



# POLICY DRIVEN INITIATIVE FOR PROMOTING ELECTRIC VEHICLES TO COMBAT CLIMATE CHANGE IN THE DEVELOPING COUNTRIES: A CASE FROM BHUTAN

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## ABSTRACT

*Climate change is a growing threat of current time and the future generations. Contribution from manmade activities is observed increasingly, posing the threats to mankind as well as the environment. With advancement of socioeconomic development of the country, there arises a series of challenges associated with it. The emissions from the developmental activities and the consequences are vital to be monitored and timely corrective actions are needed. Thus, climate change is the greatest threats at present time and has a series of effects if the trends of activities continue as usual. Research made use of primary data which are both qualitative and quantitative in nature to understand the issues of climate change, policy intervention and the implementation, especially in the case of Bhutan. This study showed that one such growing threat of emissions and effect to climate change are increasing number of vehicles making transport sectors as strong contributors of emissions (esp. Greenhouse Gas (GHG)). With pace of development, there are positive indicators of per capita GDP growth which increases the purchasing power and affordability of individuals. This linkage is visible in the trends of current rise in ownership of vehicles with even sharp rise noticed in developing countries like Bhutan. Electric vehicles are found to be promising interventions in growing transport sectors. To curb the issues of rise in the number of vehicles and provide a conducive platform for the purchase and use of electric vehicles, a right policy intervention seems instrumental. A small landlocked country Bhutan is remarked to practice guided policy interventions, backed by its unique developmental philosophy of Gross National Happiness (GNH) that aimed for holistic socioeconomic development. Such measures of balancing societal and developmental activities seem to track its approach in a timely manner to make the policy and support mechanism favorable for promotion of the green transport system in Bhutan.*

*Keywords: Climate Change, GHG, electric vehicles, GNH, holistic development, green transport system*

## INTRODUCTION

Impact of climate change is quite substantial, and it creates a greater risk to livelihood in years to come. There is significant growth in terms of infrastructures and resources worldwide in recent decade where the majority relies on fossil fuel. Records show that human activities account for approximately 1.00C of global warming (Masson-Delmotte, V., 2018). One of the prominent contributors of Greenhouse Gas (GHG) is through the transport sectors. The

need to reduce CO<sub>2</sub> emission to track global warming is felt and interventions needed as the world emits around 50 billion tons of GHG (Ritchie, H, 2020). A study conducted in 2018 shows that the present GHG emissions reaching 51.8 gigatonnes of CO<sub>2</sub> equivalent (excluding land-use change) are 57% higher than in 1090 and 43% higher than in 2000 (Olivier & Peters 2019). Also, the GHG emissions rise at a rate of 1.5%/year observed in the last decade where in 2018 GHG emissions recorded as 55.5 GtCO<sub>2</sub>e (UN Environment Programme, 2019). Least



developed and developing countries are the one that will face draughting challenges in actions against combating climate change due to its scarce income and resources.

Transport sectors is witnessed as one of the biggest emitters of CO<sub>2</sub> (Kumar & Padmanaban, 2019) globally consumes more than half of global oil demand resulting in one quarter of anthropogenic CO<sub>2</sub> emissions (Miller, Li Du & Kodjak, 2017). It also accounts for around 16.2% emissions of which the road transport itself amounts to 11.9% emissions (Ritchie, H, 2020). In the U.S. alone, the transport sectors account to around 28% GHG emission which is the highest (United State Environmental Protection Agency, 2020). Asian Development Bank work in sustainable transport reflects that the global GHG emission from transportation which was at 23% will reach 46% of global emissions in 2035 and 80% of global emission in 2050 (Asian Development Bank) creating a great concern. Study of the UN Environment program in 2019 found out that the transport sector alone is contributing 1/4<sup>th</sup> of all energy related greenhouse gas and it is projected to be at 1/3<sup>rd</sup> by 2050 (Akumu. J., 2019). There is a need for short-term and long-term mitigation strategies to achieve the deeper GHG emission reduction (Sims. et al. 2014).

Bhutan, a small landlocked country located in South-East Asia (Eastern Himalayas) is sandwiched between two bigger countries India and China. Bhutan is also known as 'Druk Yul', which translates to 'The Land of Thunder Dragon' with an area of just 38,394 square kilometers. With its population of 0.75 million (National Statistics Bureau. 2017), the country has made several identities in recent time such as the country of GNH and, carbon-neutral country. Bhutan due to its distinct forest coverage landscapes is a net sink of GHG (Shrestha, S. 2018).

Growth in transport sectors is increasing at a rapid rate in developing countries. A study conducted in 2002 shows that the number of vehicles is expected to reach 1.3 billion by 2020 (Sperling & Claussen, 2004). There is a vast shift of vehicle ownership in developing countries which reflects serious questions on the level of

transportation sectors growth in the growing economy (Dargay. et al. 2007). The green transport system with focuses on electric vehicle is one of the promising approaches which is being realized and followed in many countries with Canada having great ambition to have all its vehicles as electric vehicles by 2040 followed by other countries on its convenient approaches and timelines (Cul, H., Hall, D. & Lutsey, N. 2020). Growth in electric mobility is noted at higher speeds and in 2018 the global electric car fleet recorded 5.1 million marks which is greater by 2 million from the numbers of the previous year (IEA 2019). Still research shows that there exists a barrier in the electric vehicles market due to incremental cost of the vehicles where many benefits of such vehicles have been not well understood (Malmgren, I., 2016) and there is need for policy intervention on awareness.

Bhutan as one such developing country which is of no exception in terms for growth of vehicle ownership and transport sectors. Though Bhutan is proud to be a carbon-neutral country, the environmental issues are accelerating in line with economic development. Bhutan as one of the fastest-growing economies in South Asia needs calculated approaches to check and balance the environmental issues (Zheng, L. et al. 2017 & Zhu, D. et al. 2006). Hence, to have a proper balance of development that provides conducive environment and happiness, the holistic developmental model of Bhutan plays a pivotal role in promotion of green transport sectors with focus on electric vehicles.

Well materialized and planned national economic development of Bhutan took new shape since 1961 with the starting of the first five-year plan (Ura, K and Kinga, S., 2004). Ever since, numerous developmental thirst areas were identified to be addressed in each five-year plan cycle. In early 1970's the Fourth King of Bhutan coined the concept of GNH where the belief of happiness as an indicator of progressive development (Gross National Happiness Centre, Bhutan). The concept of GNH is thus deeply rooted in the socioeconomic development of the country with measures to achieve holistic development that can balance the needs of the society and happiness.



Further to it, the legal code of Bhutan (1629) strongly stated that “if the government cannot create happiness for its people, there is no purpose of the government to exist”. Later the constitution of Bhutan in its article 9 stressed on inclusion and continuity of GNH values (The Constitution of The Kingdom of Bhutan. 2008)

**OBJECTIVES OF THE STUDY**

This study aimed to identify the holistic socio-economic development policy of Bhutan, the effects of transport sectors on climate change, interventions that are essential and learning from the examples of policy driven initiatives in context of Bhutan.

**METHODOLOGY**

Study made use of the primary data which are both qualitative and quantitative in nature. Climate change literatures from global and regional conditions were taken as basis of problem identifications. The analysis of policy documents, constitution documents and the literature related to developmental activities is done to have greater insights on the study. The data obtained from the available primary resources are scrutinized to find the influence of policies, regulations, and implementations on the initiative of electrical vehicles in Bhutan. The overall design of the study is from background understanding and comparative analysis to highlight the important role a good policies and regulations have on initiatives to counter climate change impacts.

**RESULTS AND DISCUSSION**

**1. GNH and Transport Sector Related Intervention in Bhutan**

**1.1 Guiding developmental philosophy of Bhutan**

To ensure material, spiritual, and social wellbeing of the people of Bhutan, a strong developmental philosophy of GNH remains a

base. The four critical pillars of GNH are as follows.

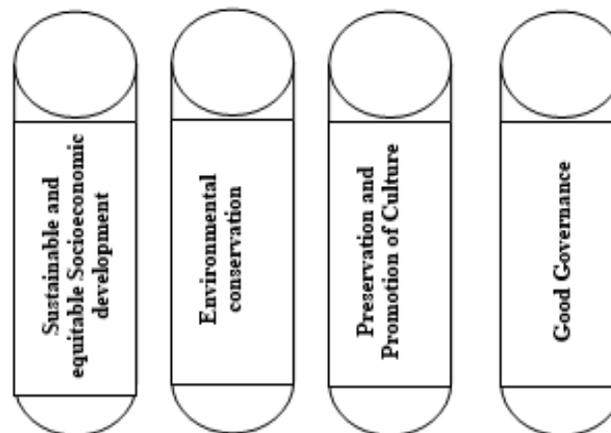


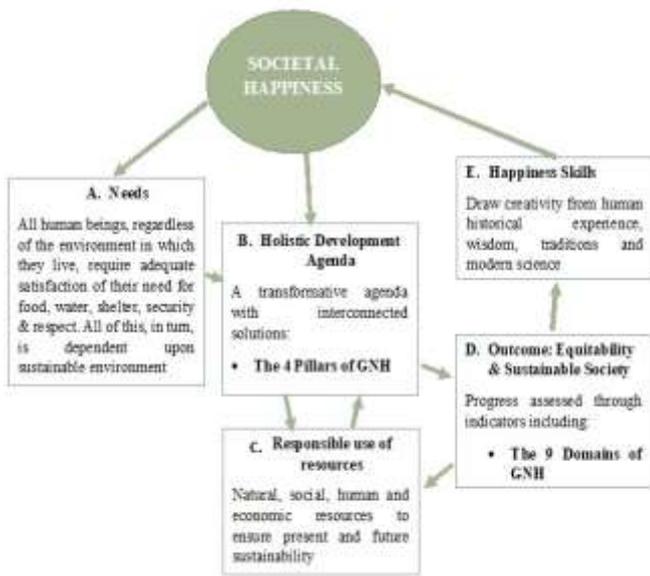
Figure 1: Four Pillars of GNH

The four pillars of GNH are further assisted with nine domains and 33 indicators and 124 variables (Ura K. et al. 2012)



Figure 2: Nine Domain of GNH

With a stronghold of policy intervention which strives to balance socioeconomic development, the concept of GNH is integrated in any planning and implementation process so that the actions incorporated are in-line with the principle of GNH. The holistic developmental approaches are the guiding index that GNH philosophy is always implemented in Bhutan.



Source: (NDP Steering Committee and Secretariat, 2013)

Figure 3: Holistic Development Model

It is evident from the NDP framework as shown in Figure 3 above that societal wellbeing as desired in the contest of Bhutan and the framing of policies and regulations are to address it.

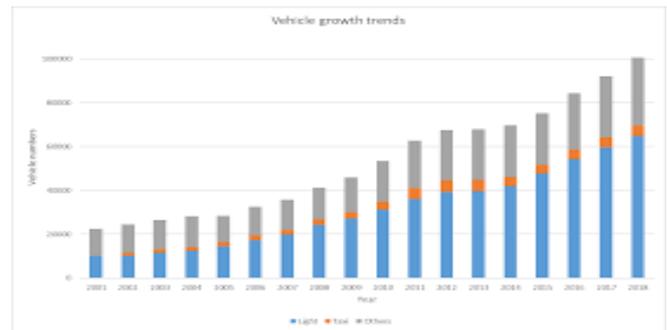
As the country experienced a rise in temperature of about 1°C in summer and 2°C in winter since 2000, the impacts are quite visible due to multiple climate related disasters (The International Centre for Integrated Mountain Development, 2016). Climate change has greater linkages with energy, environment and sustainability nexus that play crucial roles in sustainable holistic development reflecting energy itself having strong linkages/influences with seven SDGs (Bhattarai, H. 2020). For urgent adaptation needs, Bhutan prepared its National Adaptation Programme of Action (NAPA) in 2006 and the Green Climate Fund under UNFCCC is supporting the effort of Bhutan (NEC, 2019). The plan and policies of Bhutan are formulated keeping in mind the Sustainable Development Goals (SDGs) which are critically evaluated through GNH philosophy.

### 1.2 Overview of Transport system of Bhutan

Bhutan built the vehicle road in the 1960s and introduced the vehicles in the country (Japan International Cooperation Agency, 2016). Initiative on the ban of the import of second-hand cars to

Bhutan was decided in 53<sup>rd</sup> Coordination Meeting of the Council of Ministers in 1999 which was one of the policy interventions (National Council of Bhutan, 2014).

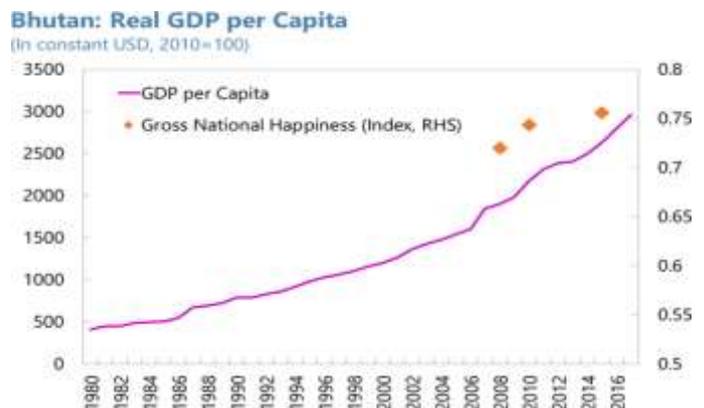
Growth of transport sectors are seen visible in Bhutan with an increase of vehicle ownership at an average rate of 15% per annum. The study also shows that the country's share of emissions from transport sectors has increased from 20% in 2000 to 30% in 2012 (status of national transport policy). Bhutan has seen the vehicle ownership growth by 9.28% in 2018 (MoIC, 2019).



Source: (RSTA, RoGoB- extracted from 2019 EAC report)

Figure 4: Vehicle's growth trend of Bhutan

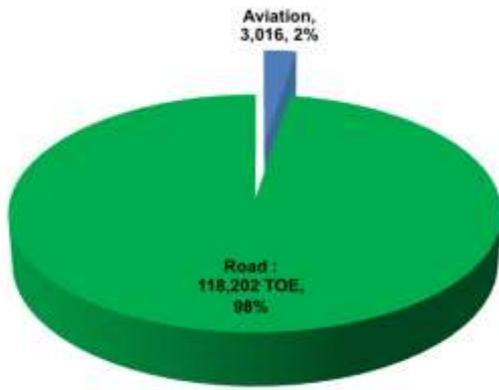
Clear indication from Figure 4 regarding the rapid increase of vehicles in Bhutan where the transport sector is dominated by road and air transport. Study by the Economic Affairs Committee highlighted a motor vehicle each for every seven persons in Bhutan (National Council of Bhutan, 2020).



Source: (Balasubramanian, S & Cashin, P. 2019)

Figure 5: GDP per capita growth of Bhutan

The above figures (figure 3 & 4) reflected the strong linkages of growth in vehicle import with that of per capita GDP growth resulting in the personal affordability. With such trends of growth, it is critical to figure out the emissions contributions from the transport sectors. Unlike that of many countries across the world, the transport sectors are a mix of road and air transport since there is no feasibility of a water transport system.



Transport Sector Consumption Mix  
Total Consumption: 121,218 TOE

Source: (MoEA, RGoB, Energy Data, 2014)

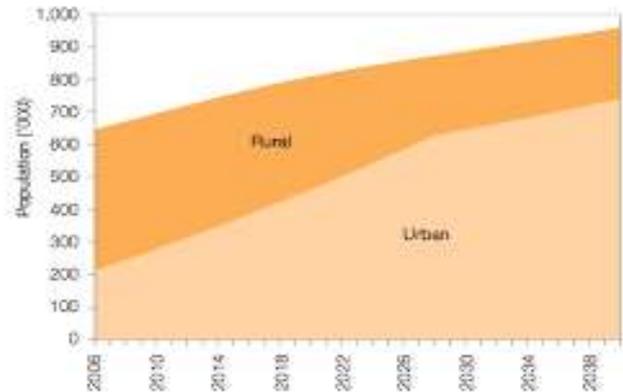
Figure 6: Transport Sector Energy Consumption mix

Statistics maintained by the Ministry of Economic Affairs (MoEA) of Bhutan clearly reflect the domination of energy consumption by road transports. On deeper analysis, the road networks in Bhutan are continuously increasing, the purchasing power of people get much better with GDP growth and developmental activities are taking leap steps, interventions in transport sectors looks timely and promising for the country.

### 1.3 Concept of Electric Vehicle

Decarbonization of the road transport sector seen necessary for the commitment of the Paris Agreement, but transition will take time (Hill, G. et al. 2019). Bhutan adopted the sustainable transport goals as part of the voluntary Bangkok 2020 declaration agreed at the 5<sup>th</sup> regional environmentally sustainable transport forum and UNDP supported project that will develop solutions along with financial and technical support to shift into energy efficiency and transform clean energy and zero carbon development (UNDP. Bhutan).

Transport 2040 Integrated Strategic Vision is one such policy and vision document aiming at transport sectors and its holistic contribution to the socioeconomic development of the country aiming to strengthen the long-term comprehensive strategies. The report also projects a drop in rural population from 0.4 million in 2013 to 0.25 million by 2040 because of rural to urban migration (Asian Development Bank, 2013).



Source: (SGNH 2010 (extracted from MoWHS Report, 2016)

Figure 7: Projected trend in rural and urban population

With measures of developments and the better living conditions in urban areas, the above figure 7 from the report of MoWHS noted and forecasted the sifting of the population more towards urban settlement in case of Bhutan. Concept of electric vehicle is quite new in the case of Bhutan dated back 2013 during Hon'ble Prime Minister of Bhutan. This was felt necessary when the countries across the globe realized the impacts of transport sectors on the growing impacts of global warming and climate change. Bhutan announced its electric vehicle initiative to address the reduction in fossil fuel dependency (World Bank, 2016). Alternative Renewable Policy of Bhutan highlighted the needs to adopt green transport technology solutions to minimize carbon emissions and growing fuel consumption (Department of Renewable Energy. Bhutan. 2013). As green transport for developing countries is seen as less feasible options due to its high purchasing price (Rajper, S, Z., Albrecht, J., 2020), policy intervention in this measure is vital in such countries. Government has put in place tax incentives to encourage the use of electric/hybrid vehicles for personal transport as a mitigation approach in transport sectors to combat climate



change. Green number plate was initiated for electric vehicles in Bhutan in 2019 to recognize them as environment friendly vehicles.

Bhutan has been exercising the tax system for years where major reforms were initiated in 2011, 2012 and 2014. As of 2011 a tax of 20% and 15% for Custom Duty (CD) and Sale Tax (ST) respectively levied for all light vehicles irrespective of its engine capacity, which was revised thereafter.

**Table 1**  
*Taxes situations*

Detail	2011		2012
	CD%	ST%	Green Tax
Below 1500 cc	20	20	5% for vehicles below 1800 cc 20% for vehicles that exceeded 1800 cc
1500 cc – 2500 cc	25	20	
Above 2500 cc	30	20	
Utility Vehicles	20	5	5% Green Tax (GT)

Source: Dept. of Revenue & Custom, MoF, RGoB, 2019

Further to this, the green tax was reworked to control the import of vehicles.

**Table 2**  
*Revised taxes (2014)*

Detail	CD%	ST%	GT%
Below 1500 cc	45	45	10
1500 cc but not exceeding 1799 cc	50	50	15
1799cc but not exceeding 2500 cc	50	50	20
2500 cc to 3000 cc	50	50	25
3000 cc and beyond	100	50	30
Utility vehicles	20	10	5

Source: Dept. of Revenue & Custom, MoF, RGoB, 2019

Evidence from Table 2 is the policy level intervention which shows the increase in green tax as the engine capacity of the vehicles increases. Further to this, the electrical vehicles were exempted from the above-mentioned taxes so that the priority of the government is to encourage the procurement and use of electric vehicles. Researchers concluded that more policies related to financial incentives, technological support and charging stations need to be materialized for promoting electric vehicles (Zhang, X. et al. 2014).

A report from national media BBS highlighted the policies of providing increased loan ceiling for electric vehicles taxis to 70% in objectives to switch the existing taxis to electrical vehicles taxis (Bhutan Broadcasting Service. 2019) where the project was focused on setting up more charging stations in six core districts where the number and flow of taxis are maximum. The move is to efficiently implement the Bhutan Sustainable Low-Emission Urban Transport System policy for the green transport system and target to have more and more support mechanisms for its use. This is also another policy level support mechanism for ease of availing the necessary services pertaining to electric vehicles.

Bhutan in the 15<sup>th</sup> COP, UNFCCC, 2009 has committed to remain carbon neutral as well as the emissions of GHG not to exceed the carbon sequestration capacity of the country’s forests and further reemphasized the commitment in COP21, 2015 (Department of Renewable Energy. Bhutan. 2019). The report also identified agencies to work on formulation and implementation of policies and regulations that are responsible for the promotion of energy efficient transport systems in the country. The country in its constitution strongly mentions that at any cost, the forest cover of the country to be maintained at 60% minimum (Constitution of Bhutan) whereby today almost 72% of the land is under forest (NEC, Bhutan). This is another policy level intervention in line with holistic developmental approaches and infused with the constitution.

Bhutan has identified transport sectors as a strategic thirst area in the 11<sup>th</sup> FYP (2013-2018) with a focus “increase access to safe, reliable, affordable, eco-friendly, convenient transport services” in line with one of the pillars (Sustainable and Equitable Socio-Economic Development) of Gross National Happiness (GNH) which is a guiding policy document of the country. Bhutan noticed stiff challenges in 11<sup>th</sup> FYP for remapping the transport sectors with focus on promotion of electric vehicles primarily aimed at addressing the environmental issues as well as reducing country dependency on the import of fossil fuels. Vehicle emission reduction targets were identified for Bhutan and it aims to reduce average annual levels of all air pollution better than World Health Organization standards by 2025 and vehicle related emissions reduction to 65%-95% by 2030 in comparisons to the level in 2015 (Zheng, L. et



al. 2019). This is another policy level intervention from the government in its five-year plan activities with priorities of focus.

Garnering the strategic analysis and finding from studies reflects a positive prospect of electric vehicles in Bhutan under any scenarios (Nyintob, N. 2019). Multiple legal and policy framework of Bhutan back by its constitution are in the form of mandates for environmental conservation, reduction of pollution & emissions, financial incentives for reducing pollution/emission and penalties for pollution, tax incentives for environmentally friendly technologies, declaration to remain carbon neutral are visible dimensions of government of Bhutan for its concern for environment, welfare and safety deriving timely intervention in transport sectors.

## RESULT AND DISCUSSION

Analysis clearly reflects that the world is bracing through critical times as the impacts of climate change is being visible across all walks of life. Contribution to global climate change issues is significant from the developed countries in terms of emissions and environmental impacts. Low income and least developed countries face increased pressure to act on intervention measures due to income and resources scarcity.

Moreover, transport sectors happen to be noticeable contributors of emissions especially GHG which has huge implications on climate change. There is growth noticed in the field of transport sectors in every economy of the globe. Sharp trend of rise in vehicle ownership is something alarming which is equally noticed for Bhutan too.

Policy intervention to support and encourage the use of electric vehicles or engaging in green transport systems seems a very promising approach. Bhutan has shown a progressive and timely intervention to promote and encourage the use of electric vehicles through its holistic mode of developmental philosophy backed by GNH and keeping track of SDGs on the planned and prioritized manner. The critical indices of electric vehicles promotion and support mechanism identified are well initiated with incentives and resources support in Bhutan.

## CONCLUSIONS

Timely interventions to combat climate change seems vital where policy intervention approach is viewed much promising. There is significant contribution of emissions and environmental degradation from transport sectors where the number of vehicles and level of GHG emissions are on dramatic rise. Policy backed with holistic development in transport sectors for promotion and encouraging the green transport system are crucial in current time. A conducive policy supported with proper checking and balance through rules and regulations that will ensure the growth of transport sectors in line with the principle of SDGs for better tomorrow. For a low-income economy, crucial support mechanisms in forms of policies and regulations necessary for changes to electric transport systems where upfront cost is quite high and availability of charging stations are the other challenges. Bhutan is certainly one such example to refer to where its derived GNH philosophy of holistic development plays instrumental roles in planning and implementation of activities for socioeconomic development with a timely check and balance system. Progress in green transport seems much more favorable with timely policy and support intervention in Bhutan which is worth implementing.

## RECOMMENDATIONS

Climate change is real, and it gives effects to the wellbeing of everyone across the globe. The responsive actions from national, regional, and personal are crucial to combat the impacts of climate change. There is growing need to understand the cause and action related to all manmade activities to protect the environment and in return assure development with societal happiness.

Notwithstanding, with transport sectors being one of the prime contributors of environmental effects due to emissions, a strong commitment for a green transport system is essential. At national and regional level, there is need for conducive support and policy intervention for the deliverables of electrical vehicles which will favor the initiative and shift to electric vehicles. Equally, individuals' concerns and commitments are essential so that one can switch from fossil



fuel-based transport system to green transport systems with ease and comfort. Green transport systems are promising future for the wellbeing of every society and commitments towards SDGs which every country should thrive with proper and timely interventions where learning from best practices of different countries can proved beneficial. A holistic developmental approach in aligning our actions towards achieving SDGs can be explored in developing or least developed country in-order to shift towards green transport. Holistic development model can suit in balancing to a more conducive and responsive manner in various field of growth and developmental goals. Such dedicated commitments in actions can ensure the approaches towards combating climate change for better tomorrow.

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