

Transition towards a green economy for sustainable development - The German experience –

Transition vers une économie verte pour un développement durable - L'expérience allemande –

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Abstract

The progress and prosperity of countries is measured by the levels of economic growth achieved by these countries. Over time, however, this growth is found to be unreal. Alongside the increase in growth, the damage to the ecosystem has been increased, resulting in increased levels of pollution that contributed to global warming. The problem is that the world is beginning to worry about the consequences of climate change resulting in high temperatures, desertification, drought and the impact on the biodiversity of organisms, which has negatively impacted the poor groups that depend on providing access to natural capital such as agriculture and fishing for sustainable development.

The aim of this study is to know the role of the green economy in achieving sustainable development, which many international experiences have achieved, in light of the objectives set by the United Nations Environment Program to increase economic growth, create more job opportunities, reduce the problem of poverty, unemployment and depletion. Natural resources and ecosystem.

Keywords: Green Economy; Sustainable development; Renewable Energies; Ecosystem; Germany's Experience in the Green Economy.

Résumé

Le progrès et la prospérité des pays sont mesurés par les niveaux de croissance économique atteints par ces pays. Au fil du temps, cependant, cette croissance se révèle irréaliste. Parallèlement à l'augmentation de la croissance, les dommages à l'écosystème ont été augmentés, entraînant une augmentation des niveaux de pollution qui ont contribué au réchauffement climatique. Le problème est que le monde commence à s'inquiéter des conséquences du changement climatique entraînant des températures élevées, la désertification, la sécheresse et l'impact sur la biodiversité des organismes, qui a eu un impact négatif sur les groupes pauvres qui dépendent de l'accès au capital naturel comme l'agriculture et la pêche pour le développement durable.

Le but de cette étude est de connaître le rôle de l'économie verte dans la réalisation du développement durable, ce que de nombreuses expériences internationales ont réalisé, à la lumière des objectifs fixés par le Programme des Nations Unies pour l'environnement pour augmenter la croissance économique, créer plus d'opportunités d'emploi, réduire le problème de la pauvreté, du chômage et de l'épuisement. Ressources naturelles et écosystème.

Mots-clés: économie verte ; développement durable ; énergies renouvelables ; écosystème ; expérience de l'Allemagne dans l'économie verte.

Introduction

Over the past years, the world has witnessed instability in energy and commodity markets, a shortage of global food and a scarcity of water, overshadowed by a financial and economic crisis whose effects still exist and are felt in most parts of the world. These impacts have been felt all over the world and have specific implications for achieving sustainable development and reaching the Millennium Development Goals. These economic, social and environmental risks pose serious threats to our future generations.

The transition to a green economy can help move the world to a new direction in development that guarantees sustainability and stability in the environment along with the economy, where the basic principles of the green economy revolve around giving equal weight to economic development, social justice and environmental sustainability, and the efficient use of natural assets from The order to diversify the economy, which is an essential mechanism and pillar of the green economy, provides immunity to the vagaries of the global economy.

Based on the foregoing, the problem of this study crystallizes in the following question:

How does the green economy contribute to achieving sustainable development with reference to the German experience?

These countries have made tremendous strides in local and economic development and have managed to establish advanced infrastructure to advance their economies. Therefore, this topic will be addressed through two axes; the first axis addresses generalities on the green economy, and the second axis deals with Germany's experience in the field of converting to a green economy and achieving sustainable development.

Summary of work

- (UNEP: Learning Unit, 2011), **advances an inclusive green economy: Rationale and context**, this unit lays the conceptual groundwork for the Green economy approach.

- (C.Conti, et al., 2018), **Transition towards a green economy in Europe: Innovation and knowledge integration in the renewable energy sector**, This paper investigates the fragmentation of the EU innovation system in the field of renewable energy sources (RES) by estimating the intensity and direction of knowledge spillovers over the years 1985–2010.

1. Generalities about the green economy

Green economy is a new model of rapidly growing economic development, which is mainly based on knowledge of environmental economics and which aims to address the mutual relationship between human economies and the natural ecosystem, and the adverse impact of human activities on climate change and global warming, and contains green energy which is generated on the basis of renewable energy, instead of fossil fuels, the conservation of energy sources and their uses as effective energy sources, as well as the importance of a green economy model that lies in creating what is known as green job opportunities, and ensuring sustainable growth. Sustainable real operational, prevention of environmental pollution, global warming and the depletion of resources and environmental decline.

1.1. Definition of a green economy

The concept of green economy has appeared on the scene during the past few years, and the idea of green economy was discussed in the context of sustainable development and poverty reduction, where the United Nations Environment Program (UNEP) defined the green economy as "that which arises with the improvement of human existence and social justice, by reducing environmental risks, but its simple definition is that it is an economy in which there is a small percentage of carbon and resources are used efficiently. Also, growth in income and employment comes through public and private investments that reduce carbon emissions and pollution, while strengthening resource and energy efficiency and preventing biodiversity loss and this can only be achieved through reforming policies and legislations.

A green economy is one that (UNEP: Learning Unit, 2011):

- Results in improved human well-being and social equity.
- While significantly reducing environmental risks and ecological scarcity.

UNEP has developed a pragmatic definition as an economy that improves human well-being and social equity, while at the same time taking significant care to reduce environmental risks and ecological shortages, or is a system of economic activities related to the production, distribution and consumption of goods and services that in the long run leads to human well-being improves, while not exposing future generations to environmental risks or situations of great ecological scarcity. On the other hand, it is an economy in which growth in income and employment is channeled through investments in the public and private sectors that will lead to greater resource efficiency, lower carbon emissions, waste and pollution, and prevent loss of biodiversity and ecosystem degradation.

The concept of a green economy does not replace the concept of sustainable development, but rather it is the result of a growing conviction that achieving the required sustainable development will only be achieved through the promotion of the idea of a green economy after decades of environmental destruction by brown economy (this term reflects the green economy based on polluting development of the environment) and, we will not be able to achieve the Millennium Development Goals without achieving sustainability, which in turn depends on the idea of a green economy.

1.2. The transition to a green economy and its requirements

1.2.1. Transition to a green economy

The transition to green development is not an immediate event that can be made with a single decision and taken at a high level, but rather a long and arduous process, directed by a political view from the top to the base and mass participation from the bottom up, this approach gives a shift in the political and social legitimacy required to ensure the mobilization of efforts on a large scale To make this transformation a reality (Conti, 2018).

A comprehensive transformation into a green economy would achieve a higher per capita income compared to that in the current economic models while reducing the environmental footprint by almost 5% in 2050, compared to the usual business approach.

Thinking of the transition to a green economy came from disappointment from the current global economic system and the many simultaneous crises (market collapses, financial and economic crises, high food prices, high unemployment, climate fluctuations, rapid decline in natural resources and accelerated environmental change, growing scarcity of land Produced).

1.2.2. The requirements for the transition to a green economy

These challenges can be summarized in the following points (Spelman, 2011):

- Review and redesign government policies to stimulate shifts in production, consumption and investment patterns
- Paying attention to rural development in order to reduce rural poverty while increasing resources.
- Paying attention to the water sector, controlling its use and rationalization, and preventing its pollution.
- Work on sustainable energy investments and energy efficiency measures.
- Develop low carbon strategies for industrial development and adopt the most efficient production technologies in new factories.
- Supporting the mass transportation sector.

- Adoption of land classification and mixed development systems for use and adoption of environmental standards in construction.
- Addressing the problem of municipal solid waste and investing it in a way that is beneficial and environmentally friendly.

1.3. Challenges of the transition to a green economy

These challenges are (Ocampo, 2012):

- Lack of tight planning in the field of development policies.
- The spread of unemployment among many segments, particularly the youth, and the shift of jobs from one sector to another: an increase in jobs in certain sectors, offset by a decrease in the number of jobs in other sectors, especially in the transitional period
- Possibility of green protectionism and additional technical barriers to trade.
- Poverty still affects more than seventy million people, especially in the Arab world (including the absence of more than forty-five million Arabs to minimum health services, to clean water, a lack of efficient use of fresh water, energy sources, and investment in the Green Economy organization, its technologies and management.
- A costly option that may not result in an automatic and equal win at the economic and environmental levels, and this may be at the expense of achieving other development goals.
- The high cost of environmental degradation, especially in the Arab countries, which reaches ninety-five billion dollars annually, equivalent to five percent of the total GDP for the year 2010.

1.4. The benefits of the transition to a green economy

The green economy invests in natural capital, including agriculture, fresh water, fisheries and forestry industry, and with the passage of time that results in improving soil quality and quality and increasing returns from major crops, and increased efficiency in agriculture, industry and municipalities works from demand for water, which reduces pressure on groundwater The surface is both short and long term (Ocampo, 2012).

Green economy contributes to poverty alleviation through the prudent management of natural resources and ecosystems to flow benefits from natural capital and deliver it directly to the poor, in addition to providing and increasing new jobs, especially in the sectors of agriculture, plants, energy and transportation.

The green economy involves separating the use of resources and environmental impacts from economic growth. It is characterized by a significant increase in investments in the green sectors, supported by its empowerment reforms at the policy level. These public and private

investments provide the mechanism needed to redefine business, infrastructure and institutions, and allow for sustainable consumption and production. This redrawing will lead to an increased share of the green sectors of the economy, an increase in the number of green and decent jobs, a decrease in energy and material quantities in production processes, a reduction in waste and pollution, and a significant reduction in greenhouse gas emissions.

1.5. The importance of the green economy and its environmental benefits

1.5.1. The importance of a green economy

In the context of achieving sustainable development, the green economy is of great importance in facing serious environmental challenges, accelerating economic growth, achieving social equality and reducing poverty. This importance can be summarized in the following elements (Ocampo, 2012):

- ❖ **Facing environmental challenges:** by reducing pollution and greenhouse gas emissions, improving the management and efficiency of resource use, reducing the volume and better management of waste, protecting biodiversity, and stopping forest depletion and fisheries.
- ❖ **Stimulating economic growth:** Expect green investments to accelerate global economic growth, especially in the long run.

1.5.2. Environmental benefits to the green economy

The transition to a green economy could lead to a significant reduction in greenhouse gas emissions. In the investment scenario, in which 2% of GDP is invested in major sectors of the green economy, more than half of the amount of that investment is allocated to increase energy efficiency and expand production and use of renewable energy resources, including the second generation of the vital delegation. The result is a 36% reduction in energy intensity globally, measured by millions of tons of oil equivalent per unit of GDP by 2030. In the investment scenario, energy-related carbon dioxide emissions would reduce 30.6 Gt in 2010 to 20 Gt in 2050 and therefore investing in a low economy carbon emissions has great potential to meet the challenges posed by climate change, although it is necessary to make additional investments and take measures in the framework of public policies to reduce Of concentrations of dioxide Hand carbon in the atmosphere to 450 ppm or less.

An additional environmental benefit to the green economy is what I can benefit sustainably: ecosystem services. Research conducted for the report of the United Nations Environment Program on the green economy on how to make significant progress towards this goal through initiatives to manage demand for services from ecosystems, to be complemented by

investments to enhance the supply and supply of those services from the range Medium to long term. A better and more sustainable approach to managing the world's forests can lead to an increase in land, which contributes to increased soil fertility, water availability and carbon emissions storage services. Moreover, improving the efficiency of water use can significantly reduce water consumption, and improving water supply management and access to water can help conserve groundwater and surface water. Economic modeling studies conducted for the report show that investment in managing and increasing supplies and improving access to water would support both groundwater and surface water conservation. Also, sustainable agriculture can lead to higher yields, improved soil fertility, reduced deforestation and the use of fresh water.

1.6. The reality of the green economy now

The global green economy has become a reality but world governments must do more to ensure its success, the head of the United Nations agency responsible for poverty reduction and environmental sustainability declared today (UN News, 2011).

The new global system has laid down basic plans for introducing the concept of green economy and green development into its rules, so environmental standards have become one of the most important conditions that must be met in the commodity in order to enter the global markets, and the use of green technology terms, green buildings, organic agriculture and others has increased. Some countries have exerted great pressure in this direction, including placing restrictions on the entry of some environmentally unsuitable goods such as: goods polluting the environment, or goods whose production is based on the overexploitation of resources, or affecting the environmental balance, such as (the trade of animal skins exposed to extinction), or even healthily harmful food products (such as agricultural products used in the production of certain chemical fertilizers or genetically modified ones), therefore factories and farms have started marking their products indicating that they were produced in an environmentally safe manner or have codes of international certification for products that take into account environmental aspects (ISO 14000 environmental certificate for example). Green stores are designed to provide all green products to consumers, and they have become popular with consumers. Support has been increased for projects that take into account the environmental aspects. Accordingly, green banks emerged that encourage and finance environmental projects (ICC, 2012).

2. The German experience in the field of transition to a green economy

Although most of the concerns presented about climate change, the increasing extinction of living organisms and desertification have been achieved, and after most of these fears have become a reality, achieving sustainable development under these conditions will only come if the environmental and social dimensions are put on an equal footing with the economic dimension. In other words, the sustainability of forests, fresh water and soil are also given equal importance in development and economic planning processes (Meek, 2007).

2.1. Germany's transition to a green economy and sustainable development

Germany is one of the important industrial countries in the world, which led to the emergence and complexity of problems in its environment, and to solve environmental problems Germany is trying to use renewable energy, taking advantage of the prosperity witnessed by this energy (Orth, 2008).

The German economy is living its "green miracle": trading in the sun, wind and water generates fantastic profits and achieving record export numbers, as the environment-based industry turns into a blow to the fortune of the twenty-first century, as Germany occupies the leading position in the world in this field, and sales volume is expected to reach The green sector "to one billion euros in 2030, and there are many areas in which German companies are the leaders on the global level: the largest production capacity in the world for wind-powered clusters, the latest power plant technology, the first in the world in many highly effective devices (Rehfeldt, Dr. Knud, January 2007).

Germany pays special attention to engineering sciences as it pays special attention to nature and the environment, being at the same time superior in registering patents and the most advanced in the field of reuse and separation of different types of garbage and waste. The environment sector is developing into a major sector in the German economy, and today it is the main driver in the labor market. Table (1) represents the status of business volume in 2005 and 2030 in the environmental technology sector compared to building machinery and the auto industry.

Table N°1: The volume of business in 2005 and 2030 in the sector of environmental technologies compared to building machinery and the auto industry

Unit: Billion Euro

Sector	Building Machinery	Automotive Industry	Environmental Technologies
2005	170	280	150
2030	290	570	1000

Source: Györk Meek: The Green Heroes, Germany Magazine, Volume: 03, Society Press, Frankfurt, 2007, p. 41.

The consulting company also polled about 1500 companies, all working in the field of environmental technologies, and analyzed various studies, and the joyous result of these efforts, "green technology manufactured in Germany" contribute to creating new job opportunities (Györk Meek, 2007). In 2020, there will be more workers in this sector than workers in the construction of machinery or the automotive industry. Globally, Germany is in the forefront, as shown in Table (2).

Table N°2: Germany's share of global markets in the fields of different environmental technologies (%)

Statement	Energy Generation	Energy Efficiency	Natural Resources Resource efficiency	Sustainable water economy	Sustainable transportation	Cycle economics
%	30	10	5	5	20	20

Source: Györk Meek: The Green Heroes, Germany Magazine, Volume: 03, Society Press, Frankfurt, 2007, p. 42.

2.2. Renewable energy sources in Germany

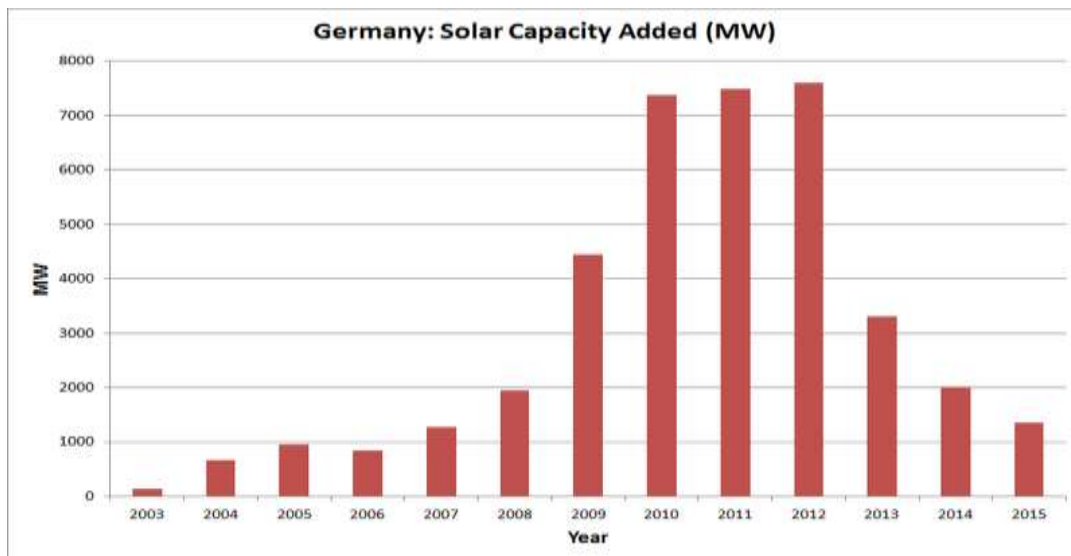
After knowing the position of German environment-based industry in the German economy and the global economy, the renewable energy sources will be covered:

2.2.1. Solar Energy:

It managed to become the largest generator of electric energy from sunlight in the world. A promising new industrial sector has emerged in Germany for the future: the solar energy technology industry, and thanks to the Renewable Energy Resources Act (EEG), this sector

has achieved phenomenal growth rates a few years ago. The volume of German solar technology has increased in a few years, from 450 million euros to nearly 4.9 billion euros. In 2006 there were 800,000 installed and ready-to-install solar collectors in Germany and in these complexes, water is heated, and heating required about 5% of inhabited German homes. And the following figure represents the capacity of solar energy in Germany:

Figure N°1: Germany Solar Capacity Added (MW)



Source: Federal Ministry for Economic Affairs and Energy, 2016 and https://en.wikipedia.org/wiki/Solar_power_in_Germany

2.2.2. Wind Energy:

In the first quarter of 2007, (Rehfeldt, Dr. Knud, January 2007), wind energy in Germany achieved a new record, as wind power generating stations with 19,000 units contributed to feeding the public grid with 15 billion kilowatt hours of electrical current. This amount is equivalent to half of what these stations generated. From TAQA during 2006, and this success is partly due to the large wind volume witnessed in January. These figures are the best evidence of the large role of wind energy in the mix of modern energy sources in Germany (Germany : Wind Power Factsheet, 2016). Germany is the largest market in the world for wind energy, as shown in Table (3).

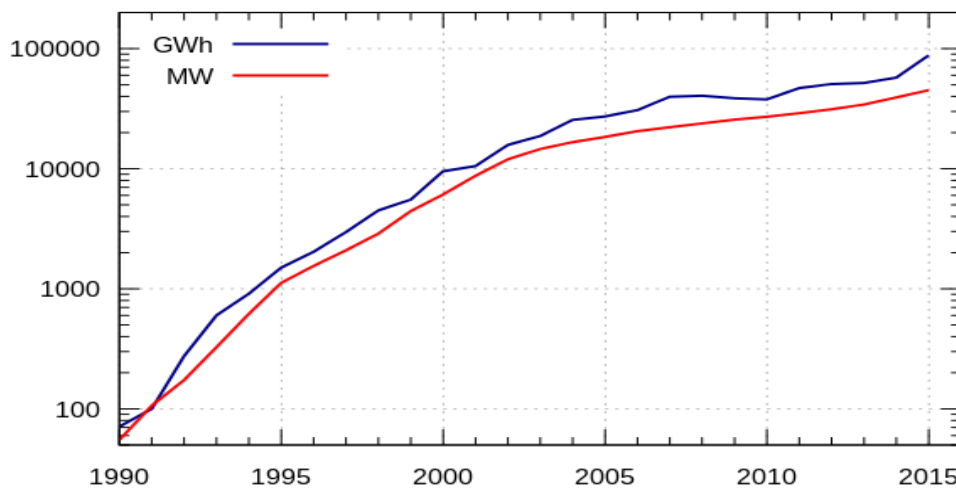
Table N°3: Germany is the world leader in wind energy in 2007

Countries	Germany	United States	Spain	India	China
Total installed power stations (MW)	22248	16818	151145	8000	6050

Source: Martin Orth: We must increase effectiveness, Germany Magazine, Volume: 02, Society Press, Frankfurt, 2008, p. 45.

Ang the following figure represents the annual wind power I Germany (Global-Wind-2015):

Figure N°2: Annual Wind Power in Germany (1990-2015)



Source: Federal Ministry for Economic Affairs and Energy (Germany), "Zeitreihen zur Entwicklung der erneuerbaren Energien in Deutschland, Stand August 2016" and https://en.wikipedia.org/wiki/Wind_power_in_Germany

2.2.3. Biomass energy:

In 2006, a quantity of electrical energy equivalent to 17 billion kilowatt hours was produced depending on the biomass, of which 10 billion relying on wood only and more than 5 billion of organic gas (biological), and about a billion of vegetable oil. The contribution of biomass to energy production Electricity from various sources is about 3%. One of the important developments in 2006 was the increased dependence on organic gas that contributed to power generation by 0.4 billion kilowatt hours, compared to the amount of 2.8 billion kilowatt hours in the previous year (Community Power Empowers. Dsc.discovery.com. 26 May 2009).

2.2.4. Ground energy:

Germany's share of ground energy in 2006 between the environmentally friendly energy sources reached only 1%, but thanks to new drilling technologies, such as those in Dornhar, experts expect high growth rates for this source of energy, also here in Germany and 360 kilometers from Dornhar has begun the Landau region, the first operating station with a geothermal energy operation, and entered the service network, and today it produces heating and electric power at the same time. According to the German Ministry of the Environment, there are now ready plans to build about 150 underground power stations (72,6 Gigawatts Worldwide, February 2007).

2.3. Facts turning Germany into a green economy

A new study has highlighted five new facts that have helped Germany transform into a green economy (German law limits renewable growth, 2014). These facts are:

2.3.1. Massive green energy success

In 2017, 36.1% of electric energy was generated in Germany, based on renewable energy sources. This means a 3.8% increase over 2016. No such increase has ever been achieved in one-year Jesper Starn, Weixin Zha (1 December 2015).

2.3.2. Wind energy is ahead of nuclear energy

Wind energy has played a pivotal role in this increase in energy production, relying on renewable energy sources. Today, it is ahead of nuclear and coal energy, for the first time.

2.3.3. Reducing dependence on traditional energy sources

By freezing several power stations, the proportion of nuclear and coal energy consumption has fallen to its lowest level since 1990.

2.3.4. More energy consumption

Considering population and economic growth, primary and electric energy consumption increased by 0.8% each.

2.3.5. Stability of emissions level

It is true that emissions of waste gases have decreased in the energy sector, but they have risen in the areas of transportation, industry and buildings. Thus, the total emissions of waste gases remained 27.6% lower than in 1990. If trends continue to drop oil prices and further growth, in 2020 Germany will be able to reduce emissions of greenhouse gases by only 30%, instead of the 40% that was declared a target.

2.4. Sustainable development, renewable energy and environmental protection in Germany

Germany, the third largest economy in the OECD, has been proactive in developing ambitious environmental policies during the last decades, both nationally and internationally. The country's strong environmental framework makes it not only a pioneer in environmental protection and sustainable development, but also constitutes a good example on how a cleaner low-carbon economy is compatible with growth (OECD, 2012).

In 2002, Germany adopted its National Strategy for Sustainable Development, making sustainability a guiding principle for national policies. The Strategy is underpinned by concrete targets and sustainability indicators, which are evaluated in regular progress reports. Germany also launched major cross-cutting initiatives on biodiversity, climate change, energy and resource efficiency (International Energy Agency, 2013).

Germany is running a race against time to protect nature, and experts in Berlin say that the German government has committed to reducing the rate of coal dioxide gases until a maximum date in 2005 by 25%, which was approved by the economic sector, as well as the German industrial sector committed to reduce coal dioxide gases by 20 While the chemical and paper industries committed by nearly 23%.

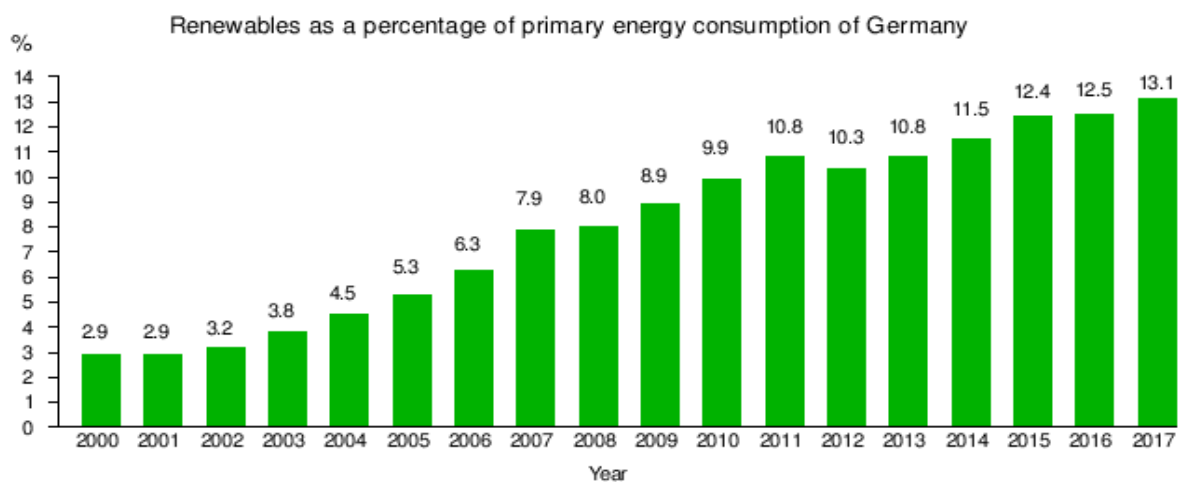
The German government is seeking to solve these problems by resorting to renewable energy, as the production of electrical energy is carried out almost half by water power stations, while the other half is produced by burning wood, garbage and clay, in addition to gas extracted from landfills and waste, and by energy Wind, solar collectors, photovoltaics and heat energy. The electric energy required for the high electricity network is also produced by large water dams, while most of the housing projects cover their energy needs through solar collectors. Whereas, when institutions and homes produce electricity from renewable energy sources in quantities that exceed their needs, whether by wind mills, water wheels or solar rays, the electricity distribution organizations are legally obligated to purchase this extra energy at a price that is not only equivalent to the proportion of providing combustion materials at energy production plants electrical.

It is estimated that it is possible in the long run to prepare half of the quantities of electricity available in German energy networks through renewable energies, i.e. solar, wind, hydro, hydro, organic, thermal, and ambient heat, and the German institutions concerned are making great efforts to achieve advanced steps in this field. As a result, the German government

expects that CO₂ will be reduced by improving energy use in addition to electricity production through renewable energy sources in order to achieve sustainable development, which is the goal that the country seeks to achieve.

The data published by the Association of Renewable Energy Producers in Germany showed that 85% of the total energy saved in Germany in 2017 was provided by sustainable energy through wind, solar, biomass and hydropower. Fifth (Energy Transition, 15 February 2017)

Figure N°3: Renewables as a percentage of primary energy consumption of Germany



Source: Federal Ministry for Economic Affairs and Energy, 2000–2017, as per August 2018 and https://en.wikipedia.org/wiki/Renewable_energy_in_Germany#:~

2.5. German experience in the energy field

« Energiewende » is the slogan Germany raised in the energy sector in 2010, which in Arabic means "the energy revolution". The German government decided to revolutionize the energy field by switching from reliance on fossil fuels as an energy source to mainly using clean renewables by the middle of the twenty-first century. This is in order to maintain a clean and sustainable environment by reducing the percentage of "Green House Gases" from their 1990 counterparts by 40% by 2020 and increasing the percentage of decline until they reach 80% in 2050.

The main challenges facing this energy revolution lie in building power plants based on renewable energy resources on a large scale, at reasonable and acceptable cost, in addition to working to rationalize and reduce energy consumption. All this without affecting the energy directed to the German industry that underpins the German economy - which is now available in reasonable quantities and at an affordable price. Despite all these challenges and difficulties

facing the German energy revolution; The Germans prepared them to face the matter and make their revolution successful through several strategies (Ringel et al., 2016):

2.5.1. The first strategy: adopted by Germany to address the energy shortage resulting from the closure of nuclear reactors; It is the expansion of building farms to generate electricity from wind energy and increasing dependence on solar energy to generate electricity. As Germany built 22 thousand turbine windmills in the north of the country near the shores of the North Sea to generate electricity and exploit high wind energy in that region. In addition to this, the German government encouraged residents of southern cities to install solar panels in their homes to convert solar energy into electricity that they can rely on. The German government also supports scientific research in the field of solar cell development research to become more efficient, effective and less expensive. Unfortunately, the matter is not so simple. Sometimes, the winds increase in the North Sea coast, causing the turbines to be closed to protect them from damage, and there is no possibility to drain the excess energy generated at the time. Also, the brightness of the sun in the south of the country is not permanent throughout the year, which may cause power outages at times.

2.5.2. The second strategy: The German government is pursuing building new infrastructure suitable for this transformation in energy production policies. And many German economic studies centers expect that the cost of developing this infrastructure will range between \$ 125 billion and \$ 250 billion spent within 8 years; This huge amount equals about 3.5 to 7% of German gross national product for 2011. For this reason, the German government increased the electricity fees by 10% as an additional tax on citizens to support renewable energy. It may seem very expensive, but on the other hand, support for renewable energy and the development of green, industrial and technological processes that are environmentally friendly have provided exports to the country of \$ 12 billion that can be increased (ICC, 2012).

2.5.3. The third strategy: To meet the challenges of the German energy revolution depends heavily on the private sector. Siemens and Germany Energy (GE) are developing new ways to store energy on a large scale. 31 power stations have been constructed to store energy by water across the country; Where the water is raised at night to the tanks in high places in these stations, then left to ventilate from these heights in the morning to manage the power of the flowing water turbines to generate electric power - as in the High Dam in Egypt. In addition, these companies are developing huge "lithium ion" batteries - as they are found in our mobile

phones - to store energy, but the main factor that prevents the use of these batteries is their high cost, which should be reduced by more than half to be practical and applicable.

2.5.4. The Fourth Strategy: The last one relies heavily on German minds and the creative solutions that it always provides to face the challenges facing its energy revolution. One of those solutions is the "virtual energy farms" created by RWE, one of the largest German energy companies. These virtual farms rely on an intelligent computer program that controls many, many small and diverse sources of energy and through coordination between them turns into a huge source of energy. This idea was applied in the city of Dortmund, where a network was established to connect 120 sources to generate a small amount of energy that varies between wind turbines, solar cells and biomass together to be controlled by a computer program. This program controls the operation and switching off small sources of energy based on information about the wind speed, sun brightness and weather conditions, so that eventually the total energy produced is constant and enough for the required needs.

Although the German government believes that these strategies are the way to achieve the goals of its revolution, there are many opponents of this idea from the ground up and their voices rise from time to time. These opponents believe that clean green energy by relying on renewable energy resources cannot compensate for the needs of German industrial society. Also, shutting down low-cost nuclear reactors and relying on expensive solar cells will further strain the German economy by affecting industrial activity; This reduces the competitiveness of German industrial companies, which will negatively affect wages and salaries. All of this has led many German companies to establish factories outside the country for fear of a future energy crisis.

Whatever it is, the world watches Germany and closely follows its revolutionary experience. If it succeeds, the success will be resounding, and Germany will follow many countries to build its own revolution. Of course, Germany will be the model to be followed and celebrated in the energy field. In the event of failure, the downfall will be loud, as the industry-based German economy will be severely affected. However, our covenant is always with the Germans that they do not fail (Ringel et al., 2016).

The policy has been embraced by the German federal government and has resulted in a huge expansion of renewables, particularly wind power. Germany's share of renewables has increased from around 5% in 1999 to 22.9% in 2012, (Jose Antonio Ocampo, 2012) reaching close to the OECD average of 18% usage of renewables. Producers have been guaranteed a

fixed feed-in tariff for 20 years, guaranteeing a fixed income. Energy co-operatives have been created, and efforts were made to decentralize control and profits. The large energy companies have a disproportionately small share of the renewables market. Nuclear power plants were closed, and the existing nine plants will close earlier than planned, in 2022.

In May 2013, the International Energy Agency commended Germany for its commitment to developing a comprehensive energy transition strategy, ambitious renewable energy goals, and plans to increase efficient energy use and supported this approach. Nevertheless, the scale of Germany's energy policy ambitions, coupled with the large size and energy intensity of its economy, and its central location in Europe's energy system, mean further policy measures must be developed if the country's ambitious energy transition is to maintain a workable balance between sustainability, affordability, and competitiveness.

Subsidies aimed at stimulating the growth of renewables have driven up consumer energy prices by 12.5% in 2013. To date, German consumers have absorbed the costs of the *Energiewende*, but the IEA says the debate over the social and economic impacts of the new approach has become more prominent as the share of renewable energy has continued to grow alongside rising electricity prices (Germany's *Energiewende* is to maintain a balance between sustainability, 24 May 2013). The transition to a low-carbon energy sector requires public acceptance, and, therefore, retail electricity prices must remain at an affordable level. Presently, German electricity prices are among the highest in Europe, despite relatively low wholesale prices. At the same time, the IEA said the new energy policy is based on long-term investment decisions, and a strong policy consensus in Germany in favor of large-scale renewable energy commercialization exists.

The *Energiewende* has been subject to a number of computer studies. Most concentrate on electricity generation and consumption as this sector is undergoing a rapid transition in terms of technologies and institutions (Germany's energy transformation *Energiewende*, 6 March 2013).

Table N°4: Key Energiewende policy targets

Target	2015	2020	2030	2040	2050
Greenhouse gas emissions (base year 1990)	-27.2%	-40%	-55%	-70%	-80% to -95%
Renewable energy share of gross final energy consumption	14.9%	18%	30%	45%	60%
Renewable energy share of gross electricity consumption	31.6%	≥35%	≥50%	≥65%	≥80%
Primary energy consumption (base year 2008)	-7.6%	-20%	Up	To	-50%
Gross electricity consumption (base year 2008)	-4.0%	-10%	Up	To	-25%
*Provisional figure for 2015					

Source: Fifth "Energy Transition" Monitoring Report: The Energy of the Future: 2015 Reporting Year – Summary. Berlin, Germany: Federal Ministry for Economic Affairs and Energy (BMWi). December 2016 and (https://en.wikipedia.org/wiki/Renewable_energy_in_Germany)

Conclusion

Environmental protection is an idea that contains a contradiction. Preserving the environment does not mean stopping economic activity or saving resources, but rather rational and efficient use of these resources. From here, sustainable development appears as a pivotal concept that achieves this equation that has eluded the world for a period, which is achieving development while preserving the environment and its resources and achieving a balance between the current and future returns.

Therefore, the issue of the environment has become a serious and important issue at the global level through international conferences held in this field in order to establish international rules to achieve sustainable development and mitigate environmental crises.

Therefore, to make the green economy and development compatible with the measures of environmental balance and ensure a sustainable environment, a fundamental change must be made, choosing clean development and the direction to renewable energies. To reduce greenhouse gases, heat confinement and achieve qualitative development.

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