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Assessing the Crop-Based Pricing of Treated Wastewater in Agriculture

Tarımda Arıtılmış Atıksuyun Ürün Bazlı Fiyatlandırılmasının Değerlendirilmesi

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ABSTRACT

Water is a vital natural asset for life that cannot be replaced by anything else. Its association with nutrients is one of its main characteristics. Water resources have been depleted due to unhealthy urbanization, population growth, an increase in greenhouse gases, and industrialization. The balance between supply and demand is deteriorating day by day, and water scarcity reveals the necessity of alternative water resources. Therefore, in addition to the proper use of clean water resources, wastewater management is also important. This study includes the management and evaluation of the wastewater of Konya's central districts. For this purpose, the neighborhoods (Karatay, Meram, Selçuklu Districts) within the impact area of Konya Wastewater Treatment Plants, where the wastewater generated in Konya Province Centre is treated, are the target group. Data obtained from farmers who live in these neighborhoods and irrigate their lands with the water from the treatment plants were used. Thus, the wastewater price was calculated based on the value of agricultural products. In the calculations, wastewater pricing was made based on barley, wheat, and sunflower products commonly grown in the region, by which the treated wastewater price was determined. Accordingly, the wastewater cost was calculated as 0.18 USD/ton for barley production, 0.28 USD/ton for wheat production, and 0.21 USD/ton for sunflower production. Pricing and determining the economic value of water will ensure the balancing of supply and demand, and the efficient use or exploitation of scarce water and natural resources. When it comes to water prices in the classical sense, calculations are generally made based on operation, maintenance, and repair costs both worldwide and in Türkiye. However, this situation leads to not only the use of water, which is a natural asset, at a high price, but also causes uncontrolled use of natural resources. Calculations based on product value will ensure that they will lead to more efficient and fair use of water.

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ÖZ

Su, başka hiçbir şeyle değiştirilemeyen yaşam için hayati öneme sahip doğal varlıktır. Besinlerle ara bağlantısı olması bu ürünün ana özelliklerinden biridir. Sağlıksız kentleşme, nüfus artışı, sera gazlarındaki artış ve sanayileşmenin etkisiyle su kaynakları azalmaktadır. Arz ve talep arasındaki denge her geçen gün bozulmakta ve su kıtlığının yaşanması alternatif su kaynaklarının gerekliliğini ortaya çıkarmaktadır. Bu nedenle temiz su kaynaklarının doğru kullanımının yanısıra atık suların yönetimi de önemlidir. Bu çalışma, Konya merkez ilçelerinin atık sularının yönetimini ve değerlendirilmesini içermektedir. Bu amaçla Konya İl Merkezinde oluşan atık suların arıtıldığı Konya Atık Su Arıtma Tesislerinin etki alanı içerisinde yer alan mahalleler (Karatay, Meram, Selçuklu İlçeleri) hedef kitledir. Bu mahallelerde yaşayan ve arıtma tesisinden çıkan su ile sulama yapan çiftçilerden elde edilen veriler kullanılmıştır. Böylece tarım ürünleri değeri üzerinden atık su fiyatı hesaplanmıştır. Hesaplamalarda; Bölgede yaygın olarak yetiştirilen arpa, buğday ve ayçiçeği ürünleri üzerinden atık su fiyatlaması yapılmış ve arıtılmış atık su bedeli belirlenmiştir. Buna göre arpa üretiminde 0,18 USD/ton, buğday üretiminde 0,28 USD/ton ve ayçiçeği üretiminde 0,21 USD/ton olarak atıksu bedeli hesaplanmıştır. Suyun fiyatlandırılması ve ekonomik değerinin belirlenmesi, arz ve talebin dengelenmesi, kıt su ile birlikte doğal kaynakların verimli kullanılması veya değerlendirilmesi sağlanacaktır. Klasik anlamda su ücreti denildiğinde, genelde dünyada ve Türkiye'de işletme, bakım - onarım maliyetleri üzerinden hesaplama yapılmaktadır. Ancak bu durum, hem doğal varlık olan suyun yüksek bedelle kullanımına yol açmakta hem de doğal kaynakların kontrolsüz kullanımına neden olmaktadır. Ürün değeri üzerinden yapılacak hesaplamalar suyun daha verimli ve adil kullanılmasına yol açacaktır.

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1. INTRODUCTION

Water is an indispensable natural product for the survival of life in the entire biosphere. The increasing pollution of clean water resources and the increasing world population have made it essential to manage water resources and even wastewater in a rational and correct way. In Türkiıye, the problem of meeting the water demand has emerged due to the ever-increasing population and decreasing water resources. If water resources in Türkiıye are evaluated according to the Falkenmark index, it is seen that Türkiıye is among the countries suffering from water shortage with an annual available water amount of 1,652 m^3 per capita in 2000, 1,544 m^3 in 2009, and 1,343 m^3 in 2021, which is the threshold value (Alagöz E., 2023).

As shown in Table 1, the available water potential per capita in Türkiıye decreased from 4,000 m^3 in 1,960 to 1,600 m^3 in 2,000. By 2030, considering population growth, it is predicted that the water potential will decrease to 1,120 m^3 per capita (Demir Y., 2021-2025).

Looking at water from this perspective, Türkiye is not a water-rich country, as has been stated on every platform. The Konya basin is a basin with the lowest annual rainfall and no large surface water resources such as the Kızılırmak, Yeşilırmak, Seyhan, Tigris and Euphrates rivers. In this basin, even if the water is treated or untreated, it is valuable enough to contribute to the agriculture of the region with proper and effective management.

In the world, 97.5% of the total amount of 1,386 million km^3 of water, including oceans, glaciers, lakes, rivers, groundwater, and water vapor in the atmosphere, is saline water in the oceans. Of the remaining 2.5%, only 0.5% is usable, while more than 90% of the so-called potable fresh water is found at the poles and underground (Survey, 2025). Groundwater is an important source of water, especially when surface water sources are unavailable due to drought or pollution. Groundwater can even be called mobilization water. Groundwater provides drinking water for at least half of the world's population and accounts for more than 40% of the water used for irrigation. In some regions, due to the scarcity of surface water and drought, this reserve water (groundwater) has unfortunately been used, and most of it has been consumed.

Table 1. Water status in Türkiye according to the Falkenmark index

Category	Amount of water available per person per year m^3	Türkiye
Water poverty	Less than 1000 m^3	1.120 m^3 /person/year (2030)
Water scarcity	Less than 2000 m^3	1.519 m^3 /person/year (2008)
Water richness	More than 8.000 - 10.000 m^3	4.000 m^3 /person/year (1960)

When water use is carefully analyzed, it is seen that the main user is the agricultural sector and agriculture is carried out with irrigation water. Moreover, water is used free of charge in this sector. However, a fair, acceptable and efficient pricing of water can not only help the world's resources to be used properly but also provide a solution to the food problem by increasing agricultural output. For this purpose, water pricing studies should be carried out in a way to protect farmer welfare as well as cropping patterns, yield, and water consumption. Water resources in the world are limited. The distribution of water in the world according to these resources is shown in Table 2. On the other hand, the amount of wastewater is not known. Therefore, wastewater is used free of charge. Due to the diminishing water resources in the world, it is considered that wastewater to be used as derivative water may also have a value and a price.

Although it is right to use wastewater free of charge, opinions have emerged that this water should also have a value. This is because water resources are gradually decreasing and cannot be replaced. Approaches that value wastewater are mostly based on treatment costs. The rationale for using wastewater in crop irrigation is primarily driven by the increasing scarcity of freshwater resources and the need for sustainable agricultural practices. Treated wastewater offers a viable alternative, providing essential nutrients and organic matter that can enhance soil fertility and crop growth (Mishra et al., 2023). In this study, the value of wastewater is calculated based on agricultural products. As is known, irrigation is one of the resources that directly affect agricultural production. Irrigation is the delivery of additional water to the plant without harming the environment and nature in cases where the water required for plant growth cannot be met by natural means (Kütahya İl Tarım ve Orman Müdürlüğü, 2015).

The growing scarcity of water resources worldwide has prompted researchers and policymakers to explore alternative water sources, including the use of treated wastewater in agriculture. Wastewater reuse not only helps mitigate water scarcity but also supports sustainable agricultural practices, particularly in arid and semi-arid regions (Qadir et al., 2010). (Bahri A., 2009; Can & Dulkadiroğlu, 2021).

Despite advancements in wastewater treatment technologies, both human health and the environment may still face significant risks, especially in the context of growing water scarcity. Wastewater often contains hazardous substances, including heavy metals, pharmaceutical residues, and pathogenic microorganisms, which can lead to serious illnesses such as hepatitis, typhoid fever, and dysentery if not properly treated. Improperly treated wastewater used for agricultural irrigation poses additional risks by contaminating food crops, which compromises food safety and threatens public health (Can & Dulkadiroğlu, 2021).

Environmental impacts are also considerable. Uncontrolled discharge of wastewater can lead to surface and groundwater contamination, eutrophication, and loss of biodiversity. High levels of salinity and chemical buildup in wastewater may deteriorate soil structure over time, while emissions of gases such as hydrogen sulfide and ammonia contribute to air pollution and offensive odors. Nonetheless, when appropriately treated, wastewater can serve as a valuable resource. It can reduce reliance on freshwater sources and provide essential nutrients to improve soil fertility. However, these benefits can only be realized through the application of advanced treatment methods such as filtration, oxidation, and disinfection, as well as through strict monitoring of water quality before use in agriculture (Can & Dulkadiroğlu, 2021; Demir Ö., 2017). (Demir Ö., 2017).

Table 2. Estimates of global water distribution (Gleick & Howe, 1995)

Water source	Water volume (km^3)	Percentage of freshwater (%)	Percentage of total water (%)
Oceans, Seas, and Gulfs	1.338.000.000	--	96.54
Glaciers, Melting Glaciers and Permanent Snow	24.064.000	68.7	1.74
Groundwater	23.400.000	--	1.69
Salt-free water	*10.530.000*	*30.1*	*0.76*
Saline water	*12.870.000*	--	*0.93*
Soil humidity	16.5	0.05	0.001
Ice under water and glaciers in permafrost	300	0.86	0.022
Lakes	176.4	--	0.013
Salt-free water	*91*	*0.26*	*0.007*
Saline water	*85.4*	--	*0.006*
Atmosphere	12.9	0.04	0.001
Swamp water	11.47	0.03	0.0008
Rivers	2.12	0.006	0.0002
Biological water	1.12	0.003	0.0001

Therefore, it is essential to implement integrated reuse and recycling strategies and conduct comprehensive assessments of treated wastewater to ensure safety and sustainability.

The use of treated wastewater for crop irrigation has gained increasing importance in the context of global water scarcity and the pursuit of sustainable agricultural practices. In response, many countries have established regulatory frameworks to govern the safe reuse of wastewater, aiming to strike a balance between environmental protection, public health, and economic viability. These regulations typically include guidelines for treatment standards and permissible uses, with a primary focus on minimizing health risks and environmental degradation (Mishra et al., 2023).

In the European Union, for example, specific directives have been introduced to promote the reuse of treated wastewater, emphasizing high-quality treatment standards to safeguard both human health and ecological systems (Santos et al., 2023). A key concern addressed in these legislative measures is the presence of pathogens and toxic elements such as heavy metals. Consequently, robust treatment protocols are mandated to ensure that wastewater meets safety thresholds before its application in agriculture (Ungureanu et al., 2020).

Environmental regulations further aim to protect soil and water resources from contamination and degradation. This includes measures to prevent the accumulation of harmful substances in the soil, which could impair fertility and productivity over time (Mishra et al., 2023). Compliance with such regulations often requires substantial investment in wastewater treatment infrastructure, which is essential not only for regulatory adherence but also for promoting the long-term feasibility of wastewater reuse in agriculture (Ungureanu et al., 2020). (Rebora, 2011).

Despite the supportive legislative environment, concerns persist regarding the potential long-term health impacts and environmental sustainability of wastewater reuse. Therefore, achieving an effective balance between maximizing resource efficiency and minimizing risks remains a critical challenge in the broader adoption of wastewater irrigation practices.

The reuse of wastewater worldwide is increasing, especially in crop production. There are many irrigation methods used to exploit amended wastewater. Regardless of the type of irrigation method, the important thing is the amount of water to be given per decare. Because giving too much water is as much of a problem as giving too little. For this reason, pricing should be based on the amount of water, not the decare. However, measuring and charging for this brings along many problems. The water to be given to crops that consume a lot of water should be covered by the income from the crops. Otherwise, this leads to irreversible waste of water. It is known that irrigation water will directly affect yield and thus income. For this purpose, a formula was developed by Direk et al. (2022) since the difference between the same two crops grown with and without irrigation is due to irrigation. In this empirical calculation, it is known that although many factors affect yield, irrigation has the greatest effect. The effect of irrigation on yield is the value of the increased inputs according to the ceteris paribus assumption used by economists, i.e., the principle of "other things being equal". The degree to which the treatment of wastewater affects plant yield is calculated based on this yield (John; & OpenStax, 2018) (Bayraktar & Erkmen, 2023; Daniel, 2005). According to this formula, a value is assigned to the wastewater, and it is recommended to be used in wastewater pricing. In this study, the wastewater value was calculated according to 3 different crops commonly grown in the region.

Economic valuation of wastewater reuse is crucial for water resource management, ensuring fair allocation and efficient use of scarce water resources (Robert A. Young, 2005) (Dinar & Mody, 2004) Several studies have explored the economic aspects of wastewater reuse, emphasizing pricing mechanisms and farmers' willingness to pay for treated wastewater (Hellegers & Leflaive, 2015; Tsur et al., 2004).

In Türkiye, rapid urbanization, population growth, and climate change have increased pressure on water resources, making sustainable water management a key priority (Can & Dulkadiroğlu, 2021; Demir Y., 2021-2025). Particularly in the Konya Basin, with its low annual rainfall and limited surface water resources, the reuse of treated wastewater has emerged as a promising alternative for agricultural irrigation (Demir, 2022).

2. MATERIALS AND METHODS

In this study, using the wastewater cost calculation method developed by Direk et al. (2022), the wastewater value was calculated based on the plants growing in the irrigation areas along the discharge route of Konya Wastewater Treatment Plants. For this purpose, the neighborhoods located in the impact area of Konya Wastewater Treatment Plants where the wastewater treatment process is carried out in Konya City Centre (Karatay, Meram, Selçuklu) were selected as the research area. It is known that the products grown in these neighborhoods are mostly grown using wastewater. In the study, data were obtained through a questionnaire. The subjects who were surveyed were selected from the producers who are close to the Wastewater Treatment Plant and located on the route of the canal through which the plant discharges. For this purpose, Acidort, Gocu, Karakaya, Ortakonak and Sakyatan neighborhoods, which are 5 neighborhoods up to the 2nd pumping station of the State Hydraulic Works after the outlet of the treatment plant, were selected. In addition to the calculation of the economic value of the treated wastewater, the effects on the producers were also examined through the products produced with wastewater by the producers living in these neighborhoods and engaged in agricultural activities. The data obtained from the questionnaire forms

prepared in this context were used as the main material of the study. The questionnaire form applied to the producers consists of 3 different sections.

a) Personal Information: Questions measuring personal information such as family structure, education, age, occupation, etc.

b) Economic information: Questions to measure the economic situation of producers such as enterprise size, cropping pattern, land use, etc.

c) Environmental Impacts: It consists of questions about whether the treatment plants create problems such as odour, noise, and traffic around the treatment plants, measuring the level of knowledge of the producers about treated wastewater and treatment sludge, which are by-products of the treatment plants, willingness to use these products, whether the treatment plant is an economic resource and their expectations from the treatment plants.

With the help of the formula given in Direk et al. (2022), in light of the primary data obtained from the neighborhoods above, the value of the water from the Wastewater Treatment Plant was calculated based on the values of the commonly grown crops in the region. At the same time, this is a pricing method requested by 77% of the enterprises in the study area. The formula shown below was used to calculate this value. The formula is empirical and was developed by researchers.

D=*Z*C*= X/Y *(A-B)

C=*A-B*

Z=*X/Y*

K=*D*F* => P=K/X

According to this formula, the value of wastewater can be calculated with given formula by Direk et al. (2022) (Table 3).

Table 3. Meaning and units of symbols Direk et al. (2022)

Symbols	Meaning	Unit
X	Amount of Wastewater Produced at the Treatment Plant	t/year
Y	Water Requirement of the Plant per Decare	t/da
A	Crop Yield in Irrigated Lands	kg/da
B	Crop Yield in Non-irrigated Lands	kg/da
F	Sales Price of the Plant	US Dollar/kg
C	Contribution of Water to Yield	kg/da
Z	Area Irrigated with Wastewater	da/year
D	Total Contribution of Wastewater Amount	kg/year
K1	Economic Value of wastewater	US Dollar/year
P1	Unit Price of wastewater	US Dolar/t

According to the farmer registration system of Karatay District Directorate of Agriculture and Forestry; there are 181 farmers in Sakyatan, 84 in Ortakonak, 113 in Acidort, 236 in Karakaya and 235 in Gocu villages. A total of 849 farmers in the research area constituted the main population. The number of samples from this main population was found by using the following formula (Yamane, 1967).

$$n = \frac{N\sigma^2}{(N\text{-}1)\ D^2+\sigma^2}$$

$$D = \left(\frac{d}{t}\right)$$

n = Sample size

N= Number of units in population

σ= Standard deviation

d = Margin of error = 0,10

t = Confidence interval = 1.65 according to 10%

In the sample made according to the number of producers residing in the research area, it was calculated that 63 questionnaires could represent the region. The distribution of the surveys to the neighborhoods was made proportionally. The surveyed neighborhoods and the number of surveys are shown in Table 4.

3. RESULTS AND DISCUSSION

3.1. Information About the Study Area

In the research area, according to the farmer registration system of Karatay District Directorate of Agriculture and Forestry, there are 849 farmers in Sakyatan, Ortakonak, Acidort and Karakaya neighborhoods. According to the evaluations made on 66 farmers sampled, it is seen that the female population is less than the male population. However, women work in the same rate as men in en-

Table 4. Number of samples by population numbers (John; & OpenStax, 2018)

Sequence No.	Neighborhoods	Main Population	Ratio	Number of Samples Calculated	Number of Surveys Conducted
1	Sakyatan	181	21.32	13.37	14
2	Ortakonak	84	9.89	6.21	7
3	Acidort	113	13.31	8.35	9
4	Karakaya	236	27.80	17.44	18
5	Gocu	235	27.68	17.36	18
Total	849	-	62.73	66	

terprises or in the workforce. When analyzed according to the neighborhoods, it is seen that the male population is higher than the female population except for the Acidort, especially the male population has the highest percentage in the Sakyatan with 64.10%. This unbalanced structure can be explained by the fact that the villages are located very close to the city and families, especially women, reside in the city center. When the occupational status and fields of work in the enterprises are analyzed, it is seen that the highest percentage is farming, the second highest is housewives, but all housewives are also engaged in agricultural activities. On the other hand, another important point is that the number of students ranks third, which means that the importance given to education in the villages is high. When the age interval of the labor force in the enterprises is examined, it is seen that the child population is more than the elderly population, while the most productive working population (36-45) has the second highest percentage. This situation is considered positive in terms of labor force resources for the future of the enterprises. When the distribution of social security in the enterprises is examined, it is seen that nearly 96% of the population is a farmer BAG-KUR and SSI. It can be said that this rate is satisfactorily high. When the enterprises in the research area are examined, it is seen that the villages with the highest number of foreign workers is Gocu, while the villages that does not employ foreign workers is Sakyatan. This shows that the Sakyatan does not need foreign labor in irrigation, shepherding, and cattle breeding. When this situation is evaluated through the data, the fact that the male population in Sakyatan is higher than that in other villages supports the understanding that there is less need for foreign labor. On the other hand, Sakyatan village is located right next to Konya city center, and temporary labor can be easily obtained. When the wages paid by the enterprises to the foreign labor force are examined, it is seen that the highest salary is paid for the shepherd job (Table 5).

3.2. Economic Information for the Study Area

It was observed that farmers in the studied region have 312.9 da of land on average, 91.08% of which is irrigable. Wheat, barley and sunflower are generally grown on these lands (Table 6). More than 90% of the land is irrigable and most of it is irrigated with wastewater. Wheat is grown 46%, barley 37.9% and sunflower 16.1%. (Fig. 1). Other field crops such as corn, sugar beet, millet, clover are also grown, albeit to a lesser extent. Regarding land holdings, it was observed that the highest amount of enterprise land was in Ortakonak village, followed by Sakyatan, Karakaya, Gocu and Acidort villages respectively (Table 6).

According to the neighborhoods, the gross profits of the products produced in the enterprises examined were calculated. Accordingly, the gross profit obtained from

Table 5. Distribution of the population according to age intervals in the enterprises surveyed

Age interval	Male (no)	Male (%)	Female (No)	Female (%)	Total (%)
0-15	10	9.17	7	9.33	9.24
16-25	18	16.51	12	16.00	16.30
26-35	23	21.10	8	10.67	16.85
36-45	20	18.35	14	18.67	18.48
46-55	14	12.84	18	24.00	17.39
56-65	16	14.68	13	17.33	15.76
66-75	8	7.34	3	4.00	5.98
Total	109	100.00	75	100.00	100.00

Table 6. Amount of cultivated land by villages

Villages	Barley		Wheat		Sunflower		Irrigated Land (%)	Total (da)
	Production area (da)	%	Production area (da)	%	Production area (da)	%		
Gocu	125.3	51.4	103.1	42.3	15.3	6.3	62.6	243.6
Ortakonak	314.3	48.6	207.1	32.0	125.0	19.3	100	646.4
Acidort	72.8	36.3	127.8	63.7	0.0	0.0	94.5	200.6
Sakyatan	118.9	32.7	152.9	42.0	92.1	25.3	100	363.9
Karakaya	58.1	21.6	161.8	60.1	49.3	18.3	98.4	269.1
Total (da)	118.5	37.9	144.0	46.0	50.4	16.1	91.2	312.9

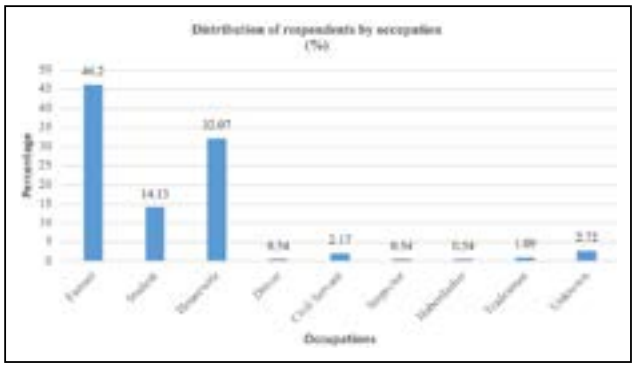

Figure 1. Distribution of the population by occupation in the surveyed enterprises.

barley varies between 117.49 USD/da and 117.72 USD/da, the gross profit obtained from wheat varies between 145.87 USD/da and 146.41 USD/da, and the gross profit obtained from sunflower varies between 169.36 USD/da and 170.05 USD/da (Table 7, 8 and 9). Farming has been practiced in the research area for many years and the crops produced are mostly cool climate cereals. However, corn and sunflower have also been included in the production pattern in recent years. In a study conducted in the region, it is stated that more than one rotation system is applied (Aydın, 2023). In this study, it was observed that the producers practiced rotation.

Table 7. Gross profit in barley production

Production costs (USD/da)	Gocu	Ortakonak	Acidort	Sakyatan	Karakaya	Ortalama
Seeds (USD/kg)	19.78	22.12	21.00	21.59	21.92	21.28
Plantation (USD/da)	1.92	0.92	1.23	0.92	1.48	1.29
Fertilizers (USD/kg)	21.66	18.02	20.35	19.17	22.64	20.37
Fertilizing (USD/da)	1.51	1.85	2.46	1.39	2.09	1.86
Pesticides (USD/L)	8.18	5.29	10.71	5.95	9.53	7.93
Spraying (USD/da)	1.09	1.08	0.62	0.69	0.99	0.89
Harvesting (USD/da)	6.78	6.16	6.43	6.16	6.64	6.43
Threshing (USD/da)	5.55	5.51	5.06	4.97	5.27	5.27
Transportation (USD/kg)	0.14	0.11	0.11	0.12	0.13	0.12
Total variable costs (USD/da)	66.62	61.06	67.97	60.95	70.68	65.46
Sales (USD/da)	184.13	178.55	185.70	178.61	188.36	183.07
Gross Profit (USD/da)	117.51	117.49	117.72	117.66	117.68	117.61

At the time of the survey, the dollar exchange rate was USD/TRY=18.67. Calculations were made accordingly.

Table 8. Gross profit in wheat production

Production costs (USD/da)	Gocu	Ortakonak	Acidort	Sakyatan	Karakaya	Ortalama
Seeds (USD/kg)	23.67	17.35	23.49	28.08	22.93	23.11
Plantation (USD/da)	1.85	1.23	1.94	2.26	1.62	1.78
Fertilizers (USD/kg)	26.51	12.85	20.09	26.96	22.70	21.82
Fertilizing (USD/da)	1.23	0.62	1.23	1.23	1.12	1.09
Pesticides (USD/L)	9.64	53.56	5.02	7.77	5.48	16.29
Spraying (USD/da)	0.92	0.62	1.14	1.03	1.06	0.95
Harvesting (USD/da)	6.96	5.36	6.73	6.25	6.91	6.44
Threshing (USD/da)	5.36	5.89	5.43	5.36	5.36	5.48
Transportation (USD/kg)	0.01	0.01	0.01	0.01	0.01	0.01
Total variable costs (USD/da)	76.16	97.49	65.08	78.94	67.21	76.98
Sales (USD/da)	222.29	243.90	211.41	224.83	213.07	223.10
Gross Profit (USD/da)	146.13	146.41	146.33	145.89	145.87	146.12

At the time of the survey, the dollar exchange rate was USD/TRY=18.67. Calculations were made accordingly.

Table 9. Gross profit in sunflower production

Production costs (USD/da)	Gocu	Ortakonak	Sakyatan	Karakaya	Ortalama
Seeds (USD/kg)	21.07	18.53	21.78	17.70	19.77
Plantation (USD/da)	2.05	0.80	1.23	0.92	1.25
Fertilizers (USD/kg)	70.34	72.04	55.35	51.29	62.25
Fertilizing (USD/da)	2.46	1.54	2.05	1.85	1.98
Pesticides (USD/L)	21.42	21.42	17.68	15.80	19.08
Spraying (USD/da)	0.82	0.92	1.64	1.85	1.31
Harvesting (USD/da)	9.82	9.11	8.39	8.57	8.97
Threshing (USD/da)	7.86	7.77	7.14	6.96	7.43
Transportation (USD/kg)	0.01	0.01	0.01	0.01	0.01
Total variable costs (USD/da)	141.40	138.84	121.88	111.91	128.51
Sales (USD/da)	311.01	308.89	291.24	281.80	298.24
Gross profit (USD/da)	169.61	170.05	169.36	169.88	169.73

At the time of the survey, the dollar exchange rate was USD/TRY=18.67. Calculations were made accordingly.

3.3. Environmental Information for the Study Area

Producers are compulsorily members of several professional and non-professional organizations along with the intensive agricultural activities. When producers were asked about their organizational status, they stated that they are members of organizations such as Agricultural Development Cooperative, PANKOBIRLIK, Agricultural Credit Cooperative, Irrigation Cooperative, Dairy Union, and Cattle Breeders Union. This is a good situation in terms of farmers acting together. A strong society can only be stronger with a strong organization. The most common membership in agricultural organizations is membership in the Irrigation Union. It is seen that the neighborhoods in the region have drinking water networks but not sewage networks. There is no systematic sewage network. It has been determined that producers solve their sewage problems by digging pits. Although it seems that there is no environmental problem in the long term, this situation can be seen as a threat to groundwater. The willingness to use wastewater was analyzed in the investigated enterprises. Producers expressed their willingness to use wastewater without treatment. As a matter of fact, in another study, land irrigated with wastewater was considered more valuable than others. However, although wastewater is valuable in the eyes of farmers, it is not known what its long-term effects will be. Although wastewater contains organic materials, it should not be forgotten that it may also contain heavy metals and harmful elements. For this reason, although wastewater may seem advantageous in the short term, it is not correct to use it without treatment due to the unknown long-term effects. When the level of knowledge of the enterprises about treated wastewater is analyzed, it is seen that 40.91% of them have sufficient knowledge about treated wastewater. This means that the majority in the region somehow know the quality of the water they use in irrigation. However, it is important to investigate the effects of wastewater treated with on agricultural crops. At least seventy percent of the enterprises find treated wastewater safe. This rate clearly shows the trust and willingness of the region towards treated wastewater (Fig. 2). The rate of those who believe in the effect of treated wastewater on productivity exceeds 86%.

When the distribution of farmers who stated that wastewater treatment plants improve the impact of wastewater on the environment is analyzed (Fig. 3), it is seen that 65.15%

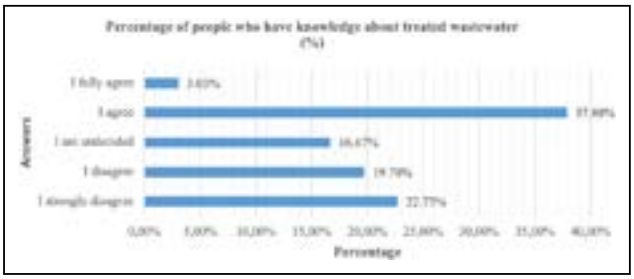

Figure 2. Proportion of people with knowledge about treated wastewater.

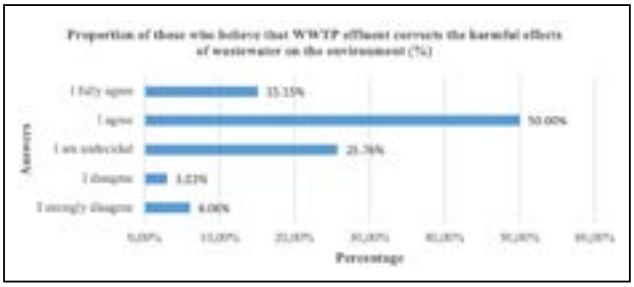

Figure 3. Proportion of those who believe that WWTP effluent corrects the harmful effects of wastewater on the environment (%).

of them find this situation positive. This clearly shows how important the existence and operation of wastewater treatment plants are.

The rate of those who believe that the construction of WWTPs is beneficial for the region and the environment and that they believe in their positive effects is quite high. Therefore, the rate of those who approve the construction of WWTPs (Fig. 4) is as high as 87.88%.

It was determined that 86.37% of the respondents stated that the value of the lands near the WWTPs increased while the value of the land far away decreased (Fig. 5). This result makes WWTP facilities strategic for the producers to increase the value of their land, along with the increase in the yield of the products they grow. Similarly, in another study that found the same result, it was determined that the value of lands irrigated with wastewater was 50% more valuable than lands not irrigated with wastewater.

According to the results of the survey conducted in the region, 87.88% of the enterprises stated that they approved the Wastewater Treatment Plants, and in case of charging for the water they use from the plants (Fig. 6), they stated that it would be more appropriate to make pricing according to the agricultural product pattern they produce (77.27%).

When we look at the reasons why they find this pricing appropriate (Fig. 6), 45.71% stated that it would be fairer pricing, and 41.90% stated that it would be a more accurate practice since it is a pricing based on yield increase.

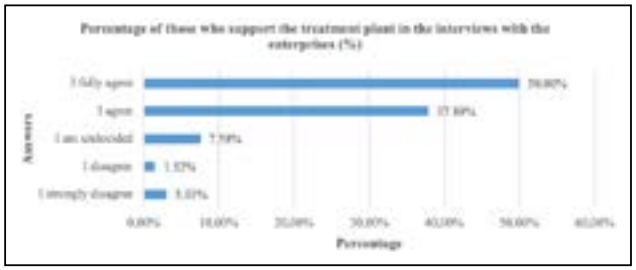

Figure 4. Proportion of those who support the treatment plant in interviews with enterprises.

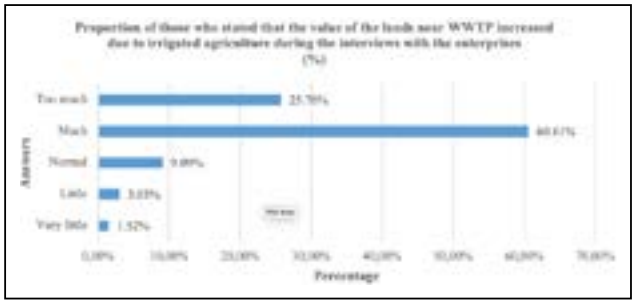

Figure 5. Proportion of those who stated that the value of the land near WWTP increased due to irrigated agriculture during the interviews with the enterprises.

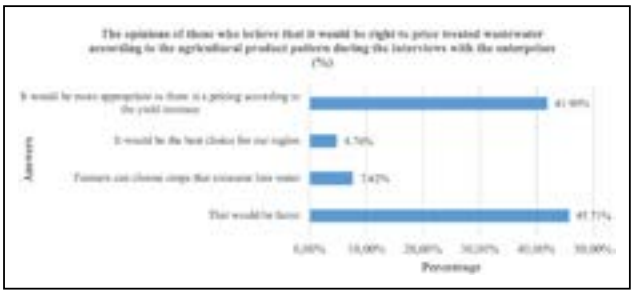

Figure 6. The opinions of those who believe that it would be correct to price the value of treated wastewater according to the agricultural product pattern in the analyzed enterprises.

3.4. Calculation of Wastewater Cost in the Study Area

Wastewater is used free of charge worldwide. However, the scarcity of water has led to the emergence of views that this water should also have a value. Approaches that value wastewater are mostly based on operating costs. In this study, the value of wastewater is calculated based on agricultural products. As is known, irrigation is one of the resources that directly affect agricultural production. Irrigation is the supply of water, which is necessary for plant growth, but cannot be met by natural means, to the plant without harming the environment and nature. **Based on the assumption that the yield difference between irrigated and non-irrigated crops will be the increase due to irrigation, the assumption was developed that the difference will be the cost of water**. Thus, wastewater will be priced based on the barley, wheat and sunflower crops commonly grown in the region. Grain and silage corn are also grown in the region. However, since these crops for which wastewater is used are not widely cultivated in the region, no calculation has been made over these crops. According to this formula, the calculation made according to the yields of the products that are widely cultivated in the region in irrigated and non-irrigated lands is shown in the following charts.

During the survey period, the dollar exchange rate was USD/TRY=18.67. It was calculated that wastewater should be valued at 0.18 USD/ton for barley production, 0.28 USD/ton for wheat production and 0.21 USD/ton for sunflower production (Table 10, 11 and 12). Thus, wastewater has a value based on barley, wheat, and sunflower, which are widely grown in the region.

4. CONCLUSION

Pricing of water is important for sustainable water management and agricultural enterprises to determine a policy in terms of production. Pricing of water and determination of its economic value will ensure balancing of supply and demand, efficient use or utilization of natural resources together with water, which is a scarce resource. From this point of view, this method can be taken as a basis instead of the calculation made by calculating the operation, main-

Table 10. Price of wastewater for barley cultivation (USD/ton)

Symbols	Meaning	Unit	Result
X	Amount of Wastewater Produced in Treatment	t/year	67.078.941.00
Y	Water Requirement of the Plant per Decare	t/daa	398.23
A	Plant Yield in Irrigated Environment	kg/da	413.00
B	Plant Yield in Dry Environment	kg/da	194.27
F	Sales Price of the Plant	USD/kg	0.32
C	Contribution of Water to Yield	kg/da	218.73
Z	Area Irrigated with Wastewater	da/year	168.442.71
D	Total Contribution of Wastewater	kg/year	36.843.474.29
K1	Economic Value of Wastewater	USD/year	11.789.911.77
P1	Unit Price of Wastewater	USD/ton	0.18

At the time of the survey, the dollar exchange rate was USD/TRY=18.67. Calculations were made accordingly.

Table 11. Price of wastewater for wheat cultivation (USD/ton)

Symbols	Meaning	Unit	Result
X	Amount of Wastewater Produced in Treatment	t/year	67.078.941.00
Y	Water Requirement of the Plant per Decare	t/da	500.00
A	Plant Yield in Irrigated Environment	kg/da	456.73
B	Plant Yield in Dry Environment	kg/da	72.14
F	Sales Price of the Plant	USD/kg	0.37
C	Contribution of Water to Yield	kg/da	384.59
Z	Area Irrigated with Wastewater	da/year	134.157.88
D	Total Contribution of Wastewater	kg/year	51.595.779.84
K1	Economic Value of Wastewater	USD/year	19.090.438.54
P1	Unit Price of Wastewater	USD/t	0.28

At the time of the survey. the dollar exchange rate was USD/TRY=18.67. Calculations were made accordingly.

Table 12. Price of wastewater for sunflower cultivation (USD/ton)

Symbols	Meaning	Unit	Result
X	Amount of Wastewater Produced in Treatment	t/year	67.078.941.00
Y	Water Requirement of the Plant per Decare	t/da	800.00
A	Plant Yield in Irrigated Environment	kg/da	315.99
B	Plant Yield in Dry Environment	kg/da	52.00
F	Sales Price of the Plant	USD/kg	0.64
C	Contribution of Water to Yield	kg/da	263.99
Z	Area Irrigated with Wastewater	da/year	83.848.68
D	Total Contribution of Wastewater	kg/year	22.135.212.04
K1	Economic Value of Wastewater	USD/year	14.166.535.71
P1	Unit Price of Wastewater	USD/t	0.21

At the time of the survey, the dollar exchange rate was USD/TRY=18.67. Calculations were made accordingly.

tenance, and repair costs, which are generally used in the world and Türkiıye. This will ensure sustainable agricultural production as it will limit the unlimited use of natural resources. In the interviews with the enterprises, those who wanted the pricing to be based on the agricultural product pattern were dominant. When asked why, they stated that a calculation based on the agricultural product pattern would be fairer, that an evaluation based on yield increase would be correct, and that such a calculation would enable enterprises to prefer products that consume less water.

Recycling and reuse of wastewater is one of the best solutions to water scarcity in terms of acquiring new water resources and protecting existing water resources. However, its implementation depends on many different factors such as management, policy, technical, economic, environmental, and social issues. Agriculture is usually the main water user. Historically, the use of human waste and other living wastes in agriculture has been a common practice for thousands of years. However, water is a natural resource that is very easily polluted, and pollutants cannot be easily removed. In this respect, it is essential to treat and reuse this polluted natural resource. The most important point to be considered in the reuse of wastewater treated is following the scientific approaches from amendment to application to the crop fields. Besides, testing the residue of any harmful microorganisms or heavy metals. The feasibility of reusing wastewater is very significant, particularly considering the initial cost and crop productivity. A significant amount of wastewater is generated near cities. Irrigating agricultural land close to cities with treated water is an easy way to reuse it. Wastewater can therefore provide 15–80% of the available irrigation water in some arid areas. This lessens the strain on pure natural water supplies, which is crucial for sustainable water management. Moreover, to lower the price of delivering this water from processing facilities to the final consumer. In this sense, it might overlook potential environmental or health risks brought on by unwise management. Treatments like filtration and disinfection should be prioritized to implement technologies that allow treated wastewater to be utilized in agricultural irrigation and meet standard values.

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Original Article / Orijinal Makale

Womenenomics: Gender Equality as a Development Approach in Japan

Kadın Ekonomisi: Japonya'da Kalkınma Yaklaşımı Olarak Cinsiyet Eşitliği

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ABSTRACT

This paper analyses the success of the "Womenomics" policy, launched in Japan in 2013 in response to demographic and economic challenges and aimed at increasing women's participation in the workforce, as well as the structural barriers behind it. Among the policy's main goals were increasing women's labour force participation rate and boosting their representation in management positions. Therefore, womenenomics has failed to achieve its goals. Although women's labour force participation rate has increased since 1986 (reaching 66% in 2016), this increase has largely coincided with a rise in irregular (precarious) employment rates. Notwithstanding, womenomics, within a neoliberal framework, primarily aims for economic growth rather than genuine social equality. This top-down approach does not adequately address the various economic challenges and pressure to leave the workforce faced by women, particularly in low-skilled occupations. All in all, to create a sustainable impact for womenomics, it must go beyond mere participation metrics and target deep-rooted cultural and institutional transformations that ensure job quality and parental leave are accessible to both genders.

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ÖZ

Bu makale, demografik ve ekonomik zorluklara yanıt olarak 2013 yılında Japonya'da başlatılan ve kadınların işgücüne katılımını artırmayı amaçlayan "Kadın Ekonomisi" politikasının başarısını ve bunun arkasındaki yapısal engelleri analiz etmektedir. Politikanın temel hedefleri arasında kadınların işgücüne katılım oranını artırmak ve yönetim pozisyonlarında temsilini güçlendirmek yer alıyordu. Bu nedenle, kadın ekonomisi hedeflerine ulaşamadı. Kadınların işgücüne katılım oranı 1986'dan beri artmış olsa da (2016'da %66'ya ulaşmıştır), bu artış büyük ölçüde kayıt dışı istihdam oranlarındaki yükselişle aynı zamana denk gelmiştir. Bununla

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birlikte, neoliberal çerçevede kadın ekonomisi, öncelikle gerçek sosyal eşitlikten ziyade ekonomik büyümeyi hedeflemektedir. Bu yaklaşım, özellikle düşük vasıflı mesleklerde kadınların karşılaştığı çeşitli ekonomik zorlukları ve işgücünden ayrılma baskısını yeterince ele almamaktadır. Kadın ekonomisi için sürdürülebilir bir etki yaratmak için, iş kalitesinin ve ebeveyn izninin her iki cinsiyet için de erişilebilir olmasını sağlayan köklü kültürel ve kurumsal dönüşümleri hedeflemelidir.

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1. INTRODUCTION

The concept of 'Womenomics' was aimed at addressing the demographic and economic problems facing Japan by increasing female labour force participation. Some of the primary objectives of Womenomics may include enhancing the female participation rate in the economy, promoting the basis of reproduction, and advancing female placement in managerial posts. It was expected that Womanomics would expand women's economic contributions and thus address the issue of an ageing workforce in Japan and promote economic growth. However, the success of Womenomics in these areas, particularly concerning job quality and opportunities for advancement within an organisation, requires judgment.

Was there any naive belief that Japanese women actively wanted to join the workforce? Since the introduction of the Equal Employment Opportunity Law in 1986, the number of women participating in the labour force in Japan has increased stepwise. From 1986 to 2012, the percentage of women's participation rose from 53.1% to 60.7, and by the year 2016, it climbed to 66% — all these assumptions point to a dramatic increase since the formal introduction of womenomics (Kawaguchi, 2012; Smith & Stewart, 2017). These figures reflect the increasing trend of women joining the workforce. However, this development has taken place concurrently with an increase in 'irregular' employment.

It has been observed that women have mostly lost out on traditional employment and are occupied in more irregular positions, since as many as 60% of all female workers now fall into that category. Women's Work Participation Policy of Womenomics thus poses many questions relating to the quality of employment that women can access and their long-term economic security (Hara, 2018).

Using a labour-force model economically based on the M-curve, people can see that female labour-force participation in Japan tends to be low while women are having young children, but is high again in their early 20s and their late 30s. More recently, however, such an outline curve has been changing as a significant proportion of women have remained in paid work in their early 30s, owing to more flexible maternity leave policies among other measures (Inoue et al., 2016). Even so, a crippling lack of childcare facilities, particularly in densely populated metropolitan areas including Tokyo, remains a major bottleneck. The figures reported above are not particularly surprising given a government guarantee to make available 320,000 childcare places by 2020. However, independent estimates show that there are nearly twice as many people looking for such provisions. The continuing lack of support systems indicates that although Womenomics has encouraged women to be part of the workforce, these reintegration measures have yet to be advanced (Schad-Seifert, 2019; Hashimoto & Naito, 2024).

Womenomics aims to promote the advancement of women into leadership positions; however, progress has been limited. Between 2012 and 2016, the percentage of women in managerial roles increased only slightly, from 11.1% to 13%. Japan's overall representation of women in senior roles remains low, as demonstrated by a decline in its Global Gender Gap Index ranking over three years, placing Japan 114th out of 144 countries in 2024 (Statista, 2025; Teranishi, 2025). This under-representation implies that although Womenomics has improved workforce participation to some extent, it has not adequately addressed the barriers to female leadership, which limits its ability to have an impact on decision-making and wider economic fairness. Socioeconomic considerations also make womenomics less effective. A male-breadwinner paradigm is reinforced and dual-income families are discouraged by Japan's tax and social security systems, which tend to support single-income households (Chopel et al., 2025). This is particularly significant since Japan is the only OECD nation where dual-income households have a higher likelihood of being impoverished than single-income households (Lebedeva, 2022). Increases in karōshi (death from overwork), stagnation in real pay growth, and a growing divide between regular and irregular income further exacerbate these issues. These conditions limit the economic options available to women, which ultimately defeats the purpose of womenomics.

2. LITERATURE REVIEW

Barriers from institutions and cultures further exacerbate the issue. High-pressure work situations and strongly embedded gender norms prohibit men from taking parental leave, while women continue to face significant barriers in the workplace, such as sexual harassment and

pregnancy-related discrimination (Ryan & Morgenroth, 2024). Working mothers are disproportionately affected by these problems, which impedes the wider adoption of family-friendly laws. Thus, many women are left with limited choices, feeling pressured to resign from their jobs or struggling to manage their work and family responsibilities (Torres et al., 2024). Without a shift in culture towards shared home duties, Womenomics' potential to boost women's economic mobility remains constrained. Womenomics has increased the number of people joining the workforce, but not everyone has profited equally (Williams, 2001; Kabakçı Günay & Ince Yenilmez, 2023). The "Tuna Girls," a group of Saitama working women, brought attention to the unfulfilled needs of ordinary working women by launching their own company to address the dearth of resources for working mothers (Shinoda, 2023; Tang, 2024). Programs that could drive them into the workforce without adequate assistance continue to make many people wary. This disparity indicates that Womenomics, which has primarily been formulated and applied at the top levels of society, is inadequate in tackling the various economic realities that Japanese women, especially those without well-known professions, encounter. These difficulties show how important it is to thoroughly reassess Womenomics. Significant gaps in employment quality, compensation, and career advancement persist despite an increase in workforce participation (Dalton, 2017; Hasunuma, 2017; Crawford, 2021; Guo et al., 2024). For Womenomics to truly promote gender equity and contribute to Japan's economic growth, it must extend beyond mere participation metrics and tackle qualitative aspects of employment, including improving job quality and ensuring parental leave is accessible to all genders.

Womenomics addresses the issues of how the inclusion of women in the workforce can help revive the economy and society of Japan, lists three expected advantages (Buchholz, 2019; Genna, 2021, Statista, 2024): 1. The employment of women will contribute to the increase of the labour supply that is necessary due to population ageing and decreasing birth rates, which have been on the rise for quite some time now. 2. This country has to pursue and attract top-qualified personnel without regard to sex to compete in a global marketplace. In terms of this goal, it is constructive to mobilise the potential women workforce. 3. Women represent the primary drivers of demand in the field of daily consumption. However, looking at the supply side, there are not enough women in decision-making positions. This background demands the involvement of more women in the workforce, which will, in turn, create a market looking towards its consumers. These ideas are closely related to the idea of "womenomics", which is about the need to recognise and incorporate women's efforts in the economy as one of the factors beneficial to the overall growth of the economy.

The focus of womenomics is to call the Japanese government, businesses and society to harness the potential of the women population to tackle the issues of population and fiscal, hence ensuring continued economic expansion. This is, as a matter of economic need or sufficed by lifestyle changes, a growing case of Japanese women now becoming gainfully employed and thereby an important source of income and Consumption (Chanlett-Avery & Nelson, 2014; Macnaughtan, 2015; Coleman, 2017). Although much more is still required at both public and private sector levels to further enhance female labour markets, we believe Japan is finally on the right path (Elysia et al., 2023) Specifically, 'do womenomics' is implemented like this; Japan's fertility is declining rapidly and the ageing population has reportedly reached a dramatic stage which a 2010 report characterized as a 'tsunami' (Nakatani, 2019; 2023), will create a huge excessive demand for labour, while reducing the size of the market, this will effectively result in a vicious cycle of deflation within the economy. In turn, Japan's continued rapid growth may lead to aggressive social security spending, further compounding the already substantial public debt (Abe, 2017; Fukunaga et al., 2024). These economic and political challenges policies, addressed solely through traditional fiscal and monetary policies; instead, they require an increase in the underutilised female labour force. There are three main reasons why Japan's national economy would benefit from a more active female workforce (Fukunaga et al., 2024; Furukawa et al., 2024). First, a significant, untapped, and well-educated labour pool could help fill the anticipated labour shortage. Second, women, who often play a crucial role in household consumption and investment decisions, would have greater disposable income. Third, a rise in female participation in the labour market would boost demand in various industries, particularly in the service sector, thereby further driving economic growth (Hogen et al., 2024). Therefore, "the absolute level of Japan's GDP could be lifted by as much as 12.5%," if the female labour participation rate in 2013 (62.5 percent) were to reach the level of men's (80.6 percent) (Bank of Japan, 2024a; 2024b).

Womenomics winners are sectors expected to grow, such as daycare, nursing care, restaurants, online services, beauty products, clothing, real estate, finance, travel, and temporary staffing. Overall, womenomics reports create a "business case" for enhancing women's participation in the Japanese workforce, using terminology typical of investment bank strategists. To equip clients with the right information for informed investment choices, the reports pinpoint the underuse of female workers as a key issue hindering Japan's economic growth, urging significant reform (Goodhart & Pradhan, 2020; Furukawa et al., 2023). As a result, the Japanese government and businesses try to boost women's labour participation; it is essential to shift the "mindset" by "dispelling myths" and promoting "greater gender equality at home" (Takeda, 2018; Salguero-Huaman, 2024). However, the view of womenomics includes the reliance on foreign domestic workers, often women, as a crucial resource that would al-

low Japanese women to join the workforce. This suggests that the concept of "gender equality" discussed in the documents may be somewhat constrained, mainly serving the goal of economic advancement in Japan (Stotsky et al., 2016; Ono & Yamada, 2020; Ince Yenilmez & Darıcı, 2025).

Economically motivated suggestions such as these took root early on, with certain policy plans being dubbed "Abenomics"- in direct reference to the popularly well-known current Japanese Premier. Essentially, womenomics serves as Abe's signature growth strategy. US Congressional Research Service publication on Japanese women shows, for example, that the source of the Prime Minister's growth strategies could be found in the basic precepts of womenomics: Governments have put in place several measures to address this part of the wage gap and promote family-friendly policies, but overall, the incentives for changing how the workplace operates have not been as effective (Abe, 2013; 2017; Groysberg, 2015; Shambaugh, 2022). The gender gap in employment rates has barely moved in the last decade, indicating slow progress on that issue.

3. WOMENOMICS AS A NEOLIBERAL POLICY

Womenomics, though framed as a policy for enhancing gender equality, is widely criticized as a neoliberal economic approach prioritising national economic gains over genuine social reform. Womenomics under Abe's administration aimed primarily to reinvigorate the economy rather than fundamentally improve conditions for women (Kano & Mackie, 2013; Yamaguchi, 2018). Critics argue that this approach reflects broader neoliberal priorities, where a "business-friendly climate" outweighs broader societal welfare. Within this context, Womenomics becomes a tool for economic growth rather than an instrument for comprehensive social change, creating tension among advocates for women's rights in Japan, who question whether Womenomics truly represents a step toward gender equality (Kano, 2018; Fisker-Nielsen, 2022).

In line with Abe's larger political position on gender, the Womenomics method, which is based on a neoliberal framework, clearly places economic efficiency above justice. Abe's cabinet voiced fears that the advancement of gender equality could upset Japan's traditional family values during his first term as prime minister (2006-2007). This led many to question his sincerity in supporting feminist causes (Zhou, 2021; Iida, 2024).

Japan's consistently low performance on global gender equality rankings was the focus of Womenomics. However, detractors point to Abe's past acts that seemed to threaten efforts at gender equality as well as the government's patchy record on women's rights. Persistent disparities are highlighted, for instance, his cabinet treated female MPs who were heckled about issues like population decrease and female ministers, many of whom felt pressured to quit (Yoshino & Taghizadeh-Hesary, 2014; Kiyoshi, 2015; Weathers, 2018). In addition to being a problem in Japanese politics, institutional sexism is also present in pop culture and corporate settings, which continue to uphold traditional gender stereotypes and hinder women's ability to pursue leadership positions. One of the primary areas of disagreement in womenomics is how childcare leave is handled. Despite its seeming preference for working women, the law might actually serve to uphold long-standing caring conventions. Although extending women's one-year childcare leave to three years may seem like a good idea, experts claim that it really encourages women to take on caregiving duties rather than working (Omori & Ota, 2023; Matsuda et al., 2024). This action strengthens the social perception of women as primary carers and makes it more challenging for men to request paternity leave by conveying the message that childcare is predominantly a woman's responsibility. The seniority-based pay plans and the male-breadwinner paradigm that is common in Japanese companies make this problem worse by discouraging men from taking time off and making it harder for women to support themselves financially.

This dynamic perpetuates systemic inequities and gender wage disparities in Japan's corporate climate. While women who leave and re-enter the workforce face salary stagnation and limited opportunities for upward mobility, men benefit from uninterrupted tenure under the seniority-based compensation paradigm (Chiang & Ohtake, 2014; Merry & Levitt, 2017). Although wage equality is supposedly required by the Equal Employment Opportunity Law (EEOL), the seniority system restricts women's earning potential. In many cases, Womenomics' methods of maternity leave and job reintegration do not yield equitable outcomes because they trap women in a loop of delayed professional progress that eventually hinders their long-term economic involvement (Shigenoi, 2022; Takahashi, 2022).

After the Second World War, Japan embarked on a rapid industrialisation journey, which in turn brought about the establishment of a unique corporate system whose employment policy thrived on strict adherence to lifetime employment, seniority, and employees' attachment to the companies (Dalton, 2022; Nemoto, 2023). Lifelong job security, seniority-based pay, and high expectations of organising corporate life near the place of work are among the attributes of this system. Consequently, a more rigid labour division became the result since employees were committed mainly to steady employment, learning, and exhausting hours. In this framework, men were obliged to work long hours and to change jobs frequently, while women exclusively took up being housewives (Takemaru, 2011; Woźny, 2022; Shao & Lee, 2023). That is, both the husband and wife are the ones who should make efforts to fulfil the family's needs equally. This scheme was institutionalised as the şmale-breadwinnerť formulaşwhere males were represented as the principal wage earners and females as housewives and child-care providers (Yagi et al., 2022; Ueno, 2024)

Under this system, women's involvement in the workforce remained extremely restricted. As a result of social expectations, getting married often signalled the end of a woman's career. This was reinforced not only by culture but by policies that required women to retire sooner than men—often to align with the major life events of marriage and childbirth. Regulations like this, which were separate for men and women, were the norm and led to an environment where it was expected that married women would put family first and their careers second (Pereira et al., 2023).

Thus, married women found themselves at a disadvantage and were often constrained to the workplace in a lesser capacity, which often limited their number of working hours and further limited their chances of progress (Schäper et al., 2023). The economic consequences of the male breadwinner model are seen as largely negative since gender divides into job responsibilities and training expenditures were institutionalised.

While men were afforded roles and routes that maximised value creation, women were confined to support roles with minimum investments oriented towards their advancement (Damman et al., 2015; Michelson, 2020; Li, 2024).

Japanese employers began using temporary employment in the 1960s during economic downturns as a way to lower labour costs. It was this twist that made married women work in the labour market as contract or part-time workers. But those were insecure positions, and when times got tough, they were among the first to go. As a result, female non-regular workers, especially housewives, became flexible labour to support job stability for male employees. It was used to justify requiring male employees to work longer hours and financial rewards for employers, as they agreed on family allowances that served a reinforcement role in propping up the model of a male breadwinner with a financially supported stay-at-home spouse (Inoue et al., 2016; Chung & van der Lippe, 2020).

This was followed in the 1980s with expanded fiscal and social policies that extended male-breadwinner norms even more. Tax-deductible was then limited to the household head (usually the husband) if his spouse's wage had simply stayed below the specific cutoff point (Sear, 2021; Nakayama, 2024). This model contained a large incentive for married women to under-earn and led to the concentration of female nonregular employees at an income limit. Other measures, such as the pension exemption for dependent spouses and social benefits targeted at part-time workers, serve to reproduce women's roles as secondary earners or primary caregivers, hence, perpetuating a gendered economic structure (Selin, 2014; Christl et al., 2022).

In the 1990s, this eventually led to a decline in the male-breadwinner model as the Japanese lost confidence and hope for their economic future after Japan's asset bubble burst, followed by decades-long stagnation. As time passed, the sharp increase in the proportion of elderly Japanese and the decrease in several newborn children compelled businesses to seek highly efficient part-time workers. Nevertheless, even with changes to the labour market and government policies (such as the Koizumi administration), there was no overarching dissolution of this solidified system formed by males (Kushida, 2024). While liberalising economic initiatives were intended to make the economy resemble a more market-oriented system, they did little for social welfare and failed to curb decreasing birthrates, spelling the possible necessity of gender equality interests and policies that will ensure sustainable labour practices in Japan's new work environment (Debroux, 2016; Ochiai, 2019).

4. FLOATING RHETORIC AND NEGLECTED PROBLEMS

The percentage of women in leadership positions was only 8.7%, even though a target had been adopted aiming for it to reach as high as 30% by year-end 2003, well after the equivalent rates had settled, hovering around the low hundreds of Women are positioned at a disadvantage over men then remained highly marginalized in Japan's labour market. While women filled just 11.2% of managerial positions in 2013, most countries showed marginal improvement over a decade (Sims et al., 2021; Galsanjigmed & Sekiguchi, 2023). The nature of employment creates additional hurdles, as 55.8% (men) compared to women get stuck in precarious low-wage jobs — an observation that speaks volumes for the vast difference in job security and pay between both genders. It was more than a decade later that the Abe administration placed notable emphasis on this target (Abe,2007), raising real questions of feasibility amidst continued structural inequities.

To fix these problems, Abe's team asked business heads to help women grow and set up a group of men to support women's rights. Yet, this plan worried some people as it made men seem key to women's success. Also, this way of doing things was like other plans from Abe's group: starting new offices under the Prime Minister with little input from real experts, resulting in plans that felt out of touch. This top-down talk often focused on change but missed real tools for real change (Ammerman & Groysberg, 2024).

The Abe government's gender plans built on old ideas but added new groups, like the "Headquarters to Make a Place Where Every Woman Shines," run by the Prime Minister. However, this change created gaps in implementing policies. The Headquarters showed little grasp of things like the "glass ceiling." This mismatch between high goals and the real lives of Japanese women revealed that the aim of achieving 30% leadership was ambitious, if not impossible, due to deep-rooted societal issues. Their work progress has been hampered by time off for babies and a lack of training opportunities, particularly for women working part-time. Several studies have found that highly educated women are the least likely to return to work after giving birth (Akagawa, 2019; Thelma & Ngulube, 2024).

Second, the number of hours men work—especially at plodding jobs (see article) - means that they cannot help much around the house; hence, married women are less likely to find a concrete incentive—or reluctantly offered support—to get back into their careers. Collectively, these entrenched dynamics imply that it is unlikely to be a straightforward policy fix for such deep labour market inequalities (Dotti Sani, 2014; Kamp Dush et al., 2018). The government proposed a more wide-ranging package of reforms, which included long working hours experienced by men as well as poor conditions suffered by irregular workers. The Basic Guidelines were designed first to address the challenge of dual earnings stability and second, to support child-rearing among men (HRW, 2025). But passing legislation to support these policies, such as the "equal pay for equal work" principle, is a different matter, with Abe already facing an uphill battle due to expected resistance from employers, and it runs counter to his pro-business economic agenda that focuses on cutting corporate costs (Hoshi et al., 2021).

The meaningful changes to Japan's workforce required are even bigger than improving women's employment rates and simply equalising pay, both of which would be challenging enough on their own. Finally, a productivist paradigm – which favours economic growth over social equity – continues to define policy responses, also partly depicted in accommodations such as the Ministry of Health equal pay guidelines that still permit employer-related wage hierarchies (Pejović, 2016; Yearby, 2019). Japan will not achieve meaningful and sustainable gender balance in the workplace until it tackles these fundamental problems with its industrial and economic policies, too.

5. METHODOLOGY

The research approach used in the study was desktop analysis. Desk research is secondary data, or data that can be gathered without going out into the field. Since desk research primarily consists of gathering data from already-existing resources, it is sometimes regarded as a less expensive method than field research because the primary expenses are related to executive time, phone bills, and directories. Thus, the study was based on research, reports, and statistics that had already been published. Online journals and library signs made it simple to obtain this secondary data for both industries.

5.1. Findings

5.1.1. Long-standing disparities in gender representation in leadership and employment

Although Japan raised an early flag in 2003 to aim at a 30% representation of women in management by 2020, figures show that progress is persistently disappointing. Figure 1 indicates how women represented just 11.2% of those in senior management positions in 2013, and that by 2024, there would be a modest increase to only a little higher, at 15.2%, indicating that over a decade, systemic

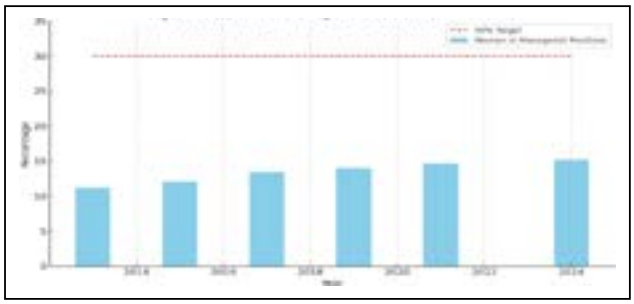

Figure 1. Women in managerial positions (2013-2024).

structural barriers-residual contemporary male-dominated corporate hierarchies and rigid career tracks-continued as impediments to gender equality in leadership. This gap between legitimate figures and the national target also calls into question both the policy design and the implementation process.

The other main concern, along with the first one, is insecure employment, affecting women more than men. Figure 2 shows a slight drop in the proportion of women in non-regular employment, from 55.8% in 2013 to 52.1% in 2024. This situation indicates that structural issues such as the seniority-based career barriers and the male breadwinner model, which were discussed earlier, persist. Nevertheless, the percentage remains significantly lower than that of males, whose equivalent number is more than half, at 32.4% in 2024. Non-regular employment typically implies low wages, limited job security, and scarce opportunities for promotion, all factors that contribute to the broader gender income gap. The very fact that this gap persists suggests conditions that require deeper, structural reforms in employment to achieve equitable labour conditions.

5.1.2. Ways forward: Policy efforts that structural barriers undermine

Most importantly, however, the Abe government floated the “Womenomics” initiative, which focused on improving female participation in the labour force as a key part of an economic strategy. The establishment of the "Headquarters for Creating a Society Where All Women Shine" was one such initiative in 2014. The initiative, however, came under fire for being devoid of bottom-up approaches and discon-

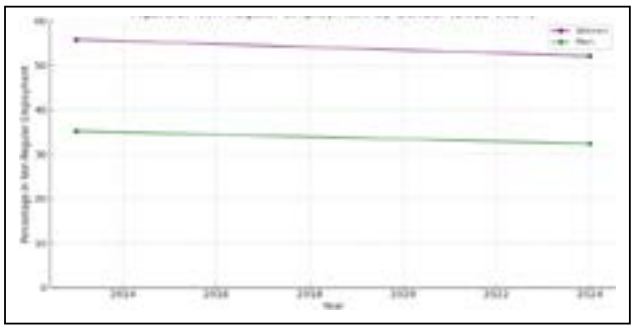

Figure 2. Non-regular employment by gender (2013-2024).

nected from workplace realities. Major obstacles included Japan's inherited culture of overwork, which made participation by men in domestic responsibilities. Childbirth, and--more importantly--involved occupations skittish towards retention after childbirth, notoriously led to this human capital drain.

5.1.3. Legislative reforms with corporate obstruction

To combat these, reforms in the law, including the promotion of "equal pay for equal work" and regulation of working conditions, were put in place in 2015. However, the enforcement became difficult mainly due to strong resistance from corporate actors who preferred the current employment model based on cost-effectiveness. Besides such policy proclamations, pay inequalities persisted, as many firms maintained internal hierarchies regarding payments, thereby favouring male employees. This implicitly undermined the intended effect of the guidelines given by the Ministry of Health and contributed to the perpetuation of long-standing gender-based wage disparities, requiring stricter enforcement with more transparent mechanisms of accountability within the corporate structure (Byttebier, 2022).

Figure 3 shows the trend of the gender wage gap in Japan between 2013 and 2024, and the impact of the "Equal Pay for Equal Work" reform, which came into effect in 2015. As can be seen from the graph, a slight but steady downward trend in the wage gap has been observed in the years following the reform. The difference, which was approximately 26.5% in 2013, decreased to 23.6% by 2024. However, this decline does not offer the expected level of great improvement. This situation can be attributed to the reforms remaining on paper and institutional resistance continuing. While the 2015 reform aimed to strengthen the principle of equality in the legal sphere, it had a limited impact in practice due to companies' cost-focused employment policies and hierarchical wage structures. Wage policies that particularly favour male employees have hindered the horizontal wage balance that the reform aimed for. This table clearly shows that legal regulations cannot have a lasting impact without being supported by a transformation of corporate culture.

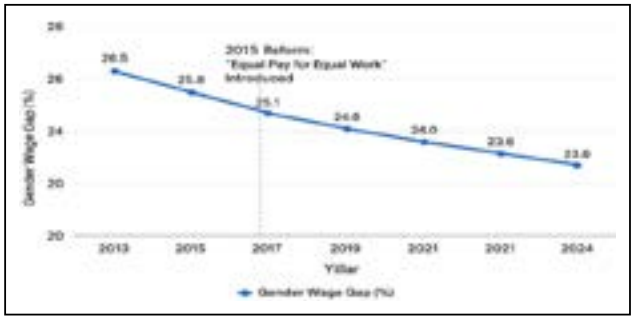

Figure 3. Gender wage gap in Japan (2013-2024).

6. CONCLUSION

Japan announced Womenomics to attract more women into the economy by drawing under Prime Minister Shinzo Abe in 2013. Yet, these historical differences in leadership and work continue to show signs of a broken system. While women in managerial positions are just insufficiently represented in leadership roles, there will be about 15 percent of leadership positions in 2024, extremely short of the target of 30 percent set by two decades, within A deeply segmented labour market. More than half of working women is clustered in low-wage, non-regular work, lacking benefits or mobility in their careers. And the divide remains even with an India that has been dwindling in its workforce and with its population ageing because it not only shows but also indicates structural barriers-the inflexible work culture coupled with poor childcare and the resistance of the companies as a whole-that reinforce women's marginalisation even more through their economic participation growing in importance.

The Abe government tried introducing policies on equal pay for equal work (2015), as well as extending childcare leave, but implementation was weak owing to resistance from the employers. Many companies exploit loopholes to clarify job positions, with the result that gender wage gaps are maintained (with women earning 77.9 percent of men's wages) based on non-transparent bonus systems (Kresal, 2021). Also, the long-hours culture in corporate Japan pushes women as the main caretaking workforce to quit after childbirth; only 38 percent of college-educated women return to full-time jobs. The government's top-down, dramatic action approach often misses grassroots necessities, such as affordable eldercare or penalties for discrimination, by just having a symbolic measure like appointing women to seats on a board. Until or unless tougher enforcement conditions exist, these reforms are still rhetorical and not really a reality (Bailey et al., 2024).

The deficiencies of "womenomics" are symptomatic of deeper problems: an economic model that is productivist and builds womb-to-tomb populations for the income growth of gross national product at the cost of social equity and traditional adherence to roles within the culture. Besides, even progressive firms, sectors developing "karoshi" (death from overwork) expectations disadvantage women, marking them with stigma for seeking work-life balance (Shiraev & Levy, 2016). Regional diversities compound the problem- there is a gap as wide as 68%-58% entry into the labour force by urban women vs. rural women due to differences in access to childcare and transport. Meanwhile, the intersections, such as single mothers and older women, get little policy attention. Comparative studies reveal that, even sharing similar cultural underpinnings, South Korea and Taiwan outpaced Japan in female leadership by instituting demands on quotas and flexible work policies- things Japan has not checked. Genuine progress necessitates the following three changes (Kim, 2022):

- Enforcement Mechanisms- Force wage transparency, penalise discrimination, and tie corporate subsidies to diversity metrics.
- Cultural Change- Involve men in caregiving through paternity leave incentives and public campaigns against the "salaryman" ideals.
- Infrastructure Investment- Universal childcare, rural job hubs, and mid-career reentry programs to retain talent.

Utilising its entire workforce is essential to Japan's competitiveness in the future. Womenomics will remain an unfulfilled promise unless institutional and cultural impediments are removed, which will weaken Japan's economy and society.

7. RECOMMENDATION

Theoretical probing is necessary into the consistent underrepresentation of women in corporate leadership roles in Japan. Social role theory explains that the expectations and stereotypes about gender influence the roles that a person chooses, which often deprives women of the hierarchy in the workplace where they should take care of nurturing and being supportive. Gender stratification theory further explains the roles through which the social structures and power relationships should maintain and create inequalities between the two genders presence of barriers to progressing from holding traditionally male positions in corporate hierarchies to achieving entry into them by women. It can be theorised that such an often angst-ridden phenomenon in the cultural context is further "contributed to" by entrenched cultural norms outside the organisation and established practices internal to the organisation that breed systemic gender biases in leadership selection and promotion processes.

While leadership is but one part of this equation, gender inequality in Japan's labour market extends to many other occupations and industries. Intersection theory helps understand some of these complexities, as it recognises that gender does not stand alone but interacts with other categories-such as age, marital status, and socioeconomic background produce women's rich and varied experiences of employment segregation and wage gaps. Research must also delve into these intersections, detailing the exact concerns facing different segments of women in the world of work in Japan. This is also an important foundation for developing interventions that deal with the root causes of exclusion, promoting true inclusivity in all sectors.

Solid policy intervention becomes the only sure way to leap from theoretical understandings into practical inequalities. Targeted mentoring schemes to support women's advancement in particular leadership development for addressing gender-specific barriers, and the inclusion of diversity quotas for senior management would, in practice, significantly increase women's presence at decision-making levels. They will also undoubtedly require openness in salaries, the principle of equal work equal pay, and efforts to combat occupational segregation using targeted recruiting practices, comprehensive anti-discrimination training, and flexible working arrangements for fulfilling caregiving responsibilities.

Since work-life balance policies and caregiving support measures greatly impact women's participation in the labour market and career paths in Japan, it is safe to say that their importance cannot be overstated. In doing so, research should be guided by the principles of social exchange theory (which states that environments promoting employee well-being and productivity) and family systems theory (which emphasises the interconnected nature of work and family life) to explore how supportive work environments can empower women. Family-friendly policies, including but not limited to subsidised and accessible childcare, inclusive parental leave policies that encourage fathers' involvement in caregiving, and increased telecommuting options, must be endorsed here to ensure an equitable distribution of caregiving responsibilities and enhance the convenience of work-life balance for both genders, to enhance gender-equal footing at the workplace and at home. Furthermore, pushing for policy reforms that require gender quotas for corporate boards, strengthen anti-discrimination legislation, and incentivise family-friendly practices will strengthen Japan's resolve to ensure that Gender Equality is regarded as a fundamental pillar in its approach to development.

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A Theoretical Introduction to Organizational Tradition: An Analytical Framework Beyond Culture

Örgütsel Geleneğe Kuramsal Bir Giriş- Kültürün Ötesinde Bir Analitik Çerçeve

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ABSTRACT

This study aims to examine the concept of organizational tradition within an independent analytical framework. While tradition has long been discussed in the social sciences through ritual, symbol, narrative, and memory, it has often been treated as synonymous with organizational culture in organizational studies, which has overshadowed its analytical potential. The study adopts a conceptual review method, systematically analyzing key literature on culture and tradition to develop a comparative framework. Within this framework, the article distinguishes between culture and tradition, highlighting the structural components of organizational tradition and its functional dimensions. Accordingly, organizational tradition is positioned not as a sub-element of culture but as a distinctive institutional structure that shapes normative orders and identity formation processes. Future research in this field can contribute to a better understanding of the analytical potential of organizational traditions as well as their practical implications.

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ÖZ

Bu çalışma, örgütsel gelenek kavramını bağımsız bir analitik çerçevede ele almayı amaçlamaktadır. Gelenek, sosyal bilimlerde ritüel, sembol, anlatı ve hafıza üzerinden tartışılan çok boyutlu bir olgu iken, örgütsel bağlamda çoğunlukla örgüt kültürüyle eşanlamlı olarak kullanılmıştır ve bu nedenle analitik potansiyeli gölgede kalmıştır. Çalışma, kuramsal bir derleme yöntemi benimseyerek kültür ve geleneğe dair temel literatürü sistematik biçimde incelemekte ve kavramsal bir karşılaştırma çerçevesi geliştirmektedir. Bu çerçevede kültür ve gelenek arasındaki kavramsal ayrım ortaya konulmakta; örgütsel geleneğin yapısal bileşenleri ve işlevsel boyutları tartışılmaktadır. Bu bağlamda, örgütsel gelenek yalnızca örgüt kültürünün bir alt unsuru değil, normatif düzenleri ve kimlik üretim süreçlerini şekillendiren özgün bir kurumsal yapı olarak konumlandırılmaktadır. Gelecekte bu alanda yapılacak çalışmalar, örgütsel geleneklerin analitik potansiyelinin daha iyi anlaşılmasına ve pratikte değerlendirilmesine katkı sağlayabilir.

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1. INTRODUCTION

Since the second half of the twentieth century, there has been a growing need and interest in understanding the social and cultural dimensions of organizations. Particularly from the 1980s onward, under the influence of globalization, the transformation of capitalism, and technological advances, organizations have increasingly been examined not merely as technical and rational structures but also as social and cultural systems. Within this context, the concept of organizational culture has gained a central position in understanding and interpreting organizational life, becoming a prominent focus in the management and organization literature (Smircich, 1983; Schein, 1985; Martin, 2002).

While organizational culture has established a central position within management and organization studies, the concept of tradition has not received comparable scholarly attention and has largely remained in the shadow of culture. Consequently, tradition has long been treated as an indirect component of organizational culture rather than as an independent analytical framework (Dacin, Dacin & Kent, 2019; Trice & Beyer, 1993; Dacin & Dacin, 2008). Conceptually, whereas culture generates a broad universe of meaning through values, norms, and symbolic systems (Geertz, 1973; Martin, 2002), tradition diverges within this universe through its focus on selective transmission, ritualized practices, and historical continuity (Shils, 1981; Hobsbawm & Ranger, 1983; Glassie, 1995).

Tradition has been widely discussed in the fields of anthropology, sociology, and history as a multidimensional phenomenon that reinforces identity, belonging, and authority (Durkheim, 1912/2008; Weber, 1978; Hobsbawm & Ranger, 1983; Handler & Linnekin, 1984). In the organizational context, however, tradition emerges as a critical dimension that renders visible the normative order, symbolic structure, and historical continuity of organizations. In this regard, tradition is not a passive subcomponent of culture but a dynamic construct that plays a distinctive role in the construction of identity, the production of belonging, and the attainment of legitimacy through selective transmission, ritualized practices, and symbolic memory (Dacin & Dacin, 2008; Hibbert & Huxham, 2010; Lockwood & Glynn, 2017; Truong, 2019).

This article is designed not as a systematic literature review but as a conceptual synthesis. Its primary aim is to analyze theoretical approaches to organizational tradition in a holistic manner and to contribute to the repositioning of the concept as an independent analytical framework. In Turkish scholarship, the notion of organizational tradition has not been directly addressed; existing studies have tended to examine it indirectly through the lenses of organizational culture, ritual, or symbolism. This has obscured the concept's potential within institutional analysis. Accordingly, the present paper seeks to fill this theoretical gap by articulating a distinct conceptual foundation for organizational tradition.

In conclusion, this article disentangles the concept of organizational tradition from approaches that conflate it with culture, positioning it as an independent analytical category within management and organization studies. The unique contribution of this manuscript lies in offering a conceptual framework that clarifies the structural components and functional dynamics of organizational tradition. The paper first delineates the conceptual distinctions between tradition and culture, then examines the place of organizational tradition in the literature, and finally evaluates its core components and functions. In doing so, it demonstrates that organizational tradition—through its multidimensional structure and distinctive functions—can be analytically distinguished from organizational culture, providing a valuable lens for understanding the normative orders, symbolic structures, and historical continuity of organizations.

2. TRADITION AND CULTURE

The term tradition derives from the Latin root tradition, meaning "to hand over" or "to transmit." This etymological origin underscores the constitutive role of tradition in sustaining continuity between the past and the present. However, tradition is not merely a historical transmission or remnant; it also functions as a mechanism for maintaining social order, constructing identity, and producing normative bonds (Shils, 1981; Hobsbawm & Ranger, 1983).

The conceptualization of tradition has evolved through the contributions of multiple disciplines, with anthropology and sociology playing particularly significant roles in this development. In anthropology, tradition has been discussed at times as a normative structure that ensures social stability and at other times as a key source of identity and meaning-making (Malinowski, 1922; Geertz, 1973; Ortner, 1996). Within the sociological literature, tradition has been regarded as a phenomenon that reinforces collective consciousness through rituals, supports the legitimacy of authority, and persists through its reconfiguration in processes of modernization (Durkheim, 1912/2008; Weber, 1978; Giddens, 1991).

Although the concept of tradition has often been used synonymously with culture in the literature, there are significant distinctions between the two. Culture refers to a broad universe of meaning that guides the entirety of social life through values, beliefs, and patterns of behavior (Geertz, 1973; Schein, 1985; Alvesson, 2002). Tradition, by contrast, consists of practices that preserve historical continuity, possess normative binding force, and are selectively transmitted within this universe (Shoham, 2011; McDonald, 1997). In other words, while culture provides a comprehensive and encompassing framework, tradition serves as the carrier of ritualized and symbolic structures that ensure continuity and attachment within that framework (Hobsbawm & Ranger, 1983; Prickett, 2009).

At this point, the distinctions between culture and tradition can be articulated more concretely across the dimensions of scope, temporal orientation, continuity, structure, and function. In terms of scope, culture represents a broad and flexible universe of meanings encompassing a society's values, norms, and symbolic systems (Geertz, 1973; Schein, 1985; Alvesson, 2002), whereas tradition involves selectively transmitted practices endowed with historical continuity (Shoham, 2011; McDonald, 1997). Regarding temporal orientation, culture tends to emphasize the contemporary context, while tradition establishes a normative linkage with the past, reconstructing the present through historical narratives (Giddens, 1991; Bauman, 2000). Structurally, culture forms a flexible and diverse system, whereas tradition represents a ritualized and normatively reinforcing order that sustains authority (Shils, 1981; Hobsbawm & Ranger, 1983). Finally, while culture functions to produce meaning and coherence, tradition contributes to the construction of belonging, legitimacy, and identity (Dacin & Dacin, 2008; Giorgi, Lockwood & Glynn, 2015). These distinctions are summarized in Table 1 below.

Table 1 summarizes the key conceptual distinctions between culture and tradition across the dimensions of scope, temporal orientation, continuity, structure, and function. This comparison is grounded in foundational works by Geertz (1973), Shils (1981), Hobsbawm and Ranger (1983), Giddens (1991), Martin (2002), Trice and Beyer (1993), and Dacin and Dacin (2008). Within the literature, these dimensions highlight the principal analytical axes through which tradition diverges from culture.

In conclusion, tradition is a normative mechanism grounded in selective transmission and historical continuity, whereas culture represents a broader, more flexible, and multilayered universe of meaning. Therefore, viewing tradition merely as a subdimension of culture obscures its distinctive functions in producing legitimacy, fostering belonging, and constructing organizational identity. In management and organization studies, the concept of tradition has likewise been predominantly examined through the lens of culture, a tendency that has hindered its development as an independent analytical category and limited its visibility within the literature (Dacin & Dacin, 2008; Dacin, Dacin & Kent, 2019; Truong, 2019).

3. THE CONCEPT OF ORGANIZATIONAL TRADITION

In the management and organization literature, the concept of tradition has long remained unaddressed directly and has typically been evaluated within the shadow of organizational culture studies. This tendency has prevented the concept from attaining an independent analytical framework and has consequently limited its visibility in scholarly discourse (Trice & Beyer, 1993; Martin, 2002; Dacin & Dacin, 2008). Yet, tradition is not a passive subelement of culture but a dynamic structure that independently generates belonging, continuity, and legitimacy (Shils, 1981; Hobsbawm & Ranger, 1983; Handler & Linnekin, 1984; Shoham, 2011).

In the organizational context, traditions are dynamic phenomena that contribute to the formation of culture, yet extend beyond being a passive component of it by possessing their own distinctive analytical structure and function (Dacin & Dacin, 2008; Truong, 2019). While organizational culture is generally defined as a system of shared values, beliefs, and behavioral patterns among members (Schein, 1985; Alvesson, 2002), organizational tradition refers within this broader framework to ritualized practices, symbolically meaningful repetitions, and the construction of historical memory. Whereas culture offers a holistic universe of meaning, tradition stands out through practices that create selective and normative forms of attachment within that universe (Weber & Dacin, 2011; Dacin, Dacin & Kent, 2019).

Table 1. Conceptual distinctions between culture and tradition

Dimension	Culture	Tradition
Scope	Encompasses values, norms, beliefs, behavioral patterns, and symbolic systems that shape the totality of social life (Geertz, 1973).	Consists of selectively transmitted practices that acquire historical continuity (Shils, 1981).
Temporal orientation/ historical reference	Primarily oriented toward the present; reference to the past is not obligatory (Giddens, 1991).	Explicitly refers to the past; links the present to historical narratives in a normative way (Hobsbawm & Ranger, 1983)
Continuity	Implicit, flexible, and adaptively reproduced according to context (Martin, 2002).	Ritualized, selective, and normatively reproduced to sustain historical continuity (Shils, 1981).
Structure	Flexible system open to change and diversity (Trice & Beyer, 1993).	A normative order that reinforces authority and provides institutional continuity (Dacin & Dacin, 2008).
Function	Generates meaning, coherence, and cultural identity (Martin, 2002).	Ensures continuity, fosters belonging, and legitimizes identity and authority (Dacin, Munir & Tracey, 2010).

The position of organizational tradition within the literature remains contested. Some studies conceptualize it as a subdimension of culture (Trice & Beyer, 1993; Zucker, 1977). In contrast, other works argue that traditions constitute an independent source of institutional continuity and legitimacy production (Dacin & Dacin, 2008; Weber & Dacin, 2011; Suddaby, Foster & Trank, 2010). Moreover, Feldman's (2006) notion of "moral memory" draws attention to the ethical dimension of tradition, offering a distinctive contribution to this body of research.

Studies on the dynamic nature of organizational traditions demonstrate that these structures are neither static nor immutable; rather, they are continually reinterpreted in relation to their contextual settings. For example, the Step Sing tradition examined by Morris (2018) has persisted despite undergoing formal changes, maintaining both its meaning and its function. Similarly, Lockwood and Glynn (2017) emphasize that traditions are not merely repetitive practices but phenomena sustained through the emotional ownership of individuals. This perspective shows that organizational tradition contributes to the production of belonging and meaning not only at the institutional but also at the individual level. In this regard, Truong's (2019) doctoral dissertation stands out as one of the most comprehensive studies systematically addressing the concept. Truong defines organizational tradition as a structure that generates collective belonging through rituals, symbols, and narratives within a consciously maintained continuity between an organization and its historical past, and through the scale he developed, makes visible the measurability of these dynamic and multidimensional structures and functions.

In addition, the multiple case study conducted by Mathias, Solomon, and Hutto (2024) demonstrates that tradition serves not merely to preserve the past but also to foster trust and legitimacy within interorganizational coopetition relationships that accompany innovation. This finding reveals that organizational tradition is not a static remnant of the past but a dynamic resource possessing strategic value.

In conclusion, the concept of organizational tradition can be regarded neither as a subordinate element subsumed within culture nor as a structure entirely detached from it. Rather, it exists as a distinctive institutional construct that shapes organizational identity, belonging, and legitimacy through historical continuity, normative binding, and the production of symbolic meaning (Dacin & Dacin, 2008; Dacin, Dacin & Kent, 2019; Truong, 2019). In this respect, organizational tradition is not merely a reproduction of the past but also functions as an institutional resource that enables organizations to strategically manage their continuity, identity, and legitimacy (Weber & Dacin, 2011; Mathias, Solomon & Hutto, 2024). Therefore, beyond organizational culture, tradition represents a multidimensional and dynamic phenomenon that shapes both normative order and strategic orientation, carrying strong analytical potential within the management and organization literature.

4. THE STRUCTURE AND FUNCTIONS OF ORGANIZATIONAL TRADITION

Organizational traditions are multidimensional structures that nurture an institution's historical identity, foster a sense of belonging among its members, and sustain organizational continuity. The literature most frequently highlights rituals, symbols, narratives, and institutional memory as the core elements of organizational tradition. These elements do not merely represent a legacy transmitted from the past to the present; they also generate the normative order of organizations and construct the framework of legitimacy that shapes their future (Trice & Beyer, 1993; Dacin & Dacin, 2008; Truong, 2019).

Although rituals, symbols, narratives, and institutional memory are analytically separable, they operate in practice as a dynamically intertwined system (Geertz, 1973; Trice & Beyer, 1993; Dacin, Dacin & Kent, 2019). Rituals draw meaning from symbolic forms, narratives embed these.

Rituals within organizational history, and institutional memory provides the temporal continuity that sustains both (Olick & Robbins, 1998). This dynamic interplay allows traditions to reproduce belonging and legitimacy not as isolated elements, but as mutually reinforcing processes that shape organizational continuity and identity (Dacin, Munir & Tracey, 2010).

Rituals are performative practices that are repeated at regular intervals and enacted through collective participation. Such activities create spaces in which members experience organizational values and perform collective identity (Alexander, 2016). Especially in times of crisis or uncertainty, rituals strengthen the connection with the past, thereby providing continuity and legitimacy (Dacin, Munir & Tracey, 2010). Closely intertwined with rituals, symbols also embody organizational values; through logos, spatial arrangements, or titles, they visually reflect organizational identity and keep institutional memory alive (Giorgi, Lockwood & Glynn, 2015).

Organizational narratives constitute another dimension through which institutions convey their history and values in a storied form. These narratives are not static; they are continuously reinterpreted according to context, adding new layers of meaning to the existing identity and reinforcing members' sense of belonging. Alongside narratives, institutional memory is also a fundamental component of tradition. Memory is sustained not only through written records but also through the attitudes of key leaders and symbolic practices. Feldman's (2006) notion of "moral memory" emphasizes that the past is not merely recalled but that ethical values and normative responsibilities are transmitted across generations.

The interplay of these components makes the functions of organizational traditions visible. First, recurring symbolic practices secure institutional continuity (Dacin & Dacin, 2008). In addition, traditions nurture a sense of belonging among members. Lockwood and Glynn's (2017) concept of "mattering" reveals the crucial role of traditional practices

in enabling individuals to feel valued within organizational life. Furthermore, traditions contribute to the preservation of the normative order by reproducing ethical values (Feldman, 2006). Strengthening the legitimacy of organizational decisions constitutes another key function; in times of uncertainty, traditional practices facilitate the acceptance of such decisions (Hibbert & Huxham, 2010; Suddaby, Foster & Trank, 2010).

Table 2 summarizes the core components of organizational tradition—rituals, symbols, narratives, and institutional memory—and their respective functions. This classification is based on the works of Trice and Beyer (1993), Alexander (2016), Dacin, Munir and Tracey (2010), Giorgi, Lockwood and Glynn (2015), Schultz and Hernes (2010), and Feldman (2006). In the literature, these four components are the most commonly identified building blocks of organizational tradition. Beyond these core elements, alternative frameworks have also been developed. For instance, Truong (2019) proposes a measurable structure of organizational tradition by categorizing it along the dimensions of objects, people, milestones, and values/practices. Similarly, Hibbert and Huxham (2010) conceptualize tradition through the dimensions of content, process, and authority, demonstrating its dynamic role in symbolic transmission and the construction of normative order.

In conclusion, organizational traditions are not passive reflections of the past; rather, through rituals, symbols, narratives, and institutional memory, they constitute multidimensional structures that shape organizational continuity, identity, and normative order. The interplay of these components enables traditions to perform critical functions such as fostering belonging, constructing identity, transmitting ethical values, and providing legitimacy in times of uncertainty. Typologies and conceptual frameworks developed in the literature further highlight this multidimensionality by presenting it within more structured and analytically coherent models (Truong, 2019; Hibbert & Huxham, 2010). In this regard, organizational traditions are not subordinate elements overshadowed by organizational culture but stand out as independent concepts with distinctive structures and functions. This distinctiveness renders organizational traditions a high-potential analytical framework in management and organization studies, contributing to a deeper understanding of fundamental processes such as continuity, identity, and legitimacy (Dacin, Dacin & Kent, 2019; Giorgi, Lockwood & Glynn, 2015; Lockwood & Glynn, 2017; Mathias, Solomon & Hutto, 2024).

5. CONCLUSION

This article has examined organizational tradition conceptually and evaluated it within a theoretical framework independent from organizational culture. As highlighted in the literature, organizational traditions are not merely passive reproductions of the past but multidimensional structures that generate identity, belonging, legitimacy, and ethical responsibility. Through rituals, symbols, narratives, and institutional memory, traditions perform these functions and occupy a central position in organizational life. Therefore, tradition should be regarded as a distinctive analytical category that differs from culture while simultaneously interacting with it.

Indeed, this article challenges the conflation of organizational tradition with organizational culture and demonstrates that the concept provides an independent analytical framework for understanding institutional continuity, identity formation, and legitimacy production. It brings to light the theoretical significance of a concept that has long remained invisible in the management and organization literature. Through a theoretical synthesis, the distinction between culture and tradition is systematically articulated, and fragmented debates in the literature are integrated into a coherent perspective. Moreover, by referring to Truong's (2019) scale development study, the paper highlights that organizational tradition possesses not only conceptual but also measurable dimensions, offering a methodological opportunity for future empirical research.

Table 2. Components and functions of organizational tradition

Component	Description	Function
Rituals	Symbolic performances repeated at specific intervals and enacted through collective participation (e.g., ceremonies,commemoration). (Trice & Beyer, 1993; Alexander, 2016)	Ensure institutional continuity; provide legitimacy during times of crisis or uncertainty (Dacin, Munir & Tracey, 2010).
Symbols	Visual representations that embody organizational values (e.g., logos, spatial arrangements, titles, uniforms) (Giorgi, Lockwood & Glynn, 2015).	Construct organizational identity; make institutional memory visible; link the past with the present (Schultz & Hernes, 2010).
Narratives	Stories that transmit the organization's history and values across generations and are reinterpreted in changing contexts(Feldman, 2006).	Build collective memory; reproduce identity; strengthen a sense of belonging (Giorgi, Lockwood & Glynn, 2015).
Institutional memory	The collective past sustained through written records, archives, leader behaviors, and symbolic practices (Schultz & Hernes, 2010).	Transmit ethical values; maintain the normative order; produce "moral memory" (Dacin, Munir & Tracey, 2010).

It is evident that organizational traditions, through rituals, symbols, and narratives, generate a sense of belonging and identity among members, while providing legitimacy during times of crisis and uncertainty. This indicates that organizations can manage traditions not merely as cultural remnants but as strategic resources that strengthen normative order and institutional continuity. Future research should examine organizational tradition across different sectors and contexts using ethnographic methods, empirically test the interaction between culture and tradition, and expand scale development efforts to deepen the concept's measurability. Furthermore, studies exploring how traditions are transformed within processes of digitalization, globalization, and institutional change could offer new insights to the literature.

This conceptual distinction offers important implications for management practice. Traditions draw on their ritual, symbolic, narrative, and mnemonic components to generate organizational resources such as trust, belonging, and legitimacy, particularly in periods of change and uncertainty (Dacin & Dacin, 2008; Hibbert & Huxham, 2010). For this reason, managers may deliberately mobilize traditions to mitigate resistance during transformation processes, strengthen organizational identity, and increase acceptance of decisions. Reframing rituals, updating symbolic elements, or aligning organizational narratives with new strategic directions can preserve a sense of continuity while supporting change initiatives. Recent research also demonstrates that traditions function not merely as cultural residues but as strategic capacities that generate coordination and predictability in complex organizational interactions (Mathias, Solomon & Hutto, 2024). In this context, organizational tradition may be viewed not as a passive cultural legacy but as a strategic institutional resource that managers can employ to reinforce identity, sustain legitimacy, and navigate organizational change effectively.

In conclusion, organizational traditions constitute indispensable dynamics of organizational life through their functions of ensuring institutional continuity, strengthening members' sense of belonging, transmitting ethical values, and producing legitimacy. This study positions organizational tradition as an independent analytical category and proposes it as a concept capable of opening new research avenues in the management and organization literature.

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A Framing-Effect-Based Analysis of Income Inequality Perceptions*

Gelir Eşitsizliği Algısının Çerçeveleme Etkisi Bağlamında İncelenmesi

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ABSTRACT

Income inequality is one of the greatest problems of our time, and what can be done to solve this problem is still under debate. Indeed, income distribution began to deteriorate especially after the industrial revolution. In particular, the fact that a small minority of the world's population receives a large portion of the world's income and wealth is truly a matter that needs to be discussed. At this point, for the discussion to be healthier and reach a solution, it may be necessary for the majority to share the same view. However, due to changing perceptions, the importance of the income inequality problem may be perceived differently. From this perspective, the behavioural economics school emerges, which argues that our perceptions can be distorted by the influence of psychology in perceptual processes. The psychological effects put forward by this school are generally referred to as biases, and perhaps the most popular of these biases is the framing effect. According to this effect, when the same situation is presented differently, the perceived reality may differ. In this study, the perception of income inequality was examined in the context of the framing effect. To test this perception, a questionnaire was designed, and participants were asked to answer numerical and verbal questions with the same meaning. The results obtained from the study show that the way income inequality is conveyed leads to perceptual differences and that the use of the framing effect could be an important tool in minimising potential income inequality problems.

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ÖZ

Gelir eşitsizliği günümüzün en büyük problemlerinden birisidir ve bu sorunun çözümünde neler yapılabileceği hala tartışılmaktadır. Öyle ki, gelir dağılımı özellikle sanayi devriminden sonra bozulmaya başlamıştır. Özellikle, dünya nüfusundaki küçük bir azınlığın dünyadaki gelir ve zenginliğin büyük bir kısmını alması gerçekten de tartışılması gereken bir konudur. Bu noktada, tartışmanın daha sağlıklı ve çözüme ulaşabilmesi için belki de çoğunluğun aynı görüşte olması gereklidir. Ancak değişen algılar nedeniyle gelir eşitsizliği sorununun önemi fark-

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lı algılanabilir. Bu açıdan, algısal süreçlerde psikolojinin de etkisiyle algımızın bozulabileceğini savunan davranışsal iktisat ekolü karşımıza çıkmaktadır. Bu ekolün öne sürdüğü psikolojik etkiler genel olarak önyargılar olarak adlandırılmaktadır ve bu önyargılardan belki de en popüleri çerçeveleme etkisidir. Bu etkiye göre aynı durum farklı şekilde aktarıldığında algılanan gerçeklik farklılık gösterebilmektedir. Bu çalışmada da gelir eşitsizliği algısı çerçeveleme etkisi bağlamında incelenmiştir. Bu algıyı test edebilmek için bir anket tasarlanmış ve katılımcılardan aynı anlama gelen sayısal ve sözel soruları cevaplamaları istenmiştir. Çalışmadan elde edilen sonuçlar, gelir eşitsizliğinin aktarım şeklinin algısal farklılıklara yol açtığı ve çerçeveleme etkisinin kullanımının potansiyel gelir eşitsizliği sorunlarını minimize etme açısından önemli bir araç olabileceğini göstermektedir.

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1. INTRODUCTION

Income inequality is a significant problem, affecting almost all countries to varying degrees. Addressing this issue is challenging because, in addition to income inequality itself being negative, perceptions of it vary widely and are perhaps an even greater problem.

The perception of income inequality is a highly diverse and intriguing phenomenon. This is because, even though data on income inequality is readily available, its interpretation varies considerably. For example, individuals with high incomes may not react to income inequality in the same way as those with low incomes. In this context, according to a study conducted by Horowitz et al. (2020), 52% of low-income individuals think that income inequality in the US as the most important problem that politicians should solve, while only 36% of high-income individuals share this view. However, 61% of people in the US believe that income inequality is high. What is interesting here is that while 61% of people think income inequality is high, 39% do not. Perceptually, these differences are also likely to make it difficult to resolve income inequality.

Our perceptions can indeed change or be distorted easily, and this situation is particularly studied by behavioral economists. According to this school of thought, psychological factors cause various biases in decision-making processes, and these factors lead to perceptual differences that influence our decisions or perceptions. The framing effect is one such bias. According to this effect, the reality we perceive can differ when the same situation is presented in different ways.

The first section of this study examines the behavioral economics school, which rise to prominence in the 1980s with Daniel Kahneman and Amos Tversky, and the framing effect, one of the psychological biases that cause bounded rationality in this school. The second section of the study addresses the issue of income inequality. The third section of the study presents a literature review on the perception of income inequality, and the final section presents an empirical study on this perception.

2. BEHAVIORAL ECONOMICS AND FRAMING EFFECT

Traditional economics' "homoeconomicus" assumption posits that individuals are rational in all circumstances and make choices that maximize their utility. In contrast, behavioral economics assumes that individuals may not always behave rationally, even if they have the capacity to do so. This assumption of behavioral economics is called "bounded rationality" (Mullainathan & Thaler, 2000).

When behavioral economics was not yet popular, its relationship with traditional economics was not very good. This was because traditional economic actors accepted economics as a mathematical field and had adopted a dismissive view of behavioral economics for a long time (Rehman, 2016). Keynes's 1936 book began to change the relationship between traditional economics and behavioral economics. Traditional economics actors sought to develop economics by examining Keynes's views within a mathematical framework, while behavioral economics actors sought to address the shortcomings of the behavioral economics school and develop it further. Towards the end of the 1970s, two important figures in behavioral economics, Daniel Kahneman and Amos Tversky, published Prospect Theory, ensuring that behavioral economics gained more ground in economics. The theory essentially determined that individuals' preferences change depending on whether they are in a gain or loss situation, with individuals generally being risk-averse in gain situations and generally taking risks in loss situations (Akerlof, 2002).

In contrast to traditional economics' rigid assumptions about preferences, behavioral economics offers a more flexible perspective and provides some critical examples challenging the assumption of rational human behavior. For example, consider a fair coin with equal and equal probabilities of landing heads or tails. Suppose this coin is tossed 50 times and lands heads 50 times. Some people may see a higher probability of heads coming up on the 51st toss because it came up tails 50 times, or they may think that since it came up tails every time, it will now come up heads

next time. However, no matter how many times the coin is tossed, the probability of heads and tails coming up each time is equal and independent of previous events. Rational individuals assume that the probabilities are equal, but many people cannot behave rationally due to previous events and may make flawed choices (The University of Chicago, 2024).

The basic logic of bounded rationality, one of the fundamental assumptions of behavioral economics, is loss aversion. According to loss aversion, individuals generally prefer guaranteed choices in positive situations and take risks in negative scenarios. The worse the negative scenario, the greater the degree of risk-taking. Furthermore, individuals react more strongly to loss situations than to gain situations. In this regard, Kahneman and Tversky (1979) conducted a simple experiment in their studies to explain how rational behavior can easily be disrupted. In the experiment, participants were asked to make choices in the following scenario:

1. Which one would you prefer?

a. Definitely earning $240 (84%)

b. A 25% chance of earning $1,000 and a 75% chance of losing nothing (16%)

2. Which one would you prefer?

c. Definitely lose $750 (13%)

d. Lose $1,000 with a 75% probability and lose nothing with a 25% probability (87%)

The first question is a typical gain scenario, and participants tended to choose option a, the more guaranteed choice. The second question is a typical loss scenario, and a large proportion of participants chose option d, i.e., taking the risk. Participants were then asked to make a choice in the following scenario:

3. Which one would you prefer?

e. A 25% chance of gaining $240 or a 75% chance of losing $760 (0%)

f. A 25% chance of gaining $250 or a 75% chance of losing $750 (100%)

In this question, all participants chose option f. It can be said that everyone acted rationally only in terms of this question. However, when all three questions are considered, it can be seen that the vast majority of participants did not act rationally. This is because option e in the third question was created by combining options a in the first question and d in the second question, while option f in the third question was created by combining options b in the first question and c in the second question. Therefore, in order to behave rationally, participants who strongly preferred options a and d in the first and second questions should have chosen option e in the third question. However, no participant chose this option and instead chose the other option, failing to behave rationally. This example is a simple illustration of how rational behavior is more difficult than assumed and how easily rationality can be disrupted.

The main focus of behavioral economics on behaviors that undermine rationality is psychology, and these behaviors are referred to in the literature as "bias." Some of these effects are loss aversion, mental accounting, confirmation bias, sunk cost fallacy, availability effect, context effect, and framing effect. In addition to these effects, other biases that have emerged in recent years include the fundamental ratio fallacy, action bias, majority effect, Dunning-Kruger effect, and IKEA effect. Among these effects, the framing effect is particularly popular and significant (Azzopardi, 2021).

According to the framing effect, decision-making can vary depending on how a situation is presented. For example, let's assume that a person named John goes to a pharmacy and wants to buy an antibacterial cleaning wipe. There are two brands of the product John wants to buy, and the price and number of wipes in these brands are the same. The only difference between the two brands is the information on the front about the percentage of germs. These two brands are "Bleachox," which claims to kill 95% of germs, and "Bleach-it," which claims that only 5% of germs survive. When John compares these two brands of wipes, he is not very interested in buying the "Bleach-it" brand, which indicates the probability of germs surviving.

As a result, John purchased the "Bleachox" brand wipe. While everything seemed normal here, there was actually a problem. This is because both brands were equally effective in combating germs. The Bleachox brand killed 95% of germs while allowing 5% to survive. Similarly, the Bleach-in brand killed 95% of microbes while allowing 5% to survive. Therefore, both brands were saying the same thing. However, John fell victim to the framing effect and interpreted the information labels on the brands as if they were different, thinking he had made a better choice (The Decision Lab, 2024).

The most famous experiment conducted on the framing effect is the one Kahneman and Tversky (1981) called the Asian Experiment. The experiment was conducted on a total of 307 students (first group 152, second group 155) at the University of British Columbia and Stanford University. In the experiment, it was expected that a virus that had emerged in Asia would also affect people in the United States and cause the deaths of approximately 600 people. It was not entirely possible to prevent the spread of this virus, so some of the participants were asked to choose one of the following treatment methods:

- If Treatment A is applied, 200 people will definitely be saved. (72%)
- If Treatment B is applied, there is a 1/3 chance that everyone will be saved and a 2/3 chance that no one will be saved. (28%)

The choice scenario presented to the first group of participants was framed positively. This is evident from the use of the term "saved." In positive scenarios, individuals are likely to gravitate toward guaranteed choices, so 72% of participants in this scenario chose Treatment A, which

was a more guaranteed choice than the other option. The second group of participants was also asked to choose one of the following treatment methods:

- If Treatment C is applied, 400 people will definitely lose their lives. (22%)
- If Treatment D is applied, there is a 1/3 chance that no one will lose their life, while there is a 2/3 chance that everyone will lose their life. (78%)

The choice scenario presented to the second group of participants was framed negatively. This is evident from the phrase "lose their lives." Since individuals are likely to make risky choices in negative scenarios, 78% of the participants in this scenario chose Treatment D, which was a riskier choice than the other option.

The framing effect is an effect that indicates that decision-making can change when the same situation is presented in different ways. In the Asian Experiment, Kahneman and Tversky also presented the same situation to participants in different ways. So, if the virus is expected to kill 600 people, in the scenario presented to the first group of participants, if you apply Treatment A, 200 people will be saved, but at the same time, 400 people will also lose their lives (because the virus is expected to affect 600 people for sure). Similarly, if Treatment C is applied, 400 people will definitely lose their lives, but 200 people will also be saved (because the virus is expected to affect 600 people for certain). In other words, Treatment A and Treatment D describe the same situation. In this context, it can be said that Treatment B and Treatment C also mean the same thing. This is because the 1/3 probability of everyone being saved expressed in Treatment B also means the 1/3 probability of no one losing their lives expressed in Treatment C. Similarly, a 2/3 probability of no one being saved is equivalent to a 2/3 probability of everyone losing their lives. As a result, participants fell prey to the framing effect and made irrational choices.

3. THE PROBLEM OF INCOME INEQUALITY

Income inequality refers to the unfair distribution of income among the population (OECD, 2024). Looking at the historical development of income inequality, between 1945 and 1970 (after World War II), countries grew economically and began to increase their incomes. During this period, the income gap between the lower and middle income classes and the upper income class, while significant, did not change much. Therefore, income differences between countries did not attract much attention. However, starting in the 1970s, countries' economic growth performance weakened, and various unemployment problems began to emerge (Sherman, Trisi, & Cureton, 2024). So much so that while the world economy's growth rate was close to 5% at the end of the 1980s, it declined to around 1.5% at the beginning of the 1990s (World Bank, 2024). This led to a marked increase in income disparities both between countries and within income groups. In particular, while people in the upper income group became wealthier, those in the lower and middle income groups were unable to increase their incomes to the desired level.

There are many methods for measuring income inequality. These methods include the Gini coefficient method, the Atkinson index method, the coefficient of variation method, the decile ratio method, the generalized entropy index method, the Kakwani index method, the total income ratio method, the Robin Hood index method, and the Sen poverty index method. The most popular of these methods is the Gini coefficient method. This coefficient takes values between 0 and 1, and it can be understood that as the coefficient approaches 0, income inequality decreases, and as it approaches 1, income inequality increases (De Maio, 2007). For example, in 2023, the countries with the lowest Gini coefficients were Slovakia (0.24), Slovenia (0.24), and Belarus (0.24), while the countries with the highest Gini coefficients were Colombia (0.55), Brazil (0.52) and Zambia (0.51) (Our World in Data, 2024). The Gini coefficient is actually an extension of the Lorenz curve, and details about the Lorenz curve can be found in the Figure 1 below.

The Lorenz curve represents the share of income received by a specific percentage of the population in a country. In a situation of perfect equality (where the Gini coefficient equals zero), the Lorenz curve has a 45-degree slope, meaning that, for example, each 20% segment of the population receives 20% of the income. As inequality increases (the Gini coefficient rises), the Lorenz curve begins to shift toward the lower right. In this case, part of society begins to receive a smaller share of income; for example, the 20% segment receives 5%. In this case, inequality increases (De Maio, 2007). These examples are supported by statistical data, and these details can be found below.

Income is distributed so unevenly that this situation is more clearly demonstrated in the World Inequality Report published in 2022. For example, 50% of the world's adult

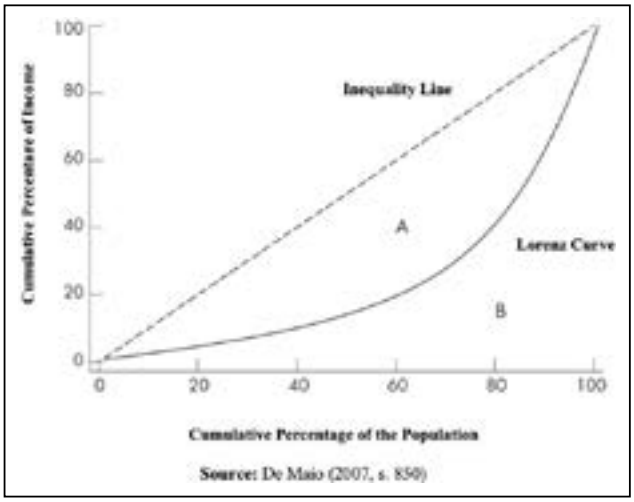

Figure 1. Lorenz curve.

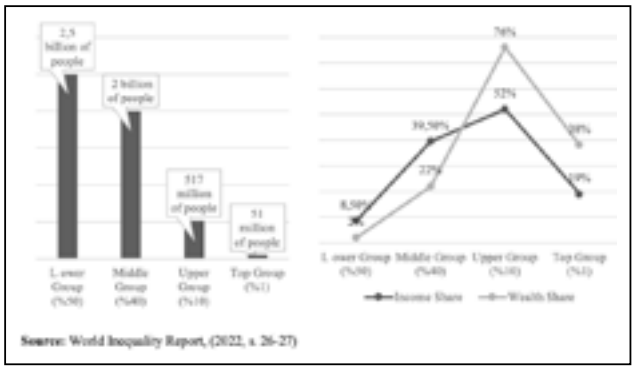

Figure 2. Distribution of the world's adult population by income groups (left) and the shares of income and wealth received by these income groups (right) (2021).

population (2.5 billion people) is in the low-income group, 40% (2 billion people) is in the middle-income group, and 10% (517 million people) is in the high-income group. Of those in the upper income group, 10% (51 million people) are in the highest income group. The real problem here is the share of income and wealth that these income groups receive (Fig. 2). For example, while the 2.5 billion people in the low-income group received 8.5% of income in 2021, the 51 million people in the top-income group received 19% of income in 2021. On average, a person in the lower income group earned €2,800 in 2021, while a person in the top income group earned an average of €321,600 in 2021. The difference is approximately 115 times. The imbalance in income is even worse in terms of wealth. At this point, it is known that in 2021, the lower income group received only 2% of the world's wealth, while the top income group received 38% of the world's wealth. On average, a person in the lower income group received €2,900 of the wealth in 2021, while a person in the top income group received €2,755,200. The difference is 950 times, which is a much worse situation in terms of income (Chancel, Piketty, Saez, & Zucman, 2022).

4. LITERATURE REVIEW

Some studies in the literature on the perception of income inequality have reported that people may have different perceptions of income inequality. For example, according to Knell & Stix (2020), individuals reach conclusions about income inequality not based on general data, but only by looking at reference groups. However, when it comes to income inequality, low-income (high-income) individuals tend to perceive themselves as worse off (better off) than they actually are. This result was also obtained in the study by Faggian et al. (2023), which also revealed that people living in the same region have similar perceptions of income inequality. Among studies examining perceptions of income inequality specifically in the US, Xu & Garand (2020) found that, regarding income inequality in the US over the past 20 years, people living in states with higher income inequality perceived a greater increase than people living in states with lower income inequality. Chambers et al. (2014) found that people living in the US perceive income inequality as a bigger problem than it actually is and underestimate their own average income. Furthermore, liberal politicians exaggerate income inequality more than conservative politicians. Another study examining perceptions of income inequality in the context of electoral processes, Engelhardt & Wagener (2014), found that perceptions of income inequality are more distorted than normal during political election cycles and that people vote based on perceptions rather than data. According to Hauser & Norton (2017), who examined the variability of perceptions of income inequality based on reference groups and social status, people tend to underestimate income inequality in their own country and make incorrect inferences about income inequality based on information obtained from their immediate environment. (2019) found that people's perceptions of their status within society also influence their conclusions about income inequality.

In terms of this study, apart from the studies mentioned in the literature, the study by Amiel & Cowell (1992) stands out on the issue of income inequality. In this study, an experiment was conducted on the perception of income inequality, and it was found that people have variable perceptions. In the experimental procedure of the study, participants were asked numerical and verbal questions about income inequality. The numerical and verbal questions asked had the same meaning. Therefore, participants were expected to answer the questions with the same meaning in a similar way. However, as the complexity level of the questions increased, the answers given to the numerical and verbal questions differed significantly. In subsequent years, two similar studies were conducted: Ballano & Ruiz-Castillo in 1993 and Jancewicz in 2016. These two studies yielded results similar to those obtained in the study by Amiel & Cowell.

5. MATERIALS AND METHODS

This study was conducted to reveal perceptions of income inequality. In this context, the study first conducted by Amiel & Cowell in 1992 was used as a basis. In that study, a survey was conducted to determine perceptions of income inequality, and it was found that participants' perceptions of income inequality varied under different scenarios.

This study differs from other studies in several ways. For example, in other studies, participants were labeled as supporters of certain axioms found in the literature on income inequality after giving their answers, but this study does not include such details. Furthermore, while in other studies the questions "Doubling Income," "Adding a Fixed Amount," and "Reducing a Fixed Amount" were all included in the "Income Transformation Scenario," in this study only the question "Doubling Income" is included in the "Income Transformation Scenario." and the "Fixed Amount Addi-

tion" question is presented as a separate scenario. The "Fixed Amount Reduction" question is not included in this study in order to reduce the number of similar questions. In addition, the options presented to participants in the verbal questions in Amiel & Cowell's "Income Transformation Scenario," "Transfer Principle Scenario," and "Population Replication Scenario" have been simplified in this study and presented as "Decreases," "Increases," and "Remains Unchanged." Again, unlike this study, Amiel & Cowell's study asked participants if they wanted to change their preferences immediately after each verbal question, but this option is not offered in this study. While Amiel & Cowell and Jancewicz's studies depict individuals' incomes as 5, 8, and 10, this study changes individuals' incomes to 2, 5, and 8. In the question posed in the "Fixed Amount Addition Scenario," 6 units are added to individuals' incomes in this study, whereas 5 units are added in other studies, and this amount is the same as in Ballano & Ruiz-Castillo's study. One important point is that the "Unequal Enrichment Scenario" in Amiel & Cowell's study, as Jancewicz also mentions, is a scenario that is quite difficult for participants to understand and answer. Therefore, this scenario will not be included in the analysis section of this study. Finally, the main objective of this study is to explain the perception of income inequality using the link between behavioral economics and the framing effect. Other studies also present a similar analysis, but they do not include the link between behavioral economics and the framing effect.

The study employed an online survey method, and 101 academics working at a foundation university were selected as the experimental group. In the survey application procedure, participants were first asked 9 numerical questions, followed by 6 verbal questions. Some of these numerical questions and each of the verbal questions have the same meaning, and participants will be tested to see if they gave the same answer to these questions in the context of the framing effect. For this purpose, frequency tests were performed using the SPSS 29.0.2.0 program to analyze the data in the study. Although this study has certain limitations, participants who wish to participate in the survey are required to share certain demographic information (such as age, gender, or income status). Those who do not wish to share this information cannot participate in the survey. However, compared to other studies, the number of participants is lower.

The following scenarios are listed in order: "Income Transformation Scenario," "Fixed Amount Addition Scenario," "Transfer Principle Scenario," "Population Replication Scenario," and "Decomposability Scenario." Since a different method was followed from other studies in terms of scenarios, a comparative analysis with other studies was performed for the three scenarios other than the "Income Transformation Scenario" and the "Fixed Amount Addition Scenario." Since the main objective of this study is to measure the perception of income inequality through the framing effect, it is irrelevant whether the questions in all scenarios are answered correctly. What matters is whether the participants give the same answer to the numerical and verbal questions (two numerical questions in the case of the Decomposability Scenario) within the relevant scenario. As mentioned earlier in this study, the framing effect is an effect where the same situation is presented differently, and preferences may change accordingly. Therefore, when examining the scenarios, it is important whether participants are influenced by the framing effect rather than whether they give the correct answer.

5.1. Income Transformation Scenario

According to the income transformation scenario, the incomes of individuals in society (3 individuals in total) (2, 5, and 7) have been doubled (4, 10, and 14). To avoid framing effects, participants should choose the "Decreases" option in the verbal question if they chose option A in the numerical question, the 'Increases' option in the verbal question if they chose option B in the numerical question, and the "Neither" option in the verbal question if they chose both options in the numerical question. (A and B together) they should choose the "Remains the same" option in the verbal question.

Q1. In which option is the income distribution more unequal?

- A = (2, 5, 7)
- B = (4, 10, 14)

Q10. Consider a society where each individual has a different income. How does income inequality change when each individual's income is doubled?

- Decreases
- Increases
- Remains unchanged

Under this scenario, a large portion of participants chose "Increases" in the numerical question, while in the verbal question, the choices 'Increases' and "Remains the same" were almost equal. The percentage of those who changed their answer from the numerical question to the verbal question was 51%. In other words, it can be said that 51% of participants in the income conversion scenario were influenced by the framing effect (Table 1).

Table 1. Analysis of income transformation scenario

Numerical Q (Q1) (%)			Verbal Q (Q10) (%)			Q1 & Q10 (%)	
Decrease	Increase	Unchanged	Decrease	Increase	Unchanged	Same	Different
7	69	24	1	49	50	49	51

5.2. Fixed Amount Addition Scenario

According to the fixed amount addition scenario, a fixed income of 6 units was added to the income of each individual in the community (3 individuals in total) (10, 11, and 13). To avoid framing effects, participants who chose option A in the numerical question should choose the "Decreases" option in the verbal question, those who chose option B in the numerical question should choose the "Increases" option in the verbal question, and those who chose both options in the numerical question (A and B together) they should choose the "Remains the same" option in the verbal question.

Q2. In which option is the income distribution more unequal?

- A = (2, 5, 7)
- B = (8, 11, 13)

Q11. Consider a society where each individual has a different income. If a fixed amount is added to each individual's income, how will income inequality be affected?

- Decreases
- Increases
- Remains unchanged

Under this scenario, a large portion of participants concentrated on the "Decreases" option in the numerical question, while concentrating on the "Remains unchanged" option in the verbal question. The percentage of those who changed their answer from the numerical question to the verbal question was 61%. In other words, in the fixed amount addition scenario, 61% of participants can be said to have fallen under the framing effect. This rate is higher than in the previous scenario (income transformation scenario) (Table 2).

5.3. Transfer Principle Scenario

According to the transfer principle scenario, 1 unit of income has been transferred from one individual (with 8 units of income) to another (with 5 units of income) among the individuals in the community (5 individuals in total). (In the new situation, the high-income individual's income has decreased from 8 to 7, while the low-income individual's income has increased from 5 to 6). The incomes of the other individuals have not changed. To avoid framing effects, participants should choose the "Decreases" option in the verbal question if they chose option A in the numerical question, the 'Increases' option in the verbal question if they chose option B in the numerical question, and the "Neither" option in the verbal question if they chose both options in the numerical question (A and B together) they should choose the "Remains the same" option in the verbal question.

Q3. In which option is the income distribution more unequal?

- A = (2, 5, 8, 11, 14)
- B = (2, 6, 7, 11, 14)

Q12. Consider a society where each individual has a different income. Assuming that the incomes of other individuals remain fixed, let us assume that a certain amount of income is transferred from the higher-income individual to the lower-income individual for only two individuals. As a result of this situation, the lowest-income individual remains the lowest-income individual, and the highest-income individual remains the highest-income individual. How is income inequality affected?

- Decreases
- Increases
- Remains unchanged

Under this scenario, although most participants chose the "Increases" option in the numerical question, a large majority changed their choice in the verbal question and selected the "Decreases" option. The same situation occurred in the other three studies, except for the study by Ballano & Ruiz-Castillo. In this scenario, the percentage of participants who changed their answer from the numerical question to the verbal question was 72%. In other words, it can be said that 72% of participants were susceptible to the framing effect in the fixed amount addition scenario. This percentage is higher than in the previous two scenarios (income transformation and fixed amount addition scenarios) (Table 3).

Table 2. Analysis of fixed amount addition scenario

Numerical Q (Q2) (%)			Verbal Q (Q11) (%)			Q2 & Q11 (%)	
Decrease	**Increase**	**Unchanged**	**Decrease**	**Increase**	**Unchanged**	**Same**	**Different**
58	23	19	24	16	60	39	61

Table 3. Analysis of transfer principle scenario

	Numerical Q (Q3) (%)			Verbal Q (Q12) (%)			Q3 & Q12 (%)	
	Decrease	**Increase**	**Unchanged**	**Decrease**	**Increase**	**Unchanged**	**Same**	**Different**
Altun & Altan (2025)	35	51	14	63	9	28	28	72
A&C (1992)	35	42	22	60	24	14	-	-
B&R-C (1993)	54	22	24	57	37	6	-	-
J (2016)	38	42	20	55	23	22	-	-

5.4. Population Replication Scenario

According to the population replication scenario, copies of each individual in society (3 individuals in total) have been included in society (2, 5, and 7). In the new situation, the number of individuals in the society is 6 (2, 2, 5, 5, 7, 7). To avoid framing effects, if participants choose option A in the numerical question, they should choose the "Decreases" option in the verbal question; if they choose option B in the numerical question they should choose the "Increases" option in the verbal question, and if they choose both options in the numerical question (A and B together), they should choose the "Remains unchanged" option in the verbal question.

Q4. In which option is the income distribution more unequal?

- A = (2, 5, 7)
- B = (2, 2, 5, 5, 7, 7)

Q13. Consider a society where each individual has a different income. Assume that a copy of each individual in this society (the real individual and the copy have the same income) is included in the society. How does this affect income inequality?

- Decreases
- Increases
- Remains unchanged

Under this scenario, a large portion of participants chose the "Decreases" option in the numerical question, while they chose the "Remains unchanged" option in the verbal question. Compared to other studies, this study shows a concentration on the "Decreases" option in the numerical question, while other studies show a concentration on the "Remains unchanged" option. However, when comparing the verbal question, all studies show a concentration on the "Remains unchanged" option. In this scenario, the percentage of those who changed their answer from the numerical question to the verbal question is 67%. In other words, it can be said that 67% of participants in the copycat scenario fell victim to the framing effect. This rate is lower than in the previous scenario (transfer principle) but higher than in the first two scenarios (income transformation and fixed amount addition scenarios) (Table 4).

5.5. Decomposability Scenario

According to the decomposability scenario, two additional individuals with fixed and identical incomes (10 units of income) were added to two different societies (3 individuals with incomes of 7, 11, and 12 units, and 3 individuals with incomes of 8, 9, and 13 units, respectively). To avoid framing effects, if participants chose option A in the first numerical question (question 8), they should choose option A again in the second numerical question (question 9). If they chose option B in the first numerical question (question 8), they should choose option B again in the second numerical question (Question 9). Unlike the other scenarios, this scenario compares two numerical questions rather than a numerical and a verbal question.

Q8. In which option is the income distribution more unequal?

- A = (7, 11, 12)
- B = (8, 9, 13)

Q9. In which option is the income distribution more unequal?

- A = (7, 10, 10, 11, 12)
- B = (8, 9, 10, 10, 13)

Q15. Suppose there are two societies with the same number of individuals and total income, but where income is distributed differently among individuals. Suppose two individuals with equal income are included in both societies. How is income inequality affected?

a. In the society where income is distributed more unequally, income continues to be distributed more unequally after the inclusion of new individuals.

b. Without knowing the exact income distribution, it is impossible to say for certain which society has a more unequal distribution of income.

c. None of the above.

Under this scenario, the percentage of respondents who gave the same answer to both numerical questions was 60%, while the percentage of respondents who gave different answers to both numerical questions was 40%. In other words, in the separability scenario, it can be said that 40% of participants were susceptible to the framing effect. This percentage is lower than in all previous scenarios. Compared to other studies, in Jancewicz's study, except for the nearly balanced ratio, the majority of participants in all other studies gave the "Same" answer (Table 5).

Table 4. Analysis of population replication scenario

	Numerical Q (Q4) (%)			Verbal Q (Q13) (%)			Q4 & Q13 (%)	
	Decrease	Increase	Unchanged	Decrease	Increase	Unchanged	Same	Different
Altun & Altan (2025)	57	19	24	10	21	69	33	67
A&C (1992)	31	10	58	22	9	66	-	-
B&R-C (1993)	28	12	60	20	16	64	-	-
J (2016)	40	9	51	31	8	60	-	-

Table 5. Analysis of population replication scenario

	Numerical Qs (Q8 & Q9) (%)		Verbal Q (Q15) (%)		
	Same	**Different**	**a**	**b**	**c**
Altun & Altan (2025)	60	40	33	52	15
A&C (1992)	57	41	40	45	11
B&R-C (1993)	68	32	43	52	5
J (2016)	51	49	27	69	5

6. RESULT AND DISCUSSION

This study is similar to those conducted by Amiel & Cowell in 1992, followed by Ballano & Ruiz-Castillo in 1993 and Jancewicz in 2016. The most fundamental difference between this study and others is that it examines the perception of income inequality through behavioral economics and the framing effect.

The framing effect is an effect whereby decisions can differ depending on how the same situation is presented. This study also tested the perception of income inequality by utilizing this effect. To this end, in the first stage of the survey, designed as an experiment, participants were asked numerical questions related to income inequality, while in the second stage, they were asked verbal questions with the same meaning as the numerical questions. The basic logic is this: The answers given to numerical questions should match the answers given to verbal questions. If this does not happen, we can say that participants have been influenced by the framing effect and their perception of income inequality has been distorted. The five basic scenarios in Amiel & Cowell's study (Income Transformation, Transfer Principle, Population Replication, Decomposability, Unequal Enrichment) were presented in this study in a slightly different form. The reason for this is the considerable complexity of the Unequal Enrichment scenario in particular and the similarity of question types within the Income Transformation scenario. The complexity of the Unequal Enrichment scenario is also mentioned in Jancewicz's study.

7. CONCLUSION

In terms of the results of this study, it was found that as the complexity of the questions increased, participants were more susceptible to the framing effect and their perception of income inequality was distorted. This result is broadly consistent with other studies. It was found that in simpler scenarios (e.g., comparing two numerical questions in the decomposability scenario), participants' perception levels were better and they were less susceptible to the framing effect.

One of the biggest problems in the perception of income inequality is how income inequality is communicated to people. It is important that data and facts that can be perceived as complex are communicated in the simplest and most understandable way. For example, the statement "we must reduce income inequality by this much in percentage terms" may not be easily understood perceptually. However, it may be easier to understand if it is framed positively, such as "if income inequality decreases, the level of prosperity and social harmony will increase," or negatively, such as "if income inequality increases, the level of social conflict and unrest will increase." From another perspective, when tax policy is implemented to reduce income inequality, it may be more beneficial to convey this as "a more equitable society." However, data on income inequality should be presented in a more transparent and impartial manner. If the level of economic literacy among individuals is also increased, a better perception of income inequality can be formed in society, which can contribute to solving the problem of income inequality.

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The Interaction Between Core Strategic Dimensions and the Iso 56001 Innovation Management System in Organizations: An Empirical Approach

Organizasyonlarda Temel Stratejik Boyutlar ve ISO 56001 Inovasyon Yönetim Sistemi Etkileşimi: Ampirik Bir Yaklaşım

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ISO 56001 innovation management system, key strategic dimensions, organizations

ABSTRACT

ISO 56001 Innovation System aims to realize and maintain the competencies of organizations to realize innovative innovations in a systematic standard. Therefore, it can be stated that the interaction of the organization with its strategic dimensions will be important. In this context, the main purpose of this research is to determine the relationship of basic strategic dimensions with the ISO 56001 Innovation Management System within the scope of the opinions of the practitioners. The survey created for the research was answered by 32 practitioners in the energy sector operating internationally, in the first ISO 56001 innovation management system certified business in the world, between January 2025 and March 2025. As a result of the research, four factors were formed: "basic strategic dimensions", "visionary, system, market and competition dimensions", "innovativeness, collaborations, reputation and image dimensions" and "behavioral dimensions". A high and moderate positive linear correlation was determined between the dimensions. According to the findings of the structural equation model, it was determined that there is a positive interaction between the basic strategic dimensions in organizations and the ISO 56001 innovation management system strategic dimensions.

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MAKALE BİLGİSİ

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ISO 56001 inovasyon yönetimi sistemi, temel stratejik boyutlar, organizasyonlar

ÖZ

ISO 56001 İnovasyon Sistemi organizasyonlarda inovatif ağırlıklı yeniliklerin gerçekleştirilmesine yönelik yetkinliklerini sistematik bir standartta gerçekleştirme ve sürdürebilmeyi amaçlamaktadır. Bu nedenle temel olarak organizasyonun stratejik boyutlarıyla etkileşiminin önemli olacağı belirtilebilir. Bu kapsamda, bu araştırmanın temel amacı, temel stratejik boyutların ISO 56001 İnovasyon Yönetim Sistemi ile ilişkiselliğinin uygulayıcıların görüşleri kapsa-

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mında belirlenmesidir. Araştırmaya yönelik olarak oluşturulan anket Ocak 2025 ve Mart 2025 tarihleri arasında uluslararası faaliyette bulunan enerji sektöründe yer alan endüstride Dünya'da ilk kez ISO 56001 İnovasyon Yönetim Sistemi belgelendirmesi gerçekleştirilen küresel ölçekli bir işletmede 32 uygulamacıya yanıtlatılmıştır. Araştırmanın sonucunda, "temel stratejik boyutlar", "vizyoner, sistem, pazar ve rekabet boyutları", "inovatiflik, işbirlikleri, itibar ve imaj boyutları" ve "davranışsal boyutlar" şeklinde dört faktör oluşmuştur. Boyutlar arasında yüksek ve orta düzeyde pozitif yönde doğrusal bir korelasyon belirlenmiştir. Yapısal eşitlik modeli bulgularına göre ise, organizasyonlarda temel stratejik boyutlar ile ISO 56001 İnovasyon Yönetim Sistemi Stratejik Boyutları arasında pozitif yönde bir etkileşim olduğu belirlenmiştir.

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1. INTRODUCTION

Organizations operating in today's constantly changing and transforming environments tend to act with a long-term perspective that shapes both the present and the future. In this context, innovation has become increasingly important for organizations to achieve sustainable competitive advantage and to ensure alignment not only with their internal environment but also with external conditions in highly competitive markets (Snyman & Kruger, 2004: 8; Çoban, 2019: 3).

Strategic management is a multidimensional framework that guides all strategic processes of organizations by defining their mission, vision, values, and principles (Hussey, 1998: 277). It encompasses internal and external analyses, the determination of strategic objectives, the selection, implementation, and control of competitive strategies, and the structuring of strategic leadership (Sammut-Bonnici, 2015: 2; Grant & Jordan, 2014: 13; Yiğit & Yiğit, 2015: 120). Therefore, differentiation in competition goes beyond products and services and encompasses managerial processes and organizational activities as a whole (Taşgit & Demirel, 2016: 308). At the same time, it supports organizations in minimizing vulnerability to external threats by enabling proactive precautions (Chaneta, 2015: 18).

ISO 56001 Innovation Management System, on the other hand, is defined as an international standard designed to institutionalize and systematically manage innovation activities in a globally recognized manner (Gueorguiev, 2023: 2). The ISO 56001 framework aims to enhance the strategic innovation capacity of organizations through foundational principles such as leadership, employee participation, knowledge management, risk-based thinking, and continuous improvement (www.iso.org). In this respect, ISO 56001 not only emphasizes achieving innovative outcomes but also positions innovation as an integral component of organizational strategy.

Although the literature includes various studies addressing the relationship between strategic management and innovation, empirical evidence regarding how these two structures are integrated—particularly within organizations that operate internationally and have become the first globally to obtain ISO 56001 certification—remains limited. Addressing this gap, the present research aims to systematically examine the relationship between key strategic dimensions and the ISO 56001 Innovation Management System within organizations.

The key strategic dimensions considered within this framework include visionary orientation, strategic planning competence, competitiveness, systemic approaches, collaboration culture, and behavioral factors. Investigating how these elements align with and complement the structural components of an innovation system forms the core focus of this study.

Within this context, a structural model regarding the alignment between ISO 56001 and strategic management dimensions was developed and tested based on the views of practitioners working in an internationally operating energy-sector organization that underwent ISO 56001 certification. The findings not only corroborate theoretical assumptions but also empirically demonstrate how innovation serves as a driving force within strategic planning and implementation processes. Consequently, this study contributes to both academic knowledge and managerial practice by offering a guiding framework for organizations seeking to integrate innovation-oriented strategic approaches.

2. LITERATURE REVIEW

2.1. Key Strategic Dimensions in Organizations

Within the scope of strategic leadership and perspective, strategic management provides a holistic short-, medium-, long-, and especially very long-term outlook shaped by both internal and external environments. It incorporates mission, vision, objectives, targets, and performance indicators, forming a proactive, competitive, and comprehensive managerial approach (Bateman & Zeithaml, 1990: 185; Turpcu, 2017: 12–13). Strategic management guides the direction of strategic decision-making and the actions required to achieve it (Howe, 1993: 27).

Mission and vision statements, as the starting point of organizational orientation, define the personality, strategic outlook, and strategic framework of the organization. The mission expresses the organization's current reason for existence—what it is and what it is not—while the vision represents an ideal long-term future state expected to be achieved. These statements play a crucial role in guiding the selection and implementation of appropriate strategic decisions (Gül, 2017: 28–30).

A rational and up-to-date understanding of the organization's current situation is essential for determining strategies and setting strategic objectives and goals. Various analytical tools—such as internal and external environment analyses, SWOT analysis, risk analysis, stakeholder analysis, financial analysis, and value chain analysis—can be employed (Lehtinen & Aaltonen, 2020: 86; Gül & Çarıkçı, 2014: 38).

Strategic goals represent the concrete, measurable objectives an organization aims to achieve in the future. Their clarity, feasibility, and time-boundedness directly influence the success of strategic orientation. Effective goal-setting enhances not only the clarity of strategy but also employee motivation and overall organizational performance.

The selection of appropriate competitive strategies is crucial for achieving strategic goals. Porter's cost leadership, differentiation, and focus strategies provide organizations with guidance on market positioning. When aligned with the organization's sectoral structure and resource capabilities, these strategies support the achievement of sustainable competitive advantage (Dess & Davis, 1984: 469).

Another key element enhancing the effectiveness of strategic structures is strategic leadership. Strategic leadership is manifested primarily through top executives and plays a decisive role across all organizational processes, decisions, time horizons, and resource allocations (Sert, 2015: 14–17).

A holistic understanding of key strategic dimensions within organizations influences not only the success of strategic plans but also organizational flexibility and environmental adaptation capacity. For this reason, each dimension must be evaluated as a complementary component within the strategic management process and effectively implemented in organizational practice.

2.2. ISO 56001 Innovation Management System

Innovation can be defined as a concept that encompasses originality and desirability, driving improvement, transformation, and novelty. For organizations, innovation is a primary source of value creation. The value created reflects processes that demonstrate desirability and reputation from the customer's perspective, making innovation directly related to competitive advantage (Porter, 1985). Rapid and dynamic environmental changes and technological shifts compel organizations to manage innovation systematically (Yüksel, 2023: 30).

At this point, ISO standards in general—and ISO 56001 Innovation Management System in particular—aim to ensure that innovation processes are managed strategically and systematically (Hyland & Karlsson, 2021: 11). ISO 56001 enables organizations to analyze and enhance innovation competencies, institutionalize innovation processes, and manage them proactively through a strategic lens (www.tse.org.tr).

For organizations, innovativeness extends far beyond products and services. ISO 56001 emphasizes that innovation is not limited to new products or services; it also requires innovative changes in organizational structures, processes, business models, and culture. Therefore, the standard outlines fundamental principles and implementation processes needed for effective innovation management (www.iso.org).

Increasing organizational innovation capacity centers on encouraging employees to generate new and creative ideas (Akyürek, 2020: 19–20). Leadership plays a critical role in inspiring, motivating, supporting, building trust and confidence, and achieving high individual and organizational performance. This process naturally requires active participation at all levels (Alharbi, 2021: 216).

Collaboration culture is another essential aspect of innovation management. While individuals may differ in their tendency toward cooperation or individualism, organizational culture plays a key role in aligning organizational and personal goals and values (Chatman & Barsade, 1995: 424). In this context, collaboration processes that support knowledge sharing, learning, and adaptation to changing conditions are vital for innovativeness (Torun, 2016: 39; Baykal Eriş, 2011: 27–28).

To implement ISO 56001, organizations must follow a structured framework. The process begins with context analysis, which helps organizations understand their internal and external environments, assess current innovation capabilities, and identify opportunities. After context analysis, innovation strategies are formulated and resources allocated accordingly. Operational innovation processes—including idea generation, commercialization, desirability assessment, and post-sales feedback—are critical steps (www.egiad.org).

Performance evaluation is essential for monitoring the effectiveness of innovation. This evaluation uses various indicators and tools to assess individual, team, departmental, and organizational-level outcomes (Yapa, 2024: 91). A robust performance measurement system adds value, while its absence creates organizational challenges.

ISO 56001 encourages organizations to continuously improve their innovation processes through standardized approaches. Continuous improvement strengthens adaptability to changing environmental conditions and enhances innovation capacity. Innovation is not a static target but a dynamic and evolving process (www.iso.org).

Systematic innovation approaches enable organizations to gain competitive advantage and ensure sustainability (Tidd & Bessant, 2020: 70). For innovation processes to become a strategic management tool, organizations must adopt foundational principles and effectively manage implementation.

2.3. Relationship Between Key Strategic Dimensions and the ISO 56001 Innovation Management System

In strategic terms, innovation refers to creating economic and non-economic value through originality, desirability, opportunity-orientation, risk consideration, entrepreneurship, and sustainable success under competitive environmental conditions (Tidd & Bessant, 2014: 6–9). Organizational innovation capacity must be continuously enhanced and integrated into managerial processes. Thus, strategic analyses, decision-making, and resource allocation must be evaluated rationally along with innovativeness (Taylan, 2024: 3–5).

ISO 56001 is built upon a strategic foundation. While defining innovation strategically, it emphasizes organizational context, leadership, strategic planning, content and value interaction, and assessment and monitoring processes. Strategically, it addresses innovation intent, innovation strategies, and policies; tactically, it focuses on innovation objectives; and operationally, on innovation implementation processes (ISO 56001, 2024: 7–9).

ISO 56001 serves as a critical guide that integrates innovation with the strategic and managerial processes of organizations. Leadership—present in both strategic management and ISO 56001—forms a natural point of alignment. Mission, vision, culture (values, principles, norms, beliefs), strategic objectives, performance indicators, and continuous improvement also align across strategic, tactical, and operational levels. Continuous improvement enhances organizational resilience to environmental conditions (Yukl & Gardner, 2020: 336–340), making standardized innovation essential for proactive adaptation.

Managing innovation systematically improves the effectiveness of strategic innovation objectives. Strategic management, in turn, provides the broader institutional context and processes that guide innovation activities. Thus, innovation becomes an integral component of strategic management rather than merely a supporting tool.

Innovation influences institutionalization at all levels by engaging the entire organization in unified, innovation-driven goals (Hancıoğlu & Yeşilaydın, 2016: 106–107) and supports the organization's future-oriented vision (Aytar & Soylu, 2017: 119). Therefore, these two approaches—strategic management and innovation management—are complementary and provide a stable foundation for modern organizations facing dynamic environmental conditions.

Strategic management minimizes randomness. Similarly, ISO 56001 replaces accidental innovation outcomes with systematic, measurable, and sustainable innovation processes supported by key strategic dimensions.

The context analysis conducted during the establishment of the innovation system resembles strategic planning's environmental analysis and demonstrates that both approaches fundamentally rely on the same managerial philosophy (www.iso.org).

3. RESEARCH

3.1. Purpose of the Research

The primary purpose of this research is to determine the relationship between the key strategic dimensions of organizations and the ISO 56001 Innovation Management System based on the perspectives of practitioners. In addition, the general opinions of participants regarding the ISO 56001 Innovation Management System were examined in a broader analytical framework.

3.2. Data Collection Tools

The data collection form used in the study consists of three main sections.

In the first section, demographic variables—the independent variables of the study—were included: age, gender, education level, job position (manager or non-manager), and years of professional experience.

In the second section, participants were asked three key questions assessing their general perceptions of the ISO 56001 Innovation Management System:

"To what extent is the ISO 56001 Innovation Management System necessary for organizations?"

"To what extent is the ISO 56001 Innovation Management System important within the framework of strategic dimensions?"

"To what extent can strategic dimensions be integrated with the ISO 56001 Innovation Management System?"

In the third section, to measure participants' views on organizational strategic dimensions, seven statements were included; and to evaluate the strategic importance of ISO 56001, twelve statements were used. These items were adapted from prior studies on strategic dimensions (Chaneta, 2015; Grant, 2014; Çıkmaz, 2024; Athapaththu, 2016; Turpcu, 2017) and ISO 56001 Innovation Management System research (Merrill, 2024; Bajić et al., 2024; Arslan et al., 2025; Prasetiyo et al., 2025).

For statistical evaluation, a five-point Likert scale was used: 1 = Strongly disagree, 2 = Disagree, 3 = Moderate agreement, 4 = Agree, 5 = Strongly agree.

3.3. Data Collection and Analysis

The survey was conducted between January 2025 and March 2025 with 32 employees who actively participated in the ISO 56001 Innovation Management System implementation in their organization. Although a sample size of 32 may be perceived as small, the originality of this research lies in its focus on a globally operating enterprise that became the first organization in Türkiye and the world to implement the ISO

56001 Innovation Management System, which strengthens the relevance and significance of the findings.

The analyses included factor analysis, one-sample t-tests, correlation analysis, and structural equation modeling (SEM). Statistical analyses were conducted using SPSS and AMOS, and the results were interpreted in light of existing literature.

3.4. Main Hypotheses of the Research

The primary hypotheses tested in the study are as follows:

H1: The identified factor is significant within the framework of organizational strategic dimensions (f1: Basic strategic dimensions).

H2: The factors associated with ISO 56001 are significant (f2: Visionary, system, market and competition dimensions; f3: Innovativeness, collaborations, reputation and image dimensions; f4: Behavioral dimensions).

H3: There is a positive linear correlation among the factors identified in the study.

H4: There is a positive interaction between the basic strategic dimensions in organizations and the strategic dimensions of the ISO 56001 Innovation Management System.

4. FINDINGS

4.1. Findings Related to Independent Variables

The age distribution of participants (n=32) ranged from 27 to 57 years, with a mean age of 38.2±7.21. The mean age of female participants (n=15; 46.9%) was 38.7±5.87, while the mean age of male participants (n=17; 53.1%) was 37.8±8.38.

The distribution of educational levels was as follows: high school 3.1% (n=1), associate degree 3.1% (n=1), bachelor's degree 31.3% (n=10), and graduate degree 62.5% (n=20).

In terms of work experience, 31.3% (n=10) had 1–9 years of experience, while 68.8% (n=22) had 10 or more years. The participants were evenly distributed between managerial (50%, n=16) and non-managerial positions (50%, n=16).

To assess participants' general perceptions of the ISO 56001 Innovation Management System, three questions were asked. A large majority of respondents evaluated the system as highly or very highly necessary, strategically important, and highly integrable with strategic dimensions.

This result is noteworthy because it reflects the views of individuals who were directly involved in implementing the system and observing its outcomes. In other words, participants' responses indicate that the system has led to strategically meaningful results for the organization. The mean age of the participants in the study (n=32) was 38.2±7.21 years, with a minimum and maximum age of 27 and 57, respectively. For female participants (n=15, 46.9%), the mean age was 38.7±5.87, while for male participants (n=17, 53.1%) it was 37.8±8.38.

The educational background distribution was as follows: high school 3.1% (n=1), associate degree 3.1% (n=1), bachelor's degree 31.3% (n=10), and postgraduate degree 62.5% (n=20).

The distribution of participants' work experience indicated that 31.3% (n=10) had 1–9 years of experience, while 68.8% (n=22) had 10 years or more.

Regarding job position, 50% (n=16) were managers and 50% (n = 16) were other employees (Table 1).

4.2. Validity and Reliability of Measurement Instruments

In the third section of the survey, a principal component analysis (PCA) was employed for the statements deemed important within the scope of strategic dimensions. The Kaiser–Meyer–Olkin value was 0.726, and the result of Bartlett's Test of Sphericity indicated statistical suitability ($\chi^2 = 139.261$, df = 21, p = 0.000). The diagonal values of the anti-image correlation matrix ranged between 0.859 and 0.734. In light of these findings, conducting a factor analysis was deemed appropriate.

The resulting single-factor structure explained 70.398% of the total variance. The Cronbach's alpha coefficient of the single-factor model was 0.903, demonstrating strong internal consistency. Accordingly, the findings indicate that the factors represented by the survey items explain the construct at a highly reliable level (Table 2). The emerging factor was named "F1: Core Strategic Dimensions" in accordance with the nature of the statements it comprises.

Table 1. Overview of the ISO 56001 innovation management system

	n	%
To what extent is the ISO 56001 innovation management system necessary		
Medium	1	3.1
High	10	31.3
Very high	21	65.6
Total	32	100.0
To what extent is the ISO 56001 innovation management system important within the framework of strategic dimensions?		
Medium	1	3.1
High	10	31.3
Very high	21	65.6
Total	32	100.0
To what extent can the ISO 56001 innovation management system be integrated with strategic dimensions?		
Medium	1	3.1
High	10	31.3
Very high	21	65.6
Total	32	100.0

Table 2. Findings of the validity and reliability test within the scope of the strategic dimension

As a strategic dimension within organizations, … holds fundamental importance	Factor	Cronbach alfa
	1	General=0.903
Effective diversification strategies for both the present and the future across all organizational processes (pre-production, production, sales, and post-sales) within an institutional framework	0.853	0.876
The presence of a strategic leadership perspective and perception awareness	0.832	0.881
Effective functional strategies (human resources, production, marketing, logistics, finance, public relations, quality, R&D, etc.) for the present and the future across all operational processes (pre-production, production, sales, and post-sales)	0.814	0.883
The ability to conduct the necessary monitoring, feedback, revisions, and updates	0.797	0.888
Achieving strategic goals and objectives within the processes defined under the selected strategies	0.788	0.884
Effective cost-leadership and differentiation strategies for the present and the future across all processes (pre-production, production, sales, and post-sales) in the markets where the organization operates	0.771	0.888
The effective execution of strategic analyses (SWOT, PEST, risk analysis, value chain analysis, financial analysis, stakeholder analysis, etc.)	0.709	0.896

In the third section of the questionnaire, a principal component analysis (PCA) was preferred within the scope of the other dimension—namely, the ISO 56001 Innovation Management System—to examine the propositions considered important. The Kaiser-Meyer-Olkin value was 0.753, and the Bartlett's Test of Sphericity produced an appropriate result (χ^2 = 230.016, df = 66, p=0.000). The diagonal values of the anti-image correlation matrix ranged between 0.883 and 0.755. In light of these findings, conducting factor analysis was deemed appropriate.

The resulting three-factor structure explained 72.884% of the total variance. The first factor accounted for 28.868% of the variance, the second factor for 27.202%, and the final factor for 16.813%. The Cronbach's alpha coefficient of the three-factor structure was 0.919, indicating strong internal consistency. Based on this result, it was demonstrated that the factors represented by the propositions in the questionnaire explain the subject at a highly reliable level (Table 3).

Accordingly, the three emerging factors were named in line with their associated propositions as follows:

f2: Visionary, System, Market, and Competition Dimensions;

f3: Innovativeness, Collaboration, Reputation, and Image Dimensions;

f4: Behavioral Dimensions.

For the other dimension of the study, the ISO 56001 Innovation Management System, a principal component analysis (PCA) was likewise employed for the statements considered important. The Kaiser–Meyer–Olkin value was 0.753, and Bartlett's Test of Sphericity confirmed the suit-

Table 3. Findings of the validity and reliability tests within the scope of the ISO 56001 innovation management system

The ISO 56001 Innovation Management System is strategically important in…	Factors			Cronbach alfa	
	1	2	3	General=0.919	
Creating innovations that provide value to customers within the framework of originality;	0.892	0.148	0.067	0.839	0.898
Developing innovations that are demanded and preferred by customers;	0.879	0.150	0.197	0.833	
Achieving sustainable competitive advantage against rivals in the markets;	0.809	0.022	0.290	0.863	
Supporting the achievement of performance indicators in an optimal manner;	0.754	0.313	0.025	0.881	
Establishing and sustaining a strong, visionary innovation system;	0.578	0.432	0.258	0.891	
Fostering creative ideas and practices through participatory R&D activities;	0.075	0.831	0.194	0.827	0.867
Leveraging strengths and improving weaknesses to access innovative opportunities;	0.233	0.813	0.021	0.849	
Successfully implementing the philosophy of continuous improvement across all processes;	0.163	0.811	0.150	0.825	
Creating and sustaining corporate reputation and image;	0.155	0.729	0.416	0.826	
Realizing collaborations based on win–win strategies;	0.386	0.525	0.366	0.863	
Ensuring the presence of effective leadership and motivation processes;	0.250	0.150	0.856	-	0.820
Embedding innovation-driven competencies, perceptions, attitudes, and behaviors within the organization.	0.133	0.310	0.850	-	

ability of the data for factor analysis ($\chi^2 = 230.016$, df = 66, p = 0.000). The diagonal values of the anti-image correlation matrix ranged between 0.883 and 0.755. These findings indicated that conducting a factor analysis was appropriate.

The resulting three-factor structure explained 72.884% of the total variance. The first factor accounted for 28.868% of the variance, the second factor for 27.202%, and the third factor for 16.813%. The Cronbach's alpha coefficient of the three-factor model was 0.919, demonstrating strong internal consistency. Accordingly, the factors represented by the survey items explain the construct at a highly reliable level (Table 3).

In line with the content of the items included within each factor, the three factors were respectively named as follows: "F2: Visionary, System, Market, and Competitive Dimensions," "F3: Innovativeness, Collaboration, Reputation, and Image Dimensions," and "F4: Behavioral Dimensions."

4.3. Findings Related to the Factors

Within the scope of the research, the H1 hypothesis established for the core strategic dimensions ("The factor … is important within the framework of strategic dimensions in organizations (f1)") and the H2 hypothesis developed for the ISO 56001 Innovation Management System ("Within the scope of the ISO 56001 System, the factor … is important")—covering the factors f2: Visionary, system, market, and competition dimensions; f3: Innovativeness, collaborations, reputation, and image dimensions; and f4: Behavioral dimensions—were accepted for each factor (Table 4).

In other words, it can be interpreted that practitioners of the ISO 56001 Innovation Management System attach a high level of importance to the "core strategic dimensions" established for the strategic dimension, as well as to the "visionary, system, market, and competition dimensions," the "innovativeness, collaborations, reputation, and image dimensions," the "behavioral dimensions," and their respective contents, which were developed for the ISO 56001 Innovation Management System.

As a result of the correlation analysis, the H3 hypothesis ("There is a positive linear correlation among the factors identified in the study") was accepted for all pairwise correlations. In other words, all pairwise covariations among the factors were found to be positive and linear.

The strength of the relationships indicates that the pair consisting of "Core Strategic Dimensions (f1)" and "Visionary, System, Market, and Competition Dimensions (f2)" exhibits a high-level correlation, whereas the correlations among the remaining factor pairs are at a moderate level (Table 5).

According to the results of the structural equation modeling, the H4 hypothesis—"There is a positive interaction between the core strategic dimensions in organizations and the strategic dimensions of the ISO 56001 Innovation Management System"—was found to be significant, as presented in Table 6. Although the model coefficients (β values) are relatively low, they are statistically significant (Table 6).

Table 4. One-Sample t-Test within the Scope of the Factors

Factors	n	$\bar{x}$±s	Test value =3	
			t	p
Core strategic dimensions (f1)	32	4.5±0.49	17.793	0.000
Visionary, system, market, and competition dimensions (f2)	32	4.4±0.60	13.366	0.000
Innovativeness, collaboration, reputation, and image dimensions (f3)	32	4.4±0.48	16.697	0.000
Behavioral dimensions (f4)	32	4.4±0.54	15.378	0.000

Table 5. Correlation analysis findings

Factors	Symbol	Core strategic dimensions (f1)	f2	f3
Visionary, system, market, and competition dimensions (f2)				
	r	0.693**		
	p	0.000		
Innovativeness, collaboration, reputation, and image dimensions (f3)				
	r	0.589**	0.508**	
	p	0.000	0.003	
Behavioral dimensions (f4)				
	r	0.519**	0.439*	0.526**
	p	0.002	0.012	0.002

Table 6. Structural equation modeling analysis results

Paths	β	Standard error	Critical ratio	p	Result
TSB <--> ID	0.097	0.044	2.187	0.029	Accepted
TSB <--> IV	0.167	0.067	2.485	0.013	Accepted
TSB <--> II	0.092	0.042	2.217	0.027	Accepted
IV <--> II	0.147	0.070	2.105	0.035	Accepted
II <--> ID	0.147	0.058	2.530	0.011	Accepted
IV <--> ID	0.151	0.075	2.006	0.045	Accepted

TSB: Core strategic dimensions; IV: Innovation: Visionary, system, market, and competition Dimensions; II: Innovation: Innovativeness, collaboration, reputation, and image dimensions; ID: Innovation: Behavioral dimensions.

Comparatively, the interaction between the core strategic dimensions and the strategic dimensions of the ISO 56001 Innovation Management System is, from highest to lowest, as follows: IV (Innovation: visionary, system, market, and competition dimensions), ID (Innovation: behavioral dimensions), and II (Innovation: innovativeness, collaboration, reputation, and image dimensions).

In addition, the research findings indicate that there is also a positive interaction among the strategic dimensions of the ISO 56001 Innovation Management System itself (Table 6).

Furthermore, the fit indices—CMIN/DF =1.788, GFI =0.902, NFI =0.902, CFI =0.903, and RMSEA =0.0788—demonstrate that the model exhibits an acceptable level of fit (Fig. 1).

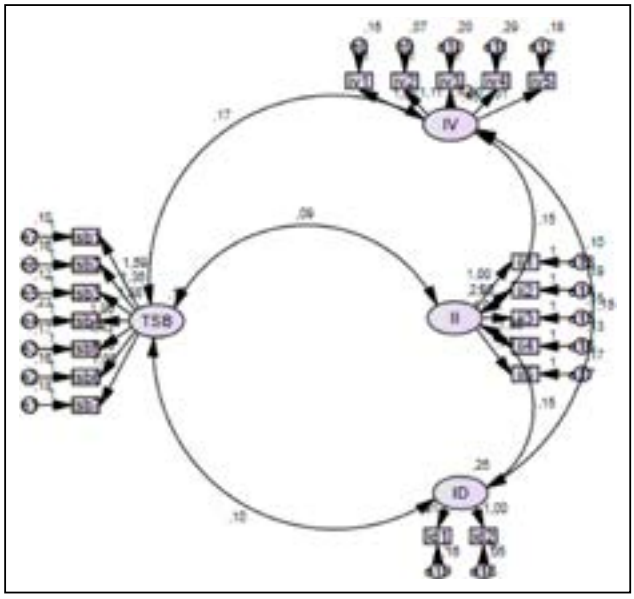

Figure 1. Structural equation model illustrating the relationship between core strategic dimensions (TSB) and the ISO 56001 innovation management system strategic dimensions (IV, II, ID).

5. CONCLUSION

Strategic management and innovation can be described as two fundamental managerial domains that interact to enhance the competitiveness and sustainability of contemporary organizations (Karaman, 2019: 43). In other words, in today's rapidly changing external environment and conditions, organizations cannot consider strategic dimensions and innovation separately. Proactive adaptation to the external environment and sustainable competitive advantage can only be evaluated together with innovativeness within a strategic framework.

This integrated perspective is consistent with prior studies emphasizing that innovation delivers sustainable value only when it is embedded within a clear strategic orientation supported by leadership and systematic processes (Tidd & Bessant, 2020). Accordingly, innovation management systems that operate independently from strategic intent tend to remain fragmented and produce limited long-term impact.

In this study, the interaction between core strategic dimensions and the ISO 56001 Innovation Management System was examined comprehensively based on theoretical approaches and the perspectives of practitioners. The survey conducted within an enterprise that holds the ISO 56001 certification and actively implements the system aimed to reveal the structural alignment between strategic management and innovation management.

The research was carried out between January 2025 and March 2025 with 32 ISO 56001 practitioners working in a globally operating enterprise in the energy sector. The questionnaire consisted of three main sections. The first section collected demographic information (age, gender, education level, position, and experience); the second section gathered participants' overall views on the ISO 56001 system; and the third section included scale-based questions evaluating the relationship between core strategic dimensions and innovation management.

The majority of participants (65.6%) evaluated the ISO 56001 system as "very highly" necessary. Similarly, the perceived relationship and level of integration between the system and strategic dimensions were assessed as "high" or "very high." This indicates that the system is regarded not only as a technical management tool but also as a strategic lever.

This perception aligns with recent empirical evidence showing that ISO 56001-based innovation management systems strengthen strategic alignment and enhance innovation performance when integrated with organizational strategy (Arslan et al., 2025).

Factor analysis revealed that the organizational strategic structure clustered into four factors: (1) Core Strategic Dimensions, (2) Visionary, System, Market, and Competition Dimensions, (3) Innovativeness, Collaboration, Reputation, and Image Dimensions, and (4) Behavioral Dimensions.

Findings from the one-sample t-test demonstrated that all these factors were considered highly important and were viewed as integral components of strategic planning processes at the organizational level.

Correlation analysis showed positive and significant relationships among all factors. The particularly strong relationship between "Core Strategic Dimensions" and "Visionary, System, Market, and Competition Dimensions" suggests that strategic orientation plays a guiding role in shaping the innovation system.

This result supports the view that innovation systems are primarily driven by strategic direction rather than isolated operational initiatives, reinforcing the role of strategy as a central coordinating mechanism for innovation activities (Snyman & Kruger, 2004).

Structural equation modeling further confirmed positive and statistically significant interactions between the core strategic dimensions and the ISO 56001 Innovation Management System dimensions.

In conclusion, the study demonstrated the presence of a strong structural and functional relationship between the ISO 56001 Innovation Management System and core strategic dimensions. The findings suggest that ISO 56001 not only enhances innovation capacity but also directly contributes to the processes of setting, steering, and monitoring strategic objectives. In this respect, the system provides organizations with visionary orientation, strategic flexibility, and competitive advantage.

Overall, these findings corroborate the argument that standardized innovation management systems function as strategic enablers by integrating innovation, leadership, and organizational behavior into a coherent strategic framework (Hyland & Karlsson, 2023).

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Review Article / Derleme

Marketing Strategies for Promoting or Preventing Tobacco Use among Youth

Gençlere Yönelik Tütün Kullanımını Teşvik Eden ve Önleyen Pazarlama Stratejileri

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ABSTRACT

The study aims to examine the marketing efforts that encourage and oppose the consumption of tobacco and tobacco products, especially among young people. The motivational marketing activities for tobacco and tobacco products are based on themes such as freedom, social belonging and aspirational lifestyles, especially to attract young people. On the other hand, counter-marketing efforts for these products focus on public service announcements, legal measures and behavioral change campaigns, or a combination of all of these, to raise public awareness, thus attempting to reduce potential harmful effects from the very beginning. The study examines both-way marketing efforts on the subject with global and regional examples, and emphasizes graphical warnings, increased tax practices, digital promotion activities and other effective policies to prevent people from quitting or starting smoking. In the literature, studies on the subject reveal the critical role of comprehensive and multi-faceted approaches in reducing the use of tobacco and tobacco products and the health risks they may bring. In addition, this study emphasizes that there is a need for continuous innovation in anti-tobacco marketing activities, especially in today's world, in digital and social media areas, in order to counter the strategies developed by the tobacco industry for the sale of their products. The most basic conclusion obtained from the research is that the long-term prevention of tobacco product use will be achieved by the integrated action of the social and legal environment in a broader sense.

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ÖZ

Bu çalışmanın amacı, tütün ve tütün mamullerinin tüketimine yönelik özendirici ve karşıt olan pazarlama çalışmalarını gençler özelinde incelenmektedir. Tütün ve tütün mamullerine yönelik özendirici pazarlama faaliyetlerinin temelinde, özellikle gençleri çekmek için özgürlük, sosyal aidiyet ve istekli yaşam tarzları gibi temalara yer verilmektedir. Diğer yandan bu ürünlere yönelik karşıt pazarlama çabalarında ise, kamuoyunu bilinçlendirmeye yönelik kamu

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spotları, yasal önlemler ve davranış değişikliği kampanyaları ya da bunların tamamının kombinasyonu faaliyetler üzerinde yoğunlaşılmakta ve böylelikle muhtemel zararlı etkiler en başından azaltılmaya çalışılmaktadır. Çalışmada konu ile ilgili her iki yönlü pazarlama çabaları küresel ve bölgesel örnekleri ile ele alınmış, sigara kullanımını bıraktırmayı ya da başlamayı önlemek adına grafiksel uyarılar, artırılmış vergi uygulamaları, dijital tutundurma faaliyetleri ve diğer etkili politikalar vurgulanmaktadır. Literatürdeki konu ile ilgili çalışmalarda, tütün ve tütün mamullerinin kullanımını ve beraberinde getirebilecekleri sağlık risklerini azaltmada kapsamlı ve birçok yönden ele alınan yaklaşımların kritik rolü ortaya konulmaktadır. Ayrıca bu çalışmada, tütün endüstrisinin ürünlerinin satışına yönelik geliştirdikleri stratejilere karşı koymak adına özellikle günümüz dünyasında dijital ve sosyal medya alanlarında tütün karşıtı pazarlama çalışmalarında yeniliğin sürekli olmasının bir ihtiyaç olduğu vurgulanmaktadır. Tütün ürünlerin kullanımının uzun vadede önlenmesi, daha geniş anlamda sosyal ve yasal çevrenin bütünleşik olarak hareket etmesi ile sağlanacağı araştırmadan elde edilen en temel sonuçtur.

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1. INTRODUCTION

Marketing is a set of activities designed to identify and meet human needs, primarily aiming to satisfy consumers, increase demand, and maximize profits. While traditional marketing strategies typically aim to promote product consumption, an alternative approach demarketing focuses on reducing the demand for products that may harm individuals or society, such as tobacco. Particularly within the health sector, demarketing is applied as a form of social marketing aimed at raising awareness and guiding behavior toward healthier lifestyles (Woodside, 1988; Koçak & Bulduklu, 2010).

Tobacco consumption, especially cigarette smoking, has increased significantly since the Industrial Revolution (Bilir & Özcebe, 2014). This rise is attributed to easier access to tobacco products and targeted marketing strategies, particularly toward youth. Research shows that adolescence is a critical stage for the initiation of smoking due to psychological and social factors (Güleç et al., 2015). In response, governments and health institutions have implemented strategies such as graphic warnings, public service announcements, tax policies, and smoking bans to control tobacco use.

While the health risks associated with tobacco use are well-documented, the marketing techniques employed by the tobacco industry continue to evolve, adapting to legal restrictions by utilizing digital platforms and packaging design. On the other hand, anti-tobacco campaigns increasingly utilize digital tools and fear appeals to counter these strategies and encourage cessation, especially among young individuals who are more susceptible to marketing influence.

However, current literature lacks a comprehensive synthesis of the dual role of marketing in both promoting and preventing tobacco use among youth, particularly from a comparative and strategy-oriented perspective. This study aims to fill that gap by examining the marketing strategies used to either promote or discourage tobacco consumption, focusing on youth as a vulnerable target group. The study contributes to the literature by providing an integrative perspective on how different marketing tools function in opposing directions and highlighting the need for continuous innovation in anti-tobacco strategies in the digital era.

2. LITERATURE REVIEW

2.1. Pro-Tobacco and Tobacco Industry Marketing Strategies

Despite the well-documented harms of tobacco, the industry has continued to implement strategic marketing campaigns across global markets. Historically, tobacco use evolved significantly during the Industrial Revolution, where it became associated with leisure, calmness, and social connectedness. By the 20th century, campaigns increasingly targeted women, emphasizing themes of empowerment, autonomy, and evolving lifestyle trends (Schivelbusch, 2012; Featherstone, 2005).

Major tobacco brands such as Marlboro and Camel developed distinctive marketing approaches to appeal to various consumer segments. Marlboro, for example, transitioned its messaging from traditional associations like marriage and happiness to visuals rooted in nature and freedom, subtly addressing emerging health concerns. In contrast, Camel initially employed its "Old Joe" character and later embraced themes of adventure and escapism, embedding cigarettes within cultural narratives (Rutherford, 1996; Bourdieu, 2014).

Throughout the 20th century, cigarettes were positioned as lifestyle products, making them among the most heavily marketed consumer goods. Tobacco companies prioritized profitability while navigating legal restrictions. Strategies included maintaining price accessibility, acquiring formerly state-owned enterprises, and deploying tailored advertising to specific markets. These methods allowed companies to

expand consumer reach despite increasing regulations such as advertising bans, tax increases, and public smoking limitations (Pierce et al., 2012; Callard et al., 2005; Gilmore et al., 2011; Holden & Lee, 2009; Yach & Bettcher, 2000).

As traditional advertising channels became limited especially television the tobacco industry pivoted toward digital and indirect promotional strategies. Social media influencers, user-generated content and subtle product placements in films and streaming platforms became instrumental in brand communication (Kaplan, 2018). Research highlights resurgence in on-screen portrayals of smoking, particularly in American media, with studies linking such portrayals to increased youth smoking initiation (Charlesworth & Glantz, 2005; Hanewinkel & Sargent, 2008).

In the Turkish context, regulatory frameworks such as Law No. 4207 and the formation of TAPDK (Tobacco and Alcohol Market Regulation Authority) have introduced restrictions on tobacco advertising and promoted public awareness (Ergin & İpek, 2020). Nevertheless, cigarette packaging remains one of the industry's most powerful marketing tools. Design elements such as color, typography, and imagery continue to signal aspirational values like luxury, elegance, and personal freedom (Doxey & Hammond, 2011; Bansal-Travers et al., 2011; Muñoz et al., 2013).

Tobacco packaging functions as a "silent salesperson," serving both branding and psychological functions. Visual components including logos, shapes, and colors significantly influence consumer perception and brand loyalty (Hoek et al., 2011; Dewhirst & Lee, 2012; Scheffels & Sæbø, 2013). Moreover, colors on packaging can imply product characteristics: lighter tones suggest smoothness, blue implies lower tar, and green denotes menthol flavor (Borland et al., 2013; Meral & Uzel, 2013). Packaging formats such as hard packs vs. soft packs further shape perceived product quality and strength, highlighting the packaging's critical role in influencing consumer behavior and maintaining brand equity.

2.2. Anti-Tobacco Campaigns and Strategies

Tobacco use remains a major global health issue, primarily due to the highly addictive nature of nicotine, which has been described as comparable to substances such as cocaine (Russell, 1971; Shiffman et al., 1994; Herbert et al., 1974). Tobacco smoke contains more than 4,000 toxic substances, and its use has been linked to cardiovascular diseases, various cancers, ulcers, and psychological disorders (Boyle & Maisonneuve, 1995; Heishman, 1999; Sloan et al., 2010; Wack & Rodin, 1982).

The initiation of smoking habits often occurs during adolescence, with peer influence emerging as one of the strongest predictors (Göksel et al., 2001; Akfert et al., 2009). Studies have consistently shown that education plays a protective role; individuals with higher levels of education are less likely to smoke, particularly in developed nations where awareness of tobacco's health impacts is widespread (Maralani, 2014; Dikmen, 2005; Yalım & Uysal, 2021; Graham et al., 2014).

In response to the growing evidence on the harms of tobacco, a variety of policy measures have been implemented globally. These include advertising bans, graphic health warnings on packaging, and the establishment of smoke-free public spaces (WHO, 2019). In Turkey, regulations such as Law No. 4207 (1996) and Law No. 5326 (2005) aimed to reduce smoking by banning tobacco advertising, restricting smoking in public areas, and prohibiting sales to minors.

International institutions have played a critical role in encouraging policy development. For example, WHO reports from 2008 and 2016 promoted legislative changes, including raising tobacco taxes and enforcing stricter regulations on sales and marketing. Oettingen et al. (2010) emphasized the importance of civil society involvement in pressuring governments for broader reforms. Economic measures like tax increases have also been shown to effectively reduce tobacco consumption, especially among low-income groups (Wasserman et al., 1991; Karagöz et al., 2010).

Packaging regulations represent another cornerstone of modern tobacco control. In Turkey, the Ministry of Health's framework for tobacco control, supported by WHO, introduced graphic warning visuals that cover 65% of the package surface, as of 2010 (Beşer & Aşkan, 2019; İleri & Özkara, 2021). These disturbing images are designed to trigger subconscious reactions, making smoking less appealing.

Recent studies have focused on the psychological and behavioral impact of packaging visuals. For example, Fathelrahman et al. (2010) found that photo-based warnings are more effective than text-only labels in encouraging cessation. Similarly, Hall et al. (2015) reported that health messages on cigarette packs can initiate conversations about quitting among smokers. Experimental studies by Brewer et al. (2019) and Noar et al. (2015) further confirmed that exposure to graphic warnings increased smokers' intentions to quit.

Cross-cultural findings also highlight the effectiveness of these interventions. In South Korea, Kim and Khang (2020) found that frequent smokers reduced or quit smoking following tax hikes and new packaging regulations. In Turkey, İleri and Özkara (2021) observed that the level of fear induced by visual warnings significantly influenced smokers' willingness to quit.

Educational attainment continues to be a key determinant in tobacco-related behavior. Higher levels of education correlate with increased knowledge of tobacco's harms and reduced smoking prevalence (Eide & Showalter, 2011; Zajacova & Lawrence, 2018). Studies by Haddad et al. (2020) and Dawood et al. (2016) suggest that health literacy enhances receptiveness to packaging warnings, while Brewer et al. (2016) confirm that repulsive images can prompt behavioral change.

In summary, contemporary anti-tobacco strategies are multifaceted, combining price-based interventions, packaging regulations, and education campaigns. These measures not only address behavioral drivers of tobacco use but also contribute to creating an environment where smoking is less socially acceptable and increasingly discouraged.

2.3. Social Media and Digital Campaigns in Tobacco Control

The emergence of digital communication channels has significantly reshaped the landscape of tobacco control strategies worldwide. Traditional forms of anti-smoking advocacy such as television campaigns and printed materials have been increasingly complemented by digital media, social networks, and interactive communication platforms. These channels provide governments and health organizations with powerful tools to raise awareness, encourage cessation, and counteract tobacco industry marketing.

In Turkey, the increasing penetration of social media has created new opportunities for public health messaging, especially among younger demographics. The National Tobacco Control Action Plan (2015–2018), published by the Turkish Ministry of Health, explicitly acknowledged the potential of educational programs and digital tools to combat tobacco use. The plan emphasized the importance of early prevention, cessation support, and efforts to limit passive smoking exposure through communication-based interventions.

One of the most prominent tools in Turkey's digital strategy is the ALO 171 Smoking Cessation Helpline, established in 2010. Operating 24/7 with professional support staff, this service provides counseling, follow-up tracking, and, when necessary, referral to cessation clinics and access to free medications. This initiative reflects the government's commitment to combining behavioral support with structural services for smoking cessation.

In addition to helplines, public service announcements (PSAs) have become a key element in tobacco control messaging. PSAs often utilize emotional appeals, fear-based imagery, and personal stories to raise public awareness. According to Aydın (2016), PSAs are expected to educate and engage the public by promoting health-conscious behavior. Similarly, Becerikli (2012) identifies PSAs as a form of social marketing, especially when used to influence behaviors in areas like smoking, traffic safety, and pandemic response.

The concept of "demarketing" has also gained traction in public health literature. Originally developed for industries managing excess demand, demarketing refers to strategies aimed at reducing the consumption of harmful products (Altınay & Sert, 2012). Applied to tobacco control, demarketing involves raising prices, restricting access, and portraying the product negatively. Beeton and Benfield (2002) argue that demarketing strategies have been successfully adapted for tobacco regulation to address broader social and economic concerns.

From a broader marketing perspective, governments have adapted the four Ps of marketing product, price, promotion, and place to serve public health goals. "Product" refers to alternatives to cigarettes, such as nicotine replacement therapies. "Price" involves taxation as a deterrent, while "promotion" includes anti-smoking advertisements and warning labels. Finally, "place" is addressed through smoking bans in public areas and transport systems, limiting the availability and visibility of tobacco (Wall, 2005; Chilievich & Kostusev, 2021).

Digital campaigns also reflect these principles. For example, targeted online advertisements, social media engagement, and the use of influencers by health institutions mimic commercial marketing tactics but with a reverse objective: discouraging consumption and encouraging cessation. Countries such as New Zealand have adopted comprehensive approaches, including banning cigarette sales to individuals born after a certain year, leveraging digital platforms to explain the rationale behind such bold policy measures (BBC Turkish, 2022).

In addition to digital messaging, statistical reporting plays an important role in contextualizing the urgency of tobacco control. According to WHO (2010), global cigarette consumption more than doubled from 1980 to 2008, despite economic crises and awareness campaigns. In Turkey, male smoking rates reached 50%, while female rates were approximately 18%. TÜİK (2022) data revealed that 28.3% of individuals over age 15 used tobacco daily, underscoring the ongoing relevance of anti-smoking policies and campaigns.

Overall, the integration of social media, helplines, PSAs, and demarketing principles within tobacco control reflects a shift from traditional to modern public health communication. These tools not only extend the reach of anti-smoking messages but also enable governments to engage with specific demographics more effectively, especially youth and digital natives.

2.4. Anti-Tobacco Activities Targeting the Youth

Youth populations represent one of the most vulnerable and strategically significant groups in global tobacco control efforts. Research consistently indicates that tobacco use often begins during adolescence, with initiation commonly occurring before the age of 15 (Global Adult Tobacco Survey Turkey Report, 2012). Early exposure increases the risk of long-term nicotine dependence, making this demographic a primary focus of public health policies (Curry et al., 2009). In the 1990s, increasing awareness of tobacco's health risks led to more assertive global action. Turkey implemented its first indoor smoking ban in 1996, marking the beginning of a broader national effort. Over time, additional legislative measures—such as Law No. 4733 (2002), which privatized the state tobacco monopoly TEKEL, and Law No. 4207, which banned advertising and mandated health warnings were enacted to protect the public, particularly youth (Şahin, 2014; Tobacco Report, 2018).

Despite regulatory progress, the effectiveness of anti-smoking measures targeting youth has been challenged by inconsistent implementation and political factors. In response, researchers have advocated for multi-level interventions, including school-based programs, family engagement, and community-based education, to counteract peer pressure and misinformation among adolescents (Thomas et al., 2013; Wiehe et al., 2005). Preventive programs aimed at adolescents must begin before behavioral patterns solidify. Studies have shown that age-appropriate interven-

tions—especially before or during early adolescence—are more effective in delaying or preventing smoking initiation (Sussman, 2005; Cote et al., 2004). These programs should not rely solely on didactic education but instead focus on interactive learning, critical thinking, and self-efficacy development.

The WHO's Framework Convention on Tobacco Control (FCTC), which Turkey joined in 2004, introduced the MPOWER framework in 2008, providing governments with practical tools for tobacco prevention. However, the lack of youth-specific guidelines has led individual countries to develop creative outreach strategies, including digital toolkits, video campaigns, and e-learning materials targeting younger users (WHO, 2003; WHO, 2008). Psychological vulnerability during adolescence—such as emotional volatility and susceptibility to social influence—heightens the risk of tobacco use. Research suggests that even minimal experimentation with cigarettes can result in early nicotine dependency, reinforcing the need for tailored cessation programs for youth (Curry et al., 2009). Furthermore, environments that normalize smoking, whether through family, friends, or media, increase the likelihood of early initiation.

Legislative enforcement also plays a key role in youth tobacco control. Measures such as age restrictions on sales, bans on smoking in indoor public spaces, and graphic warnings on packaging are crucial for shaping young people's perceptions. These policies help reinforce anti-smoking norms and increase cognitive dissonance regarding tobacco consumption. Research has also questioned the standalone effectiveness of school-based interventions. Backinger et al. (2003) found that education alone is insufficient unless reinforced by mass media efforts and smoking bans. Similarly, behavior-focused programs that emphasize non-smoking identity in youth populations have been linked to reduced initiation rates (Patnode et al., 2013).

Pharmacological interventions for smoking cessation remain limited among youth, as most treatments are not approved for individuals under 18. As a result, preventive strategies, social norm shifting, and consistent policy enforcement remain the most practical and ethically viable tools in this context. In conclusion, protecting youth from tobacco requires a multi-dimensional strategy that includes preventive education, targeted communication campaigns, and strict enforcement of age-related tobacco laws. Coordinated international frameworks and country-specific programs alike have highlighted that intervening early and across multiple contexts offers the greatest potential for reducing youth smoking initiation and promoting long-term public health.

5. CONCLUSION

This study aimed to examine the effects of smoking particularly cigarette consumption on tobacco use among young people by synthesizing current literature. The review highlighted key themes related to the initiation, normalization, and prevention of tobacco use within youth populations. Smoking, first and foremost, should be recognized as a form of addiction, rather than merely a behavioral choice. Therefore, public health interventions must prioritize the prevention of initiation, as it is considerably more effective than cessation efforts after dependency develops.

The early onset of smoking, sometimes beginning in childhood or early adolescence, underscores the urgency of targeted interventions. Factors influencing smoking initiation among youth include the emotional instability of adolescence, the perceived social benefits of smoking, and various psychological or familial stressors. These dynamics are often amplified by media messages that associate smoking with freedom, maturity, or rebellion.

In response, governments and civil society organizations have increasingly invested in counter-advertising campaigns, social marketing strategies, and public health policies. International institutions such as the World Health Organization have also played a crucial role in encouraging regulatory frameworks, tax increases, and packaging reforms. However, it is important to note that pro-tobacco marketing has historically dominated the narrative, and anti-tobacco efforts, despite their growing impact, often began later and faced resistance from industry stakeholders.

The findings indicate that schools, digital environments, and peer groups are central spaces where smoking behaviors among youth are formed and reinforced. Social media, in particular, has emerged as both a risk factor and a potential tool for intervention. Given the unregulated nature of some digital platforms, youth are frequently exposed to tobacco-positive content, making it essential for governments to monitor and regulate online messaging more proactively.

Recent public health measures—such as banning indoor smoking, establishing smoke-free zones, increasing tobacco taxes, and launching emotionally resonant public service announcements—have contributed to a decline in smoking rates. These efforts demonstrate the important role of governmental policies in protecting public health and reshaping societal attitudes toward smoking.

In conclusion, while substantial progress has been made in reducing tobacco consumption among youth, ongoing efforts are necessary to sustain and amplify these gains. A multi-pronged approach that includes early education, regulatory oversight of digital spaces, taxation, and targeted awareness campaigns remains essential. Moreover, future studies should aim to evaluate the long-term effectiveness of current interventions and provide comparative analyses using updated data. Such research will be valuable in developing adaptive, evidence-based policies that address the evolving landscape of tobacco use in youth populations.

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Review Article / Derleme

Green Economy in Focus: A Comprehensive Review of Its Thematic Dimensions

Yeşil Ekonomiye Odaklanmak: Tematik Boyutlarının Kapsamlı Bir Değerlendirmesi

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ABSTRACT

This study provides a comprehensive, interdisciplinary review of the green economy literature, focusing on the multidimensional thematic areas that shape this evolving field. It systematically examines eight key components of the green economy: jobs, finance, innovation, infrastructure, energy, growth, taxation, and education/skills. These eight pillars were selected because they represent the domains most consistently highlighted across both academic studies and international policy frameworks, ensuring that the review captures the core dimensions of the green economy. For each component, the conceptual framework, practical implementations, and existing gaps in the literature are analyzed. Drawing on academic studies and policy documents from 2000 to 2025, the review explores the intersections of the green economy with critical issues such as just transition, digitalization, and social inclusion. The study emphasizes methodological diversity and measurement challenges. It also highlights opportunities for theoretical and policy integration, offering an original contribution that advances both scholarly understanding and practical guidance in green economy research.

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Anahtar kelimeler:
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ÖZ

Bu çalışma, yeşil ekonomi literatürüne kapsamlı ve disiplinler arası bir bakış sunarak, bu gelişmekte olan alanı şekillendiren çok boyutlu tematik alanlara odaklanmaktadır. Yeşil ekonominin sekiz temel bileşeni; istihdam, finans, inovasyon, altyapı, enerji, büyüme, vergilendirme ve eğitim/becerileri sistematik olarak incelenmektedir. Bu sekiz sütun, akademik çalışmalar ve uluslararası politika çerçeveleri arasında en tutarlı şekilde vurgulanan alanları temsil ettikleri için seçilmiş; böylece incelemenin yeşil ekonominin temel boyutlarını yakalaması sağlanmıştır. Her bir bileşen için kavramsal çerçeve, pratik uygulamalar ve literatürdeki mevcut boşluklar analiz edilmiştir. 2000–2025 yılları arasında yayımlanmış akademik çalışmalar ve politika belgelerinden yararlanılarak, yeşil ekonominin adil dönüşüm, dijital-

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leşme ve sosyal katılım gibi kritik konularla kesişimleri araştırılmıştır. Metodolojik çeşitlilik, ölçüm zorlukları ve kuramsal ile politik bütünleşme fırsatlarına vurgu yaparak, bu çalışma hem akademik anlayışı derinleştiren hem de yeşil ekonomi araştırmalarına pratik rehberlik sunan özgün bir katkı sağlamaktadır. Çalışma, yöntemsel çeşitliliğe ve ölçümle ilgili zorluklara dikkat çekmektedir. Ayrıca teorik ve politik bütünleşme için fırsatları vurgulayarak, yeşil ekonomi araştırmalarında hem akademik anlayışı hem de pratik rehberliği geliştiren özgün bir katkı sunmaktadır.

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1. INTRODUCTION

Framed around the pillars of environmental sustainability, social inclusion, and economic resilience, the green economy has increasingly become central to global development discourse. High-level policy frameworks such as the Paris Climate Agreement (United Nations Framework Convention on Climate Change (UNFCCC), 2015b), the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (United Nations (UN), 2015), and the European Green Deal (European Commission, 2019) reflect a growing effort to align economic growth with ecological integrity. In addition, successive Conferences of the Parties (COP) under the UNFCCC framework, including COP21 in Paris (United Nations Framework Convention on Climate Change (UNFCCC), 2015a), COP26 in Glasgow(United Nations Framework Convention on Climate Change (UNFCCC), 2021), and COP28 in Dubai (United Nations Framework Convention on Climate Change (UNFCCC), 2023), have further reinforced the global commitment to embedding the green economy within international climate governance. Within this context, the green economy is not merely an environmentally driven transformation; it represents a multidimensional paradigm that seeks to restructure employment, finance, innovation, infrastructure, and education systems.

In the existing literature, both the definition and the implementation framework of the green economy are still evolving. Georgeson et al. noted that the methodological ambiguity surrounding its core components hinders the concept's measurability and comparability (Georgeson et al., 2017). Similarly, a comprehensive indicator-based analysis by Sarkodie et al. revealed major inconsistencies across studies assessing various aspects of green growth and development, noting that many comparisons are akin to "comparing apples and oranges" (Sarkodie et al., 2023). Against this backdrop, the present study is motivated by the need for a measurable, multidimensional analytical framework that enhances conceptual clarity and facilitates meaningful evaluation. This article provides a comprehensive literature review, addressing both theoretical and practical dimensions of the green economy through eight thematic lenses: green jobs, green finance, green innovation, green infrastructure, green energy, green growth, green taxation, and green education and skill development. By conducting multilevel evaluations across these domains, the study offers a holistic framework for understanding the green economy from both interdisciplinary and sectoral perspectives.

Research articles, reviews, and books have been published on the green economy. As illustrated in Figure 1, the number of publications in this field has risen exponentially in recent years, highlighting the green economy's emerging significance as a strategic response to climate change, environmental degradation, and unsustainable economic models. Accordingly, this topical review aims to analyze the existing literature to identify key trends, policy developments, implementation barriers, and emerging opportunities. Through this analysis, the review aims to provide a comprehensive perspective on the green economy's role in advancing global sustainability objectives.

This study is grounded in ecological economics, post-growth theory, environmental externality theory, and sustainable development principles. Ecological economics highlights the need for economic systems to operate within planetary boundaries (Daly, 1997), while post-growth theory calls for alternative development metrics beyond Gross Domestic Product (GDP) growth (Raworth, 2018). Environmental externality theory supports a rationale for internalizing negative externalities through taxation and regulation, forming the basis for discussions on green taxation (Pigou, 1920). These theoretical perspectives, collectively, shape the study's normative and analytical framework.

The article provides a multidimensional analysis of policy models, financial instruments, technological applications, data-driven indicators, and research gaps, combining conceptual insight with practical examples. It further integrates institutional perspectives by drawing on reports from the Organization for Economic Co-operation and Development (OECD), the United Nations Environment Programme (UNEP), the International Labour Organization (ILO), the United Nations Development Programme (UNDP), the International Renewable Energy Agency

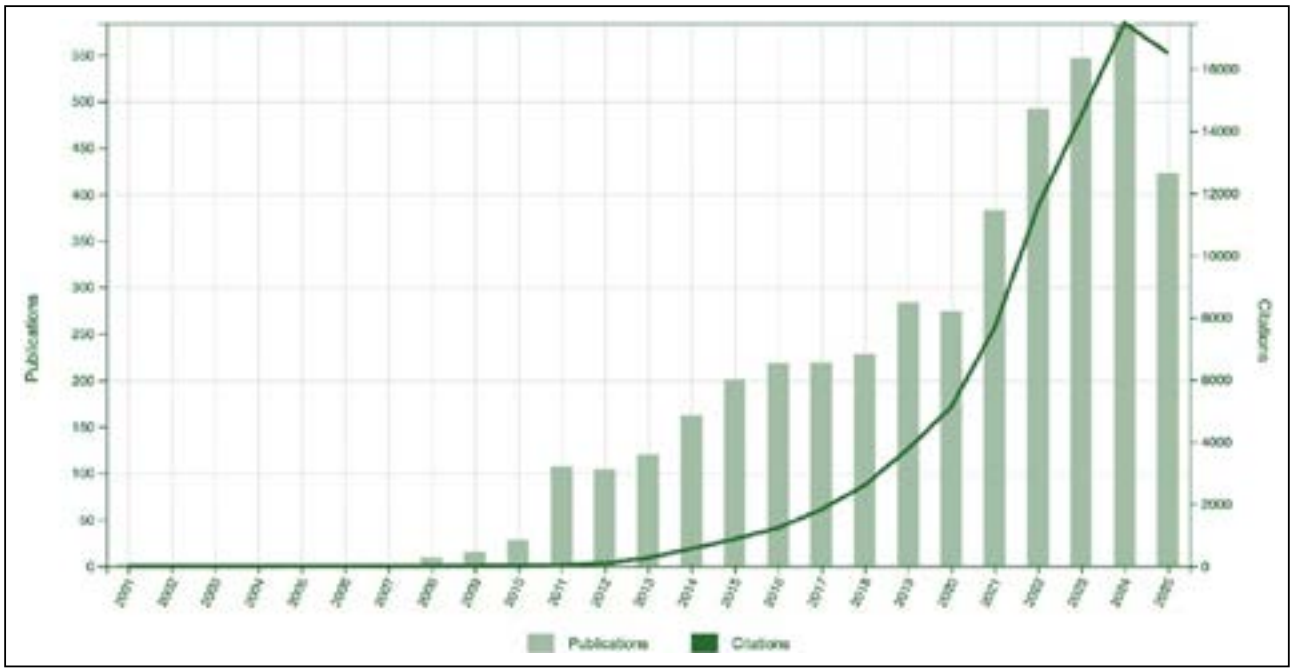

Figure 1. Trends in the number of publications/citations per year resulting from a Web of Science search using the keyword "Green+economy" for the period 2000-2025.

Source: Web of Science, data retrieved in November 2025.

(IRENA), and The European Centre for the Development of Vocational training (Cedefop).

This work contributes to the literature by framing the green economy as a comprehensive development model rather than solely an environmental agenda, emphasizing just transition, social protection, financial inclusion, and education reform, while promoting conceptual clarity, measurement consistency, and policy alignment.

This study thus provides an original synthesis that strengthens both academic debate and policy practice. The identification of the eight pillars was based on a systematic screening of both academic literature and institutional policy frameworks. Across sources such as the UN, OECD, ILO, and UNEP, these domains emerged as the most consistently highlighted dimensions of the green economy. Their recurrence provided a coherent structure for analysis, while ensuring that the review reflects the area's most widely recognized in both scholarly debates and international agendas. Although the broader sustainability literature includes additional concepts, the chosen pillars represent the core fields where academic and policy discussions converge, thereby offering a balanced and comparable framework for evaluation.

In addition, foundational economic analyses such as the Stern Review on the Economics of Climate Change emphasize that the benefits of strong and early action on climate policy far outweigh the costs of inaction, providing a critical rationale for integrating environmental externalities into the green economy framework (Stern, 2006).

The remainder of the article is structured as follows: Section 2 outlines the methodology, Sections 3–10 analyze the eight pillars, and the final section concludes with implications and future directions.

2. METHODOLOGY

In here, the multidimensional nature of the green economy is examined through an interdisciplinary lens, using a qualitative literature review complemented by thematic and systematically structured content analysis.

Analysis focuses on eight thematic areas (green jobs, green finance, green innovation, green infrastructure, green energy, green growth, green taxation, and green education and skill development), organized around the key subsystems of the green economy, as illustrated in Figure 2. This framework enables evaluation at both conceptual and sectoral levels. The methodology is carried out in two main stages:

2.1. Literature Review Strategy

The literature review, covering 2000-2025, was conducted using keywords such as "green economy," "green jobs," "green finance," "sustainable growth," "green taxation," "green skills," and "green infrastructure" across Scopus, Web of Science, and Google Scholar. Three databases were used to balance coverage and quality: Web of Science to ensure high impact, indexed journals; Scopus to widen interdisciplinary reach (including social sciences); and Google Scholar to capture grey literature (policy reports, books) relevant to the green economy. To prevent

Figure 2. Conceptual structure of the green economy and its eight thematic pillars.

duplication across sources, records were de-duplicated through manual screening based on exact matches in title, author(s), and year; where duplicates occurred between Google Scholar and an indexed source, the indexed record was retained. Bibliometric methods guided the review, with particular focus on systematic reviews (Georgeson et al., 2017; Kozar & Sulich, 2023; Mathieu, 2024; Sarkodie et al., 2023; Stanef-Puică et al., 2022). The search employed Boolean operators (e.g., 'green economy' and 'jobs'; 'green finance' or 'sustainable finance'), English-language filters, and document-type limits (articles, reviews, books, institutional reports) within 2000–2025. Inclusion criteria required conceptual or empirical relevance to the eight pillars and traceable sources; exclusion criteria removed non-scholarly content without identifiable provenance or incomplete records. In parallel, strategic documents and technical reports published after 2010 by institutions including the OECD, UNEP, ILO, UNDP, IRENA, International Finance Corporation (IFC), and Cedefop were analyzed. This phase involved a comparative assessment of conceptual definitions, policy models, and measurement tools related to the core components of the green economy.

2.2. Thematic Analysis and Conceptual Structuring

The study employs a thematic analysis strategy, examining each domain at three levels: (i) conceptual definition and theoretical framework, (ii) implementation models and policy orientations, and (iii) gaps in the literature and future research directions. This approach follows a systematic theory → practice → critique progression. Sections on green growth, green finance, and green education further provide comparative analyses that highlight measurement inconsistencies and methodological divergences.

The analysis draws on four theoretical foundations: ecological economics (Daly, 1997), post-growth models (Raworth, 2018), environmental externalities and Pigouvian taxation (Pigou, 1920), and the principles of sustainable development and social inclusion (International Labour Organization, 2015). These frameworks ensure theoretical consistency and enhance the interdisciplinary scope of the study.

Overall, content from both academic and institutional sources is integrated through systematic literature review, thematic analysis, and conceptual structuring. This methodology provides a robust foundation for analyzing the green economy's components in a manner that is measurable, comparable, and critically informed.

3. GREEN JOBS

The employment dimension of the green economy reflects a broad transformation that reshapes occupational structures and skill requirements. This section provides a multidimensional analysis of the evolving concept of green jobs, their sectoral impacts, the transformation of skills, and the policies supporting a just transition.

3.1. Conceptual Evolution of Green Jobs and the Definition Problem

Labor structures shaped by the green economy are commonly analyzed through the concept of green jobs. Initially associated with environmentally friendly production, the term has evolved into a broader framework aligned with social welfare and sustainable development. According to the ILO (International Labour Organization, 2015), green jobs are defined as employment that preserves ecosystems, promotes efficient resource use, minimizes environmental harm, and ensures decent working conditions.

Considerable conceptual diversity exists in the literature. Stanef-Puică et al.(Stanef-Puică et al., 2022) emphasize the multiple associations of green jobs with concepts such as sustainable development, the green economy, the circular economy, and the welfare economy. Green jobs are linked not only to low-carbon sectors but also to areas including circularity, natural capital management, and ecological restoration (Bradley et al., 2025).

This definitional diversity creates methodological challenges for measurement and comparing green jobs. Some studies focus narrowly on technical changes in production, such as energy efficiency or waste management, while others adopt a broader scope that includes sustainability-oriented service sectors (World Economic Forum (WEF), 2025). Such variation complicates the quantitative tracking and hinders the establishment of clear policy priorities.

Ambiguities in the definition also raise questions about inclusiveness and transformative potential of green jobs. Bibliometric analysis by Mathieu (Mathieu, 2024), shows that while the thematic focus of green jobs research has evolved, its geographical coverage remains limited. These

findings highlight the need for a clearly defined framework that links the concept's normative and analytical dimensions.

3.2. Sectoral Transformation of Green Jobs and Employment Impacts

The green economy reshapes both production methods and the sectoral composition of the labor force. The shift toward low-carbon technologies contracts many traditional sectors while fostering new occupations centered on environmental sustainability. A comprehensive analysis by the UK Energy Research Centre demonstrates that renewable energy investments generate more jobs than those in fossil fuel sectors, and deliver positive local economic impacts (Hanna et al., 2022). Emerging employment hubs include solar energy, electric vehicle systems, building insulation, and carbon accounting.

The sectoral impact of green jobs entails both quantitative and qualitative changes. According to the World Economic Forum's Future of Jobs Report 2025, the rapidly growing roles in the green transition such as wind and solar energy technicians, sustainability consultants, environmental impact assessment specialists, and circular design engineers (World Economic Forum (WEF), 2025). These occupations combine technical expertise with environmental and social awareness, reflecting not only sectoral diversification but also a qualitative redefinition of occupational structures.

However, the transition away from fossil fuels risks exacerbating regional and demographic inequalities. The ILO (2025) emphasizes that a just transition must be central to labor market policies, with training programs addressing both technical skills and social inclusion (International Labour Organization, 2015).

Overall, the expansion of green sectors presents multidimensional policy opportunities, particularly for regional development and the mitigation of skills-based inequalities. Sectoral transformation thus offers more carbon reduction; it provides a crucial pathway toward inclusive and equitable labor markets.

3.3. Skill Transformation in Green Jobs and Education Policies

The expansion of green jobs drives sectoral transformation while simultaneously reshaping workforce skill profiles. This transition requires a new skills architecture built on multidimensional competencies, including technical expertise, environmental awareness, systems thinking, and digital literacy. Recent OECD research highlights the importance of these competencies not only for emerging green occupations but also for the redefinition of existing roles. In particular, workers in manufacturing sectors face substantial reskilling needs to transition effectively into green jobs (Organisation for Economic Co-operation and Development (OECD), 2023).

Sector-specific skill foresight studies by Cedefop, conducted within the framework of the European Green Deal, demonstrated that the green transition requires different degrees of skill transformation across sectors (The European Centre for the Development of Vocational Training (Cedefob), 2021). In areas such as waste management and green urban planning, social communication and problem-solving skills are emphasized alongside technical expertise. This indicates that green skills extend beyond engineering and environmental sciences, becoming equally essential in service and management domains.

The capacity of education systems to support this transformation remains contested. The ILO's *Greening the Global Economy – The Skills Challenge* noted that many countries suffer from a shortage of qualified educators in fields such as environmental awareness, renewable energy, and sustainability, while vocational curricula often fail to adequately integrate green skills (International Labour Organization, 2011). Vocational education and adult learning programs, in particular, struggle to keep pace with the rapid demands of the green transition.

In response, education policies should combine technical training with inclusivity and attention to regional disparities. The OECD's *Greener Skills and Jobs* study argued that a successful low-carbon transition depends on a flexible workforce reskilling, positioning education as a fundamental component of ecological transformation (European Centre for the Development of Vocational Training, 2014).

3.4. Just Transition and Social Protection

The green economy transition should align environmental sustainability with social justice. Central to this balance is the concept of a *just transition*, which refers to social policy measures designed to prevent job losses and regional inequalities arising from the phase-out of fossil fuel sectors. The ILO defines it as an inclusive, human-centered transformation process that ensures no one is left behind while achieving environmental goals (International Labour Organization, 2023).

Robust and adaptable social protection systems form a basis of just transitions. The ILO's research on *Social Protection and Climate Change* highlighted how climate change heightens pressures on these systems, which are vital in easing adjustment costs (International Labour Organization, 2021). For workers in sectors vulnerable to job displacement, instruments such as unemployment insurance, reskilling programs, and active labor market policies are critical to mitigating the social risks.

At the global level, the UN's *Global Accelerator on Jobs and Social Protection for Just Transitions* initiative aims to generate millions of new jobs across the green, digital, and care economies, while expanding social protection coverage (Women & UNICEF, 2024). It provides technical and financial support to help countries integrate climate-sensitive social assistance into development strategies, particularly in low-income regions.

The OECD's report *Labour and Social Policies for the Green Transition* further stresses the importance of linking green investments, such as those in energy efficiency, with social protection systems (Keese & Marcolin, 2023). Such integration not only advances environmental objectives but also strengthens public support. Collective bargaining and social dialogue are also identified as essential to ensuring workers' voices are part of the transition.

In sum, just transition is more than an environmental agenda; it is a strategic framework that promotes social inclusion and economic resilience. Embedding strong social protection within this process is crucial for both the sustainability and legitimacy of the green economy.

3.5. PANEL: Green Jobs

Although research on green jobs has expanded rapidly, notable methodological and conceptual gaps remain. A systematic review by Stanef-Puică et al. (Stanef-Puică et al., 2022) revealed that the concept is interpreted through highly diverse definitions which, while enriching methodological approaches, undermine conceptual clarity and coherence. Much of the literature focuses on broad policy frameworks such as sustainable development, the green economy, and the European Green Deal, whereas sector-specific and occupation-based analyses remain limited.

Mathieu's dataset of 414 articles confirmed that green jobs are most often linked to sustainable development, the circular economy, and the European Green Deal (Mathieu, 2024). Yet, these connections largely remain theoretical, with insufficient attention to implementation and measurement tools, hampering comparability and traceability across studies.

Institutions such as the ILO and OECD also highlighted the lack of a standardized definitions and methodologies for measuring green jobs (Organisation for Economic Co-operation and Development (OECD), 2023; Strietska-Ilina et al., 2011). The use of varying national and institutional definitions complicates data collection, creates uncertainty for policymaking, and weakens cross-country comparability. Moreover, empirical research addressing job quality, covering dimensions such as security, wages, and social protection, remains scarce.

Future research should develop an analysis of the links between green jobs and skill transformation, their potential to reduce regional inequalities, and their interaction with digitalization. An IMF study further showed that green jobs are disproportionately male-dominated, with women facing limited access, underscoring the need to examine into gender-based skill disparities in the green transition (Fabrizio et al., 2024).

Finally, bibliometric evidence indicates that the definition of green jobs continues to evolve and varies widely across disciplines (Kozar & Sulich, 2023). This features the urgency of interdisciplinary integration and the development of shared conceptual frameworks.

4. GREEN FINANCE

Green finance occupies a central position in both academic and institutional debates as a critical mechanism for channeling investments toward environmental sustainability. This section examines the field systematically, addressing conceptual ambiguities, financial instruments, measurement frameworks, policy and institutional developments, and key gaps that persist within the literature.

4.1. Conceptual Framework of Green Finance and the Definition Problem

Green finance has gained prominence in recent years as a strategy for directing capital toward environmentally sustainable activities. Yet, the literature still lacks consensus on its definition. UNEP's *Definitions and Concepts* report frames green finance as policy and institutional mechanisms that channel capital into areas such as environmental protection, energy efficiency, and clean energy (United Nations Environment Programme (UNEP)-Inquiry into the Design of a Sustainable Financial System, 2016). By contrast, the OECD defines it more broadly as financial activities that support economic growth while reducing resource use and minimizing environmental harm (Organisation for Economic Co-operation and Development (OECD), 2024b).

These definitional variations blur the boundaries between green finance and related concepts. The IFC distinguished green finance, focused on environmental benefits, from "sustainable finance", which covers wider development goals (International Finance Corporation, 2023). Within this framework, green finance covers not only climate-oriented investments but also instruments targeting biodiversity, water infrastructure, and pollution reduction.

Lack of definitional clarity creates methodological challenges for measurement and classification. While the European Union, China, and Singapore have developed national taxonomies, their inconsistencies complicate cross-border investment and raise the risk of greenwashing. To address this, the Common Ground Taxonomy initiative seeks to align national approaches and provide a shared reference framework (International Platform on Sustainable Finance (IPSF), 2022).

Such definitional uncertainties also influence investor confidence and policy effectiveness. M. Ben Ghoul showed that although consumers express environmental concerns, awareness of green finance products remains limited, highlighting the need for clearer definitions (Ben Ghoul, 2019). Similarly, IMF analysis stresses that ESG (Environmental, Social, and Governance) criteria must be transparent, science-based, and standardized to enhance credibility and effectiveness (International Monetary Fund., 2023).

In summary, the conceptual framework of green fi-

nance remains in a state of evolution. Persistent ambiguities in definition and taxonomy hinder coherence across academic, policy, and investment domains. Advancing internationally harmonized and precise definitions is essential for strengthening its legitimacy and impact.

4.2. Financial Instruments and Mechanisms in Green Finance

The most definite expression of green finance lies in the financial instruments and mechanisms that channel capital toward environmentally sustainable investments. These tools direct funding into low-carbon and nature-positive projects, with green bonds standing out as the most prominent example. Sartzetakis described green bonds as debt securities issued to finance projects with environmental benefits, a market that has grown rapidly since its launch in 2007, led by institutions such as the European Investment Bank and the World Bank (Sartzetakis, 2021). Beyond green bonds, established by the Loan Market Association, stipulate that such loans must finance activities with measurable environmental benefits and require transparent reporting. In the Asia-Pacific region in particular, green loans have played a pivotal role in enabling small and medium-sized enterprises to access sustainability-oriented financing (Organisation for Economic Co-operation and Development (OECD), 2022).

Blended finance mechanisms combine public, private, and development resources to mitigate investment risks and boost investor confidence. According to the OECD, such instruments mobilized nearly $70 billion in development-related investments in 2023 (Organisation for Economic Co-operation and Development (OECD)). They are particularly vital for financing climate adaptation and infrastructure projects in developing economies. Institutions such as the World Bank and the Green Climate Fund have effectively applied blended finance models to attract private capital into renewable energy and carbon reduction initiatives.

Carbon markets represent another important component of green finance. By enabling the trade of carbon credits through voluntary and compliance-based systems, these markets channel funding into emission reduction projects. Nonetheless, concerns regarding transparency, verification standards, and risks of greenwashing continue to spark debate (International Organization of Securities Commissions (IOSCO), 2024). The international framework established under Article 6 of the Paris Agreement aims to address regulatory gaps in this area.

In addition, impact investing and ESG integration enable investors to allocate financial returns with environmental and social outcomes. Incorporating ESG principles into investment strategies enhances both the ethical foundations and long-term performance potential of green finance (Meng & Shaikh, 2023).

4.3. Measurement Frameworks and Standards in Green Finance

Reliable and comparable frameworks are essential for evaluating the environmental impacts of investment activities and for ensuring the effectiveness of green finance. Yet, the literature highlights a persistent lack of standardization in this area. While regulatory bodies such as the European Union and China have advanced by creating their own green finance taxonomies, development finance institutions like the IFC provide additional reference frameworks and guidelines, particularly targeting emerging markets. These systems diverge considerably in scope and technical criteria (International Finance Corporation, 2023; International Platform on Sustainable Finance (IPSF), 2022).

The EU Sustainable Finance Taxonomy provides scientifically based technical screening criteria to define economic activities that contribute to environmental objectives. It applies principles such as "Do No Significant Harm" and "Minimum Safeguards" to maintain environmental integrity (European Commission, 2021). By contrast, China's Green Bond Endorsed Project Catalogue adopts a more sector-specific, policy-oriented approach, emphasizing projects that deliver demonstrable environmental benefits (People's Bank of China (PBoC), 2020). A comparative study conducted by the IPSF under the Common Ground Taxonomy initiative identified shared definitions for 72 activities, representing an important step toward international alignment (International Platform on Sustainable Finance (IPSF), 2022).

Nonetheless, discrepancies among national taxonomies create uncertainty for cross-border investment flows and complicate investor decision-making. Aligning domestic regulations with international standards remains a pressing challenge, particularly for developing countries (Organisation for Economic Co-operation and Development (OECD), 2024a). In addition, the datasets used to evaluate the impact of green finance are often incomplete, outdated, or inconsistent. The NGFS *Enhancing Market Transparency* report highlights that such data gaps undermine both market transparency and investor confidence (Network for Greening the Financial System (NGFS), 2022).

Emerging technologies such as blockchain have recently been explored as tools to enhance the traceability and accuracy of green finance data (Li et al., 2025). These innovations could significantly improve transparency in areas like carbon markets and impact investing. However, their effective adoption will depend on the development of robust technical infrastructure and closer regulatory coordination.

4.4. Institutional and Policy Developments

The global advancement of green finance is driven not only by market dynamics but also by institutional strategies and public policies. The OECD's report *Green Finance Policies, Institutions, Tools and Governance* underlines the importance of a holistic policy approach and robust regu-

latory frameworks centered on environmental integrity as prerequisites for effective green finance (Organisation for Economic Co-operation and Development (OECD)). Such an approach calls for an active role of public financial institutions and regulatory authorities in reshaping the financial system.

The IFC has placed particular emphasis on strengthening green banking capacities in developing countries. Programs such as the Green Bond Technical Assistance Program and the Market Accelerator for Green Construction provide technical support and financing models that encourage private sector engagement in green investments (International Finance Corporation (IFC), 2024). These initiatives enhance the capacity for green bond issuance and stimulate investor interest in areas such as energy efficiency and green buildings.

UNEP, through its *Green Financing for SDGs* strategy, aims to align financial systems with the 2030 Sustainable Development Agenda. This strategy recommends reforms in financial regulation, promotion of public-private partnerships (PPP), and integration of inclusive mechanisms such as microfinance into the green transition (United Nations Environment Programme (UNEP)). In parallel, the UNEP Finance Initiative actively promotes the adoption of sustainability principles across banking, insurance, and investment sectors.

Empirical research has also evaluated the effectiveness of institutional strategies. For instance, Meng and Shaikh identified green bonds, ESG integration, and renewable energy funds as central components of green finance strategies (Meng & Shaikh, 2023). Similarly, Iddrisu, Yakubu, and Abor analyzed banks' motivations for adopting green finance practices, highlighting barriers such as limited awareness, insufficient demand for green financial products, lack of technical expertise, weak regulatory frameworks, and inadequate data for environmental impact assessment (Iddrisu et al., 2025).

At the national level, several countries have embedded green finance within their development agendas. *Türkiye's Sustainable Finance Framework* (2021), for example, outlines priorities such as promoting green bond and sukuk issuance, supporting the financial sector's green transformation, and strengthening regulatory infrastructure (Republic of Türkiye Ministry of Treasury and Finance, 2021). When aligned with global institutional initiatives, such national strategies can significantly accelerate the mainstreaming of green finance.

4.5. Challenges and Opportunities in Green Finance

While the global expansion of green finance offers substantial opportunities for advancing environmental sustainability, it also introduces forth structural and implementation challenges. One of the most widely discussed risks is greenwashing, where firms or financial institutions misrepresent or exaggerate their environmental commitments, thereby undermining investor and consumer trust. Hao et al., using Evolutionary Game Theory, analyzed greenwashing in ESG disclosures and its effects on stakeholders, including firms, investors, and rating agencies (Hao et al., 2025). Their study indicates that a greenwashing-free equilibrium is possible, but only if market-based mechanisms are complemented by strong government oversight.

From the perspective of investor behavior, the growing number of ESG-conscious investors faces significant obstacles due to the inconsistency and diversity of ESG evaluation methodologies. Poiriazi et al. demonstrate that many institutions report high ESG disclosure levels despite weak environmental performance, raising doubts about the reliability of ESG scores as credible investment indicators (Poiriazi et al., 2025).

In developing countries, access to green finance remains limited by regulatory shortcomings and underdeveloped financial markets. According to the IFC (2023), green finance initiatives in these regions are often catalyzed by international investor pressure or guidance from development finance institutions (International Finance Corporation, 2023). However, local financial institutions are frequently reluctant to introduce green financial products due to concerns about the "first-mover disadvantage".

Despite these challenges, the sector offers considerable opportunities. Analysis by the World Economic Forum highlights that the transition to a low-carbon economy creates avenues for banks and investors to pursue long-term business model transformation and innovative product development (McWaters et al., 2016). Moreover, the growth of green bond markets allows financial centers to position themselves as global leaders in sustainable finance.

4.6. PANEL: Green Finance

Although research on green finance has expanded significantly over the past decade, important methodological, conceptual, and practical gaps persist. Georgeson et al. show that many indicators used to measure the green economy remain underdeveloped and often misaligned with existing definitions, limiting the ability to evaluate the true impact of green finance instruments (Georgeson et al., 2017).

A systematic review by Akomea-Frimpong et al. highlights that, despite the diversification of green finance products in the banking sector, empirical evidence on their effectiveness is still scarce (Akomea-Frimpong et al., 2022). In particular, the social inclusiveness of green loans, green bonds, and ESG integration in developing countries has received little attention, raising concerns that environmental priorities may overshadow social objectives.

Mohanty et al., through bibliometric analysis, demonstrate that green finance scholarship is largely concentrated in economics, finance, and business disciplines (Mohanty et al., 2023). While links with environmental and social sciences are emerging, the field's multidisciplinary potential remains underdeveloped, creating methodological chal-

lenges for building a framework that fully reflects the multidimensional nature of green finance.

Digitalization and fintech integration have recently emerged as promising research directions. Zaid et al. emphasize the enabling role of fintech in expanding access to green investment opportunities, yet questions remain regarding their implications for social equity, data transparency, and investor behavior (Zaid et al., 2025). The IMF's *Fintech Applications for Climate Finance* report acknowledges the potential of such tools while also warning of regulatory risks and gaps in data infrastructure (Loukoianova, 2024).

Finally, the relationship between green finance and social inclusion remains insufficiently understood. An empirical study by Han and Gao finds that social inclusion policies exert no statistically significant effect on green economic growth in OECD countries (Han & Gao, 2024). This result underlines the need for deeper inquiry into how green finance mechanisms can be structured to advance not only environmental sustainability but also social equity.

5. GREEN INNOVATION

Green innovation represents a strategic domain encompassing transformative changes in products, processes, and systems that contribute to environmental sustainability. This chapter examines its conceptual foundations, pathways of technological diffusion, and the interactions between policy frameworks and research and development (R&D). It also identifies methodological gaps in the existing literature. The discussion is organized under dedicated subheadings to ensure a systematic and comprehensive analysis.

5.1. Conceptual Framework and Definition of Green Innovation

Green innovation is increasingly recognized as a multidimensional concept encompassing product, process, and system innovations that prioritize environmental sustainability. Guinot et al. define it as the development of environmentally friendly, non-harmful, and sustainability-oriented products and services (Guinot et al., 2022). Beyond reducing ecological impacts, green innovation also functions as a strategic instrument to strengthen firms' competitiveness.

The term frequently overlaps with related concepts such as eco-innovation, environmental innovation, and sustainable innovation. Chen et al. describe green innovation as technological advancement in areas including energy conservation, pollution prevention, waste recycling, green product design, and corporate environmental management (Chen et al., 2006). This definition has since expanded to include both hardware and software innovations. Similarly, Leal-Millán et al. emphasize its role as a strategic imperative that enables firms to respond to environmental demands while capitalizing on emerging market opportunities (Leal-Millán et al., 2020).

Tseng et al. classify green innovation into four categories: managerial, product, process, and technological innovation (Tseng et al., 2013). This typology highlights that corporate environmental strategies extend beyond production to encompass organizational structures, management practices, and technology integration.

Another distinction lies between radical and incremental innovation. Chen, Chang, and Lin argue that radical green innovations represent transformative shifts departing from established knowledge, while incremental innovations involve gradual improvements that build on existing ecological practices (Chen et al., 2014).

Over time, the conceptualization of green innovation has evolved from a narrow focus on environmental impact reduction toward broader systemic transformation goals. These include social responsibility, ethical production, the circular economy, and sustainable consumption. Guinot et al. further observe that while green innovation often emphasizes production processes, some firms extend it across business functions, such as distribution channels and after-sales services (Guinot et al., 2022).

Taken together, these perspectives illustrate how green innovation has emerged as a strategic transformation tool that integrates environmental sustainability with competitive business models within an interdisciplinary framework.

5.2. Technological Applications and Sectoral Diffusion of Green Innovation

The practical impact of green innovation is evident in the diffusion of technological applications across diverse sectors. These applications contribute to sustainable development goals by reducing environmental impacts, improving resource efficiency, and lowering carbon emissions. According to the IMF's *Green Innovation and Diffusion* study, although the patenting and diffusion of low-carbon technologies (LCTs) has recently slowed, targeted policy interventions could help revitalize this process (Hasna et al., 2023).

In the energy sector, notable green innovations include renewable energy technologies such as solar and wind systems, high-efficiency panels, smart grids, and energy storage solutions. The World Intellectual Property Organization's (WIPO) *Green Technology Book* highlights the increasing adoption of urban-scale technologies, including waste heat recovery, microgrids, and prosumer energy models (World Intellectual Property Organization, 2023). These advances not only reduce energy demand but also promote decentralized and participatory energy systems.

In transportation, green innovation is revolutionizing mobility through electric vehicles (EVs), hydrogen fuel cells, and smart mobility technologies. The International Energy Agency's *Global EV Outlook* reported that demand for EV batteries rose by 25% in 2024, reaching over 950 GWh, with passenger vehicles accounting for more than 85% of this demand (International Energy Agency, 2025).

Innovation efforts center on battery technology, charging infrastructure, and recycling systems, while digital tools such as route optimization and fleet management reduce transport-related emissions.

Green innovation also plays a role in expanding energy access. WIPO highlights rural deployments of microgrids and solar-powered irrigation systems that improve livelihoods while limiting environmental pressures (World Intellectual Property Organization, 2023). In industry, green innovation is expressed through low-carbon production methods, waste recycling, eco-certification schemes, and the use of sustainable materials. In energy-intensive sectors such as cement, steel, and chemicals, carbon capture, utilization, and storage (CCUS) technologies are increasingly prioritized. The International Energy Agency estimates that CCUS could deliver about 15% of emissions reductions in these industries (Maldonado & Gallagher, 2022). Although CCUS in steel production remains in early stages, Sun et al. underscore its importance for achieving carbon neutrality targets (Sun et al., 2025). Digital optimization and process modeling tools further enhance industrial efficiency and accelerate adoption.

From a sectoral diffusion perspective, progress is uneven. Clausen and Fichter note that innovation spreads more quickly in information technology and energy efficiency products, while sectors such as transportation and agriculture show slower uptake (Clausen & Fichter, 2019). These disparities reflect differences in technological infrastructure, investment capacity, and policy support.

5.3. Policy and R&D Ecosystem

The diffusion of green innovation depends on both the technological capacity of the private sector and the enabling role of public policy and research systems. Countries where green innovation has advanced most rapidly typically benefit from strong public–private partnerships and university–industry collaboration. The OECD's *Exploring New Metrics to Measure Environmental Innovation* report argued that environmentally friendly innovations cannot rely solely on market dynamics; instead, direct incentives, tax benefits, and strategically targeted R&D grants are essential to accelerate their adoption (Dussaux et al., 2023).

Empirical studies show that strengthening environmental innovation capacity requires access to external knowledge, active support from university partnerships, and the use of open innovation models (Torres de Oliveira et al., 2022). This is particularly important in fields such as renewable energy, waste management, and environmental engineering, where the transfer of academic research into industrial practice determines innovation outcomes.

The European Commission's *Horizon Europe* program illustrates the strategic role of public R&D investment. With a budget of €95.5 billion for 2021–2027, the program prioritizes projects in areas such as the circular economy, low-carbon production, sustainable urban development, and biotechnology (European Commission & European Economic and Social Committee, 2025). Annual allocations for environmental themes are estimated between €8–10 billion, fostering not only technological breakthroughs but also cross-sectoral learning and knowledge diffusion (Clausen & Fichter, 2019). Despite these efforts, regional disparities remain significant. Zhang and Meng find that digital transformation and green innovation efficiency yield stronger effects in disadvantaged regions, where limited financing, educational resources, and technology transfer capacity constrain progress (Zhang & Meng, 2023). This highlights the importance of designing green innovation ecosystems that integrate both technological development and socio-economic equity.

The UNEP's *Global Resources Outlook* further emphasizes that R&D investments should generate not only environmental gains but also social inclusion and equity in order to contribute meaningfully to sustainable development goals (United Nations Environment ProgrammeUnited Nations Environment Programme). Within this framework, micro-enterprises, community-based initiatives, and localized technological solutions are identified as crucial elements of a holistic green innovation ecosystem.

5.4. PANEL: Green Innovation

Although research on green innovation has expanded rapidly, significant methodological, thematic, and contextual gaps persist. There is no consensus on the diversity or consistency of indicators used to measure its impacts, highlighting a lack of reliable analytical tools for policy formulation and strategic decision-making aligned with environmental sustainability goals. Many studies also overlook the environmental and institutional dimensions of innovation, underscoring the need for more holistic theoretical and practical approaches.

A systematic review by Rupasinghe et al. identifies green innovation as an emerging field that requires deeper exploration in areas such as behavioral dynamics, financial integration, product innovation, and technological diffusion (Rupasinghe et al., 2024). Their bibliometric analysis of 381 articles published between 2015 and 2023 maps the knowledge landscape and proposes future research themes, including green innovation behavior, green finance, innovation barriers, environmental regulations, organizational learning, and capabilities.

Thirakulwanich conducted a bibliometric analysis revealing regional disparities in green innovation management literature (Thirakulwanich, 2024). The study shows that policy frameworks in developing countries significantly shape academic output and emphasizes the importance of examining green innovation beyond technology, incorporating governance and institutional capacity perspectives. Structural factors behind these disparities are further elucidated through analyses of institutional collaborations and research networks.

Xu et al. noted that concepts such as digital sustainability orientation and capability restructuring are insufficiently addressed in research on the integration of green innovation and digitalization (Xu et al., 2024). While research on the transformative effects of digital technologies, including Internet of Things, artificial intelligence, and big data, are increasing, their implications for organizational behavior, strategic orientation, and environmental performance remain underexplored.

An empirical study by Zhou et al. further revealed that resource orchestration mechanisms, which explain how digital technologies influence green innovation, are inadequately covered in the literature (Zhou et al., 2024). The study outlines two critical phases shaped by digitalization, green technology R&D efficiency, and successful technology transfer, supported by structures such as digital resource integration, resource synergy, and optimized portfolio management. These findings suggest that future research should extend beyond technological factors to encompass strategic resource management and organizational structuring within green innovation.

6. GREEN INFRASTRUCTURE

Green infrastructure represents a holistic planning approach that integrates nature-based systems to enhance ecological functionality and improve urban quality of life. This chapter examines its multidimensional character, technological applications, and financing mechanisms, and highlights key research gaps identified in the literature.

6.1. Conceptual Framework and Dimensions of Green Infrastructure

Green infrastructure is an interdisciplinary concept involving the strategic planning and integration of natural and semi-natural elements into urban environments to deliver environmental, social, and economic benefits. Benedict and McMahon defined it as "an interconnected network of green spaces that conserves natural ecosystem values and functions and provides benefits to human communities" (Benedict & McMahon, 2002). This definition underscores that green infrastructure extends beyond physical layout, emphasizing ecological functionality alongside societal benefits.

The concept spans multiple disciplines, including ecological planning, landscape architecture, urban design, environmental engineering, and sustainable development (Hansen & Pauleit, 2014; Whitten, 2023). This interdisciplinary reach highlights its multidimensional potential and capacity for integration across diverse areas of expertise.

Green infrastructure is typically analyzed through three core dimensions:

Ecological Dimension: Green infrastructure restores urban ecosystems, preserves biodiversity, and sustainably provides ecosystem services. Umoh et al. note that it reshapes intra-urban ecosystems through ecological networks, green corridors, and nature-based solutions (Umoh et al., 2024). By creating interconnected green spaces that emulate natural ecosystems, green infrastructure enhances urban ecological functionality.

Social Dimension: Green infrastructure improves public welfare, strengthens community spaces, and promotes social inclusion. Whitten emphasizes that planning should incorporate sociocultural values and community participation to enhance urban resilience and adaptive capacity (Whitten, 2023). Parks, green streets, and community gardens act as social hubs, supporting physical and mental health, fostering social interaction, and cultivating a sense of belonging.

Economic Dimension: Investments in green infrastructure yield long-term economic and societal benefits. Shakya and Ahiablame highlight its role in reducing stormwater management costs, enhancing urban livability, creating recreational spaces, and generating green employment opportunities (Shakya & Ahiablame, 2021). By transforming built environments into more livable and aesthetically appealing spaces, green infrastructure also reduces maintenance costs and indirectly strengthens local economies.

6.2. Application Areas and Technological Components

Green infrastructure practices are implemented across multiple sectors and scales to enhance urban sustainability, build climate resilience, and improve quality of life. Literature typically classifies these practices into thematic domains, including urban green infrastructure, water management systems, energy infrastructure, transportation solutions, and sustainable construction technologies, as given in Table 1 (Ashinze et al., 2024; Sitzenfrei et al., 2020).

In urban environments, common applications include green roofs, green walls, permeable surfaces, and rain gardens. These systems provide ecosystem services such as stormwater management, air quality improvement, carbon sequestration, and mitigation of urban heat islands (Ashinze et al., 2024). Green roofs are particularly effective for energy efficiency and microclimate regulation, retaining rainwater through vegetation and stabilizing indoor temperatures (Vink & Vinke-de Kruijf, 2023).

Water infrastructure integrates nature-based solutions like Sustainable Drainage Systems (SuDS), biofiltration zones, rainwater harvesting, infiltration trenches, and permeable pavements. These alternatives to conventional grey infrastructure enable onsite water retention, filtration, and reuse. Bioretention systems improve water quality through chemical and biological purification while mitigating flood risks (Sitzenfrei et al., 2020).

Energy infrastructure also benefits from green innovations. For example, energy recovered from metro braking systems can power electric vehicle charging

Table 1. Thematic classification of green infrastructure applications and associated technologies

Thematic area	Technological components	Key functions & benefits
Urban green infrastructure	Green roofs, green walls, permeable surfaces, rain gardens	Stormwater management, air purification, carbon sequestration, urban heat island mitigation
Water management systems	SuDS, biofiltration zones, rainwater harvesting, infiltration trenches, permeable pavements	Onsite retention, filtration, reuse; flood risk reduction, water quality improvement
Energy infrastructure	Metro brake energy recovery, data center waste heat reuse	Energy efficiency, carbon footprint reduction, climate resilience
Transportation solutions	Bicycle lanes, tree-lined boulevards, sustainable transit stops	Emission reduction, ecological connectivity, public space enhancement
Sustainable construction tech	Recycled aggregates, bio-based composites (e.g., bamboo, hempcrete), low-carbon concrete	Reduced environmental impact, improved thermal performance, long-term durability

*Developed by the author based on interdisciplinary literature published between 2017 and 2025.

stations, while waste heat from data centers provides supplementary energy. Such solutions, documented by WIPO, enhance urban energy efficiency and resilience against climate impacts (World Intellectual Property Organization, 2023).

Transportation infrastructure incorporates green elements through bicycle lanes, tree-lined boulevards, and sustainable transit stops. These interventions reduce carbon emissions, strengthen ecological connectivity, and improve public spaces and social interaction (United Nations Development Programme (UNDP), 2023).

Sustainable construction technologies further support green infrastructure using environmentally friendly materials, such as recycled aggregates, bio-based composites (e.g., bamboo, hempcrete), and low-carbon concrete (Abera, 2024). Geopolymers and fly ash-based concretes, in particular, offer significant potential to reduce carbon emissions while improving energy efficiency, thermal performance, and durability.

To provide a structured overview of these applications, Table 1 summarizes the main thematic areas of green infrastructure together with their associated technologies and functions. This classification is designed to highlight the breadth of recent interdisciplinary research and to facilitate comparison across domains.

6.3. Financing Models and Policy Approaches

Green infrastructure investments deliver substantial long-term environmental and social benefits, yet they often face financing challenges due to high upfront costs and uncertain returns. The literature emphasizes the need for hybrid and innovative financing models tailored to these projects. The OECD's *Approaches for Financing Climate-Resilient Infrastructure* report highlights public-private partnerships and green investment banks as strategic actors in enhancing both climate resilience and financial viability (G20/Organisation for Economic Co-operation and Development (OECD), 2024).

Public-private partnerships are particularly effective for green infrastructure, enabling risk-sharing, securing long-term financing, and facilitating technical knowledge transfer. Owojori and Erasmus identify critical success factors for green-oriented PPPs across sectors such as renewable energy, sustainable urban mobility, water and wastewater management, solid waste management, green buildings, and urban greening (Owojori & Erasmus, 2025). Their findings indicate that the importance of supportive institutional frameworks, committed financing, and collaborative governance. Shamanina further illustrates how PPPs can be integrated with green financing instruments, demonstrating their applicability in Russia and Europe (Shamanina, 2023).

Financial instruments such as green bonds and sustainability-linked loans play a key role in mobilizing private capital. In 2023, the World Bank issued bonds totaling USD 42.2 billion, including USD 0.5 billion in green bonds (World Bank, 2023b). Municipal governments and infrastructure agencies increasingly leverage these products to attract investors, particularly in transportation and energy projects.

Blended finance models, which combine public, private, and development resources, are critical in mitigating investment risks and enhancing project feasibility in developing countries. These mechanisms mobilize roughly USD 70 billion annually and help address infrastructure inequalities in low-income regions.

Policy frameworks and institutional regulations also shape investment patterns. UNEP (2023) highlighted the importance of integrating nature-based solutions and ecosystem services into financing decisions (United Nations Environment Programme (UNEP)). The Inter-American Development Bank's *Resilient PPP Toolkit* provides a multi-sectoral roadmap for embedding climate resilience throughout the design, implementation, and lifecycle management of PPP projects (Donadi et al., 2024).

6.4. PANEL: Green Infrastructure

Despite rapid growth in the literature over the past decade, significant gaps remain in conceptual clarity, measurement consistency, and performance evaluation methodologies for green infrastructure. A major limitation is the insufficient availability of comprehensive data systems capable of holistically assessing the environmental, social, and economic impacts of green infrastructure components, which hampers the evaluation of their long-term effects. Existing studies tend to emphasize the technical dimensions of green infrastructure, while crucial sustainability principles, such as social inclusion, local participation, and equity-based distribution, are often underrepresented. This gap underscores the urgent need to develop integrated, multi-actor approaches in green infrastructure planning.

Sitzenfrei et al. note that research on green infrastructure predominantly focuses on water management systems, yet analyses of long-term performance and system resilience remain limited (Sitzenfrei et al., 2020). Similarly, Vink and Vinke-de Kruijf argue that current models inadequately capture holistic impacts on water and energy resources, while social adaptation and community participation are frequently overlooked (Vink & Vinke-de Kruijf, 2023).

Whitten emphasized that although technical knowledge dominates green infrastructure policymaking, the sociocultural contributions of local communities are often marginalized or treated as subjective, resulting in limited integration into planning processes (Whitten, 2023). This finding points to the the importance of design frameworks that balance technical requirements with social inclusion.

Empirical evidence from Shakya and Ahiablame indicates that green infrastructure projects can increase property values; however, quantitative data on the equitable distribution of benefits across income groups is scarce (Shakya & Ahiablame, 2021). Economic models often rely on assumptions rather than direct observational data, reducing the robustness of conclusions.

A comprehensive review by Ashinze et al. acknowledges the critical role of green infrastructure in climate adaptation, disaster resilience, and ecosystem service integration, while highlighting persistent methodological constraints in developing interdisciplinary data models (Ashinze et al., 2024). The study stresses the importance of multi-stakeholder collaboration and integrated planning, arguing that such approaches are essential for managing the complexity of green infrastructure and enabling sustainable urban transformation.

7. GREEN ENERGY

Green energy has emerged as a cornerstone of sustainable development, encompassing energy production methods that rely on low-carbon and environmentally friendly sources. This section adopts a multi-level approach to explore the definition of green energy, the range of technologies involved, relevant policy and financing mechanisms, as well as key methodological gaps identified in the literature.

7.1. Conceptual Framework and Definition of Green Energy

Green energy refers to energy production methods that use natural resources while minimizing environmental impacts and aligning with sustainable development goals. While often considered a subset of renewable energy, not all renewable sources qualify as green; for instance, certain biomass applications can generate significant carbon emissions, complicating their classification as environmentally "green" (Constellation Energy, 2022; International Renewable Energy Agency, 2022).

Aktar et al. define green energy as "clean energy sources that generate lower environmental impact compared to conventional energy technologies," highlighting its role in combating climate change and driving sustainable economic and social transformation (Aktar et al., 2020).

A recurring theme in the literature is the distinction between green and renewable energy. While renewable energy broadly covers naturally replenishing sources, green energy emphasizes the net environmental impact of energy production. It is inherently linked to low-carbon energy systems: the International Energy Agency's "Net Zero by 2050" roadmap projects that by 2050, 90% of global electricity generation will derive from renewable sources, aiming to reduce carbon emissions to near zero (International Energy Agency, 2021). This transition affects not only energy production but also consumption patterns, infrastructure, and policy frameworks.

IRENA further highlights green energy as a strategic tool for achieving climate goals, expanding energy access, creating jobs, and fostering socio-economic development (International Renewable Energy Agency, 2023). Accordingly, green energy plays a multidimensional role within the broader sustainable development agenda.

In summary, green energy functions as a transformative instrument integrating environmental sustainability, low-carbon transitions, and social inclusion. Its diverse definitions reflect the interdisciplinary nature of the concept and its adaptability across contexts and applications.

7.2. Technology Types and Application Areas

Green energy technologies encompass environmentally friendly systems developed to reduce reliance on fossil fuels and lower carbon emissions. In the literature, these technologies are typically classified by energy sources: solar, wind, hydroelectric, geothermal, biomass, and green hydrogen, the latter recognized by the OECD as a strategic element in the green transition (International Renewable Energy Agency, 2023; Paunov et al., 2025). Table 2 provides a concise overview of these technologies.

Solar energy is harnessed for electricity and heat generation through photovoltaic panels and solar thermal sys-

Table 2. Renewable Energy Technologies: Sources, Applications, and Strategic Insights

Technology type	Energy source	Key applications	Strategic notes
Solar energy	Sunlight	Residential, industrial, agriculture	Cost-effective, scalable
Wind energy	Wind (onshore/offshore)	Urban grids, industrial zones	Offshore systems offer higher efficiency
Hydroelectric energy	Flowing water	Large dams, small rivers	Environmental impact must be assessed
Geothermal energy	Earth's heat	Heating, electricity, greenhouses, tourism	High efficiency in volcanic regions
Biomass energy	Organic waste	Biofuel production, rural energy access	Supports energy equity
Green hydrogen	Water + renewables	Energy storage, transport, industrial use	Enhances supply security and flexibility

*Developed by the author based on recent interdisciplinary literature.

tems. Applied across residential, industrial, and agricultural settings (e.g., irrigation), solar energy is valued for its technical contribution to decarbonization, cost-effectiveness, accessibility, and versatility. Its growing strategic importance underscores its central role in low-carbon transitions.

Wind energy converts kinetic energy into electricity via onshore and offshore turbines. Offshore turbines benefit from stronger, more consistent winds, improving efficiency, while onshore turbines are optimized for lower wind speeds. Wind farms supply electricity to both industrial and urban grids, supporting large-scale renewable energy deployment (International Energy Agency (IEA), 2025).

Hydroelectric energy generates power by utilizing the potential energy of water through large dams or small-scale river systems. While renewable, hydroelectric projects require careful environmental planning due to ecological impacts and high capital costs (International Finance Corporation, 2015).

Geothermal energy exploits heat from beneath the Earth's crust for electricity generation and direct heating applications. Particularly effective in volcanic regions, geothermal energy supports building heating, greenhouse climate control, and thermal tourism.

Biomass energy is derived from converting organic materials such as agricultural residues, animal waste, and forest products into biofuels and energy. By converting these materials into biofuels or electricity, biomass enhances energy access, particularly in rural and semi-urban areas (Alao et al., 2024).

Green hydrogen is produced via water electrolysis powered by renewables, green hydrogen serves as a zero-carbon energy carrier and storage medium (Nnabuife et al., 2024). Integrating green hydrogen with solar and wind systems enhances production stability and energy security, supporting broader low-carbon infrastructure (Bernadett, 2025).

Across sectors, green energy technologies are increasingly deployed to reduce emissions and enhance efficiency. In transportation, these include electric vehicles, hydrogen fuel cell buses, and biofuels; in industry, low-carbon production processes and green steel; and in buildings, solar panels and geothermal heat pumps play a critical role (International Renewable Energy Agency, 2023).

7.3. Policies, Regulations, and International Developments

The acceleration of the green energy transition relies not only on technological innovation but also critically on effective policy and regulatory frameworks. At the global level, the Paris Agreement serves as the cornerstone guiding green energy policies. Through Nationally Determined Contributions (NDCs), countries commit to carbon emission reductions, many of which prioritize renewable energy targets. According to IRENA, 90% of the 156 submitted NDCs incorporate renewable energy measures focused on the electricity sector, and 67% set quantitative targets for renewable electricity generation (World Health Organization, 2021).

In the European Union, the European Green Deal and its follow-up, REPowerEU, prioritize green energy investments to enhance energy security and accelerate the phase-out of fossil fuels. By 2023, renewable sources accounted for 47% of EU electricity generation, with solar and wind energy surpassing natural gas (Eurostat (European Commission), 2025). REPowerEU also includes legal and regulatory measures promoting energy efficiency, grid modernization, and industrial decarbonization.

International organizations, including IRENA, United Nations Conference on Trade and Development (UNCTAD), IEA, and UNDP, provide technical guidance, policy recommendations, and financial assessments to support the diffusion of green energy strategies. IRENA's *Policies for the Energy Transition* report emphasized the need for comprehensive policy packages across all technological sectors to achieve deployment targets by 2030 (International Renewable Energy Agency, 2023). UNCTAD highlighted a substantial annual investment gap of USD 2.2 trillion for energy transition efforts in developing countries, stressing the urgent need for balanced and inclusive policy instruments (United Nations Conference on Trade and Development (UNCTAD), 2023a).

At the national level, Türkiye ratified the Paris Agreement in 2021 and committed to achieving net-zero emissions by 2053. Initiatives under the National Energy and Mining Policy include Renewable Energy Resource Zones (REZ) projects and the development of a Green Taxonomy aligned with EU standards. The Investment Strategy 2024–2028 by the Presidency of the Republic of Türkiye Investment Office targets the expansion of green energy capacity, domestic technology development, and the implementation of carbon pricing mechanisms. Despite these efforts and capacity increases in 2022, Türkiye's overall energy dependency remains high, with continued fossil fuel consumption driven by rising demand (Erdemir, 2022).

Regulatory tools such as feed-in tariffs, carbon taxes, renewable portfolio standards, and net metering have been widely adopted to incentivize green energy investments. Successful examples include Germany's Energiewende, the UK's Contracts for Difference scheme, and Canada's carbon tax regime, which collectively serve as models for promoting clean energy transitions (Energy Evolution Conference, 2024).

7.4. Economic Impacts and Financing Mechanisms

The green energy transition drives substantial economic effects by fostering environmental benefits, stimulating investment flows, and reshaping global energy markets. According to BloombergNEF's Energy Transition Investment Trends Report (2023), global investments in the energy transition rose by 11% in 2024, reaching USD 2.1 trillion (BloombergNEF, 2023). This increase is largely attributed to record-level funding in sectors such as solar energy, electrification, and energy storage (BloombergNEF, 2025).

Data from the IEA indicated that global energy investments exceeded USD 3 trillion for the first time in 2024, with approximately USD 2 trillion allocated to clean energy technologies (International Energy Agency, 2024). Investment in renewable and low-carbon technologies now nearly doubles that in fossil fuel sectors. Concurrently, the cost of solar photovoltaic technologies has declined by 30% over the past two years, driven by technological innovation, economies of scale, and improvements in global supply chains (International Energy Agency, 2024).

Financing the green energy transition increasingly relies on innovative mechanisms that go beyond traditional capital models. A systematic review by Long et al. categorizes financing tools into six groups: public finance, private finance, market-based instruments, innovative financing models, risk mitigation mechanisms, and institutional capacity development (Long et al., 2024). This framework offers a comprehensive lens to evaluate which financial instruments are most suitable at different stages of energy transition projects.

High upfront capital requirements and perceived investment risks remain major barriers for green energy projects. In developing countries, additional challenges such as political instability, currency fluctuations, and regulatory uncertainties complicate project financing and affect banking sector readiness. To address these challenges, blended finance models, which strategically combine public and private resources, have emerged as effective instruments to mitigate risks and mobilize investment, particularly for large-scale renewable energy projects (Institute for Energy Economics and Financial Analysis (IEEFA), 2024).

7.5. PANEL: Green Energy

Although the rapid growth of academic research on green energy, several critical gaps persist, particularly in the integration of technology, policy, and finance, as well as in understanding the social dimensions of the energy transition. Most studies focus heavily on resource development and financial instruments, whereas energy justice, behavioral transformation, and socio-political influences remain underexplored. A bibliometric analysis by Sahin and Ok Ergün highlighted that current research predominantly emphasizes technological and financial aspects (Ok Ergün & Şahin, 2025). Similarly, Hayford et al. underlined the complex yet under-investigated interactions between energy efficiency and green technology integration, pointing to the urgent need for more comprehensive, interdisciplinary studies (Sam Hayford et al., 2025).

The role of digital technologies, including the Internet of Things, big data analytics, and artificial intelligence, has gained attention in green energy scholarship. However, there is still a lack of quantitative models assessing how these technologies influence decision-making, consumer behavior, and infrastructure performance. Olson noted that these gaps hinder a holistic understanding of the synergy between digitalization and the green energy transition (Olson, 2024).

In the financing domain, Long et al. revealed that existing research is fragmented, lacking a comprehensive classification of financial mechanisms suitable for different stages of the energy transition (Long et al., 2024). This fragmentation complicates the development of coherent strategic models and underscores the need for a unified theoretical framework to guide investment deployment effectively.

Spatial and regional disparities in energy investments further exacerbate global inequalities. According to IRENA, per capita renewable energy investment in Europe was 41 times higher than in Sub-Saharan Africa and 57 times greater than in North America (Climate Policy Initiative, 2023). Such disparities lead to uneven energy access, divergent development outcomes, and varying levels of environmental resilience, highlighting the necessity of research grounded in energy justice principles.

Finally, while green energy financing research has largely focused on advanced economies, hybrid and context-specific financing models for developing countries remain underrepresented. Expanding the research scope to these regions is essential for designing inclusive, universally applicable strategies that support a global and equitable energy transition.

8. GREEN GROWTH

Green growth represents a holistic development paradigm that seeks to align economic progress with environmental sustainability. The OECD defines green growth as a strategy that promotes economic development while ensuring that natural assets continue to provide essential resources and ecosystem services for human well-being (Organisation for Economic Co-operation and Development (OECD), 2011). By challenging the perception of a zero-sum relationship between economic growth and environmental protection, green growth emphasizes that both objectives can be pursued simultaneously through appropriate policy instruments. The concept gained prominence as an "exit strategy" for both developed and developing countries following the 2008 global financial crisis. UNEP further characterizes green growth as a low-carbon, resource-efficient, and socially inclusive transformation process with the potential to reduce poverty, generate employment, and support sustainable development (United Nations Environment Programme (UNEP)).

8.1. Conceptual Framework and Definition of Green Growth

Academic literature conceptualizes green growth through three principal theoretical lenses:

Neoliberal Approach: Focuses on market-based mechanisms and technological innovation to address environmental challenges. Central policy tools include carbon pricing, green taxation, and incentives for private sector investment (Hallegatte et al., 2012).

Ecological Economics Approach: Emphasizes that economic activity must operate within ecological limits. Daly and others advocate for development that prioritizes qualitative improvements over quantitative expansion, recognizing the finiteness of natural resources (Daly, 1997).

Post-Growth Approach: Questions the compatibility of traditional economic growth with sustainability goals, promoting alternative models such as degrowth and doughnut economics to redefine prosperity and human well-being (Raworth, 2018; Schulz & Bailey, 2014).

Despite its growing influence, green growth suffers from definitional inconsistencies and methodological misalignments, as highlighted by Georgeson et al., particularly between theoretical constructs and available measurement tools (Georgeson et al., 2017). These gaps pose challenges for evaluating the effectiveness of green growth policies and initiatives.

Operational frameworks, such as the Green Growth Index developed by the Global Green Growth Institute, translate these objectives into measurable dimensions: efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion (Global Green Growth Institute, 2020). Green growth thus functions as a strategic, multidimensional framework that bridges economic development, environmental sustainability, and social equity, providing guidance for both policymakers and researchers.

8.2. Green Growth Policies and Implementation Models

Green growth policies comprise multi-level strategies aimed at harmonizing economic development with environmental sustainability. The OECD's *Towards Green Growth* strategy emphasizes that successful green growth requires correcting market failures, pricing environmental externalities, and fostering technological and institutional innovation (Organisation for Economic Co-operation and Development (OECD), 2011). Key policy instruments under this framework include carbon taxes, green subsidies, environmentally responsible public procurement, and support for R&D activities.

Integrated modelling approaches are increasingly recognized as essential for guiding green growth strategies. UNEP's Green Economy Modelling framework employs tools that simultaneously address economic, environmental, and social dimensions, enabling policymakers to evaluate sectoral transitions, project policy impacts, and assess synergies among interventions (United Nations Environment Programme (UNEP); World Economic Forum (WEF), 2025). For example, the Integrated Green Economy Modelling framework combines system dynamics, general equilibrium models, and social accounting matrices to analyze the multidimensional effects of green growth policies.

Social inclusion and equity are central to green growth implementation. The World Bank's Inclusive Green Growth strategy emphasizes integrating environmental objectives with social policies, such as labor market transformation, skills development, and reducing regional inequalities, to achieve equitable and sustainable outcomes (World Bank, 2012).

Several countries have pioneered practical green growth policies: South Korea launched its Low Carbon Green Growth strategy in 2009, focusing on investment in 27 priority green technology areas, supported by R&D funding and commercialization incentives (Jung et al., 2022). China, through its 12th Five-Year Plan, aimed to create one million new jobs and reduce rural poverty via green industrial policies and sustainable natural resource management (Green Growth Best Practice Initiative, 2014). The European Union has advanced its energy transition via the Green Deal and REPowerEU, expanding carbon pricing mechanisms and promoting sustainable finance to restructure markets toward low-carbon outcomes (European Commission, 2019). Türkiye has integrated green growth into strategic planning, including the 2024–2028 International Direct Investment Strategy by the Presidency of the Republic of Türkiye Investment Office. Key priorities include green energy, circular economy investments, green infrastructure, enhanced investor access, Green Taxonomy development, and prepa-

ration for an Emissions Trading System aligned with international standards (Investment Office of the Presidency of the Republic of Türkiye, 2024).

Guidance for national-level implementation is also available through frameworks such as the Global Green Growth Institute's 18-step Green Growth Planning Guidelines (2018). This tool-based, participatory framework covers diagnosis, assessment, action planning, and implementation, helping policymakers strengthen capacities for sectoral transitions, data-driven analysis, and informed decision-making (Global Green Growth Institute, 2018).

In sum, green growth policies combine regulatory, fiscal, and strategic instruments with integrated modeling and planning frameworks to facilitate sustainable, equitable, and economically viable development pathways.

8.3. Measurement Tools and Indicators

Effective monitoring of green growth necessitates both conceptual clarity and robust, multidimensional measurement tools. The OECD's Green Growth Indicators framework provides over 30 indicators organized into four key dimensions: environmental and resource efficiency in production and consumption, the natural asset base, environmental quality of life, and economic opportunities alongside policy responses (Organisation for Economic Co-operation and Development (OECD), 2011). These indicators enable multi-level tracking of green growth by measuring metrics such as energy and carbon intensity, natural resource consumption, green employment shares, and environmental R&D expenditures, allowing policymakers to evaluate both efficiency and sustainability outcomes.

To assess the sustainability of economic growth beyond conventional GDP metrics, the Inclusive Wealth Index (IWI) developed by Managi and Kumar (Managi & Kumar, 2018) offers a comprehensive evaluation by integrating natural capital, human capital, and produced capital. A 2024 study analyzing 163 countries over 30 years demonstrated that the IWI provides a more realistic depiction of long-term wealth accumulation and depletion than traditional economic measures (Managi et al., 2024). Notably, the IWI functions as an early warning system, revealing instances where short-term income gains may mask losses in natural capital, thereby guiding more sustainable policy interventions.

The Inclusive Growth Index by UNCTAD evaluates the equitable distribution of economic growth, incorporating social and environmental dimensions (United Nations Conference on Trade and Development (UNCTAD), 2023c). Data reveal significant disparities: developed countries score an average of 42.5 on environmental criteria, while developing countries average 31.3, highlighting persistent equity gaps in green growth outcomes.

In addition, the Environmental Kuznets Curve (EKC) literature has extensively examined the hypothesized inverted U-shaped relationship between income and environmental degradation, providing a widely used framework for analyzing growth–environment dynamics (Grossman & Krueger, 1995).

The broader Beyond GDP movement includes a variety of alternative measurement systems designed to overcome GDP's limitations. The WISE (Wellbeing, Inclusion, and Sustainability Evaluation) Metrics platform, developed by Jansen et al., integrates over 60 indicators into a triangular model of sustainability, inclusion, and wellbeing (Jansen et al., 2023). This platform allows for comprehensive policy assessment by comparing multiple indices, including the Human Development Index (HDI), Genuine Progress Indicator (GPI), Index of Sustainable Economic Welfare (ISEW), SDG Index, Doughnut Economics frameworks, and Planetary Boundaries.

Principles for effective green growth measurement include: First, utilizing data-driven, reliable, and comprehensive indicators. Second, assessing multidimensional indicators in an integrated manner to capture policy complexity. Third, ensuring that short-term economic gains do not obscure natural capital losses. Finally, explicitly considering social inclusion and regional inequalities to promote equity. By adhering to these principles, measurement frameworks can effectively guide green growth policies, ensuring that economic development aligns with environmental sustainability and social inclusiveness.

8.4. PANEL: Green Growth

Despite the rapid expansion of the green growth literature over the past decade, notable gaps remain in conceptual consistency, indicator alignment, social inclusion, and engagement with post-growth debates.

A comprehensive review by Georgeson et al.(Georgeson et al., 2017) highlighted critical definitional inconsistencies between green economy and green growth, which lead to misalignments with measurement tools and hinder effective policy analysis. Ambitious frameworks such as the "transformational green economy" cannot be adequately monitored using current green growth indicators, underscoring the need for conceptual clarity.

Sarkodie et al.(Sarkodie et al., 2023) examined green growth indicators across 203 countries and identify substantial methodological challenges. The indicators rely on diverse data sources and lack a unified theoretical foundation, limiting cross-country comparability. Their analysis, based on five dimensions (natural resources, environmental efficiency, policy responses, quality of life, and socio-economic outcomes), does not fully correspond with the green growth conceptual framework, limiting the robustness of policy evaluation.

Regionally tailored approaches offer partial solutions but also present their own limitations. The Africa Green Growth Index (AGGI), developed by Kararach et al.(Kararach et al., 2018), offers context-specific insights for 22 African countries. However, applying international metrics

directly at the regional level constrains comparability with other country groups, suggesting that indicator frameworks must be adapted to local socio-economic and environmental realities.

Social inclusion emerges as a particularly underexplored dimension in the green growth literature. Pegels(Pegels, 2015) emphasized the importance of integrating green growth policies with social development objectives, especially in developing and emerging economies where poverty reduction is urgent. The social impacts of green growth are frequently overshadowed by economic and environmental considerations, and explicit assessments of these impacts are limited. Genuine transformation through green growth requires participatory governance and inclusive policy design, which remain insufficiently addressed in current frameworks (Green Economy Coalition, 2016).

Finally, the post-growth discourse challenges conventional green growth paradigms by prioritizing environmental and social outcomes over GDP expansion. The Multifutures (2025) report (MultiFutures Consortium, 2025) analyzed four paradigms (Green Growth, Mission Economy, Post-Growth, and Great Mindshift) and found that the green growth approach largely treats GDP growth as the primary pathway to sustainability. In contrast, post-growth frameworks treat GDP as a secondary outcome, fostering a more holistic integration of social welfare and environmental goals.

In summary, advancing green growth research and policy requires:

- Harmonized conceptual definitions to align indicators with policy objectives.
- Robust and context-sensitive measurement frameworks for cross-country and regional comparability.
- Explicit integration of social inclusion and participatory governance into policy design.
- Engagement with post-growth paradigms to explore alternative pathways beyond GDP-focused development.

9. GREEN TAXATION

Green taxation is a key instrument that integrates environmental externalities into market mechanisms and provides an economic orientation for sustainability policies. This section explores the theoretical foundations of green taxation, its implementation methods, socio-economic impacts, and existing research gaps through a multidimensional perspective.

9.1. Conceptual Framework and Definition Distinctions

Green taxation refers to fiscal policy instruments designed to internalize environmental externalities, reshape market behavior by pricing environmentally harmful activities, and promote sustainable development. Within this framework, tax systems reflect the economic costs of environmental degradation, thereby increasing public revenues while steering environmentally conscious behavior (United Nations Environment Programme (UNEP)).

From the standpoint of core economic theory, green taxation is grounded in the externality theory formulated by British economist Arthur Pigou. Pigou argued that the social costs associated with activities generating negative externalities can be internalized into private costs through appropriate taxation, guiding producers and consumers toward a socially optimal equilibrium (Pigou, 1920). This principle underpins the "double dividend" hypothesis, which posits that taxing environmentally damaging emissions can yield simultaneous environmental improvements and increased public revenue. Wallace E. Oates(Oates, 1995) further reinforced this framework by emphasizing that green taxes serve both environmental and fiscal objectives, thereby offering an essential mechanism to integrate environmental concerns into fiscal policy.

In the literature, green taxation encompasses various related mechanisms, including carbon pricing, environmental taxes, energy taxes, emissions trading schemes, and resource use levies. According to the World Bank's State and Trends of Carbon Pricing Report(World Bank, 2023a), 73 carbon pricing instruments were operational as of 2023, covering about 23% of global greenhouse gas emissions. These instruments, comprising carbon taxes and emissions trading systems (ETS), aim to embed environmental costs into market operations to incentivize behavioral change while generating public revenue.

A carbon tax places a direct price on each ton of greenhouse gas emissions, internalizing the environmental costs they generate. The OECD's Green Budgeting Framework highlights that carbon taxes not only encourage emission reductions but also increase funding for green R&D, thereby fostering innovation in low-carbon technologies (Organisation for Economic Co-operation and Development (OECD), 2021).

Green taxation functions as an environmental policy instrument, a central component of fiscal policy, a driver of energy transition strategies, and a pillar within broader societal transformation frameworks. The Parry, et. al.(Parry et al., 2021) report underlines carbon pricing as a cost-effective instrument that balances macro-fiscal stability with climate objectives. It stimulates innovation in low-carbon technologies, mobilizes private sector investments, and enhances government revenues. Consequently, reforming tax systems is strategically critical for financing low-carbon transitions and supporting societal adaptation (Parry et al., 2021).

In summary, green taxation provides both a theoretical foundation and a practical mechanism to internalize environmental externalities, correct market failures, and align fiscal policy with the goals of environmental sustainability.

9.2. Implementation Models and Instruments

A carbon tax seeks to discourage environmentally harmful activities by assigning a monetary cost to specific levels of greenhouse gas emissions. Several countries provide illustrative examples of long-term, systematic carbon tax implementation that serve as benchmarks for policy design. Sweden introduced its carbon tax in 1991, which by 2025 had reached €134 per ton, placing it among the highest carbon pricing levels globally (Government of Sweden, 2024). Likewise, Canada established a national carbon pricing framework aimed at reducing fossil fuel consumption, stimulate investment in clean energy, and advance its climate commitments. These experiences demonstrate that carbon taxation operates not only as an emission reduction mechanism, but also as a strategic instrument for financing the energy transition and strengthening policy coherence (Government of Canada, 2025).

The European Union Emissions Trading System is a market-based mechanism that allocates tradable carbon allowances to firms under a capped total emissions limit. Since its inception in 2005, it has developed into the world's largest carbon market, covering over 11,000 installations across the electricity, heat generation, industrial, and aviation sectors. In 2023, carbon prices at ETS auctions ranged between €66.49 and €96.33 per ton, averaging €83.60. These price signals have accelerated renewable energy investments and contributed to a 16.5% reduction in emissions within the regulated sectors (European Commission, 2024).

Environmental taxes target a wide spectrum of externalities, including air pollution, waste management, water use, and plastic consumption, aiming to internalize ecological costs within economic systems. Germany's environmental tax model represents a comprehensive framework combining revenues from energy, motor vehicle, and national emissions trading taxes. In practice, sectors such as agriculture, forestry, and manufacturing benefit from reduced taxation on specific energy inputs, whereas households and the service sector face comparatively higher tax rates. According to the European Environment Agency, sectorally differentiated taxation constitutes an effective policy instrument for reducing resource consumption and advancing environmental sustainability (Umweltbundesamt (UBA)-German Environment Agency, 2025).

Green subsidies and tax incentives represent essential fiscal tools for promoting investments in clean energy, energy efficiency, and environmentally sustainable production. The United States' Inflation Reduction Act of 2022 allocated approximately $369 billion in public funding to address climate change while reinforcing domestic industrial capacity. These measures have catalyzed record levels of investment in solar and wind energy, establishing them as the most cost-effective pathways for emission reduction in the U.S (BloombergNEF, 2023).

At both local and regional levels, South Korea supports its green growth strategy through strong institutional monitoring and evaluation systems. The country is recognized in the *Green Growth Best Practice* report for its comprehensive "government-wide monitoring and evaluation" framework, reflecting a holistic approach to implementing environmental policies. Meanwhile, China has introduced pilot emissions trading systems in five provinces and eight cities, laying the groundwork for a unified national ETS aimed at reducing carbon emissions and energy intensity across the country in a cost-effective manner (Green Growth Best Practice Initiative, 2014).

9.3. Economic and Social Impacts

While the primary aim of green taxation is to mitigate environmental harm, its economic consequences are broad and multifaceted, extending far beyond mere reductions in carbon emissions. These effects include significant shifts in price formation, employment patterns, income distribution, and social transition justice. According to the IMF/OECD (2021) report, environmental taxes raise the prices of carbon-intensive fuels, and the goods produced from them, thereby encouraging market behavior that favors more sustainable outcomes. At the same time, these taxes generate clear price signals that stimulate private investment in clean technologies, helping to expand the overall tax base (International Monetary Fund (IMF)/Organisation for Economic Co-operation and Development (OECD), 2021).

One of the most debated aspects of green taxation is its effect on energy prices. According to the IMF/OECD, increases the cost of carbon-intensive fuels and the products derived from them, yet it simultaneously incentivizes businesses and households to shift toward cleaner energy sources. Modeling studies by Gerlagh and van der Zwaan(-Gerlagh & Zwaan, 2006) show that carbon tax scenarios can significantly reduce energy consumption, enhance energy efficiency, and lower overall energy costs in the medium term. These results suggest that, although carbon taxes may raise costs initially, the efficiency gains over time can help offset these short-term increases (Gerlagh & Zwaan, 2006; International Monetary Fund (IMF)/Organisation for Economic Co-operation and Development (OECD), 2021).

Employment impacts of green taxation vary across sectors. While carbon-intensive industries often see job reductions, labor-intensive sectors, such as renewable energy and environmental technologies, tend to experience job growth. Bowen and Fankhauser(Bowen et al., 2011) argue that low-carbon technologies can be more labor-intensive than capital-intensive, offering significant employment potential, particularly in less developed countries. For a successful transition, however, supportive mechanisms, including technical assistance, skill development, and workforce retraining, are essential. From a social justice perspective, green taxation policies should be coordinated with local development programs to ensure equitable and inclusive outcomes (Bowen et al., 2011).

In terms of income distribution, carbon taxes often have regressive effects, especially in higher-income countries. Low-income households spend a larger share of their income on energy, making them disproportionately affected by carbon pricing. Dorband et al.(Dorband et al., 2019) showed that as income decreases, the relative burden of carbon pricing on poorer households rises compared to the national average, suggesting that such policies may exacerbate income inequality. Therefore, green tax reforms should be paired with complementary measures that address social equity while advancing environmental goals (Dorband et al., 2019).

Just Transition policies are crucial for integrating the social dimension into green taxation frameworks. The ILO's Just Transition Guidelines emphasize that effective and legitimate green tax policies require: (i) prior assessments of employment and socio-economic impacts, (ii) provision of adequate and sustainable social protection to mitigate job losses and displacement, and (iii) inclusion of social dialogue throughout policy development and implementation to ensure broad stakeholder participation. These principles enhance both economic efficiency and social justice, ensuring legitimacy in transitions driven by green taxation (International Labour Organization, 2015).

9.4. PANEL: Green Taxation

Although the literature on green taxation offers interdisciplinary insights across environmental economics, public finance, and sustainable development, it still faces significant, particularly in methodological diversity, availability of micro-level data, and integration of social justice dimensions. The "double dividend" hypothesis, introduced by Oates(Oates, 1995), proposes that environmental taxes can deliver both environmental protection and improved efficiency within the tax system. Yet, Freire-González's(-Freire-González, 2018) comprehensive review of empirical models finds finds the efficiency dimension of this hypothesis to be inconclusive. Similarly, Dorband et al.(Dorband et al., 2019), in a global comparative study of 87 countries, emphasize that categorical limitations and unequal access to detailed household consumption data hinder accurate assessments of carbon pricing's distributional impacts. These challenges highlight the need for richer panel databases and country-specific micro-simulation models capable of capturing both equity and efficiency outcomes of green tax reforms (Dorband et al., 2019; Freire-González, 2018; Oates, 1995).

In a comprehensive analysis, Sarkodie et al.(Sarkodie et al., 2023) highlight major inconsistencies in the measurement tools applied to green growth and taxation concepts. Their study categorizes green growth indicators across 203 countries into five dimensions, such as natural asset base, environmental efficiency, policy responses, quality of life, and socio-economic outcomes, but finds that these indicators often lack alignment with the underlying conceptual framework. In addition, the heterogeneity of datasets and methodologies employed by different countries reduces the reliability of these indicators for monitoring the impacts of green taxation and complicates methodological consistency in cross-country policy comparisons (Sarkodie et al., 2023).

The UNCTAD (2023) report(United Nations Conference on Trade and Development (UNCTAD), 2023b) identifies several structural constraints that limit the applicability of green taxation in developing economies. Rising debt burdens, limited access to finance, and higher borrowing costs weaken these countries' ability to invest in climate action and social programs. Ongoing monetary tightening further exacerbates income inequality and fuels societal resistance to green reforms. In regions such as Sub-Saharan Africa and South Asia, data scarcity and infrastructural gaps in carbon pricing systems hinder direct assessments of behavioral impacts, forcing reliance on indirect inference methods (United Nations Conference on Trade and Development (UNCTAD), 2023b).

The BloombergNEF report(BloombergNEF, 2023), which evaluates the global impact of tax incentives on investment flows, criticizes widely used climate scenario models for insufficiently accounting for regional disparities in capital expenditure. It argues that factors such as economic development stage, demographic growth, and energy mix diversity strongly shape public investment capacity in low-income countries, thereby reducing the effectiveness of incentive schemes. This underlines the need for comparative assessments of green subsidy and incentive frameworks across different national contexts and calls for a methodological reassessment of their generalizability (BloombergNEF, 2023).

Finally, the IMF (2021) report(Maldonado & Gallagher, 2022) examines the macroeconomic and financial stability implications of climate change, stressing the need for comprehensive, long-term fiscal analyses that account for public debt sustainability, asset valuation, and trade balances. It proposes embedding climate policies within macro-fiscal frameworks through institutional mechanisms such as its annual "Article IV" consultation dialogues with member states. The report further advocates systematic assessments of climate adaptation and transition policies, particularly in countries with high greenhouse gas emissions or significant climate vulnerability, to ensure strategic alignment between climate objectives and public finance management, not only in terms of short-term budgetary impacts but also long-term institutional resilience (Maldonado & Gallagher, 2022).

10. GREEN EDUCATION AND SKILLS DEVELOPMENT

Establishing the societal and professional foundations for the green transition requires more than environmental expertise; it demands a transformation grounded in behavioral change, ethical responsibility, and continuous skill

development. This section examines the concept of green education, the structuring of curricula, and lifelong learning strategies, while also highlighting persistent gaps in the literature.

10.1. Conceptual Framework and Definition of Green Education

Green education is an interdisciplinary, action-oriented approach to learning that equips individuals with the knowledge, skills, and attitudes needed for environmental sustainability, climate change mitigation, and resource management. Within UNESCO's Education for Sustainable Development framework, green education is framed not simply as knowledge transfer but as a catalyst for behavioral transformation through systems thinking, future-oriented reflection, and value-based learning. Its ultimate aim is to foster both environmental awareness and a strong sense of responsibility, empowering learners to actively contribute to societal transformation (United Nations Educational Scientific and Cultural Organization (UNESCO), 2020).

The European Commission's GreenComp (the European Sustainability Competence Framework) defines 12 core competencies organized into four categories: embodying sustainability values, understanding complexity, envisioning sustainable futures, and acting for sustainability. These competencies address cognitive, interpersonal, and ethical dimensions, fostering empathy, responsibility, and planetary sensitivity in learners' thinking, planning, and actions. GreenComp is designed to help learners not only comprehend environmental challenges but also build systematic capacity to develop solutions (Bianchi et al., 2022).

While green education overlaps with related concepts such as climate education, environmental education, and sustainability education, it is distinct in its scope and focus. Leal Filho et al.(Leal Filho et al., 2023) emphasize that higher education institutions foster attitudinal and behavioral change through climate awareness, capacity building, and interdisciplinary collaboration. Such transformation enhances adaptive capacity and societal preparedness, equipping individuals to navigate evolving climate realities. In this sense, green education is not merely the transfer of knowledge but a pedagogical instrument for social and cultural change (Leal Filho et al., 2023).

UNESCO's 2024 Greening Curriculum Guidance offers a standardized framework for designing green education curricula across formal, informal, and non-formal learning environments. It identifies four core learning domains: environmental knowledge, skills, attitudes and values, and action orientation, aimed at integrating climate change and sustainability topics. The guidance stresses that green education must go beyond knowledge transfer to foster value-driven, behavior-transforming learning. It promotes action-oriented teaching that develops ethical reasoning, systems thinking, and social responsibility, supporting societal-level climate action and long-term problem-solving (United Nations Educational Scientific and Cultural Organization (UNESCO), 2024).

10.2. Mapping Green Skills: Transformation Strategies in Vocational Education

Technical and Vocational Education and Training (TVET) comprises workforce-focused educational programs that equip individuals with sector-specific skills. In the green transition, TVET serves as a platform for developing technical expertise alongside ethical reasoning and systems thinking, ensuring alignment with environmental sustainability.

ILO Green Skills Map (Strietska-Ilina et al., 2011) organizes green skills into areas such as energy efficiency, clean production, ecosystem management, and the circular economy. For example, energy sector skills include solar panel installation, wind turbine maintenance, and smart grid management, while agriculture emphasizes climate-resilient farming, sustainable fertilization, and waste management. Combined with Cedefop's sectoral skill profiles (The European Centre for the Development of Vocational Training (Cedefob), 2021) and UNESCO-UNEVOC's *Greening TVET* guide (Cedefob & UNESCO-UNEVOC, 2025), these frameworks support vocational curricula that integrate technical proficiency with environmental awareness and ethical responsibility. Greening TVET strategies further prepare learners for evolving labor market needs through digital skill mapping, simulation tools, micro-credentials, teacher training in green competencies, and applied internships via public–private partnerships, transforming the system into a dynamic driver of sustainable development goals.

10.3. Lifelong Learning and Community Capacity Development

Green education extends beyond formal schooling, encompassing lifelong learning that cultivates sustainability awareness and skills throughout individuals' lives. UNESCO's Greening Education Partnership initiative advances this transformation through four core components: greening school environments, curriculum integration, teacher training, and community-based capacity development (United Nations Educational Scientific and Cultural Organization (UNESCO), 2024). Lifelong learning within this framework is central to fostering climate-resilient and inclusive societies.

Community-based learning mechanisms seek to cultivate collective awareness and behavioral change in response to environmental challenges within local contexts. UNESCO emphasizes its potential to strengthen climate resilience through lifelong learning. A notable example is Morocco's "One Student, One Tree, One School, One Forest" project, which involved around six million students in tree-planting activities on school grounds, serving as an effective model for increasing environmental literacy and ecological awareness (Global Education Monitoring Report Team, 2024).

In adult education, Colombia is implementing innovative models that incorporate traditional knowledge into formal curricula to tackle climate change. Global Education Monitoring Report noted that learning processes rooted in local ecological observations and practices have enhanced climate adaptation capacities among rural farmers while supporting the transfer of technical knowledge. Similarly, Kenya is advancing adult climate education through teacher training and community-based programs, aiming to foster climate-resilient lifestyles.

Micro-certification and short-term training programs provide flexible pathways for acquiring skills essential for green and circular transitions. UNESCO-UNEVOC's *Building Skills for the Green and Circular Transition* initiative encourages TVET institutions to strengthen the competencies of young graduates and new labor market entrants in sustainable production practices. Supported by trainer education, digital learning modules, and a "Train the Trainer" approach, these programs enable participants to apply circular economy principles across sectors such as construction, agriculture, textiles, recycling, and design (UNESCO-UNEVOC (UNESCO International Centre for Technical and Vocational Education and Training), 2022).

In conclusion, lifelong learning strategies play a crucial role in equipping individuals with both knowledge and sustainability-oriented behaviors, thereby enhancing societal resilience. By ensuring that green education is inclusive, flexible, and context-sensitive, these approaches provide a strategic foundation for transforming education systems and supporting long-term sustainable development.

10.4. PANEL: Green Education and Skills Development

The literature on green education and skills development is growing within the sustainable development framework; yet notable theoretical, methodological, and practical gaps persist. Leal Filho et al.(Leal Filho et al., 2023) point out that environment-focused curricula often lack consistency in content and show significant conceptual and pedagogical differences across countries. This variability makes it challenging to assess how effectively curricula incorporate elements such as systems thinking, value-based decision-making, and behavioral transformation.

UNESCO's Greening Education Partnership report(United Nations Educational Scientific and Cultural Organization (UNESCO), 2024) highlights a lack of comparative analyses across countries on key transformation components, such as teacher training and community engagement. Data gaps and limited implementation models regarding teachers' acquisition of green competencies hinder the evaluation of educational impacts. Although digital learning tools are increasingly adopted in green education, research on their long-term effects on behavior and attitudes remains limited. Few comparative case studies examine the effectiveness of digital solutions for micro-skills acquisition and lifelong learning, complicating impact assessment. Huang et al.(Huang et al., 2024) note that while digital pedagogical transformation is essential for sustainable education systems, current practices predominantly focus on short-term outputs, and systematic models to measure behavioral change are still underdeveloped.

Definitions of green skills within TVET systems vary considerably across sectors and regions. Albertz and Pilz (Albertz & Pilz, 2025) identify differences and regional disparities in connecting green skills to labor market needs, which complicate the identification of skill clusters and the integration of curricula. While frameworks such as the ILO's Green Skills Map provide clear guidance on sector-specific micro-competencies, there remains a notable lack of applied studies examining their implementation in education systems.

The literature on green skills development also reveals significant gaps from a social justice perspective. Kwauk and Casey (Kwauk & Casey, 2022) note that green skills training is often concentrated in science, technology, engineering, and mathematics fields, limiting access for low-income and marginalized groups to climate-focused education opportunities. Aligning green education policies with the "just transition" framework is therefore crucial for future research, ensuring both inclusive skill development and climate justice. Additionally, the scarcity of comparative analyses on the implementation of UNESCO-UNEVOC's Greening TVET strategies across countries constrains the evaluation of their effectiveness. This highlights a promising avenue for developing data-driven curriculum assessment tools and enhancing pedagogical impact evaluations (Cedefop & UNESCO-UNEVOC, 2025).

11. LIMITATIONS AND FUTURE DIRECTIONS

While this review provides a comprehensive synthesis of the green economy's eight pillars, certain limitations must be acknowledged. The scope of databases and the time frame (2000–2025) may have excluded relevant studies, and definitional ambiguities across concepts such as green finance and green jobs continue to challenge comparability. Moreover, methodological diversity in measurement frameworks limits the generalizability of findings.

Policy implications of the analysis highlight the need for stronger integration of labor, finance, and energy policies, alongside clearer taxonomies and inclusive governance structures. Looking ahead, future policy directions are expected to emphasize carbon pricing, digitalization, and social equity as central priorities. Emerging research areas include energy–growth dynamics, the role of digital tools in sustainability transitions, and the development of new multidimensional indicators that move beyond GDP. Addressing these gaps will strengthen both academic debate and policy practice, ensuring that the green economy evolves as a robust paradigm for sustainable development.

12. CONCLUSION

This study evaluates the multidimensional structure of the green economy through conceptual analysis, systematic implementation review, and literature-based critical reflection, addressing the environmental, social, and economic pillars of sustainable development in an integrated manner. Analyses across green jobs, finance, innovation, infrastructure, energy, growth, taxation, and education reveal that the green economy represents not merely a technical transition, but a paradigm shift grounded in social justice, inclusivity, and resilience.

In the domain of green jobs, workforce transformation involves both the emergence of new occupations and the reskilling of existing roles. Competencies such as environmental awareness, digital literacy, and systems thinking are essential. Vocational education and skills development programs should reflect sector-specific demands within standardized frameworks that integrate social, technical, and environmental dimensions. Strengthening labor market data systems, regional planning, and lifelong learning, supported by digital tools, can reduce skill inequalities and form the foundation for a just transition.

Social protection mechanisms are critical to minimizing the societal costs of phasing out fossil fuel–based sectors. Regional transition plans, workforce support programs, and comprehensive social protection instruments should complement market-based tools such as carbon pricing, environmental taxation, and emissions trading, while redistributive measures and sectoral balancing mitigate potential social impacts.

Green finance remains a key driver of sustainable investment, yet definitional ambiguities, data gaps, and inconsistent taxonomies continue to limit effective policymaking. Aligning financial instruments with international standards, leveraging blockchain for traceability, and supporting *Environmental, Social, and Governance* investments with independent audits and transparent impact reporting are crucial for accountability and reducing greenwashing risks.

Green innovation plays a strategic role in advancing low-carbon production systems. Public–private partnerships, open R&D ecosystems, and university–industry collaborations can facilitate localized technological solutions and enhance social inclusion. Prioritizing green technology deployment in marginalized sectors, alongside digital integration, is particularly transformative in emission-intensive industries such as energy and transportation.

Green infrastructure investments provide broad co-benefits, from disaster resilience and water management to public health and energy justice. Blended finance models, community engagement, and nature-based solutions can improve accessibility and equity. Technological diversification, cross-sectoral integration, and regional strategies that address spatial inequalities are essential for scaling up sustainable energy systems.

Green growth policies should balance economic development with ecological boundaries. Incorporating alternative measurement frameworks, including well-being indicators, natural capital accounting, and social inclusion metrics, enables comprehensive evaluation beyond GDP, ensuring multi-dimensional monitoring of policy effectiveness and sustainability outcomes.

Green education and skills development form the societal foundation of the green economy. Key competencies such as systems thinking, ethical decision-making, and co-creation should be embedded in both formal and informal learning environments. Expanding digital platforms, micro-credentialing, and short-term training modules can enhance equitable access and support behavioral transformation necessary for sustainable development.

In conclusion, the transition to a green economy requires not only technical capacity but also strategic governance, data-informed planning, and cross-sectoral collaboration. Policy frameworks that emphasize definitional clarity, measurement coherence, social equity, and sectoral integration will be essential for aligning sustainability imperatives with economic systems.

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