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Environmental Performance Index Score: A Driving Force towards Green Business Model and Process Innovations

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2 Environmental Performance Index Score: A Driving Force towards Green Business Model and Process Innovations

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2.1 INTRODUCTION

Sustainability is a broad concept meaning that people cannot ignore the environmental impact and business impact, both positive and negative senses (Couckuyt & Van Looy, 2019). Currently, numerous business models have eco-efficiency as their objective. Eco-efficiency is defined as the production of products and services at competitive prices that meet human requirements and provide the worth of life. However, the environmental consequences and the use of numerous resources during the life cycle are progressively reduced-level equivalent, at least, to the estimated capacity of the planet.

The issue of environmental pressure on firms is increasing day by day so that this part of the domain must have recent strategic planning (Javed, Yasir, & Majid, 2018). The fast pace of industrialization toward achieving economic development has had a lasting and detrimental impact on the environment. Environmental damage has created a danger to environmental health and caused an ecological imbalance. Moreover, a large part of the pollution is caused by substantial wasteful utilization of resources (Chen, 2008). Therefore, damage to the environment is irrefutable.

In the above Figure 2.1, WMO has highlighted accelerating adverse effects of environmental change on public wellbeing due to environmental health deterioration and impact on nature due to ecosystem volatility. The significant impact of environmental deterioration is rising temperature. Global climate study of the year 2020 provides authoritative evidence of an incremental increase in global temperature (Figure 2.2).

From 1880–2020, global temperatures in March have shown an incremental pace and a significant increase in resulting impacts, for example, accelerating sea-level rise, contracting ocean ice, glacier retreat, and heat waves. As a result, the global average surface temperature in 2020 has been around 1.16°C over the pre-industrial baseline.

2.2 SIGNIFICANCE OF THE STUDY

According to the Climate Action Summit (2019), "There is no longer time for delay." The effects of environmental change must be emphasized, and there is an urgent need to accomplish the sustainable development goals for environmental safety. The crusade for safeguarding the environment with the self-doctrine of sustainable development has become one of the biggest challenges and most important targets of the present time. Environmental performance as a sustainable move to control the growth rate of environmental hazards has become an urgent need. Global green transition can only be a savior in this alarming situation. Greening of value-chain processes may help improve resource productivity (Bisgaard et al., 1995). Green policies supporting eco-innovation and green business model development may positively impact sustainable

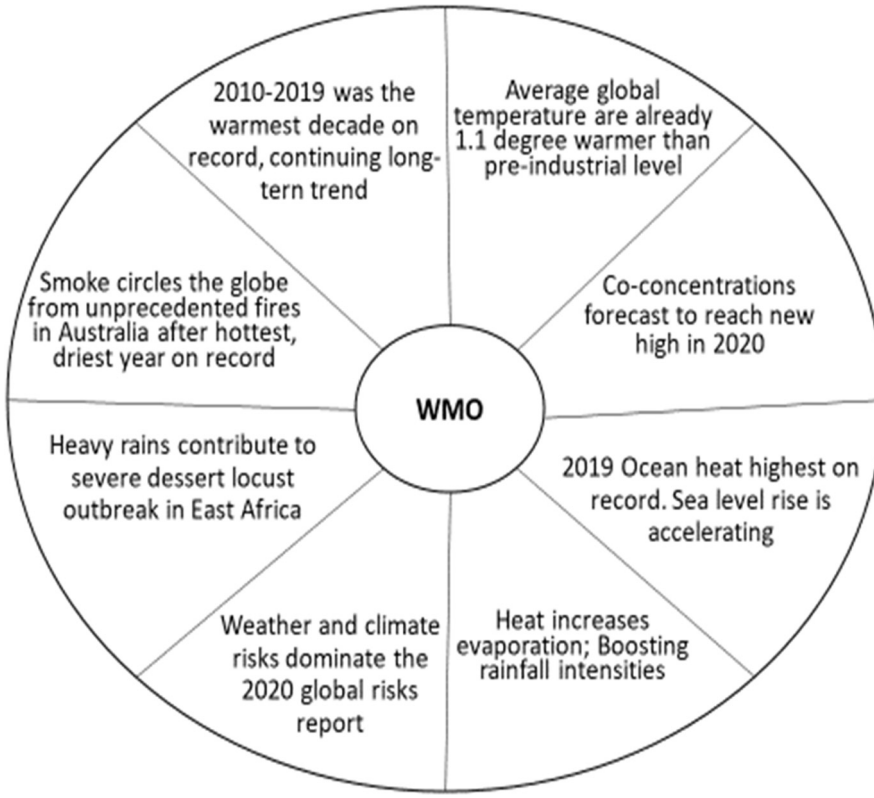

FIGURE 2.1 Impacts of environmental health deterioration and ecosystem volatility.

Source: World Meteorological Organization (2020) Climate action is a priority and a driver of world affairs: UN chief.

development (Henriksen et al., 2012). A stepping point toward environmentally sustainable practices calls for an industrial paradigm shift from conventional business models and processes to green business models and processes. To reinforce the green dimension, many nations have imposed a penalty mechanism through a green policy framework. The companies are measured on the environmental indexes and are enforced to improve the index for their long-term sustainability. Therefore, we must identify green practices and their relative contribution to avoid environmental damage. The growing importance of saving the environment by regulation gave impetus to the study to measure and identify the best green practices for environmental performance.

2.3 LITERATURE REVIEW

2.3.1 Green Business Model and Process Innovation

Green innovations include developing an entirely new process or modification in the existing processes, products, and overall operating systems that are environmentally

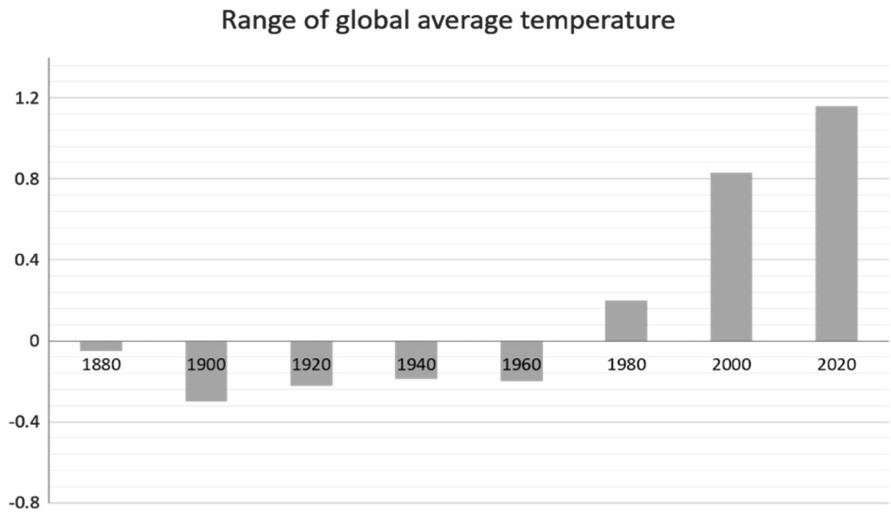

FIGURE 2.2 Global March temperature from the Year 1880 to 2020.

Source: Global Climate Report – NOAA (March 2020).

free and help drive environmentally sustainable operation (Oltra & Saint Jean, 2009). More business models that are innovated or re-engineered with a subsequent green effect have reflected a more significant green change. The greener the business model innovation, the greater the likelihood of forming essential green innovation (Bisgaard et al., 1995).

2.3.2 Environmental Performance Index

Green transformation is desirable to preserve the enduring development of the economy. Green business models focusing on sustainability in environmental and resource matters are broad contributors to environmental protection (Ernst & Young, 2008). The 2020 environmental performance index (EPI) ranks 180 countries on 32 performance indicators across 11 issue categories covering environmental health and ecosystem vitality. This metric measures how closed countries are to well-known environmental policy goals at a national scale. The EPI bids a scorecard that highpoints leaders and laggards in environmental performance (Wendling et al., 2020). Some countries have designed very encouraging green policies and robust penalty mechanisms for non-green companies (Seychelles National Climate Change Committee, 2009). For example, Libya aims to meet 10% of energy requirements from renewable energy by 2030 (Nachmany et al., 2017). The countries that are excelling in EPI have revolutionized business practices by innovative green models and processes. The ever-increasing environmental threat has lately but awakened the laggards' countries to go green.

2.3.3 Lead Generation

EPI provides complete insights on most acceptable practices and provides direction for nations seeking to be privileged in sustainability. EPI uses 32 indicators of environmental performance, which guide other nations to improve their overall environmental performance. However, which indicator can be improved if the innovative green process model is not strongly analysed? This was identified as a gap, and research is directed toward analysing green models and process innovations about the specific indicator on EPI.

2.4 RESEARCH METHODOLOGY

The research aims to explore innovative green practices and identify the impact of green practices on environmental performance specific to each indicator. First, the exploratory research design is used to get insights into green practices and technological advancements. After that, the EPI improvement score is identified with a descriptive design. The scope of the research has been confined to measuring the 2020 EPI index v/s last ten years longitudinal data series drove baseline index. The top ten indicators of EPI contributing to environmental health and ecosystem volatility are taken for impact analysis of green practices. Green practices are identified from the top five ranked countries on EPI as Denmark, Luxembourg, Switzerland, United Kingdom, and France.

The hypothesis of the study has been defined as **H0:** green business model and process innovations do not have a significant impact on indicators of EPI.

2.4.1 Environmental Performance Index Measurement Methodology

The measurement of EPI has a hierarchical approach. The below table describes the methodology used to construct the 2020 environmental performance index. The measurement is based upon two objectives as environmental health and ecosystem vitality. It includes 32 total variables grouped into 11 major indicators. Four indicators explain environmental health and seven ecosystem vitality (Table 2.1).

2.5 ANALYSIS

The following Table 2.2 identifies the top five countries aggressive in environmental performance with the highest score attainment

The green business innovation model and business-process innovation analysis are done concerning the top five EPI-listed countries set as benchmarking green practices.

2.5.1 Circular Economy

The circular economy is a closed cycle with a 3R approach – reduce, reuse, and recycle. The circular economy is analysed as an alternative to the traditional linear economy as a more resilient and future-fit strategy to manage waste. Denmark is the

TABLE 2.1
Environment Performance Indicator Metrics

Environment Performance Index (EPI) Indicators	Environmental Health (40%) (It measures threat to human health)	Air quality (20%)	PM_{25} Exposure (11%)
			Household solid fuels (8%)
			Ozone (1%)
		Sanitation & Drinking Water (16%)	Drinking water (9.6%)
			Sanitation (6.4%)
		Heavy metals (2%)	Lead (2%)
		Waste management (2%)	Solid waste (2%)
	Ecosystem vitality (60%) (It measured threat to natural resources and eco system services.)	Climate change (24%)	CO_2 (11.6%)
			CH_4 (3.15%)
			SNMI (3%)
			F-Gas (2.4%)
			So_2 (1.5%)
			NO_x (1.5%)
			Black C (1.2%)
			GHG Int. (1.2%)
			N_2O (1.05%)
			GHG pop (0.6%)
			Land cover (0.6%)
		Biodiversity & Habitat (15%)	Marine protect (3%)
			Biome protect [Nat'l] (3%)
			Biome protect [Global] (3%)
			SPI (1.5%)
			PARI (1.5%)
			SHI (1.5%)
			BHI (1.5%)
		Fisheries (6%)	Stock status (2.1%)
			MTI (2.1%)
			Trawling (1.8%)
		Ecosystem services (6%)	Tree cover (5.4%)
			Wetlands (0.3%)
			Grasslands (0.3%)
		Water resources (3%)	Waste water (3%)
		Pollution emission (3%)	SO_2 (1.5%)
			NO_x (1.5%)
		Agriculture (3%)	SNMI (3%)

Source: Compiled by the researcher from the 2020 ranking methodology derived from Nardo et al. (2009).

world's largest recycler with a maximum number of start-ups models on waste-to-energy mechanisms. E.g. CopenHill is the cleanest waste-to-energy plant with annual processing of 440,000 tons of combustible waste. Moreover, it has inbuilt the idea of the world's first steam-ring generator and crowdfunding through Kickstarter.

TABLE 2.2
Top Five Countries on EPI

Rank	Country	EPI Score
1	Denmark	82.5
2	Luxembourg	82.3
3	Switzerland	81.5
4	United Kingdom	81.3
5	France	80.0

Source: The 2020 EPI rankings.

2.5.2 Carbon Capture Technology

Step-change Company was established with a green business model to purify the air. Step-change is the most significant industrial-scale carbon capture plant. The plant removes carbon dioxide from the air directly and keeps the air clean (The Guardian, 2020).

2.5.3 Green Digital Finance

Switzerland is soundly recognized as a worldwide centre for green digital finance. It is accredited to the following fintech business models that have speedily scaled up and heavily contributed toward environmental performance (Table 2.3).

2.5.4 Eco-Refining System Technology

France has introduced a new industrial dimension of refinement. OLVEA group has come up with the business model of eco-refining technology. They have set up a plant having two refining lines with 100 tonnes of capacity daily. The technology uses equipment and processes that purify the oils and leave no possibility of cross-contamination. The plant runs on utterly renewable energy and refines other fuels.

2.5.5 Bio-Mass Energy Technology

Denmark had provided 70% of renewable energy from biomass. It targets to grow bio-mass technology to become a significant source of bringing heat and power to residential and commercial buildings.

2.5.6 Regasification LNG to Power

In 2015, France swapped fuel production from oil to natural gas and made all infrastructure facilities available for the gasification process. As a result, oil consumption cut down by 35% in 1973 and 2015, although natural gas usage augmented.

TABLE 2.3
Fintech Business Model in Switzerland to Assist Green Digital Finance

Fintech Company and Its Business Model	Business Process
Fintech companies: Carbon Delta AG Net guardians	It collects publicly available and proprietary data and uses computer modelling to correlate its value and climate change risks and opportunities.
Business model: Data power MLAI to inform greener	**Result:** **Switzerland enjoys leadership in green investment screening through MLAI**
Fintech company: WePower	It mediates wind or solar energy projects to increase capital by selling energy tokens that signify energy they are obligated to deliver through Blockchain technology.
Business model: Blockchain for Social Impact Coalition (BSIC)	**Result:** **Switzerland ranked in the top three countries for blockchain technology, with many fintech startups**
Fintech company: Green match	It provides tools to value and evaluate renewable energy project proposals and compute situations on a software-as-a-service (SaaS) basis
Business model: Matchmaking funding platform	**Result:** **Matchmaking Platforms in Switzerland have become a common way of getting new sources of finance, especially for renewable energy**
Fintech company: Sela-labs	It eliminates funding barriers to sustainable projects by creating a marketplace for them, by connecting them using DLT to unlock funds.
Business model: Distributed Ledger Technology as cryptocurrency	**Result:** **Switzerland is recognized as a green Crypto-financial center and aiming to become Crypto valley**

Source: Developed by the researcher from published data (Ries, 2011).

2.5.7 Hydrogen Fuel Cell Technology-Electro Mobility

To remove the storage barrier of renewable energy sources, solar or wind, hydrogen fuel cell technology experiments at Luxembourg. Hydrogen is an abundant source in the universe. For the further development of this technology, billions of Euros are currently being invested. Hydrogen is not the energy source like wind energy, or solar energy splits water molecules like hydrogen and oxygen and then uses hydrogen as a transport fuel industrial fuel. It becomes a storable energy source.

2.5.8 Construction Reengineering: Passive House System

Luxembourg is attributing its second rank in EPI majorly to introducing the "Passive house" construction system. It is a construction standard that is energy

resourceful and reasonable. It captures available energy sources inside the building structure, e.g. the body heat from the residents in the house, from employees in the corporate/factories. It also absorbs solar heat toward the inside of the building. Suitable windows with ventilation and building shell with decently protected outside walls, roof, and floor slab keep the space warm throughout wintertime and allow heat to go out during summer. Construction21 is designed on the Passive House System. Passive houses restrict the use of traditional energy sources and control emissions into the air. Though Luxembourg is very high in energy consumption, it regulates greenhouse gas emissions through innovative renewable energy techniques. Over the years, Luxembourg increased its renewable energy (Thomas & Piron luxembourg. "Certifications", n.d).

2.6 FINDING AND DISCUSSION

It has been found that innovative green business models and green processes have remarkably helped control the specific emission and have become significant contributors to improving the country's EPI score and thereby ranking well. Green innovative models and processes include green digital finance initiatives with blockchain technology, distributed ledger technology, cryptocurrency, data power MLAI, and other green initiatives like passive house system, hydrogen fuel cell technology, regasification LNG to power, bio-mass energy, eco-refining system have yielded good improvement in EPI, which is presented in the below Tables 2.4 and 2.5.

In the indicator environmental health, it can be seen that Switzerland, Luxembourg, and France are excelling in air quality as per current status but observing the growth rate of EPI, France environmental health indicator is increased by 7.39%, which is quite a significant improvement. In environmental health, Switzerland has topped in air quality due to its major investments in operating through green digital finance. However, Luxembourg has shown an 11.50% highest improvement score in air quality due to hydrogen-fuel technology and passive house system initiatives. All five countries have reached a significant high in sanitation and drinking water, in which Switzerland and the United Kingdom have the top rank with 100% attainment. Denmark scores highest in metal exposure due to complete regulation on GHG emission through circular economy and compulsion on renewable sources. Luxembourg, United Kingdom, followed by Switzerland, have shown significant improvement scores due to emphasizing green industrial projects. Ecosystem Vitality, France, and the United Kingdom have earned top scores in the indicator biodiversity & habitat, primarily due to the eco-refining system of France and carbon-captured technology initiatives. The United Kingdom has joined them in first place in the protection of terrestrial biomass. Denmark excels in climate change and in fisheries due to the circular economy. This assistance has helped move toward green processes. In water resources and agriculture, steady control is found with no fluctuation or incremental growth.

2.7 CONCLUSION AND IMPLICATIONS

In general, high scorers depict a committed approach toward defending public well-being, conserving natural resources, and controlling and dissociating GHG emissions

TABLE 2.4
2020 Current Score v/s Baseline Score of All Indicators on EPI

EPI Indicators	Comparison	Top Five Countries on EPI and Their Indicators Score (%)				
		Denmark	Luxembourg	Switzerland	UK	France
EPI	**Current**	82.5	82.3	81.5	81.3	80
	Baseline	75.2	70.7	72.9	72.3	74.2
Environmental Health	**Current**	91.7	92.6	95	91.7	91.5
	Baseline	86	86.8	90.7	88.3	85.2
Air quality	**Current**	85.5	87.2	90.6	84.7	88.1
	Baseline	76.7	78.2	82.7	79.2	79.8
Sanitation & Drinking Water	**Current**	97.4	98.6	100	100	96.2
	Baseline	94.9	96.6	–	99.2	92
Heavy metals (Lead)	**Current**	100	96.1	95	94.6	84
	Baseline	93.6	85.3	88.4	87	75.5
Waste management (Solid waste)	**Current**	99.8	96.2	99	92.9	94.8
	Baseline	–	–	–	–	–
Ecosystem vitality	**Current**	76.4	75.4	72.5	74.3	72.3
	Baseline	68	59.9	61	61.6	66.9
Climate change	**Current**	95	77.5	81.6	90	81.9
	Baseline	75.4	48.2	58.1	70.1	69.7
Biodiversity & Habitat	**Current**	81.7	85.5	63	88	88.3
	Baseline	81.1	83.4	59.5	68.7	87.7
Fisheries	**Current**	13.2	–	–	8.8	12.1
	Baseline	12.6	–	–	5.3	8.5

Ecosystem services	**Current**	30.2	34.3	46.4	28.3	36.1
	Baseline	25.8	31.3	43.7	28.9	33.9
Water resources (Wastewater treatment)	**Current**	100	98.5	96.7	98.5	88
	Baseline	–	–	–	–	–
Pollution emission	**Current**	100	100	100	100	100
	Baseline	–	68.8	–	–	–
Agriculture Sustainable N Mgmt Index	**Current**	73	42.2	47.6	54.3	65.2
	Baseline	73.6	46.2	51.7	61.9	69.1

Sources:
Current Score: EPI 2020 score of indicators.
Baseline score: Calculated from last ten years longitudinal data series.
Extracted and compiled by the researcher from secondary sources of data.

TABLE 2.5
Improvement Rate Score of EPI Indicators

EPI Indicators	Improvement Rate Score of Indicators on EPI (%)				
	Denmark	Luxembourg	Switzerland	United Kingdom	France
EPI	9.70744681	16.407355	11.7969822	12.4481328	7.81671159
Environmental Health	6.62780698	6.68202765	4.74090408	3.85050963	7.3943662
Air quality	11.4732725	11.5089514	9.55259976	6.94444444	10.4010025
Sanitation & Drinking Water	2.63435195	2.07039337	–	0.80645161	4.56521739
Heavy metals (Lead)	6.83760684	12.6611958	7.46606335	8.73563218	11.2582781
Waste management (Solid waste)	–	–	–	–	–
Ecosystem vitality	12.3529412	25.8764608	18.852459	20.6168831	8.07174888
Climate change	25.994695	60.7883817	40.4475043	28.3880171	17.5035868
Biodiversity & Habitat	0.739827374	2.51798561	5.88235294	28.0931587	0.684150513
Fisheries	4.76190476	–	–	66.0377358	42.3529412
Ecosystem services	17.0542636	9.58466454	6.1784897	–2.07612457	6.48967552
Water resources (Wastewater treatment)	–	–	–	–	–
Pollution emission	–	45.3488372	–	–	–
Agriculture Sustainable N Mgmt Index	–0.815217391	–8.65800866	–7.9303675	–12.2778675	–5.64399421

Source: Developed by researcher.

from economic activity. Almost in all indicators, Denmark has excelled with the highest improvement rate, followed by Luxembourg. It can be said that green digital finance assistance initiatives have encouraged green models and processes to expand. For example, in Luxembourg, hydrogen-fuel cell technology-based models have significantly controlled harmful emissions.

In the EPI, Cote d'Ivoire and Sierra Leone and Afghanistan, Myanmar, and Liberia are close to the lowest positions. Shallow scores on the EPI reveal the urgency of sustainable efforts by the respective nation. Green models and processes like eco-refining system, renewable energy, bio-mass energy, circular economy, and re-gasification of LNG to power can be adopted immediately to initiate the move toward green and to protect the environment. As a future scope, hydrogen-fuel cell technology, passive house systems, and green digital finance can be targeted to excel in environmental performance. These techniques also hold true for other nations looking to improve the score to outshine the environmental performance index.

All five countries have implemented a feed-in tariff scheme to promote renewable energy sources. Feed-in tariffs are a continuing agreement and pricing attached to costs of production for renewable energy producers. Thus, these tariffs subsidize the cost of generating renewable energy, and producers are protected from nearly all of the intrinsic perils in renewable energy production. Moreover, as the feed-in tariff scheme has prominently encouraged green move in their respective countries, the other countries can incorporate it in their regulatory framework toward green.

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