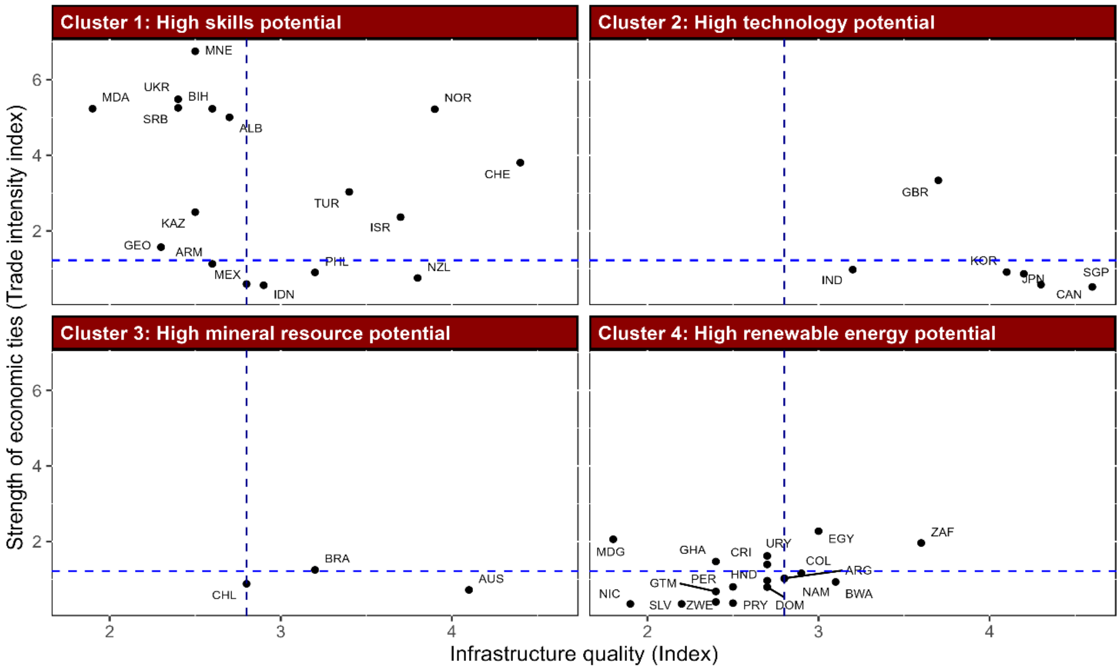
The identified country clusters also differ considerably in terms of infrastructure quality (see Figure 5). All countries in clusters 2 and 3 score highly in terms of trade-related infrastructure. In contrast, the majority of countries in cluster 4 score at the lower end of the scale. **This highlights the fact that partnerships targeting different resources also require different priorities and tailor-made cooperation instruments to overcome their specific obstacles.**

Figure 4: Comparison of political barriers and strength of current economic ties



Source: own calculations; light-blue dotted line: median level of trade intensity; dark-blue dotted line: median level of political barriers.

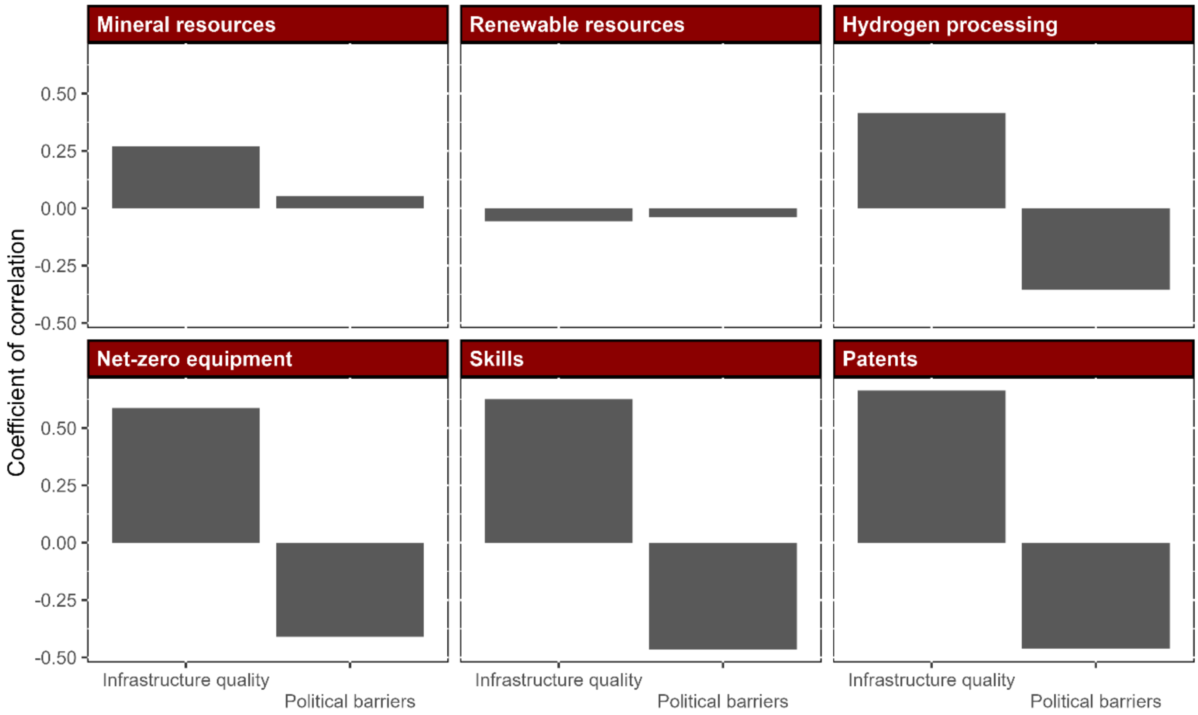
Figure 5: Comparison of infrastructure quality and strength of current economic ties



Source: own calculations; light-blue dotted line: median level of trade intensity; dark-blue dotted line: median level of infrastructure quality.

Finally, the general relationship between cooperation potentials and types of cooperation barriers becomes even clearer when comparing the bilateral correlation coefficients. Figure 6 shows the correlation between a country's supply of different capabilities and its framework conditions. The correlation coefficients are highly positive (infrastructure quality) / negative (political barriers) for capabilities in the areas of net-zero equipment, skills and patents. Hence, partnerships to enhance cooperation in these areas do not usually require massive improvements in the partner country's enabling environment. In contrast, the correlation coefficients of mineral and renewable resources with both framework indicators are close to zero. **In partnerships that mainly target natural resources, therefore, the EU will have to focus more on obstacles related to infrastructure and institutional quality in partner countries**. This in turn implies different priorities for the implementation of partnership instruments.

Figure 6: Correlation between countries' capabilities and framework conditions



Source: own calculations

4 Recommendations

4.1 Partner portfolio

The preceding illustrative analysis points to some basic principles for the EU in forging new partnerships. This starts with the choice of partner countries for deepening cooperation. At the diplomatic level, it is important for the EU to signal that it is open to economic integration with any country that is interested in cooperation and shares at least some of the EU's core values. However, practical implementation involves up-front costs (setting up consultation platforms, negotiations, etc.) that require the EU to prioritize some partners over others. Simply working first with those countries that are most eager to do so is not a proactive strategy and is unlikely to make the greatest contribution to the EU's goals. Instead, the EU should develop a strategic approach to building a portfolio of partners that best suits its needs.

Our analysis has demonstrated that building new competitive green value chains for the EU requires a bundle of different resources, not all of which can be provided by individual partner countries. Potential partner countries differ greatly in their specific resource advantages. This argues for **complementarity** as a principle for partner selection. Countries whose capabilities are as complementary as possible to those of the EU and the existing partner portfolio, i.e. which have genuine comparative resource advantages, should be prioritized when establishing new collaborations. Focusing on comparative rather than absolute advantages also promises efficiency gains in implementation, as cooperation instruments can be more specialized to the specific resource advantages of partners (see next section). At the same time, the principle of complementarity ensures that the diversity of resource needs is well covered by the partner portfolio as a whole.

However, relying solely on complementary partners does not protect against the risk of long-term instability in partnerships. This speaks for applying the principle of **substitutability**, the more so the greater the economic importance of the value chains concerned. It would therefore be negligent on the part of the EU to base the future supply of rare earth metals, a key raw material for the low-carbon economy, solely on a strategic partnership with a single large supplier country. To avoid this, the portfolio of partnerships needs a certain degree of redundancy in the provision of specific capabilities. Another advantage of substitutive partners is the prospect of positive synergy effects in cooperation. If similar specialized forms of cooperation (e.g. clean technology forums with several strong research partners) are implemented with similar partners, the EU can benefit more from the experience gained and realize efficiency gains from consolidating bilateral formats into plurilateral clubs.

Therefore, the optimal mix of substitutability and complementarity is crucial when designing the partner portfolio. This optimum cannot be determined on an aggregate level, but is technology-specific. For clean technologies with especially high economy-wide significance, e.g. due to the lack of alternatives for decarbonizing certain sectors, the idea of risk minimization should be given greater priority. They thus require a relatively higher degree of substitutability/redundancy in the choice of cooperation partners for the development of new value chains. In the case of other technologies, the focus may be more on exploiting specialization advantages by combining partners with different strengths and positions in future supply chains.

4.2 A strategic roadmap for partnerships

Given the urgency of creating new supply channels, cooperation instruments also need to be prioritized appropriately. Two questions are crucial: How can the EU harness the specific cooperation potentials of its partners as quickly as possible? And how can it ensure that cooperation activities pave the way towards long-term, stable partnerships? These questions require the EU to analyze not only its own needs, but also the social and economic situation of partner countries.

A strategic roadmap for deepening economic cooperation should start with a decision on which capabilities of partner countries should be prioritized for cooperation. On this basis, the next step is to identify appropriate instruments to bring the partnership to life. Priority should be given to those types of instruments that help to overcome the main obstacles to the use of the specific capabilities. Our analysis of the framework conditions in section 3 has developed a methodological framework for this. Table 2 presents a decision matrix based on the framework indicators we have analyzed. Accordingly, the selection results from a simultaneous consideration of the physical and political environment as well as current economic linkages.

The specific design of each instrument will depend on the capabilities addressed. For example, enhanced regulatory cooperation with partner countries whose strengths lie in renewable energy exports should focus on developing a common market design for cross-border trade and transport of green hydrogen or biomethane. For partners with specific strengths in the manufacturing segment of net-zero technology, the focus is on creating a level playing field through industrial policy coordination. A similar specialization is appropriate for infrastructure development. For countries with relatively high natural resource potential, programs such as Global Gateway (see Subsection 2.3) should initially focus on jointly promoting tangible upstream infrastructure. For countries with specific strengths in technological expertise, however, the creation of a common (tangible and intangible) research and science infrastructure is more central.

Table 2: Decision matrix for prioritizing cooperation instruments

		Weak economic ties with the EU	Strong economic ties with the EU
High infrastructure quality	Low political barriers	**Create new business and knowledge networks:** Forums, conferences, Standing committees	**Maintain close political exchange**
	High political barriers	**Reduce direct trade barriers:** lower tariffs, harmonize technical standards	**Enhance regulatory cooperation:** Harmonize energy, climate and industrial policies
Low infrastructure quality	Low political barriers	**Support infrastructure development:** PPPs, development aid, investment platforms	**Support infrastructure development:** PPPs, development aid, investment platforms
	High political barriers	**Support infrastructure development; Reduce direct trade barriers**	**Support infrastructure development; Enhance regulatory cooperation**

Source: own illustration

In the medium term, the choice of cooperation instruments must also take account of global competition with other countries' partnership strategies. China's extensive investment in resource-rich countries deserves particular attention.[38] Countries are faced with the choice of which economic clubs to join. An important competitive factor is the level of club-specific entry costs. These are, on the one hand, the costs of adjustment required to meet the requirements of membership. For poorer countries with relatively underdeveloped institutions, the focus will often be on the costs of political-regulatory adaptation, i.e. the costs of monitoring prescribed quality and environmental standards, creating administrative transparency and controlling corruption.

In addition to these immediate costs, club membership may also entail additional long-term costs. For resource-rich countries, the main risk here is economic lock-in: the establishment of joint value chains threatens to confine them permanently to the role of raw material supplier in international trade, with no prospect of participating in the usually more value-added and innovation-intensive downstream production stages. The reason for this is that the partner countries' demand for raw materials keeps domestic productive resources tied up in the raw materials sector. The development of infrastructure, which primarily serves to reduce the cost of extracting raw materials, can exacerbate this lock-in. Strategic partnerships thus risk triggering a new form of the 'resource curse', which has been the subject of empirical research for some time.[39]

This makes it all the more important for Europe's success to keep the second component of access costs low for potential partners. One way to do this is to include binding steps to increase value-added contributions in roadmaps for future cooperation. Partner countries will be offered the prospect of expanding their role in joint value chains over time to include downstream processing steps, thereby advancing their industrial development while benefiting even more from domestic knowledge and innovation. To make this possible, joint infrastructure and research projects should be deliberately

38 Kaplinsky, R., & Morris, M. (2009). Chinese FDI in Sub-Saharan Africa: engaging with large dragons. The European Journal of Development Research, 21, 551-569.

39 Ploeg, F. V. D. (2011). Natural resources: curse or blessing?. Journal of Economic Literature, 49(2), 366-420.

designed with a view to their potential use in downstream production. In addition, trade integration within the club should follow a gradual approach, taking into account the industrial capacities of the partners.

5 Conclusion

The EU's attempt to boost competitiveness in clean technologies through a Clean Industrial Deal requires a new strategic approach to its external economic relations. Joining forces with third countries to build up new supply chains is imperative not only to raise cost efficiency, but also to diversify existing supplier-specific risks and bottlenecks in resource access. The horizon goes well beyond securing raw materials, but also encompasses access to renewable energy, manufacturing capacities, knowledge and skilled workers. The recent trade crisis has further highlighted the need for a diversification-centered approach.

Implementing such an overarching strategy requires coordinated action by stakeholders in business and politics. On the policy side, the Clean Trade and Investment Partnerships announced by the Commission could prove to become key for steering the existing pool of bilateral cooperation arrangements with third countries towards the supply chain needs of clean technologies. However, a roadmap for their implementation and management is still missing. First, it should comprise transparent guidelines and principles for the choice of partners for deepening economic cooperation, corresponding to the idea of a consistent partner portfolio. Second, it should provide guidelines on choosing policy measures from the big catalogue of potential cooperation instruments, considering a partner country's specific capabilities, cooperation barriers and existing economic ties with the EU.

This article provides some theoretical considerations and empirical insights for such a roadmap. It argues that defining an optimal partner portfolio is primarily determined by the trade-off between efficiency-enhancing complementarity and risk-reducing substitutability, which requires a technology-specific approach to negotiation strategies. It further argues that partnership agreements should take into account the economic incentives of partners not only to join but also to maintain deep economic integration with the EU. This requires agreements that address the desire for short-term risk diversification gains, but also the potential for positive long-term growth through productivity gains and value chain expansion.

Moreover, the article proposes a practical framework for categorizing partnerships based on a set of core country indicators from diverse public sources. It consists of clustering potential partners according to their relative strengths and mapping these strengths against the framework conditions. This enables a targeted selection of cooperation instruments and value chain stages to focus. Our empirical results hint a close relation between the two factors: Partnerships targeting different resources typically require different priorities and tailor-made cooperation instruments to overcome their specific obstacles. For instance, in partnerships mostly targeting access to natural resources, the EU will have to focus more on obstacles related to infrastructure and institutional quality in partner countries

To apply these considerations to the practical design and management of Clean Trade and Investment Partnerships, a broader information base is needed. The criticality assessment methodologies developed by the European Commission for mineral resources and technologies provide a good starting point. These need to be developed into a holistic criticality assessment of entire value chains. In the medium term, the benefits of potential partnerships as a contribution to risk reduction should also be assessed. This not only concerns the measurement of cooperation potentials, but also the indicator-based assessment of existing barriers to cooperation. Our analysis provides initial suggestions based on publicly available information. More detailed indicators are needed for technology-specific analyses, in particular for the identification of regulatory barriers.

6 Annex

6.1 Cooperation indicators and data sources

Table A 1: External sources

Category	*Indicator*	*Explanation*	*Time*	*Unit*	Source	*URL*
		Capabilities / Cooperation potentials				
Mineral resources	**Bauxite**	Estimated geological reserves of bauxite	2025	tonnes	USGS (2025)	Link
	Cobalt	Estimated geological reserves of cobalt	2025	tonnes	USGS (2025)	Link
	Copper	Estimated geological reserves of copper	2025	tonnes	USGS (2025)	Link
	Gallium	Estimated geological reserves of gallium	2025	tonnes	USGS (2025)	Link
	Lithium	Estimated geological reserves of lithium	2025	tonnes	USGS (2025)	Link
	Manganese	Estimated geological reserves of manganese	2025	tonnes	USGS (2025)	Link
	Natural graphite	Estimated geological reserves of natural graphite	2025	tonnes	USGS (2025)	Link
	Nickel	Estimated geological reserves of nickel	2025	tonnes	USGS (2025)	Link
	Platinum	Estimated geological reserves of platinum	2025	tonnes	USGS (2025)	Link
	Rare earth metals	Estimated geological reserves of rare earth metals	2025	tonnes	USGS (2025)	Link
	Titanium minerals	Estimated geological reserves of titanium minerals	2025	tonnes	USGS (2025)	Link
Renewable energy	**Solar energy**	Average specific PV output	2025	kWh/kWp	World Bank Group (2025)	Link
	Wind energy	Average wind power density	2025	W/m^2	DTU (2025)	Link
Skills	**STEM-graduates**	Share of university graduates that graduated in STEM-fields	2022/23	%	UNESCO (2025)[40]	Link
	Tertiary education	Share of workers with tertiary education	2022/23	%	World Bank (2025b)	Link
Patents	**Patent numbers**	Number of patent families for energy technologies[41] (see Section 3.2) by country of residence of the inventor	Period 2013-2022	No.	PATSTAT (2025)	Link
	Citations	Average size of patent families for energy technologies by country of residence of the inventor	Period 2013-2022	No.	PATSTAT (2025)	Link

40 UNESCO (2025). UIS Data Browser.

41 The energy technologies were approximated by IPC-classes in PATSTAT as follows: Batteries: H01M; Electrolysis: C25B; Fusion reactors: G21B; Heat pumps: F25B 30/00; Solar cells: H01L; Solar heat collectors: F24S; Sustainable Fuels: C10L 5/40; Wind motors: F03D.

Hydrogen processing	**H_2 production capacity**	Total capacity of electrolysis-based hydrogen production operational or under construction	2025	tonnes	IEA (2025a)	Link
	CO_2 capture capacity	Total carbon capture capacity operational or under construction	2025	tonnes	IEA (2025b)	Link
Net-zero technology equipment	**Batteries**	Exports of lithium-ion batteries (HS code: 850650)	2023	USD	UN Comtrade (2025)	Link
	Electrolysers	Exports of electrolysers (854330)	2023	USD	UN Comtrade (2025)	Link
	Heat pumps	Exports of heat pumps (841961)	2023	USD	UN Comtrade (2025)	Link
	Nuclear reactors	Exports of nuclear reactors (84110)	2023	USD	UN Comtrade (2025)	Link
	PV modules	Exports of PV cells/modules (854142)	2023	USD	UN Comtrade (2025)	Link
	Wind power	Exports of wind power generators (850231)	2023	Euro	UN Comtrade (2025)	Link
Framework conditions						
Quality of governance	**Control of corruption**	Worldwide Governance Indicator	2023	Dimensionless (-5 to +5)	World Bank (2025a)	Link
	Government efficiency	Worldwide Governance Indicator	2023	Dimensionless (-5 to +5)	World Bank (2025a)	Link
	Political stability	Worldwide Governance Indicator	2023	Dimensionless (-5 to +5)	World Bank (2025a)	Link
	Regulatory quality	Worldwide Governance Indicator	2023	Dimensionless (-5 to +5)	World Bank (2025a)	Link
	Free trade agreements	Existence of bilateral trade agreement	2023	Yes/no	Larch (2023)	Link
	Infrastructure quality	Pillar of Logistics Performance Index	2023	Dimensionless (1 to 5)	World Bank (2025c)	Link
	Tariffs	Weighted average of applied tariff rates	2023	%	WITS (2025)	Link

Existing economic ties						
	Trade intensity	World Bank Trade Intensity Index	2023	Dimensionless (centered around 1)	WITS (2025); UN Comtrade (2025)	Link

Source: own representation

6.2 Detailed results cooperation potentials

Table A 2: Capabilities of countries (Results Principal Component Analysis)

Code	Country	Mineral resources	Renewable energy	Skills	Patents	Hydrogen processing	Net-zero equipment
ALB	Albania	0.00	0.17	0.46	0.00	0.00	0.00
ARG	Argentina	0.06	0.56	0.27	0.36	0.00	0.00
ARM	Armenia	0.00	0.17	0.54	0.04	0.00	0.00
AUS	Australia	1.00	0.33	0.62	0.23	0.26	0.04
AZE	Azerbaijan	0.00	0.19	0.55	0.00	0.00	0.00
BIH	Bosnia and Herzegovina	0.00	0.16	0.44	0.06	0.00	0.00
BRA	Brazil	0.51	0.18	0.31	0.13	0.12	0.03
BWA	Botswana	0.00	0.32	0.27	0.00	0.00	0.00
CAN	Canada	0.13	0.17	0.72	0.21	1.00	0.24
CHE	Switzerland	0.00	0.18	0.80	0.21	0.00	0.23
CHL	Chile	0.28	1.00	0.47	0.10	0.01	0.00
CIV	Cote d'Ivoire	0.00	0.09	0.21	0.00	0.00	0.00
COL	Colombia	0.00	0.07	0.37	0.03	0.01	0.01
CRI	Costa Rica	0.00	0.23	0.36	0.00	0.00	0.00
DOM	Dominican Republic	0.00	0.22	0.24	0.00	0.00	0.00
DZA	Algeria	0.00	0.39	0.58	0.18	0.00	0.00
ECU	Ecuador	0.00	0.11	0.33	0.03	0.00	0.00
EGY	Egypt	0.00	0.44	0.32	0.10	0.00	0.00
GBR	United Kingdom	0.00	0.10	0.73	0.31	0.80	0.61
GEO	Georgia	0.00	0.12	0.61	0.04	0.00	0.00
GHA	Ghana	0.00	0.10	0.17	0.00	0.00	0.00
GTM	Guatemala	0.00	0.17	0.23	0.00	0.00	0.00
HND	Honduras	0.00	0.20	0.29	0.00	0.00	0.00
IDN	Indonesia	0.28	0.04	0.60	0.08	0.08	0.25
IND	India	0.19	0.18	0.50	0.28	0.34	0.75
ISR	Israel	0.00	0.33	0.82	0.27	0.00	0.12
JOR	Jordan	0.00	0.39	0.50	0.00	0.00	0.02
JPN	Japan	0.00	0.11	0.74	1.00	0.01	1.00
KAZ	Kazakhstan	0.02	0.16	0.52	0.08	0.00	0.00
KEN	Kenya	0.00	0.32	0.24	0.00	0.01	0.00
KOR	Korea, Rep.	0.00	0.15	0.85	0.38	0.03	0.77
LBN	Lebanon	0.00	0.29	0.70	0.04	0.00	0.00
LSO	Lesotho	0.00	0.45	0.23	0.00	0.00	0.00
MAR	Morocco	0.00	0.41	0.45	0.06	0.00	0.00
MDA	Moldova	0.00	0.04	0.52	0.00	0.00	0.00
MDG	Madagascar	0.08	0.27	0.32	0.06	0.00	0.00
MEX	Mexico	0.04	0.31	0.49	0.11	0.00	0.07
MKD	Macedonia	0.00	0.12	0.52	0.00	0.00	0.00
MOZ	Mozambique	0.06	0.20	0.00	0.00	0.00	0.00
NAM	Namibia	0.00	0.41	0.03	0.00	0.01	0.01
NIC	Nicaragua	0.00	0.25	0.38	0.00	0.00	0.00
NOR	Norway	0.04	0.11	0.63	0.32	0.20	0.02

NZL	New Zealand	0.00	0.50	0.65	0.19	0.01	0.00
PER	Peru	0.08	0.18	0.37	0.08	0.01	0.00
PHL	Philippines	0.05	0.15	0.47	0.04	0.00	0.00
PNG	Papua New Guinea	0.01	0.02	0.51	0.00	0.01	0.00
PRY	Paraguay	0.00	0.17	0.35	0.00	0.00	0.00
SGP	Singapore	0.00	0.00	1.00	0.38	0.00	0.49
SLV	El Salvador	0.00	0.29	0.35	0.00	0.00	0.00
SRB	Serbia	0.00	0.07	0.71	0.15	0.00	0.01
SWZ	Swaziland	0.00	0.19	0.34	0.00	0.00	0.00
TUN	Tunisia	0.00	0.35	0.77	0.00	0.00	0.01
TUR	Turkey	0.03	0.23	0.41	0.25	0.00	0.24
UKR	Ukraine	0.05	0.03	0.70	0.08	0.00	0.00
URY	Uruguay	0.00	0.22	0.22	0.08	0.00	0.00
VNM	Vietnam	0.32	0.07	0.63	0.07	0.00	0.00
ZAF	South Africa	0.28	0.36	0.30	0.17	0.02	0.03
ZWE	Zimbabwe	0.01	0.26	0.18	0.00	0.00	0.00

Source: own Illustration

6.3 Results gravity estimations

Table A 3: Coefficient estimates from gravity regression (see subsection 3.1.2)

	Dependent Variable: Trade volume	
	Estimate	*t-value*
Regressors		
Intercept	-38.270	-239.312***
Ln(GDP_exporter)	0.963	116.237***
Ln(GDP_importer)	0.907	98.466***
Ln(Population_exporter)	0.413	40.083***
Ln(Population_importer)	0.305	26.973***
Ln(Area_exporter)	-0.075	-16.301***
Ln(Area_importer)	-0.095	-19.793***
Ln(Distance)	0.000	-106.136***
Dummy common border	2.364	46.871***
Ln(1+tariff rate)	-1.600	-8.490***
Dummy trade agreement	0.597	41.306***
Political governance_exporter	2.355	73.909***
Political governance_importer	0.715	19.330***
McFadden's R^2	0.717	
No. observations	132,848	

Source: own calculations; year dummies included.

Centrum für Europäische Politik
FREIBURG | BERLIN

Author:

Dr. André Wolf
Head of Division Technology, Infrastructure and Industrial Development
wolf@cep.eu

Centrum für Europäische Politik FREIBURG | BERLIN
Kaiser-Joseph-Straße 266 | D-79098 Freiburg
Schiffbauerdamm 40 Raum 4205 | D-10117 Berlin
Tel. + 49 761 38693-0

Das **Centrum für Europäische Politik** FREIBURG | BERLIN, das **Centre de Politique Européenne** PARIS, und das **Centro Politiche Europee** ROMA bilden das **Centres for European Policy Network** FREIBURG | BERLIN | PARIS | ROMA.

Das gemeinnützige Centrum für Europäische Politik analysiert und bewertet die Politik der Europäischen Union unabhängig von Partikular- und parteipolitischen Interessen in grundsätzlich integrationsfreundlicher Ausrichtung und auf Basis der ordnungspolitischen Grundsätze einer freiheitlichen und marktwirtschaftlichen Ordnung.