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RESEARCH ARTICLE

# Prospect for green policing: Constructs and dimensions of environmental sustainability in the context of public safety

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**Abstract**
The vulnerability of the environment to the risk posed by climate change becomes even more exponential with the rapid phase of the industrial revolution and globalization in the contemporary era. As a key pillar of sustainability, the role of every societal sector is critical in the consummation of environmental equilibrium. This study was carried out to develop a common framework for the programming of green activities in the realm of public safety sectors and to establish standardized indicators for the coordination and complementation of environmental sustainability efforts and initiatives. The study employed a quantitative research design that supports the use of an instrument to explore the constructs and dimensions of environmental sustainability in public safety through Principal Component Analysis (PCA) via Exploratory Factor Analysis (EFA). The data harbored a 0.964 index on the Kaiser-Mayer-Oldin (KMO) Measure of Sampling Adequacy which implies that the explored constructs are highly correlated. Similarly, Barlett's Test of Sphericity demonstrated strong significance with a value of .000, implying that all indicators are factorable. Furthermore, the Scree plot revealed that there are two (2) dimensions that yielded an Eigenvalue that is equal to or greater than 1 ($\lambda=\geq1$) namely Green Behavior and Sustainable Operations. The explored constructs and dimensions are necessary for the development of a model for Green Policing which can serve as a basis for monitoring and evaluation of environmental law enforcement and environmental sustainability efforts of the public safety sectors.

**Keywords:** green behavior, sustainable operations, public safety sectors, indicators

## Introduction

In recent years, a wide range of megatrends in the spectra of demographic upheavals, economic and social dynamics fluctuation, technological advancement, and environmental degradation have accelerated global concerns of sustainable development (Lefevre et al., 2022). In the environmental landscape, a key tenet of Sustainable Development, organisms' habitats are diminishing, the capacity to repair biodiversity is dwindling, the climate is changing, invasive alien species are exponentially rising, and natural resources are under unprecedented demand.

The World Economic Forum (WEF) Report argued that the most significant concerns for the next five years are social and environmental risks. Over a 10-year horizon, environmental concerns takes the center stage of the global environment's health. Environmental issues and challenges are regarded as the five most serious long-term dangers to the globe, and possibly damaging to people and planet. Accordingly, rated as the top three most serious risks relative to environment are climate action failure, extreme weather, and biodiversity loss (WEF, 2022).

For instance, pollution impacts every part of the earth, affecting our health through the food we eat, the water we drink, and the air we breathe. Pollutants such heavy metals and organic chemicals, as well as those used in electrical insulators and flame retardants, have been detected in plant and animal tissues even at the most distant areas like polar ice caps, deep abyssal seas, and high mountains (Jamieson et al., 2017). According to the World Health Organization, environmental causes account for approximately one-quarter of all deaths worldwide, or 12.6 million people in 2012, with at least 8.2 million attributable to non-communicable environmental causes and more than three-fourths occurring in just three locations (Prüss-Üstün et al., 2016).

The Global Dangers Report of the World Economic Forum's in 2018 outlined that six of the ten largest risks that might afflict the world in terms of likelihood and effect are environmental in nature (WEF, 2018). Existentially, all

sorts of ecosystems and biomes, as well as all the processes and mechanisms that manage the Earth system's balance and resilience, are under great stress (Aukema et al., 2017; Collins, 2018). This phenomenon of worldwide environmental deterioration offers a serious threat to social and economic growth and development, and its consequences necessitate the intervention of public safety or law enforcement.

In response to the 1992 Earth Summit in Rio de Janeiro, a slew of international accords and national environmental laws are in existence, and they are carried out by environmental regulation and enforcement among public safety and law enforcement organizations. However, since environmental deterioration continues at its sophisticated high, present environmental legislation implementation is not as successful as intended in halting environmental damages (Vogel et al., 2016). These limitations are the result of a variety of causes, including limited human capacities, leadership and management, a lack of access to technology, unpredictable economic development, and expansion, and the transboundary character of environmental impacts, among others (Baloch et al., 2020; Soga & Gaston, 2018; UNEP, 2018).

Because the implementation of environmental law necessitates adaptation, countries' implementation and compliance practices and strategies shift from relying solely on severe penalties for environmental violations to viewing compliance through criminal sanctions to heed action for substantial compliance (Paddock et al., 2017). Agenda 21, a global roadmap or blueprint for sustainable development born out of the 1992 United Nations Conference on Environment and Development (UNCED) Earth Summit and heeded by the Philippines through Philippine Agenda 21, recognizes the importance of public safety law enforcement in enabling legislation to effectively manage the environment and promote sustainable development in full swing.

The role of public safety sectors particularly the law enforcers or police is critical in the attainment of environmental sustainability. Given this importance, most law enforcement agencies fail to examine the environmental impact of their operations (Konyk, 2018). Alarmingly, according to the United Nations Environment Programme (2014), environmental deterioration is rising, and the current environmental law enforcement in almost all developing countries of the world is not as effective as may be desired. This can be attributed to constraints in human capacity and access to technology; nationwide push toward poverty alleviation and rapid economic growth; and, most importantly, a lack of knowledge of potential solutions that could be appropriate, or resilient to countries' environmental policing needs (UNEP, 2014). More so, there is a dearth of study and literature vis-à-vis Green Policing and environmental sustainability in the parlance of public safety and in the context of public safety sector. Evidently, studies on environmental sustainability primarily pitched into the efforts undertaken by educational institutions, businesses and enterprise, and other government institutions, and study on sustainability initiatives, most specifically Green Policing, is almost nil, if not nothing at all.

This study was borne out of the aforementioned realities. As environmental problems worsen, the role of public safety, particularly law enforcement, becomes increasingly important. This study explored the constructs and dimensions of environmental sustainability in public safety, prospecting the concept of Green Policing as a strategy to complement sustainability and public safety in promoting a green community.

## Literature Review

### *Legal Foundation*

Sustainable development was previously established as a policy in the Philippines as early as the 1970s, long before the concept gained international recognition. This is based on Presidential Decree No. 1151 of 1977, also known as the Philippine Environmental Policy (PEP), which urged the broadest range abuse of resources (exploitation), subject to the circumstance that it will not destroy or pose threat to humanity’s health and safety, and that it will not set conditions that are detrimental to country's economy by and large (de Guzman, 2012). The Philippine Strategy for Sustainable Development (PSSD) that was crafted in 1987 is the country's most robust approach for attaining the twin pillars of sustainable development back in the 1980s: economic growth and environmental integrity. During the time, social development did not emerge as a pillar of sustainable development until ten years later, when the Philippine Agenda 21 (PA21) was established. Following the PEP declaration came the Philippine National Strategy for Sustainable Development framed in 1989 and the Action Plan for Sustainable Development, commonly called as Philippine Agenda 21. The 1989 strategy aimed for economic growth while protecting the country's biological variety, key ecosystem services, and overall environmental quality. The Philippine Agenda 21 also established parameters for long-term national development and centered economic development on ecological responsibility and improved on the PEP by shifting the emphasis from maximum output to "suitable productivity" within the bounds of the physical environment's carrying capacity, in some ways (Lasco et al., 2018).

Clearly, as a response to the 1992 United Nations Conference on Environment and Development, also known as the Earth Summit, the PA21 became the country's national agenda for sustainable development in the 21st century. Consequently, in addition to providing enabling policies for economic and environmental sustainability and integrating the concept of sustainable development into the

framework of governance of the country, the action agenda enshrined in PA21 explicitly highlighted investments in "human and social capital, health, population management, and human settlements, while also acknowledging the need to address" community poverty and other pressing social issues (Haque, 2017; Howes et al., 2017). Today, PA 21 is still used as the pertinent document for the government's sustainable development policy.

The Philippines has been a pioneer in enacting laws and regulations concerning the environment and natural resources (ENR). The government has passed several laws and established agencies over the years to manage, protect, and conserve the country's environment and natural resources (World Bank, 2009). The 1987 Philippine Constitution, which clearly and explicitly regarded the right of people "to a balanced and healthful ecology in accordance with the rhythm and harmony of nature," established the country's commitment to all aspects of sustainability including towards environmental preservation and protection, economic growth and development, and social justice and equity promotion (Delloro & Gonzalez III, 2021).

The creation of the MidTerm Philippine Development Plan (MTPDP) 2004–2010 and the country's commitment to the Millennium Development Goals bolstered the sustainable development agenda even more. It recognized five (5) environmental and natural resource sector targets, namely, maintaining self-sustaining and more productive usage of available resources to encourage investments and entrepreneurial spirit; promotion of sustainable mining operations that conform to the principles of sustainability: economic growth, environmental protection, and social equity; reinforcing protection provided to vulnerable and ecologically-fragile areas; ensuring a healthy environment for the people; and preventing the incidence of natural catastrophes in order to save lives and properties (World Bank, 2009).

Following that, in September 2015, the 192 United Nations (UN) member states including the Philippines, made an agreement to pursue efforts in attaining the seventeen (17) Sustainable Development Goals (SDGs) and the associated 169 objectives by 2030. The 17 Global Goals encompass the sustainability pillars (environmental, social, and economic). The underlying objectives or targets for each goal relate to the Sustainable Development theme *no one is left behind*. It was then recognized that the Global Goals are crucial in the fulfillment of the long-term vision delineated in AmBisyon Natin 2040 (Reyes et al., 2019).

The concept of Green Policing is based on the existence of campaigns and the implementation of environmental laws and programs by the Philippine National Police in accordance with its core value *Makakalikasan* (pro-environment), which is centered on environmental protection and conservation in order to maintain ecological balance.

As per Executive Order Nos. 23 and 26, series of 2011, the Department of Environment and Natural Resources (DENR) as the primary government agency in charge of conserving, managing, developing, and using the country's environment and natural resources launched the National Greening Program (NGP) as the agency's banner program in 2011, with the goal of implementing sustainable management of natural resources through resource conservation, protection, and productivity enhancement, as well as consolidating and harmonizing all greening efforts of the government, civil society, and the private sector, among others. Through the PNP LOI 42-09 (Project T.R.E.E.s.) "Pulis Makakalikasan: 10 Milyong Puno, Pamana sa Kinabukasan" project, the DENR has collaborated with the Philippine National Police. Other than tree-growing operations as the main focus of Pulis Makakalikasan, there have also been environmental initiatives such as clean-up drives on the town's streets and coastal regions, as well as beneath the water via Pulis Scubasureros. The cleanliness of police camps and stations is one aspect of the Intensified Cleanliness Program (ICP). These fundamental values and green policing initiatives are expected to be implemented in all police stations around the country.

***Sustainability and Its Overarching Pillars***

Environmental risks are associated with greater rates of violence. This is related to system processes, in which resource scarcity and violent conflict fuel one another, establishing a chain reaction (IEP, 2021). Rockström et al., (2009) argues that if one environmental problem is not fixed, the other will be adversely affected such that one environmental problem does not remain fixed in its current condition but rather worsens other environmental concerns in a domino effect. For instance, the habitat loss has an impact on agricultural productivity as well. An "indirect" ecological function is the loss of pollinators which results in lower harvests of native pollinators species of plants (Nilsson, 2019).

When one views sustainability as a three-pronged pillar comprised of the environment, the economy, and society, or as a dualistic connection between humans and the ecosystems they occupy, there should be consensus that maintaining the supply of clean air, clean water, and clean and fertile land is fundamental to a sustainable socioeconomic system. It is evident that creating a sustainable civilization would be hard or impossible without a sustainably suitable environment to offer a resource basis. Likewise, a sustainable economy is dependent on a continuous material flow, energy, and natural resources for without it, the economic systems will fail (Morelli, 2011).

As supported by (Gibson, 2010), sustainable development is an ever-changing process. The sustainability of social, economic, and environmental systems is inextricably

intertwined thus, while building a sustainable development paradigm, possible trade-offs among these three pillars of sustainability must be addressed. Extreme event risk and trade-offs between economic growth, social wellbeing, and the environment are examples of environmental sustainability links.

### *Environmental Sustainability Framework for Public Safety*

On the level of policies for sustainability, Howes et al., (2017) claimed that there is a plethora of new policies, spanning from international treaties to national initiatives, environmental regulations at several levels of the government, regional programs, and even local plans and programs. Nonetheless, years of scientific monitoring reveal that the globe is no closer towards achieving environmental sustainability. In fact, the situation is worsening, with policy implementation failure playing a large role. Howes and colleagues further stress that multiple literature demonstrates that the inability of environmental policies to achieve their intended goals is related to economic, political, and communicative problems. Overlaps between environmental and economic development objectives, insufficient resources to adopt environmental regulations, and inability to meet objectives to various stakeholders are all crucial factors contributing to the nonattainment of environmental sustainability.

According to the United Nations Environment Programme, environmental deterioration is rising, and the current environmental law enforcement in almost all developing countries of the world is not as effective as may be desired (Holley, 2017; UNEP, 2014). As environmental problems worsen, the role of public safety, particularly law enforcement, becomes increasingly important thus, environmental law enforcement must evolve. As a result, states have begun to shift their strict enforcement processes and operations away from relying solely on the imposition of strict sanctions for environmental violations or towards viewing punitive measures as just one of the components of a set of actions that national governments must aim to accomplish substantial compliance. As the link between national and international laws on environment becomes more significant and recognized, it is evident that effective and efficient enforcement and implementation of environmental laws is required if international environmental legislation is viewed to be sustainable.

UNEP (2014) also reported that in emerging and transition economies, some of the policy instruments have frequently not transpired in concert with investment in employee capacity, knowledge bases, or equipment due to conflicting priorities. Failure to pay enough attention to inspection and monitoring, as well as failure to put processes in place for engaging the regulated community and discouraging infractions, fosters a culture of impunity and undermines the efficacy of environmental legislation and enforcement. The report also suggests that as technology progresses and the world is at its rapid pace, an effective enforcement necessitates executives staying to stay on top of appropriate and updated technological tools and equipment to empower law enforcement officials to fulfill their duties more effectively and efficiently, thus, appropriate training must be prioritized to enhance and upskill the capacity of police agencies.

## Methodology

### *Research Design*

This study employed a quantitative technique that promotes the use of a research instrument to determine the indicators of environmental sustainability in public safety and to identify the possible dimensions of Green Policing as a basis to develop a green strategy for the public safety sectors. The identification of the indicators of environmental sustainability in public safety was validated by key experts from the Department of Environment and Natural Resources (DENR) and Philippine National Police Region 12.

### *Research Respondents/Locale*

Upon consolidation, the indicators identified were then tested on the respondents who were the police officers in the eight (8) police stations under the General Santos City Police Office (GSCPO) that are strategically established to deliver basic police services in all twenty-six (26) barangays of the city.

### *Sampling Technique*

The population was established using stratified random sampling, a probability sampling approach in which the researcher divides the overall population into subgroups to represent a population (Acharya et al., 2013). This makes it easier for the researcher to glean relevant inferences from the responses. Using this sampling strategy, the researcher randomly picked respondents who fit the target group using a confidence interval of 5%.

### *Data Administration and Collection*

The administration and collection of data were made through digital forms.

### *Data Analysis*

The responses obtained were statistically treated and analyzed utilizing Exploratory Factor Analysis (EFA) through Principal Component Analysis (PCA) to sequentially standardize linked metrics and examine the

underpinning factor structure of a set of observed variables without attempting to impose a predetermined structure on the conclusion (Knekta et al., 2019; Suhr, 2006). EFA, as the name suggests, explores the latent and manifest constructs or variables.

## Results And Discussion

### *Kaiser-Mayer-Olkin and Barlett's Test of Sphericity*

The KMO (Kaiser-Mayer-Olkin) index is a statistical test that determines if the correlation between variables is too low for a factor model to be regarded as adequate (Watkins, 2018). It is a more accurate measure of factorability since it determines if the correlation coefficients within the data are close enough to zero to indicate that there is at least one (1) latent factor underlying the variables, with 0.50 being the minimum acceptable value ((Smyth, R. & Jonhson, 2016).

Table 1 shows the result of the Kaiser-Mayer-Oldin measure of Sampling Adequacy and Barlett's Test of Sphericity result for the dimensions of environmental sustainability in the context of public safety. The KMO value of .964 implies that the sample is in high correlations and that the 286 sample size is sufficient for analyzing the dimensions of environmental sustainability.

Correspondingly, Barlett's Test of Sphericity showed high significance with its value of .000, which is less than .001, and therefore further implies that all items are factorable (Williams et al., 2010).

**Table 1.** KMO and Bartlett's Test

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | .964 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 7217.072 |
| | df | 210 |
| | Sig. | .000 |

### *Scree Plot Analysis*

The Scree plot is a graphical representation of the total variance of data suited by the total initial Eigen value vs the number of components or indicators (Frey, 2018). Through the Scree Plot Analysis, first step in factor analysis is deciding how many factors to extract in order to produce the most parsimonious (but still interpretable) factor structure. Drawing a straight line across the plotted eigenvalues, beginning with the greatest, the last point on this line symbolizes the last factor extracted, with the notion being that any more variation explained beyond this point is meaningless (Smyth & Jonhson, 2016).

The Scree plot below reveals that there are two (2) factors or dimensions that yield an Eigenvalue that is equal to or greater than 1 ($\lambda=\geq1$). Starting with the initial element, the slope gradually descends until it approaches a semi-vertical horizontal line formation, as shown in Figure 1.

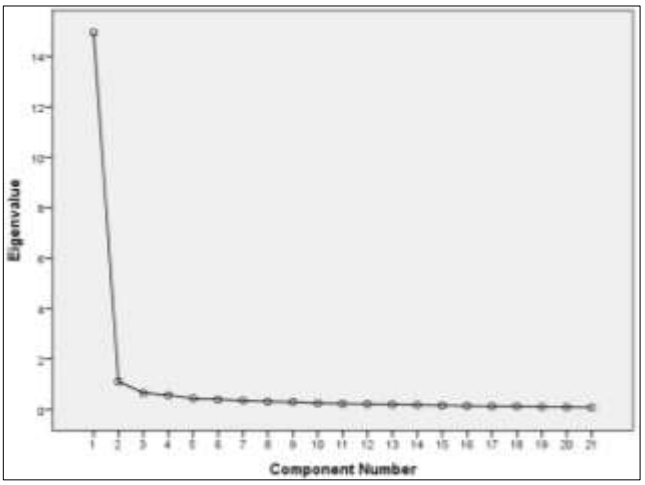


**Figure 1.** The Scree Plot

### *Constructs and Dimensions of Environmental Sustainability in Public Safety*

The result of Exploratory Factor Analysis using Principal Component Analysis (PCA) generated two (2) dimensions: Green Behavior and Sustainable Operations.

Tables 2 and 3 underscored the unidimensionality of the constructs by way of determining the base linear combination of indicators through Principal Component Analysis.

The dimension of *Green Behavior* includes setting aside time during meetings to talk about environmental sustainability strategies; development of an operation plan for promoting environmental-friendly initiatives; expansion of messaging around zero waste and recycling and promoting the same in the community sectors; promotion of staff carpooling by choosing public transport preferably e-jeeps, and use of a bicycle in congested and heavy traffic areas; establishment of secure video/web Group conferencing capabilities at all main sites to reduce travel; establishment of green policing network among stakeholders and the community to increase information sharing and foster environmental leadership.; usage of fleet card for monthly fuel consumption to control fuel and maintenance expenses; and the requirement for external stakeholders to electronically submit documents and accept paperless transactions.

**Table 2.** Dimension on Green Behavior and Its Indicators

| Indicators | Value | Dimension |
|---|---|---|
| Allot time at meetings to discuss environmental sustainability measures | .822 | Green Behavior |
| Develop an operation plan for promoting environmental-friendly initiatives | .808 | |
| Expand messaging around zero waste and recycling and promote the same in the community sectors | .720 | |
| Encourage staff carpooling, choose public transport preferably e-jeeps, and use of bicycle in congested and heavy traffic areas | .852 | |
| Establish secure video/web Group conferencing capability in all major facilities to reduce travel | .760 | |
| Establish a green policing network among stakeholders and the community to enhance knowledge-sharing and promote environmental leadership | .672 | |
| Use of fleet card for monthly fuel consumption to control fuel and maintenance expenses | .693 | |
| Require external stakeholders to submit documents electronically and accept no paper copies | .599 | |

**Table 3.** Dimension on Sustainable Operations and Its Indicators

| Indicators | Value | Dimension |
|---|---|---|
| Implement Intensified Cleanliness Policy in the station and police-community outpost | .730 | Sustainable Operations |
| Continue to support the DENR National Greening Program and environmental awareness campaigns like afforestation, planting of trees, and gardening, and adopt a forest program | .743 | |
| Implement paper use reductions (paperless) such as records digitization and use of electronic approvals for administrative matters | .730 | |
| Implement bring-your-own-mug and bring-your-own-container programs | .689 | |
| Implement a police uniform recycling program | .579 | |
| Install on-site composting bins in community gardens | .733 | |
| Follow the 3R's concept (Reduce, Reuse, Recycle) | .843 | |
| Upgrade the 3R's concept to 5R's (addition of Refuse and Repurpose) | .830 | |
| Organize Green Audits and use electricity and water resources judiciously in compliance with RA 11285 or the Energy Efficiency and Conservation (EEC) Act | .772 | |
| Buy and promote the use of reusable paper utensils, water bottles, cloth or cotton mesh bags (eco-bag), and other eco-friendly products and ensure single-use items are biodegradable | .744 | |
| Use of renewable resources like solar panels or solar-generated lamps | .620 | |
| Enforce environmental laws by apprehending violators in coordination with the DENR's law enforcers | .838 | |
| Continues to enhance environmental performance in conformance to ISO 14001:2015 or the Environmental Management System (EMS) | .795 | |

Green behavior encompasses the promotion of sustainability awareness, education of staff on best practices, and advocacy for sustainability in everyday behaviors. It is also about elevating the profile of sustainability and fostering a green culture. Individual choices have varying degrees of relevance when it comes to environmental sustainability. By organizing options such that the greenest alternatives are the default, police stations may essentially assist raise awareness about the benefits of ecologically friendly choices (Konyk, 2018).

Sustainable operations as another dimension covers the implementation of Intensified Cleanliness Policy in the station and police community outpost; continuance of support to the DENR National Greening Program and environmental awareness campaigns like afforestation, planting of trees and gardening and adopt a forest program; implementation of paper use reductions (paperless) such as records digitization and use of electronic approvals for administrative matters, bring-your-own-mug and bring-your-own-container programs, and police uniform recycling program; installation of on-site composting bins in community gardens; abidance on the 3R's concept (Reduce, Reuse, Recycle) and upgrading it to 5R's (addition of Refuse and Repurpose); organization of Green Audits and use electricity and water resources judiciously in compliance with RA 11285 or the Energy Efficiency and Conservation (EEC) Act; buying and promotion on the use reusable paper utensils, water bottles, cloth or cotton mesh bag (ecobag) and other eco-friendly products and ensure single-use items are biodegradable; use of renewable resources like solar panels or solar-generated lamps; enforcement of environmental laws by apprehending violators in coordination with the DENR's law enforcers; and continuous enhancement of environmental

performance in conformance to ISO 14001:2015 or the Environmental Management System (EMS).
Sustainable operations underpin the organizational and administrative activities that police stations conduct to improve the environmental sustainability of their internal and external operations. These measures are concentrated in incorporating sustainability into everyday routines – from fostering sustainable projects like community gardens to knowledge-sharing, advocating green policing, and enforcing environmental laws (Bovornkijprasert & Rawang, 2016; Konyk, 2018).

**Conclusion**

As established by the results and findings of the study, Green Behavior and Sustainable Operations are the two (2) dimensions yielded through Exploratory Factor Analysis utilizing Principal Component Analysis (PCA). Green behavior entails elevating the importance of sustainability and promoting a green culture through the promotion of sustainability awareness, employee education on best practices, and advocacy for sustainability in everyday actions while sustainable operations serve as the foundation for the organizational and administrative initiatives undertaken by the public safety sectors to improve the environmental sustainability of their internal and external operations.
The explored constructs and dimensions of environmental sustainability in the context of public safety behooves to establish a standard framework of Green Policing as a prospect strategy toward sustainability. Through this, public safety sectors particularly the law enforcers will be urged to prioritize sustainable choices and incorporate sustainability into their daily police operations and routines. More crucially, public safety sectors may take important efforts toward greening their operations by raising their awareness and understanding on environmental sustainability and making the smartest and greenest decision the default option.

**Contribution/Originality**

This research contributes to the breadth of knowledge by providing empirical data and results on the explored constructs and dimensions of environmental sustainability specifically within the bounds of public safety. As an outcome of my independent and original work, I duly acknowledge all the sources from which the ideas have been derived.

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