ENABLING FACTORS OF THE GREEN ECONOMY TRANSITION

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Abstract

In response to the global challenges of climate change and environmental degradation, the process of green economy transition has significantly accelerated in the last decade. The aim of this study is to provide a comprehensive picture of the international and national policy instruments, economic incentives and legal frameworks used between 2015 and 2025 to facilitate the transition to a green economy. The study identifies the most important areas of intervention based on a systematic literature review: the research reviews fiscal, regulatory, market-based and social integration instruments used in international practice and their effectiveness. The results show that a successful green economy transition requires a multi-level, integrated policy framework. The article highlights the importance of long-term planning, predictable regulation and social acceptance, multi-level governance and stakeholders in ensuring an effective green transition.

Keywords: *green economic transition, policy instruments, economic incentives, legal frameworks, areas of intervention*

1. INTRODUCTION

The confirmation of the Paris Agreement in 2015, along with the initiation of the United Nations Sustainable Development Goals (SDGs), has generated a collective understanding globally about the pressing need for environmental sustainability while chasing economic enhancements[1].

The Sustainable Development Goals consequently establish a tangible link between the ecological framework and the economic framework, underscoring the imperative to transition towards more sustainable practices in production and consumption [2].

The green economy transition is an economic transformation that involves changing production and consumption patterns in a way that reduces negative environmental impacts while improving social well-being and resource efficiency [3]. Over the past decade, governments, international organizations and private sector actors have launched a number of initiatives to accelerate the green economy transition. These include various policy instruments, economic incentives, legal and regulatory frameworks, and technological and financial innovations [4]. Despite this, the pace and performance of execution manifest considerable differences among various nations and geographical areas, which can be partially ascribed to divergences in economic status, resource availability, and institutional competence [5].

The aim of this study is to provide a systematic overview of the instruments and measures used to support the green economy transition at a global level between 2015 and 2025. The research seeks to answer the following questions:

1. What types of policy instruments and public measures are used to support the green economy transition in different countries?

2. How has the effectiveness and prevalence of these instruments changed over the past decade?

3. What are the critical success factors and barriers to a successful green economy transition?

4. What prospective trajectories and developmental frameworks can be examined within the purview of policies associated with the green economy?

2. MATERIALS AND METHODS

The research involved a systematic literature review of international scientific publications on the green economy transition published between 2015 and 2025. The databases examined within the parameters of the analysis comprised: Web of Science, Scopus, Google Scholar, and ResearchGate. The subsequent keywords and their respective combinations were employed in the research inquiry: "transition to a green economy", "instruments for green policy", "policy regarding environmental matters", "policy pertaining to sustainable development", "policy related to climate change", "economy of circularity", "policy on renewable energy", "pricing of carbon emissions", "finance for green initiatives", "taxation related to environmental concerns", "policy for sustainable transportation".

The inquiry yielded a cumulative total of 874 scholarly articles, which were subsequently refined to 312 pertinent publications in accordance with the specified filtering criteria:

− publications in English or Hungarian

− articles, book chapters or high-quality research reports published in peer-reviewed journals

− publications containing empirical data or case studies

− studies focusing on instruments and measures for the green economy transition.

The PRISMA methodological framework was applied during the analysis [6], which ensured a systematic and transparent literature review. I subjected the content of the selected publications to a thematic analysis, identifying the main intervention areas, instrument types, supporting factors and challenges. A comparative analysis of the practices of individual countries and regions allowed for the highlighting of good practices and different approaches.

The literature review was supplemented with secondary data from databases of international organizations (OECD, World Bank, UN, EU), with a particular focus on indicators and country assessments measuring the green economy transition. This enabled a comparative analysis of the prevalence and effectiveness of individual policy instruments.

The structure of the article is as follows: after the introduction, the second chapter presents the methodology applied, then the third chapter discusses in detail the different tools and measures that support the green economy transition. The fourth chapter provides a comparative analysis across countries and regions. The fifth chapter discusses the enabling factors and challenges, while the sixth chapter outlines future trends and policy recommendations. The study concludes in the seventh chapter with conclusions.

3. TOOLS AND MEASURES TO SUPPORT THE GREEN ECONOMY TRANSITION

Global climate risks and recent extraordinary crises have drawn even more attention to the need for a green economy transition. Many tools for this are known in the international literature. These tools are briefly presented below.

3.1. Government policy and regulatory measures supporting sustainability and the promotion of a circular economy

One of the fundamental conditions for the implementation of the green economy transition is that there is an effective policy framework, appropriate regulation and its consistent implementation in all areas where the green economy transition requires urgent intervention. The green economy is often used as an umbrella term that brings together a number of economic concepts, tools and measures that support the reduction of negative impacts on the environment while improving social well-being and resource efficiency. The paradigm of the circular economy, regarded as an instrumental mechanism for fostering sustainability, has garnered heightened scrutiny over the past ten years as a fundamental framework for sustainable economic advancement. In opposition to the traditional linear economic framework, the circular economy endeavors to eradicate pollution, maintain the circulation of products and materials, and rejuvenate natural systems [7]. The concept of the circular economy and its role in almost every

sector have been addressed by representatives of the literature [8]. Its importance is also demonstrated by the fact that, for example, in the Web of Science, 1682 articles in 2025 deal with some aspect of the circular economy, compared to 82 in 2015. In the past decade, many countries and regions have developed comprehensive circular economy strategies and action plans. The European Union implemented its inaugural Circular Economy Action Plan in the year 2015, succeeded by a more comprehensive strategy in 2020, which was integrated into the framework of the European Green Deal. China adopted the Circular Economy Law in 2009, while Japan has been applying the "3R" (reduce, reuse, recycle) approach since the 1990s [9].

In 2013, Su and associates assess the differences in circular economy frameworks between China and Japan, pointing out that the Chinese model is mainly top-down and rooted in regulations, while the Japanese approach stresses voluntary participation and private sector contributions [10]).

In addition, a growing number of legislative instruments have emerged to enable international and national legislators to regulate the necessary steps of the circular economy model. For example, extended producer responsibility (EPR) schemes make producers responsible for the entire life cycle of products, including post-consumer waste management. In the European Union, EPR schemes have significantly contributed to the increase in recycling rates for electronic waste, packaging waste and end-of-life vehicles[11], but for example, the introduction of landfill taxes and bans in the EU has resulted in a significant reduction in the amount of waste going to landfill in several countries [12], or EU ecodesign and product standards require or encourage environmentally friendly product design, including durability, repairability, reusability and recyclability. As posited by McDowall et al. [13], ecodesign regulations possess the potential to be exceptionally efficacious when they implement a life cycle perspective and consider all dimensions of the product's environmental performance. Dalhammar [14] points out that increasing the lifespan of products and improving repairability can bring significant environmental benefits, especially for electronic products.

3.2. Support policy instruments for the green economy transition

3.2.1. Fiscal instruments

a) Environmental taxes and levies: in the context of the green economy transition, various environmental taxes and levies (e.g. carbon dioxide tax, energy taxes) play an important role in internalizing negative externalities [15]. Based on the empirical examination, carbon dioxide taxes introduced in European countries have ensured a 15-30% emission reduction in the 10 years following their introduction [16], nonetheless, the efficacy of environmental taxation is significantly influenced by the overarching policy framework, within which the government plays a critical role in its formulation. Furthermore, the allocation of tax revenues is imperative for optimizing efficiency and garnering social endorsement. For instance, Sterner emphasizes that the implementation of differentiated energy taxation contingent upon the carbon intensity of energy carriers can serve as an especially potent mechanism in promoting a transition from fossil fuels to renewable energy sources [17].

b) Tax incentives and direct subsidies: Tax incentives and direct subsidies continue to assume a pivotal role in fostering investments in renewable energy sources. In a climate overflowing with opportunities, the Production Tax Credit (PTC) and the Investment Tax Credit (ITC) have profoundly encouraged the growth of wind and solar energy capabilities [18]. Tax incentives and direct subsidies: tax incentives and direct subsidies continue to play an important role in encouraging renewable energy investments. In the USA play the Production Tax Credit (PTC) and the Investment Tax Credit (ITC) important role [18]. Empirical studies by Crago and Chernyakhovskiy [19] show that tax incentives can be particularly effective if they provide long-term stability and complement the impact of other policy instruments.

Subsidies and tax breaks for renewable energy, energy efficiency and clean technologies provide public support for the diffusion of green innovations [20]. However, the effectiveness of support schemes is often reduced by excessive administrative burdens [21]. Support schemes should be designed taking into account the level of technological maturity and market conditions: Polzin et al. suggest that R&D grants and financing of demonstration projects are effective for early-stage technologies, while investment grants and tax breaks may be more appropriate for the market entry phase [22]. However,

Carley [23] warns that the use of subsidies alone is usually not sufficient to address market failures and ensure systemic transition.

It is also important to highlight that in addition to positive subsidies, harmful subsidies need to be eliminated, especially in the case of fossil fuels [24].

c) Mandatory renewable energy shares and feed-in tariffs: Renewable Portfolio Standards (RPS) and quota systems require energy providers to provide a specified percentage of their energy portfolio from renewable sources. These instruments have been particularly widespread in the United States, the United Kingdom and Australia. RPS systems introduced in US states have increased the share of renewable energy sources by an average of 7 percentage points in the 7 years following their introduction [25]. As per the research carried out by Carley et al. [25], the effectiveness of Renewable Portfolio Standards (RPS) systems is greatly shaped by the specifics of regulatory structures and compliance strategies. The adoption of Renewable Portfolio Standards (RPS) frameworks yields the benefit of leveraging market-based strategies to enhance the incorporation of renewable energy sources, ultimately aiding in the attainment of economically feasible practices [26]. Empirical research suggests that the effectiveness of RPS systems is enhanced by setting long-term targets, using stable regulations and additional financial incentives (e.g. tax breaks) [27].

Feed-in tariffs (FITs) and feed-in premiums (FIPs) confer upon renewable energy producers a secured price or a supplementary financial incentive for the energy they generate. Empirical studies investigating the efficacy of feed-in mechanisms indicate that meticulously structured FITs and FIPs have resulted in considerable augmentation of capacity, especially within the domains of solar energy and terrestrial wind power [22]. However, Nicolini and Tavoni [28] point out that the long-term sustainability of these systems is a challenge in the face of increasing renewable capacities, which has led to the transformation of these forms of support in many countries.

d) Deposit schemes and extended producer responsibility: Extended Producer Responsibility (EPR) shifts the costs associated with the end of a product’s life cycle onto producers, encouraging them to adopt eco-design and improve waste management systems [29]. In order to promote a circular economy, many countries have introduced deposit schemes and extended producer responsibility programmes. EPR schemes are particularly effective for electronic waste, packaging and vehicles, where the complex material composition and difficult-to-recycle components pose significant environmental risks [30]. Empirical research suggests that effectively operating deposit schemes can achieve collection rates of 80-95%, significantly reducing the amount of materials going to landfills and illegal dumping [31].

3.2.2. Market-based instruments

a) Emissions trading systems: Emissions trading systems (ETS) operate on the "cap-and-trade" principle: a regulatory authority sets a maximum amount of greenhouse gases that can be emitted, and emission rights are distributed among market participants who can trade them. The European Union ETS is the first and largest such system in the world, launched in 2005, but similar systems have since been introduced in several other regions, such as China, South Korea, California and several Canadian provinces. Bayer and Aklin's analysis from 2020 [32] indicated that the EU Emissions Trading System (EU ETS) resulted in a 3.8% decline in greenhouse gas emissions during the first two phases (2005-2012), without revealing any considerable harmful impact on economic performance. In the subsequent third phase (2013-2020), the efficacy of the system was augmented through the systematic reduction of the emission cap and the gradual cessation of the free allocation of emission allowances. China launched the world’s largest emissions trading scheme in 2021, initially focusing on the energy sector and gradually expanding to other sectors. In their 2019 study, Zhang and co-authors [33]suggest that the Chinese Emissions Trading System (ETS) might be essential for overhauling the climate policy setup in the country; nonetheless, achieving its goals will fundamentally require the implementation of effective monitoring, reporting, and verification (MRV) frameworks with stringent regulatory enforcement. Several factors need to be considered when designing emissions trading schemes, including the sectors covered, the method of quota allocation, pricing mechanisms and the possibilities for international interconnection [34].

b) Green financial instruments and investments: The transition to a green economy requires significant financial resources. The OECD estimates that achieving the Paris Agreement targets would require a global infrastructure investment of USD 6.9 trillion per year by 2030 [35]. A number of innovative financial instruments and initiatives have emerged in the past decade to finance this.

One of the most important regulatory products of the recent period has been green taxonomies, which are essentially classification systems that define which economic activities can be considered environmentally sustainable. The EU Taxonomy Regulation (2020/852) is the first legally binding taxonomy that sets out detailed technical criteria related to six environmental objectives. According to the scholarly investigation conducted by Ameli et al. [36], the establishment of taxonomies alongside compulsory disclosures pertaining to environmental, social, and governance (ESG) criteria is instrumental in mitigating the phenomenon of "greenwashing" and directing financial resources towards sustainable endeavors. Within the European Union, the regulatory framework concerning taxonomies is augmented by an array of initiatives, which include the mandate for participants in financial markets to reveal their associated sustainability risks and repercussions.

In their 2020 research, Bolton and associates delineate [37] the principal instruments employed by central banks and regulators, which encompass the execution of climate stress tests for financial institutions, the adoption of green macroprudential measures such as differentiated capital requirements, the initiation of green refinancing initiatives, and the procurement of assets, in addition to the enforcement of obligatory climate risk disclosure mandates. The Bank of England became the first to incorporate climate considerations into its central bank asset purchase program in 2021, while the People's Bank of China introduced green refinancing programs and preferential reserve requirements to encourage green lending [38].

Perhaps the best-known financial instruments supporting the green economy transition are green bonds, which are debt securities whose proceeds are used exclusively to finance environmentally friendly projects [39]. The green bonds market has witnessed impressive development throughout the preceding decade, with the overall worth of green bonds issued jumping from USD 42 billion in 2015 to USD 290 billion in 2020. [40]

Empirical research by Flammer [41] suggests that issuing green bonds provides companies with a number of benefits, including lower capital costs, increased long-term institutional investor participation, and improved environmental performance. In addition to green bonds, other types of sustainability bonds have emerged, such as sustainability bonds to co-finance environmental and social projects, transition bonds to finance the green transition of high-carbon sectors, or blue bonds to finance projects aimed at ocean and water sustainability.

In addition, sovereign wealth funds and pension funds are increasingly integrating ESG considerations into their investment strategies. For example, Norway's sovereign wealth fund, the world's largest sovereign wealth fund, introduced significant fossil fuel exclusions in 2021 and strengthened its climate risk management policies.

According to Krueger and colleagues [42], a detailed examination of global institutional investors showed that a striking 93% of them take climate risks into account when making investment choices, with many actively weaving these risks into their portfolio management practices.

In their 2019 investigation, Bassen et al [43]. revealed that investment strategies that embrace Environmental, Social, and Governance (ESG) criteria can have benefits that go beyond just environmental concerns and also touch on financial gains, particularly during extended timelines and periods of upheaval. However, Halbritter and Dorfleitner [44] point out methodological differences and inconsistencies in ESG assessments and rankings, which can make sustainable investment decisions difficult.

3.3. Support for green innovation and technology transfer

Technological innovation serves a pivotal function in the transition to a green economy, facilitating the separation of economic advancement from environmental sustainability. A wide array of policy mechanisms are adopted around the world to stimulate the progress and propagation of green

innovations, particularly those that are environmentally safe, have reduced carbon emissions, and are resource-efficient. Nonetheless, the pursuit of technological change aimed at sustainability frequently necessitates a more profound transformation in technology, which concurrently entails the establishment of novel systemic frameworks. The research by Xu and others indicates that an uptick in green technology usage aligns with a considerable fall in emission of pollutants. [45].

Furthermore, ecological innovations are integral to the reconfiguration of traditional industrial functions, which not only mitigates environmental impacts but also fosters enhanced economic growth by supplanting conventional products and methodologies with more efficient alternatives [46]. Direct subsidies for research and development and tax incentives serve as vital mechanisms within green innovation policies. For instance, the European Union's Horizon Europe initiative designates substantial funding to support innovations that advance climate-neutral and circular economies, whereas the United States Energy Research and Development program seeks to cultivate clean energy technologies. Numerous research findings also indicate that the adoption of green innovations can be facilitated by suitable financial incentives. As outlined by Acemoglu and colleagues in 2016, fostering research and innovation is especially vital for emerging clean technologies in their early phases [47] Moreover, the government plays a pivotal role in the adoption of such technologies, as it possesses the authority to regulate market access for green innovations and to establish the legal and quality assurance parameters for their application, in addition to creating a conducive incentive structure. For instance, through the framework of green public procurement, the government can exemplify exemplary practices in the acquisition of sustainable products and services.

Since public procurement accounts for 15-20% of GDP in many countries, this can be a significant market-creating tool for green innovations [29]. Ghisetti [48] based on an empirical analysis of EU countries showed that green public procurement policies have a positive impact on environmental innovations, especially for SMEs.

In addition, green innovation clusters and ecosystems play an important role in promoting knowledge transfer and cooperation. Tanner [49] empirically found that green technology clusters have a positive impact on the innovation performance of the region and the number of green patents. The study also finds that successful clusters typically have a strong research institutional background, a specialized industrial base and a supportive policy environment.

Kanda and associates [50] demonstrate in their research about the global outreach strategies for environmental technologies that clusters can meaningfully aid Small and Medium Enterprises (SMEs) in penetrating international markets, especially under the existing global conditions. These clusters assume a critically important function, especially within developing nations, in the acknowledgment and dissemination of green innovations, alongside the enhancement of knowledge, skills, and capacities [51]. Numerous multilateral initiatives have been instituted to promote technology transfer, including the UNFCCC Technology Mechanism, the Clean Technology Centre and Network (CTCN), and the Global Environment Facility (GEF). Nonetheless, a salient area for advancement pertains to the enhancement of adaptation capabilities and the establishment of robust regulatory frameworks [52], as well as the fortification of intellectual property rights to augment the efficiency of technology transfer.

4. THE TRANSITION TOWARDS A GREEN ECONOMY IN SPECIFIC REGIONS

Policies and measures supporting the green economy transition show significant differences between regions and countries, which can be traced back to social, economic, cultural and historical characteristics. The most significant models of the green economy transition are briefly reviewed below.

4.1. The transition towards a green economy within the European Union

The European Union has marked its presence as a dominant player in the international movement towards an eco-friendly economy, particularly after the ratification of the European Green Deal in 2019, which sets forth a broad strategic outline for reaching a climate-neutral economy by the year 2050. The policy framework of the EU concerning the green economy is principally defined by the subsequent instruments:

- A strong regulatory framework and ambitious objectives: Sustainable development is a fundamental principle of the Treaty on European Union and a key objective of the EU's internal and external policies. The European Green Deal aims to eliminate net greenhouse gas emissions by 2050 and to decouple economic growth from resource use. In addition, several strategic documents support the European framework for the green transition.

  The EU is pursuing the principles of integrating climate considerations and low-carbon technologies through ambitious policy frameworks. In addition, the European Climate Regulation provides a legal framework for the climate neutrality targets set out in the European Green Deal by 2050 [53]. The EU has one of the most advanced environmental regulatory systems in the world, including directives on industrial emissions, water quality, waste management and biodiversity [11]

- Integrated policy approach: In order to implement the green economy objectives, the EU has developed extensive policy measures in addition to general strategic documents. For example, the "Fit for 55" package links different policy areas, including energy, transport, buildings, land use and the reform of the EU ETS [54] The EU is also seeking to exploit sectoral synergies for the green transition.
- Significant financial resources: The EU is also seeking to provide resources for the green transition through direct and indirect support policy instruments. The EU's multiannual financial framework and the NextGenerationEU recovery package together allocate at least 30% to climate objectives, while the Just Transition Mechanism provides targeted support for the transition of carbon-intensive regions [53].
- International leadership: The EU is also a prominent international supporter of the implementation of the Paris Agreement and international climate finance [55].
- Wurzel et al. [56] undertook a comparative research study that showcases the leadership of the Nordic countries, such as Denmark, Sweden, and Finland, in the sectors of green innovation and sustainable economic initiatives.

4.2. The Green Economy Transition in North America

The approach of the United States and Canada to the green economy transition has undergone significant changes in the past decade. This can be characterized by the following main points:

- Active federal-state green economy dynamics in addition to the federal one: federal states in the US and Canada have the opportunity to develop their own climate and environmental frameworks and legal regulators. For example, California has its own emissions trading system and ambitious renewable energy targets [57].
- Favoring market mechanisms: The North American approach is generally characterized by an emphasis on market mechanisms and business innovation over direct regulation [58].
- Sectoral parallels: The US has made significant progress in renewable energy (especially wind and solar), while the oil and gas industry is also constantly expanding. Canada supports both fossil fuel extraction and climate protection measures[57].
- In an effort to promote a sustainable economy, the United States is launching important infrastructure investments, illustrated by the 2021 Infrastructure Investment and Jobs Act and the Inflation Reduction Act, which feature significant funding for clean energy infrastructure improvements, electric vehicle charging network setups, and transportation system enhancements. [59]

A comparative analysis shows that the North American approach is characterized by a greater degree of pragmatism and economic considerations compared to the European, value-based approach.[60]

4.3. Green Economic Transition in East Asia

The East Asian region – particularly China, Japan, and South Korea – is assuming a progressively vital role in the global transition towards a green economy, albeit through markedly divergent methodologies:

- China has taken center stage in the international effort for sustainability in the previous ten years, particularly given its major carbon emissions and ongoing use of fossil fuels. In 2020, China conveyed its aspiration to be carbon neutral by 2060, and its 14th Five-Year Plan (2021-2025) strengthens a considerable emphasis on sustainable practices [61]. The strategic framework delineated by China prioritizes several crucial domains, which encompass the advancement of renewable energy resources—most notably solar and wind energy—as well as the enhancement of electric vehicle production and battery manufacturing capabilities. The Chinese paradigm is predominantly characterized by state leadership, amalgamating industrial policy, direct governmental investment, and centralized planning with market-oriented mechanisms [62]The authors emphasize that the shift in China's environmental policy was, in part, spurred by public discontent regarding air quality and the acknowledgment of economic prospects within low-carbon sectors.
- Japan has emerged as a frontrunner in the advancement of low-carbon technologies, encompassing hybrid vehicles and energy efficiency measures. Nonetheless, subsequent to the catastrophic Fukushima incident in 2011, the nation's energy policy experienced modifications that impeded the decarbonization trajectory[63]. In 2020, Japan emphasized its pledge to achieve carbon neutrality by 2050 and took on a groundbreaking plan for 'green growth' that centers around hydrogen technology, battery developments, and renewable energy options. The Japanese methodology is distinguished by its focus on technological advancements, corporate voluntary actions, and collaborative international efforts. [64]
- Responding to the global economic collapse of 2008, South Korea was among the trailblazing countries to endorse the Green New Deal, which hinges on two primary elements: the development of digital infrastructure and the establishment of a sustainable economy. The initiative for green infrastructure enhancement seeks to augment the energy efficiency of public edifices, establish a low-carbon, decentralized energy framework, and foster the development of renewable energy sources, smart grid technologies, as well as electric and hydrogen-fueled vehicles. Furthermore, it facilitates the progression of green industries through innovations in green technology. A comprehensive support structure has been instituted for this program[65]. The South Korean model is distinguished by its robust collaboration between the public and private sectors, alongside the export-oriented advancement of green technologies.[66]

A comparative analysis conducted by Loher [67] underscores that nations within East Asia predominantly embrace a more pragmatic and development-centric methodology towards the transition to a green economy, which emphasizes economic competitiveness and industrial advancement either in lieu of or concurrently with environmental factors.

4.4. Green transition in developing countries

Emerging economies encounter distinct challenges and prospects. Presented below is a concise examination of several pivotal domains of green economy strategy within prominent nations:

- India is undertaking substantial initiatives aimed at establishing a green economy and fostering sustainable development. Its strategic framework emphasizes various critical domains, particularly the advancement of renewable energy sources, wherein it has achieved considerable solar power capacity installations and, commencing in June 2026, mandates that clean energy projects utilize domestically produced solar cells, thus diminishing reliance on foreign imports. The National Action Plan on Climate Change (NAPCC) has established eight targeted sub-programmes intended for both mitigating and adapting to climate change, featuring initiatives that encourage solar energy and foster the expansion of forest cover. In 2023, India unveiled the Green Credit Programme, a market-oriented mechanism that offers incentives, among other objectives, for encouraging afforestation in degraded regions and the generation of green credits. Furthermore, a range of

infrastructure projects pertinent to the green economy has been initiated, including the creation of high-yield seed varieties and the enhancement of storage infrastructure. Taking into account the results highlighted by Chaudhary and associates [68], India's framework is appreciated for its purpose to harmonize its developmental activities with ecological viability, particularly in confronting energy inadequacy and advancing employment prospects.

- Brazil: In recent years, the nation has undertaken substantial initiatives aimed at fostering a green economy and advancing sustainable development. In this context, it actively promotes foreign investments in green technologies and endeavors to forge extensive international collaborations (for instance, with the European Union through investments in Brazil's lithium sector). Further, the nation exhibits substantial potential in the renewable energy landscape, notably in exploiting hydroelectric, wind, and solar power. The CIDE (Contribuição de Intervenção no Domínio Econômico) has been instituted as a fuel tax, with a portion of its revenues allocated to financing environmental projects and enhancing transportation infrastructure. Viola and Franchini [69] underscore, however, that Brazil's environmental policy exhibits notable variations in its approach to combating deforestation, which constitutes a critical component of the nation's climate policy.
- South Africa aspires to augment the proportion of renewable energy sources while concurrently ensuring a stable and sustainable energy supply. Moreover, initiatives pertaining to the green economy also strive to foster economic growth and enhance employment opportunities. The nation additionally endeavors to cultivate extensive international relations. For instance, in March 2025, the European Union and South Africa reached an accord on a substantial investment package that, inter alia, facilitates a just energy transition of essential raw materials and the advancement of energy infrastructure. According to the analysis conducted by Montmasson-Clair [70], South Africa represents a noteworthy case of a "just transition" framework that harmoniously combines the imperative of decarbonization with an awareness of social inequities and the necessity for job creation. The meta-analysis suggests that the success of policies to support the green transition in emerging economies is largely influenced by institutional capacity, access to finance and technological capabilities. The authors argue that international cooperation and capacity building are particularly important in these countries.[71]

The analysis performed by Winkler and others[72] points out the essential need for technology spread and the offering of global financial aid.

5. FACTORS SUPPORTING AND HINDERING THE GREEN ECONOMY TRANSITION

Drawing from the comprehensive literature review, pivotal elements that affect the efficacy of policies and initiatives promoting the transition to a green economy, alongside the principal obstacles encountered during execution, can be discerned. I shall succinctly encapsulate these factors in table 1 below:

Factors supporting the green economy transition		**Factors hindering the transition to a green economy**	
1. A coherent policy framework	The success of the green economy transition depends largely on the coordination of different policy areas and the implementation of mutually reinforcing measures. Policy coherence is fundamentally important at three levels: – Horizontal coherence between environmental, energy, industrial, innovation and financial policies – Vertical coherence between different levels of government (local, regional, national, supranational)	**1. Market failures and economic challenges**	The transition to a green economy is hampered by a number of market failures, including: – Inadequate pricing of negative externalities, especially carbon emissions [74] – Information asymmetries and transaction costs, especially in the area of energy efficiency investments [75] – Path dependency and lock-in effects that make it difficult to

	– Consistency over time, which provides a predictable framework for long-term investments [73]		move away from fossil infrastructure [76] These market failures require systemic government intervention to create appropriate market signals and encourage private investment [77]
2. Integrated policy framework	Successful countries generally adopt a "whole-of-government" approach, in which sustainability goals are integrated into the operations of all ministries and authorities [78].	**2. Political and institutional challenges**	The transition to a green economy is often hindered by political and institutional factors: – Resistance from stakeholders (especially high-emission industries) [79] – Tension between short-term political cycles and long-term climate goals [80] – Lack of institutional capacity, especially in developing countries [81] The sustainability of environmental policy reforms depends largely on building political consensus and gaining public support. A solid institutional framework and stakeholder engagement can help overcome resistance and facilitate policymaking. depoliticization [82].
3. The right mix of policy instruments	There is no single solution to facilitate the transition to a green economy. A combination of different policy instruments is needed. Successful energy efficiency programs typically combine the following tools: – Regulatory instruments (e.g. building energy codes, energy efficiency standards) – Economic incentives (e.g. tax breaks, subsidies) – Information tools (e.g. energy labelling, advice) – Voluntary agreements with industry [83] Furthermore, effective transition requires not only the promotion of new, sustainable technologies and practices (“constructive” policies), but also the dismantling of old, unsustainable systems (“destructive” policies). According to the scholarly investigation conducted by the authors, it is imperative to implement both categories of policies in order to attain comprehensive systemic transformation[84].	**3. Technological and infrastructure challenges**	There are several obstacles to the rapid deployment of low-carbon technologies: – Inflexibility of electricity grids and lack of storage capacity, which limits the integration of renewable energy[85] – The long lifespan and high replacement costs of existing infrastructure [86] – Technological uncertainties and the difficulty of choosing between competing solutions.[87] In addition, addressing technological challenges requires a combination of a diversified R&D portfolio, targeted demonstration projects and policies that promote technological learning [74].
4. Long-term goals and stability	Investments required for the green economy transition typically have long payback periods. Tvinnereim and Mehling [88] emphasizes, that long-term, legally binding	**4. Financing needs**	Financing the investments needed for the green economy transition remains a significant challenge:

	targets and policy stability are critical to creating investment security. The United Kingdom Climate Change Act is often cited as an example, which sets legally binding, long-term emission reduction targets and establishes an independent body is created to assess progress and provide advice [89].		− The "green financing gap" is particularly significant in developing countries [90] − Lack of long-term capital to finance long-term infrastructure projects [91] − A lack of proper assessment regarding climate-related dangers within the financial sector [37] Mazzucato and Semieniuk [92] assert that an integrated approach involving both public and private financial resources is essential for amplifying green investments, thereby underscoring the significant function of public development banks and specialized public financing initiatives.
5. Social acceptance and inclusivity	Social acceptance of the green economy transition is critical for the sustainability of policies. Pahle this al. [93] suggest that successful policies typically take distributional impacts into account and aim to minimize adverse impacts on vulnerable groups. The "just transition" (just transition) concept is gaining more and more attention, which is a key factor in decarbonization stresses the importance of social justice and workers' rights in the process. Based on Newell and Mulvaneys opinion [94] a just transition framework can help overcome potential social resistance and build broader support.		

Table 1. Factors supporting and hindering the green economy transition

Source: Own editing based on literature research.

6. EMERGING TRENDS AND POLICY RECOMMENDATIONS IN THE GREEN ECONOMY TRANSITION

6.1. Emerging patterns in the shift towards a sustainable economy

According to the existing body of literature, a multitude of novel paradigms can be identified that are projected to profoundly affect the course of the transition towards a green economy.

Primarily, it is essential to underscore that the circular economy paradigm (a) is projected to be progressively assimilated into economic policies and corporate strategic frameworks. As articulated by Kirchherr et al.[95], the notion of the circular economy is evolving from a mere waste management framework towards a more holistic economic model that will incorporate all stages of the value chains.

The advent of digital technologies, innovative business models (e.g., product as a service), and enhanced producer (b) The convergence of climate policy and digitalization ought to be acknowledged as the second most significant emerging trend. A multitude of scholars underscore the progressively vital function of digital technologies within the transition to a green economy. Monasterolo [96] emphasizes that breakthroughs like artificial intelligence, the Internet of Things (IoT), blockchain technology, and big data analytics create unique chances for evaluating climate-related risks, refining energy infrastructures, and advancing sustainable consumption methodologies.

A rapidly emerging trend is the integration of nature-based solutions (c). The United Nations Environment Programme (UNEP) points out that nature-inspired solutions possess the capacity to enable nearly 30% of the crucial emission reductions by 2030 [97].

The findings from Seddon at al. [98] imply that actions like planting trees, restoring wetlands, and implementing agroecological approaches can greatly enhance efforts toward net-zero emissions aims.

The unification of climate and biodiversity frameworks, in conjunction with advancements in natural capital assessment, is foreseen to support the uptake of nature-aligned strategies[99].

A fundamental prerequisite for the transition towards a green economy involves the effective integration of resources alongside sustainable financial innovations (d). This domain is currently experiencing significant advancements, with a plethora of novel instruments emerging within financial markets, notably including job and sustainability bonds which facilitate the decarbonization of sectors characterized by high emissions [100], as well as natural capital investment vehicles that support the conservation and restoration of biodiversity [101], in addition to the utilization of digital technologies aimed at monitoring sustainable investments and mitigating instances of greenwashing [102]. As articulated by Luiz Awazu [103], the evolution of the financial system has gained momentum, with the evaluation of climate-related risks being progressively incorporated into conventional financial decision-making processes. It is anticipated that climate stress tests, obligatory disclosure mandates, and taxonomies will further bolster this emerging trend.

6.2. Policy recommendations

Informed by the comprehensive literature review, the subsequent policy recommendations may be articulated to proficiently facilitate the transition towards a green economy:

- Developing an integrated policy approach that includes improving in-government coordination between environmental, energy, industrial, innovation and financial policies [73], establishing long-term, legally binding frameworks to provide investment security [88], and developing systematic policy learning and adaptive management to deal with uncertainties [104];
- Optimizing policy instruments, which includes optimizing different types of policy instruments (regulatory, economic, information) to exploit synergies [83], defining the framework for targeted support programs to support the initial market introduction of low-carbon technologies [105];
- Ensuring a just transition, which aims to develop comprehensive strategies to support high-carbon regions and sectors during the transition [106], increasing social support [93], and improving the social integration of green economy measures;
- Strengthening international cooperation: to support the transfer of green technologies and good practices between developed and developing countries [51], [107], [108].

7. CONCLUSIONS

This document presents an exhaustive examination of the diverse instruments and public policies that facilitate the transition to a sustainable economy on a global scale, with particular emphasis on the timeframe of 2015-2025. From the thorough literature review, multiple significant conclusions can be deduced.

At the outset, the collection of policy mechanisms established to promote the transition towards a green economy has undergone notable augmentation and diversification in the preceding decade. Beyond conventional "command-and-control" regulations, market-oriented mechanisms (such as carbon taxes and emissions trading systems), financial incentives (including green bonds and sustainable investment funds), as well as instruments aimed at fostering innovation (like R&D subsidies and green public procurement) are assuming increasingly prominent roles. Nevertheless, empirical investigations indicate the absence of a singular "optimal" solution; a successful transition to a green economy necessitates a judicious amalgamation of various policy instruments, tailored to the local context and the unique characteristics of different sectors [73].

Second, there exist notable variances in the methodologies adopted for the green economy across different regions and nations. The European Union is typically distinguished by a holistic regulatory framework and aspirational objectives, whereas the North American model tends to prioritize market-driven mechanisms and innovation; conversely, East Asian nations frequently embrace development-centric and state-directed approaches. Emerging economies encounter particular obstacles that necessitate the amalgamation of environmental and developmental goals, alongside international assistance to effectively tackle these issues [109].

Third, the transition to a successful green economy necessitates not solely technological advancements but also comprehensive economic, political, and societal transformations. The research has delineated critical determinants for an effective transition, which encompass a cohesive and integrated policy framework, an appropriate amalgamation of policies, long-term objectives coupled with stability, as well as social acceptance and inclusivity. Nevertheless, several challenges can also be recognized, including market inefficiencies, policy and institutional limitations, technological and infrastructural impediments, along with financing deficiencies [77].

Fourth, novel paradigms are emerging within the green economy transition process that are anticipated to influence forthcoming advancements significantly. These concepts unify the intersection of climate governance with digital advancements, the surge of circular economy principles, the embrace of nature-centric solutions, and the proliferation of sustainable financial advancements. Such paradigms present novel opportunities but concurrently introduce new challenges for policymakers [96].

In conclusion, the research articulated policy recommendations aimed at effectively facilitating the green economy transition, underscoring the necessity of an integrated policy framework, the optimization of policy instruments, the assurance of a just transition, and the enhancement of international collaboration. The execution of these recommendations has the potential to foster a more efficient and equitable green economy transition on a global scale.

So these work validates that the shift to an eco-friendly economy is a complicated and diverse endeavor that calls for a thorough and collaborative plan across multiple levels of governance, sectors, and participants. A successful transition transcends mere technological and economic considerations, as it is also contingent upon political will, institutional capacities, and societal endorsement. Future inquiries should delve deeper into the interrelationships among diverse policy instruments and the social and distributional ramifications of the green economy transition, to ensure a more effective and equitable progression toward a sustainable future.

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