EFFECTS OF THE EUROPE 2020 STRATEGY ON THE CURRENT EUROPEAN CONTEXT

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Abstract

The European Union has faced a number of structural deficiencies in recent decades, as global challenges have intensified. The European Union must face some challenges that are exacerbated by the current global crisis, but also the global economic interconnection, the adaptation of the global financial system, climate challenges and resource depletion. The challenges are major and have a number of short-term implications - exiting the health crisis, as well as long-term ones. On the other hand, EU member states have to deal with globalization, resource pressures and an aging population. In this article, we set out, based on the objectives proposed in the EU's 2020 Strategy, to analyze the binomial of eco industries - reducing harmful emissions. The binomial eco industries - reduction of harmful emissions was used in a mathematical model, the main source of statistical information being Eurostat, the data being subsequently processed in the Eviews program. All this research in the article aims to quantify the relationship of influence between the evolution of investments in eco-industries and that of greenhouse gas emissions at European level, starting from the arrangements made by the European Union in recent decades, in the context of amplifying the phenomenon of climate change.

Key words: Gross Domestic Product; growth favorable to economic inclusion; sustainable development; greenhouse gas emissions; European eco-industry.

1. Introduction:

The European Union has launched a new strategy in the light of current realities as a result of the world economic challenge that it has faced in the last decades of the 20th century. Across the Union, it is promoted as a strategy "for a smart, eco-friendly growth, favorable to social inclusion".

The current health crisis has revealed a series of structural deficiencies within the Union, given that the global challenges become fiercer, and it is truly necessary to approach a strategy on the harmonious sustainable economic development of the European Union members states.

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The Europe 2020 Strategy relies on two pillars: a thematic approach structured on objectives and priorities, and the draw up of regular Country reports through which the Commission could constantly assess the situation in each member state. At the same time, each member state will receive specific recommendations; in case of an incompliant reply to these recommendations, political warnings may be issued at country level.

The Europe 2020 Strategy focuses on three priorities:

- smart growth – the development of an economy based on knowledge and innovation;

- sustainable growth – the promotion of an economy which is more efficient in respect of resource use, eco-friendlier and more competitive (economic growth under the conditions of low carbon dioxide emission, the limited use of non-sustainable resources and the loss of biodiversity);

- growth favorable to inclusion – the promotion of an economy with a high rate of labor force occupancy, capable of ensuring economic, social and territorial cohesion.

The *five objectives* of the Europe 2020 Strategy are as follows:

- the rate of labor force occupancy within the population in the 20- and 64-year range should grow from the level set in 2010, namely 69%, to at least 75%, including through more involvement of women, aged workers and better integration of migrants on the labor market;

- the European Union is currently following the target of investing 3% of the GDP in research and development (RD). The Commission proposed to maintain the 3% target together with the development of an indicator which would reflect R&D intensity and innovation;

- the reduction of greenhouse effect emissions by at least 20% as compared to the 1990 levels, or by 30 %, if there are favorable conditions to this end; the increase to 20 % of the importance of renewable energy sources in the end power consumption and a 20% increase of power efficiency;

- an objective related to studies which approach the issue of early school drop-out, with the aim of diminishing the drop-out rate from the current 15% to 10% and increasing the percentage of persons aged 30-34 attending higher education forms from 31% to at least 40% in 2020;

- the number of European citizens with a living standard lower than the domestic poverty threshold must be diminished by 25%, which would mean that over 20 million persons should rise over the poverty status.

All these objectives are interconnected. For instance, investments in more eco-friendly technologies, with low carbon emissions, will protect the environment, will contribute to

fighting climate changes and will generate new business opportunities and new jobs by reducing unemployment rate across various sectors of activity.

2. European Union Eco-Industry

During the last decades of the 20th century, environmental issues have continued to grow worldwide. This was due to the excessive use of natural resources, air and water pollution, industrial waste; all these have contributed to the increase of the global demand for eco-industries and the services they entail.

Eco-industries are "those productive economic sectors which generate products or services meant to allow the measurement, prevention, limitation or correction of changes occurring in the environmental climate and which are detrimental to it. They include technologies, products and services which diminish the environmental risk and minimize pollution" (OECD and EUROSTAT 1999).

This definition comprises the production of those equipment, activities and services provided in connection with pollution and resource management. The focus is on fields such as wastewater treatment, air pollution control, waste management, monitoring instruments, water utilities, reusable resources. They must not be mistaken for those eco labels, "green" products or productive processes which are more visibly nonpolluting.

In the last decades, eco-industry has proven to be one of the most dynamic sectors of European economy. In fact, starting with 1993, the envisaged industrial subsectors have been deemed main sources of competitive edge. The most competitive companies in the eco-industry field are to be found in countries such as France, Germany, Great Britain and the Netherlands.

A well-thought environmental policy could provide opportunities for innovation, creates new markets and increases competitivity through a more efficient use of resources, but also generates new investment opportunities. One such example of competitive edge at global level can be noted especially in the field of wind power.

For society as a whole, these are highly beneficial, as they result in the reduction of financial and personal expenses; such actions can also diminish healthcare costs, particularly since 1/6 of all diseases affecting European children can be attributed to environmental factors.

The efficiency of eco-innovations is a first example of how environment protection and competitivity development can go hand in hand.

3. Methodology of the Eco-Industry Research – Harmful Emission Reduction Binomial

The results of the research relying on the scenario of the *eco-industries – harmful emission reduction binomial* are mainly targeted at emphasizing the role played by the increasing volume of investments in eco-industries across the European Union on the evolution of greenhouse gas emissions in the European Union and implicitly on the phenomenon of climate changes, thus estimating the fulfillment of commitments made within the Europe 2020 Strategy (the 20% reduction of greenhouse gas emissions).

The general objective of the research is the analysis of the eco-industries - harmful emission reduction binomial starting from the need to increase investments in eco-industries in the context of new challenges triggered by climate changes.

An essential role in this context is played by the evolution of greenhouse gas emissions in the European Union, as a main element of the climate change phenomenon.

In order to reach this goal, in this paper we envisage several objectives:

- the analysis of the European GDP evolution as current prices;

- the analysis of the evolution of greenhouse gas emissions in the European Union;

- the analysis of the future evolution of the volume of investments in European eco-industries – we believe this to be a key factor in approaching environmental issues;

- drafting an analysis scenario on eco-industry efficiency – harmful emission reduction binomial from the perspective of the Europe 2020 Strategy;

- proposing and analyzing an indicator for the reduction of greenhouse gas emissions following the investment effort;

- proposing an indicator able to measure the degree of efficiency of eco-industry investments in terms of environmental issues – this being a pillar of the objective related to harmful emission reduction.

The research methodology contains an analysis of data from published studies, mainly the EUROSTAT web page of the European Commission, with individual investigation of all analyzed indicators at the level of European Union member states.

In order to analyze the eco-industries – harmful emission reduction binomial in our research, we have considered four scenarios (GDP in current prices, greenhouse gas emissions, volume of investments in European eco-industry and emission reduction following the investment effort), each scenario relying on a series of hypotheses.

First, we used an indicator which measures the eco-industry efficiency in terms of greenhouse gas emission reduction.

In our opinion, the most representative factors which must be and have been analyzed are as follows:

- *Gross Domestic Product (GDP) in current prices* - which reflects the value of all produced goods and services, minus the value of goods and services used as interim consumption within the production process.

- *greenhouse gas emissions* – with the paramount objective of decarbonization of the European economy.

- *volume of investments in European eco-industry* – which quantifies the evolution of investments made at European level in various control or pollution curbing equipment.

- *emission reduction following the performed investment effort* - which measures the efficiency of investments in eco-technologies at European level and the extent to which they trigger a reduction of harmful emissions, simultaneously generating an increase in the quality of citizens' living standard. This indicator is expressed in tCO2 / mil. euro.

All four indicators will be analyzed at the level of UE27 and based on these factors we will create another one starting from the vectors.

Ieei = a1 * X1 + a2 * X2 + a3 *X3 + a4 * X4, where:

X1 – GDP per capita expressed as current prices

X2 – greenhouse gas emissions

X3 – volume of investments in European eco-industry

X4 – emission reduction following the investment effort

a1, a2, a3, a4 = weight of factors x1, x2, x3, x4 in the efficiency eco-industry indicator

The Ieei indicator may take values in the [-1, 1] range, where:

-1 represents the economy with the lowest eco-efficiency degree

1 represents the highest eco-efficiency degree

In order to determine the weight of the four factors in the indicator for the measurement of eco-industry efficiency, we will consider the four coefficients (a1, a2, a3, a4) as the product of two components: bi *ci, where i takes values between 1 and 4.

- bi represents the importance coefficient assigned to factor xi within Iee and will be positive/negative depending on the influence of xi on Iee.

- ci represents the weight coefficient of factor xi on Iee

$c_i = 1 / (Xi\ max – X\ i\ min)$, where:

Xi max – maximum value that Xi may take in the analyzed range;

Xi min – minimum values that xi may take in the analyzed range.

First, we will consider the values of coefficient bi, so that the sum of coefficients of factors with a positive influence can be equal to 1, and the sum of factors with a negative influence be equal to -1.

b1 = + 0,7 – consider that the indicator GDP/capita in current prices reflects the economic growth as a whole and has a major influence on the identification of the aggregated indicator of eco-industry eco-efficiency;

b2 = - 0,7 – since greenhouse gas emissions have a major impact on climate warming, they are also a factor of high negative influence within this system of indicators;

b3 = - 0,3 – since the evolution of the volume of investments in the European eco-industry is mainly an expense, it is thus also a factor of negative influence.

b4 = + 0,3 – since the greenhouse gas emission reduction, following the investment effort, is a determining goal of the European Union, it has a positive influence.

All analyzed factors X1, X2, X3, X4 have positive values, and so we will consider their minimum value as 0.

In order to estimate their maximum value, we will consider the Eurostat statistical database. Based on it we will estimate in table 1 below the maximum values of the four factors for the time interval between 2010 and 2020, in order to calculate the values c1, c2, c3, c4 and implicitly the values a1, a2, a3, a4.

Table 1. Maximum values of the four factors

	min Xi	max Xi	Ci	bi	ai*
X1	0	17000000	5.88235E -0.8	0.7	4.12 E – 08
X2	0	5000000	0.0000002	-0.7	-1.4 E -07
X3	0	20000	0.00005	-0.3	- 1.5 E -05
X4	0	600	0.001666667	0.3	0.0005

Source: Authors' estimate based on Eurostat data (*ai = bi*ci), where i takes values from 1 to 4

Based on hypothetical reference scenarios, we will analyze the evolution of Ieei indicator on the efficiency of the European eco-industry related to the greenhouse gas emission reduction.

3.1. Reference Scenario – Evolution of the European GDP in Current Prices

In order to research the eco-industries – harmful emission reduction binomial we will focus on two scenarios which we deem referential in our paper: *the evolution of European GDP expressed in current prices* and the *volume of investments in the European eco-industry*, considering the above-mentioned established objective.

In this scenario, we analyzed the Eurostat statistical data on the evolution of European GDP in current prices, for the 27-UE, the main target being the analysis of the Ieei indicator evolution for an 11-year time horizon (2010-2021).

First, we will apply the method of smaller squares, determining the parameters of the trend line of GDP in current prices.

The equation of a line is generally written as $Y = \alpha + \beta X$; in our case, we can write the equation of the GDP trend line as:

$GDPt = \alpha + \beta X$, where:

GDPt – is the GDP value at time t

β – is the curve of the GDP trend line

α – is the projection of the GDP trend line at moment t=0

values α = -7.30E +0.8 and β= 369408.8 are provided in the Eviews output in table 2 below.

The deviation of the square average in table 2 has the value of 378262,7, which is considerably lower compared to the average value of the European GDP in current prices, namely 10892844.

Depending on the student test, we will consider the following hypotheses:

H_0: $\beta = 0$

H_1: $\beta \neq 0$

If H_0 null hypothesis is true, there is no connection between the value of European GDP in current prices and the year.

Calculated t = 8.870348

The critical region is calculated $t < -t_{\alpha/2,\, n-2} = -t_{0,05\ /2,13-2} = -t_{0,02510} = -2.633766915$ or calculated $t > -t_{\alpha/2,\, n-2} = t_{0.05/2,12-2} = t_{0,02510} = 2.633766915$

In the equations above, α represents the relevance threshold (we choose it to be 0.05), while n is the number of observations (12 in our case).

In order to determine $t_{\alpha/2,\, n-2}$, we used the value of the calculated t statistical test = 8.870348 with a p- value of 0.0000 (probability); the result is that there is an obvious linear relation (since the probability is lower than 5%, we reject the null hypothesis, which means that the year has a significant influence on the European GDP in current prices).

In order to test α, there is:

H_0: $\alpha = 0$

H_1: $\alpha \neq 0$

Calculated t = -8.739852

Critical region is calculated $t < -t_{\alpha/2,\, n-2} = -t_{0,05\ /2,13-2} = -t_{0,02510} = -2.633766915$ or calculated $t > -t_{\alpha/2,\, n-2} = t_{0.05/2,12-2} = t_{0,02510} = 2.633766915$

Since the value of the t-statistical test is calculated t = -8.739852 with a p – value of 0.0000 (probability), we reject the null hypothesis according to which $\alpha = 0$, at a 5% relevance threshold. As we have the values of α and β we can estimate the values of the factor European GDP in current prices.

Table 2. Checking the estimated parameters for the factor European GDP per capita in Eviews

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.30E +08	83478203	-8.739852	0.0000
X	369408.8	41645.36	8.870348	0.0000
R-squared	0.907710	Mean dependent var		10892844
Adjusted R-squared	0.896174	S.D. dependent var		1173923
S.E. of regression	378262.7	Akaike info criterion		28.70142
Sum squared resid	1.14E+12	Schwarz criterion		28.76194
Log likelihood	-141.5071	F-statistic		78.68307
Durbin-Watson stat	1.287446	Prob(F-statistic)		0.000021

Source: Authors' processing from the Eviews econometric program

All these scenarios were created considering the objectives mentioned at the beginning of our research, the main goal being to emphasize and compare European trends.

In respect of the objective of greenhouse gas emission reduction, a key role will be played by eco-industry, through the promotion of those "technologies, products and services that will reduce the environmental risk and will minimize pollution" (OECD, EUROSTAT,1999, p9).

Fossil fuel use will continue to have a major relevance in power consumption at European level, and investments in eco-technologies are relatively costly. In the future, eco-industry will continue to be the main source of competitive edge in economy, providing Europe with the role of leader in the field.

If the European Union manages to fully reach the objectives set in the 2020 Strategy with respect to energy and climate changes, this will positively increase the quality of life for European citizens and the entire ecosystem; in the near future, the European Union certainly will take the role of world leader in this sector.

3.2. Reference Scenario – Volume of Investments in the European Eco-Industry

We determine the verification of parameters using the same pattern as for GDP, the new values being $\alpha =$ -736708 and $\beta = 373.1985$.

In what follows we will analyze, using the Eviews program, the reliability of the newly estimated parameters.

Table 3. Verification of estimated parameters for the factor volume of investments in the European eco-industry

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-736708.0	267380.3	-2.755282	0.0187
X	373.1985	133.6899	2.791523	0.0175
R-squared	0.414663	Mean dependent var		9689.029
Adjusted R-squared	0.361451	S.D. dependent var		2257.029
S.E. of regression	1803.575	Akaike info criterion		17.97357
Sum squared resid	35781729	Schwarz criterion		18.06048
Log likelihood	-114.8282	F-statistic		7.792602
Durbin-Watson stat	0.675946	Prob(F-statistic)		0.017539

Source*: Calculated by the authors with the Eviews econometric program*

First, we notice that the deviation of the square average is 1803.575, which is considerably lower compared to the average value of resource productivity, namely 9689.029.

We will continue by calculating the t- student test, considering the following hypotheses:

H_0: $\beta = 0$

H_1: $\beta \neq 0$

If the H_0 null hypothesis is true, there is no linear connection between the value of resource productivity and the year.

There is $t_{calculat} = 2.791523$.

The critical region is $t_{calculat} < -t_{\frac{\alpha}{2},n-2} = -t_{\frac{0.05}{2},13-2} = -t_{0,025,11} = -2.593092681$ or $t_{calculat} > t_{\frac{\alpha}{2},n-2} = t_{\frac{0.05}{2},12-2} = t_{0,025,10} = 2.593092681$.

In the equations above, α represents the relevance threshold (we select it as 0.05), while n is the number of observations (12 in our case).

In order to determine $t_{\frac{\alpha}{2},n-2}$ we used the Excel function *tinv ()*.

As the value of the statistical test is $t_{calculat} = 2.791523$ with a p-value of 0.0175 (probability), the result is that there is an obvious linear relation (since the probability is lower than 5%, we reject the null hypothesis, which means that the year has a significant influence on resource productivity).

In order to test α , there is:

H_0: $\alpha = 0$

H_1: $\alpha \neq 0$

$t_{calculat} =$ -2.755282

The critical region is $t_{calculat} < -t_{\frac{\alpha}{2},n-2} = -t_{\frac{0.05}{2},13-2} = -t_{0,025,11} = -2.593092681$ or $t_{calculat} > t_{\frac{\alpha}{2},n-2} = t_{\frac{0.05}{2},12-2} = t_{0,025,10} = 2.593092681$

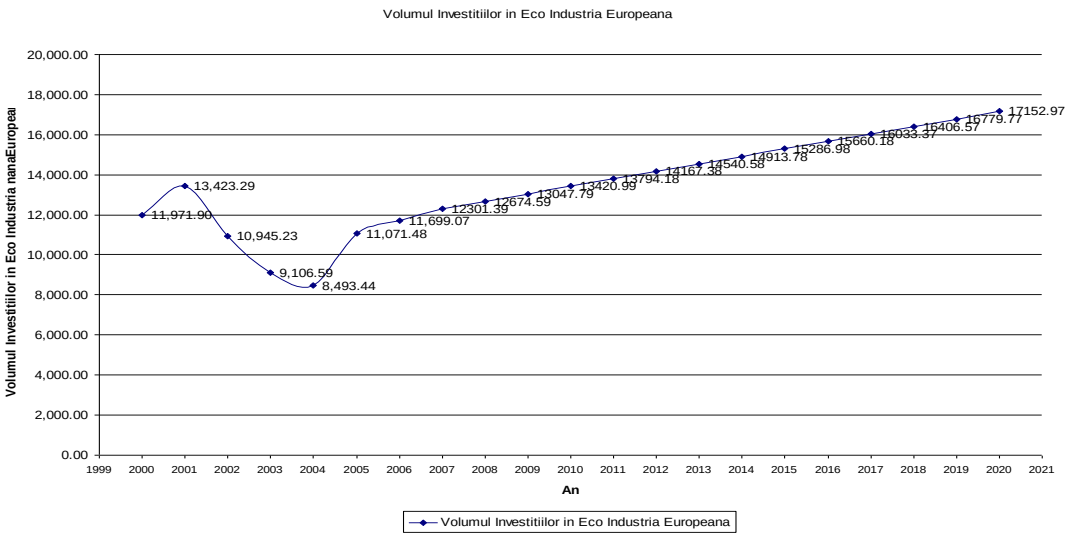
Since the value of the statistical test is $t_{calculat} = -2.755282$ with a p-value of 0.0187 (probability), we reject the null hypothesis according to which $\alpha = 0$, at a 5% relevance threshold.

As we have the values of α and β, we can estimate the values of the factor volume of investments in eco-industries for the entire period (2000-2021) considered in this scenario, according to Figure 1 below.

Investments in nonpolluting technologies have a crucial role in fighting climate changes and can ensure, together with power efficiency, winning solutions for all the parties involved, allowing economic growth and supporting the fight against climate changes.

Figure 1 indicates that the volume of investments in eco-industries registers a slightly upward trend during the period (2000-2021), which is explained by frontloading through the growth rate of community GDP, the growth rate of domestic resource consumption across EU-27, but also through the sustained trend to implement the measures approved by the Sustainable Development Strategy. During this entire period, the European Union has encouraged investments by granting subsidies and fiscal aids to small companies in member states.

Fig.1. Volume of Investments in European Eco-industry (2000 - 2021)



Source: Authors' processing based on Eurostat data

Due to the fact that the 27 European economies are strongly interconnected, and the environmental issues have, by their very nature, a transborder character, the new environmental challenges can be solved through a strategic research agenda, the creation of new European partnerships in the field of innovation for the continual development of eco-technologies necessary to maintain the position of world leader.

Investments in nonpolluting technologies have a crucial role in fighting climate changes, and they can ensure, together with power efficiency, winning solutions for all the parties involved, allowing economic growth and the fight against climate changes to unfold at the same pace.

Worldwide, we have to mention that the European Union is a leader in certain sectors of the environmental agenda through ambitious projects such as, in the area of climate change fight, the promotion of nonpolluting technologies, the protection of biodiversity, the increase of power efficiency and the allocation of important funds through Structural and Cohesion Funds.

4. Advantages of Cost Internalization in Economy in the Environmental Field

In order to internalize environmental costs in economy, there is increasing concern to identify economic indicators that would rigorously reflect such costs. One such example is the conventional GDP, which has a number of drawbacks, it does not always reflect the path to obtaining sustainability or actual productivity, and econometric modelling can lead to "misleading economic implications". Therefore, in order to obtain a GDP increase that would reflect wealth and a stable income, green GDP needs to be used with an adjusted calculation.

Green GDP = GDP - Da – Dn - R – A, where:

Da – depreciation of anthropic capital

Dn – depreciation of natural capital

R – consolidation expenses

avoidance expenses

Green GDP or green PIN / domestic eco-internal product is a modified macroeconomic aggregate, which is conventional GDP minus all the forms of capital depreciation (human, natural or anthropic capital). S.C. Kolm came up with the notion of environment function, using the following formula: E = E (Y, B), where Y is the net internal product, B is the protection budget and E represents the environment quality index. According to Kolm, pollution increases with the economic activity (Y), as protection expenses maintain the environment, having a decreasing trend (B).

A highly significant issue is whether the activity of pollution and environment damage prevention, of restoring environment quality, is solely consuming net domestic product or whether it also generates value, net domestic product.

The activity of environment protection influences positively the increase of domestic income, acting favorably on the physical and mental health of society members and contributing to the increase of labor productivity.

The increase of social labor productivity contributes to the maintenance of the labor quality at a high standard, since it eliminates or reduces sickness periods, which, under pollution or natural environment damage conditions, become frequent and chronic.

A non-polluted environment influences in a positive manner people's health, not to mention the reduction of cases of early retirement due to health issues. Thus, it provides the citizen with the opportunity to carry out a useful activity for a longer period, and people's life in itself becomes more enjoyable and satisfying.

Natural environment protection and maintenance of the high quality thereof also ensure resource protection, since, on the one hand, these actions protect the natural environment necessary for human existence and production, and, on the other hand, they lead to resource economies by removing waste, using resources in a more complex manner through the recycling of waste which otherwise would have been detrimental to the environment. Many times, environment protection activities increase the quality thereof.

It is well-known that environment damage prevention is always less costly than the action of fixing damage which, most of the time, is irreversible.

5. Conclusions

The European Union specifies that although the objectives of Europe 2020 Strategy are representative, they are not exhaustive, being a general idea of the Commission's vision on the situation generated in 2020 by Covid 19, and it is not an approach for all member states.

Each member state is different, but despite disparities among development levels and living standards, the Commission considers that the proposed objectives are generally relevant for all member states.

In order to reach the objectives related to climate changes, it is imperative to diminish carbon dioxide emissions much faster in the decade to follow than in the previous one and to fully use the potential of new technologies such as opportunities to capture and store carbon dioxide.

A more efficient use would have a greater contribution to emission reduction, to making large scale economies and the stimulation of economic growth. To this end all economic sectors are envisaged, not only those generating a high emission level.

Likewise, it is necessary to consolidate the ability of domestic economies to resist the risks of climate changes, as well as the ability to prevent disasters and respond to them.

For the next decades, investments in eco-technologies will continue to grow as a result of subsidies and fiscal stimuli, remaining a main source of competitive edge on the European market, the result being the significant reduction of emissions provided the member states comply with the undertaken commitments.

The European Union's commitment to reduce greenhouse gas emissions is often deemed a cost in respect of economic competitivity, but it can also be seen as an opportunity.

Major investments in green technologies can provide the advantage of "first comer" on global markets for those companies that will first develop environmentally friendly products or services.

The European Union is already world leader in certain areas of the "green economy" such as wind turbine technologies, waste recycling or water treatment systems.

Emphasis must be placed on power efficiency and the rational use of resources, the development and use of new services and technologies with low carbon consumption, the promotion of global prices on carbon emission, so that markets are stimulated to invest in clean technologies.

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