

# PAKISTAN AUTOMOTIVE LEGISLATION: DRIVING EMISSIONS UP OR SLOWING THEM DOWN?

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## ABSTRACT

The United Nations Intergovernmental Panel on Climate Change has sounded an extremely urgent alarm to reduce carbon dioxide emissions to avoid catastrophic climate change. However, despite this warning to act, 43% of all harmful emissions in Pakistan can be attributed to the country's transport industry, including the automotive sector. This paper discusses greenhouse gas and other dangerous gas emissions standards along with their policing in the automobile sector in Pakistan, in juxtaposition to similar international standards, against the background of environmental law. It considers domestic and international legislation regarding automotive manufacturing guidelines on the control and policing of emissions and the fuel policy in Pakistan. It also critiques the electric vehicle policy in Pakistan that is being spearheaded by the government as a sustainable solution to the global environmental crisis, given that Pakistan is in the thick of being the fifth most populous country in the world. Both governmental and international bodies have done much research on Pakistan's current environmental position. To this end, this paper aims to uncover how legislation in Pakistan has enabled vehicle emissions to reach this environmental tipping point and provide workable policy changes and recommendations that can be incorporated into future emissions regulations and legislation, specifically in relation to automobiles.

**KEYWORDS:** United Nations, Climate Change, Pakistan, Automobiles, Environmental Law, Intergovernmental Panel on Climate Change, Harmful Emissions.

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## 1. INTRODUCTION

Pakistan's transport industry has been instrumental in the country's development. However, it has also played a significant role in the country's environmental degradation, with the Food and Agriculture Organization attributing 43% of all harmful emissions to the transport sector in Pakistan in a 2019 report measuring emissions in rice-growing districts.<sup>1</sup> The United Nations Environment Programme also estimates that a quarter of "all energy-related greenhouse gas emissions" originate from the transport industry.<sup>2</sup> Greenhouse gases (**'GHG'**) is an umbrella term

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<sup>1</sup> Food and Agriculture Organization of the United Nations, 'FAO Report Analyzes the Causes of Smog in Punjab Focusing on Agriculture' (*Food and Agriculture Organization of the United Nations*, 5 February 2019) <<https://www.fao.org/pakistan/news/detail-events/en/c/1179183/>> accessed on 28 April 2022. Despite its limited geographical scope, the report is the only recent one apportioning emissions in Pakistan.

<sup>2</sup> United Nations Environment Programme, 'Transport' (*UN Environment Programme*) <<https://www.unep.org/explore-topics/energy/what-we-do/transport>> accessed 26 April 2022.

for a plethora of noxious emissions that come off exhaust fumes, including ultrafine particles, black carbon, nitrogen oxides, carbon monoxide and particulate matter 2.5 and 10.<sup>3</sup> Studies have shown that the last two have a direct effect on shortening lifespans.<sup>4</sup> Pakistan's national temperatures have also risen at a level higher than the global average.<sup>5</sup> This thus raises the question of what legislative action Pakistan is taking to circumvent the automotive industry and reduce vehicle emissions to prevent the country from facing an environmental disaster. This paper aims to answer that by considering the legislation surrounding fuel standard guidelines, guidelines to auto manufacturers to lower emissions, and existing checks and balances to observe and police vehicle emissions, particularly on Pakistan's land freight economy. Taking into account emission levels, Pakistan's electric vehicle policy will be analysed as a feasible solution, along with alternatives to the policy. This analysis will be conducted in light of international legislation on climate change, such as the United Nations Framework Convention on Climate Change (the 'UNFCCC'). Finally, the paper will conclude with policy recommendations.

## 2. FUEL QUALITY

### 2.1. Standard Use in Pakistan

Pakistan follows the European Union ('EU') standards for fuel quality. It adopted these standards through a two-part process, the basis of which lies in the *Mansoor Ali Shab v Government of Pakistan* decision.<sup>6</sup> The case led to the creation of the Punjab Clean Air Commission, which recommended that Pakistan adopt the Euro II, Euro III and Euro IV fuel quality standards. The commission's findings also led to the promulgation of the National Environmental Quality Standards for Motor Vehicle Exhaust and Noise 2008,<sup>7</sup> which mandated the adoption of Euro II standards across the board for all vehicles in Pakistan. This standard would be used until the late 2010s but was archaic as it is similar to fuel standards used in the 1990s in Europe and has almost three times the sulphur content in its diesel compared to standards used in other South Asian countries.<sup>8</sup>

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<sup>3</sup> Doug Brugge, John L Durant and Christine Rioux, 'Near-Highway Pollutants In Motor Vehicle Exhaust: A Review Of Epidemiologic Evidence Of Cardiac And Pulmonary Health Risks' (2007) 6 Environmental Health 1, 2.

<sup>4</sup> Ali Habib, Sanval Nasim, Amna Shahab, 'Charting Pakistan's Air Quality Policy Landscape' (2021) E-21019-PAK-1, 2.

<sup>5</sup> Khaleeq Kiani, 'Climate Change to Cost Pakistan \$3.8 Billion Yearly' *Dawn News* (Islamabad, 19 May 2021).

<sup>6</sup> *Mansoor Ali Shab v Government of Pakistan*, 2007, PLD 403.

<sup>7</sup> National Environmental Quality Standards for Motor Vehicle Exhaust and Noise 2008.

<sup>8</sup> Rizwan Haider, Abdullah Yasar, Amtul Bari Tabinda, 'Impact of Transport Sustainability on Air Quality in Lahore, Pakistan' (2018) 114 Current Science 2380, 2383.

It took Pakistan nearly 12 years to shift from the Euro II fuel standard to the more modern Euro V fuel standard, as announced by the Ministry of Energy.<sup>9</sup> This was a massive step forward due to the significant difference between Euro II and Euro VI standards with regard to mg/km pollutant emission.<sup>10</sup> However, this new policy seems to be largely performative. A survey from one of the major Petroleum/Diesel suppliers, Shell Petroleum, showed that out of their 1020 pumps in Pakistan, only 185 offered or advertised the offering of Euro V fuel.<sup>11</sup> Past legislation has also not set up a timeline by which all fuel suppliers in Pakistan must equip themselves with the new standard, nor penalties for failure to comply with the standard.

Fuel companies' adherence to these new standards has been controversial. As highlighted, in 2018, Honda Atlas filed a complaint about fuel quality in Pakistan with the Oil and Gas Regulatory Authority ('**OGRA**'). Following engine-knocking issues in their recently debuted Honda Civic Turbo models, Honda tested fuel samples from different fuel suppliers in Pakistan. They found that fuel suppliers used additives to artificially increase the fuel's Research Octane Number. The fuels were also found to have dangerous levels of manganese (53 mg/kg).<sup>12</sup> The case is relevant here for two reasons – (i) these lower-quality fuels kept auto manufacturers from releasing more fuel-efficient engines and catalytic converters in Pakistan, and (ii) lower concentrated fuels lead to higher emissions of dangerous gases and chemicals, such as benzene and sulphur dioxide.<sup>13</sup> Only after the complaint did the Ministry of Energy issue new metal level standards in fuel at 40 mg/litre maximum.<sup>14</sup> Importantly, under section 15(2) Pakistan Environmental Protection Act 1997 ('**PEPA**'),<sup>15</sup> the Pakistan Environmental Protection Agency is solely responsible for setting fuel standards. However, in recent years, the Ministry of Energy has issued Research Octane Number

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<sup>9</sup> Khaleeq Kiani, 'Govt Orders all Petrol, Diesel Imports be Euro-V Compliant as Oil Companies Protest Move' *Dawn News* (Islamabad, 9 July 2020) (hereinafter 'Kiani 2020').

<sup>10</sup> Ali Habib, Sanval Nasim, Amna Shahab, 'Charting Pakistan's Air Quality Policy Landscape' (2021) E-21019-PAK-1, 3.

<sup>11</sup> Shell, 'EURO 5: Available at Shell Retail Stations Now!' (*Shell*) <<https://www.shell.com.pk/motorists/shell-fuels/euro-5-available-at-shell-station.html#iframe=Lz9sb2NhbGU9ZW5fUEsmcHJlZmlsdGVycz1mdWVscy5zdXBlc9wcmVtaXVtX2dhc29saW5lly9AMzAuMzc0NSw2My42NzMyNiw2eg>> accessed 25 April 2022.

<sup>12</sup> Usman Ansari, 'Honda Says Fuel From Shell, Total and PSO Harms Engines' (*Car Spirit PK*, 2 November 2017) <<https://carspiritpk.com/honda-says-fuel-shell-total-pso-harms-engines/>> accessed 23 April 2022.

<sup>13</sup> Haider and others (n 10) 2384.

<sup>14</sup> Monitoring Report, 'Govt Finally Imposes Restrictions on Metal Contents Level in Gasoline Products' (*Pt Profit*, 26 May 2018) <<https://profit.pakistantoday.com.pk/2018/05/26/govt-finally-imposes-restrictions-on-metal-contents-level-in-gasoline-products/>> accessed 18 October 2022.

<sup>15</sup> Pakistan Environmental Protection Act 1997, s 15(2) (hereinafter 'PEPA').

standards.<sup>16</sup> This encroaches on the powers vested in PEPA and goes against the trichotomy of powers.<sup>17</sup>

Following this complaint, Pakistan State Oil, a state-owned petroleum company, made a statement claiming that their “products fully adhere to official specifications laid out by the Ministry of Energy”, though later testing by OGRA on samples proved that there were excessive chemicals in the samples.<sup>18</sup> Notably, neither the sections of the Petroleum Exploration and Production Policy 2012<sup>19</sup> of the Ministry of Energy nor that of the Technical Standards For Oil Refineries 2009<sup>20</sup> of OGRA mention any standards or procedures for testing fuel quality. Furthermore, the HydroCarbon Development Institute of Pakistan (**‘HDIP’**) is the only government institute responsible for testing fuel. Its objectives are provided in the HydroCarbon Development Institute Act 2006.<sup>21</sup> Section 4(p) states that “[an aim of HDIP is] to establish laboratories, facilities and infrastructure anywhere in Pakistan, and to take all steps and measures which are necessary to promote, implement and undertake assignments and tasks to fulfil its objectives and functions”.<sup>22</sup> This is extremely vague – it establishes no timeline and/or method or standard by which fuel tests should be conducted, nor does it set up a body responsible for laboratory testing. This means that an objective analysis cannot be made comparing other countries’ fuel quality. However, an inference may be drawn, keeping the Honda Atlas scandal in mind. OGRA only took heed of the fuel tampering by large corporations after Honda Atlas took it upon itself to test and send samples to the authority. Thus, one may conclude that OGRA does not test fuel often enough or at all.

Consequently, this area of policy and procedure requires more transparency and stricter guidelines. These may help in pursuing consumer protection litigation where a customer of these large fuel companies has been wronged. Also, in lowering emissions levels, testing would lead to the

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<sup>16</sup> Monitoring Report (n 16). The Research Octane Number is used to measure a fuel’s ability to combust – the higher the number, the less easy the fuel is able to auto-ignite and the higher the quality of the fuel is.

<sup>17</sup> *Syed Mushabid Shah v Federal Investment Agency* [2017] SCMR 1218.

<sup>18</sup> Usman Ansari, ‘OGRA Tests Confirm Petrol in Pakistan is Harmful for Engines, Environment & Health’ (*Car Spirit PK*, 13 March 2018) <<https://carspiritpk.com/ogra-tests-confirm-petrol-in-pakistan-is-harmful-for-engines/#:~:text=According%20to%20a%20media%20outlet,as%20well%20as%20human%20health>> accessed 23 April 2022.

<sup>19</sup> Petroleum Exploration and Production Policy 2012.

<sup>20</sup> Technical Standards For Oil Refineries 2009.

<sup>21</sup> HydroCarbon Development Institute Act 2006.

<sup>22</sup> *Ibid.*, s 4(p).

regulation of the standards mentioned above, which ensures accountability of large fuel companies, and cleaner-burning fuels, leading to fewer emissions.

## 2.2. Fuel Quality Standards from Third Countries

Contrary to the lack of a specific fuel quality policy in Pakistan, many countries have introduced and implemented guidelines and legislation on fuel quality. Although there are no standardised international standards for ‘fuel’, countries have taken the liberty to break this component down into different fuel derivatives, including gasoline, diesel and autogas, which are subsequently subdivided into separate fuel specifications. The reason for doing so is that depending on the particular fuel derivative, the composition of its parameters can be very different. Thus, regulating fuel as a whole would be unrealistic, if not impossible.

### 2.2.1. The EU

As fuel qualities have a bearing on fuel trading within the EU, matters relating to fuel quality fall within the ambit of the Common Commercial Policy, over which the EU enjoys exclusive competence.<sup>23</sup> Subsequently, under the principle of uniformity and to safeguard the European Single Market, the European Commission (the ‘**Commission**’), rather than the EU Member States, proposes fuel quality standards.

Within the EU, both directives, where compliance is mandated, and the European Standards, where compliance is voluntary, establish the guidelines for fuel quality.

#### *a. Directives*

The primary European directive regulating fuel qualities is the Fuel Quality Directive (the ‘**FQD**’),<sup>24</sup> which details binding harmonised standards for all EU Member States. Such standards

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<sup>23</sup> Consolidated versions of the Treaty on the Functioning of the European Union (TFEU) [2016] OJ L 326/47, art. 3. See also, Luigi Lo Piparo and others, ‘Support Study on the Evaluation of Article 7A of the Fuel Quality Directive and Assessment of Approaches to Reduce Greenhouse Gas Emissions from Transport Fuels: Final Report’ [2021] 1, 119 <[https://www.technopolis-group.com/wp-content/uploads/2021/12/ML0521317ENN.en\\_.pdf](https://www.technopolis-group.com/wp-content/uploads/2021/12/ML0521317ENN.en_.pdf)> accessed 26 April 2022 and Opinion 1/75 of 11 November 1975 [1975] ECR 1975-01355.

<sup>24</sup> Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC [2009] OJ L 140/88.

regulate the qualities of petrol, diesel, biofuel and gas-oil and are determined by assessing the impact of fuel derivatives on the environment and human health. Apart from requiring Member States to comply with the specific fuel quality standards provided in Annexes I and II,<sup>25</sup> the FQD also imposes a duty on Member States to oblige fuel suppliers to monitor and report on life cycle GHG emissions from automotive fuel<sup>26</sup> and to reduce these emissions by no less than 6% by the end of 2020.<sup>27</sup> Member States must also report fuel quality data from the previous year.<sup>28</sup>

The FQD is supplemented by two other directives – Directive 2015/652 and Directive 2018/2001. Directive 2015/652 acts as an extension of the FQD and specifies detailed methods to calculate GHG emissions stemming from fuels,<sup>29</sup> as well as the mode that Member States should use when reporting their fuel quality data from the previous calendar year.<sup>30</sup> In contrast, Directive 2018/2001 complements the FQD and regulates the usage of renewable energy sources for energy generation. It establishes an overall target for the share of energy via renewable energy sources in the gross final energy consumption that is to be achieved in 2030<sup>31</sup> and requires Member States to maintain national contributions to achieve this target. Finally, as well as laying out specifications, such as the regulation on calculating the GHG emissions from burning biofuel, the Directive also obliges Member States to require fuel suppliers to comply with the target that the shares of renewable energy sources be at least 14% of the final energy consumption in the transport sector.<sup>32</sup>

#### *b. European Standards*

European Standards are standardised technical guidelines established by the European Committee for Standardization (“CEN”). Unlike the binding nature of EU Directives, these standards apply to the Member States of the CEN – all EU and European Free Trade Association Member States

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<sup>25</sup> *Ibid.*, arts. 1(3) and 4, Annexes I and II.

<sup>26</sup> *Ibid.*, art. 7a(1).

<sup>27</sup> *Ibid.*, art. 7(a)(2)(a).

<sup>28</sup> *Ibid.*, art. 8(3).

<sup>29</sup> Council Directive (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels [2015] OJ L 107/26, Annexes I and II.

<sup>30</sup> *Ibid.*, art. 5, Annexes III and IV.

<sup>31</sup> Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources [2018] OJ L 328/82, art. 3(1).

<sup>32</sup> *Ibid.*, art. 25.

and other countries which are part of the European Single Market,<sup>33</sup> and do not mandate compliance unless the standards are ratified and incorporated into domestic legislation.<sup>34</sup>

Currently, there are three European Standards on fuel quality – EN 228 for gasoline, EN 589 for automotive LPG and EN 590 for diesel fuel,<sup>35</sup> each of which provides detailed lower and upper limits regarding specific properties of the fuel derivative.

### **3. AUTO MANUFACTURER GUIDELINES**

#### **3.1 Pakistan**

Auto manufacturer guidelines for emissions standards in Pakistan primarily operate under the Motor Vehicle Rules 1969.<sup>36</sup> Section 158 explains the rules for vehicular noise production. It states, “Every motor vehicle shall be so constructed and maintained as not to cause undue noise when in motion”.<sup>37</sup> This makes no mention of the maximum level of decibels of sound allowed, nor does it make any distinction between urban and highway noise pollution ambits. Section 163 has to do with emissions. It reads, “[e]very motor vehicle shall be so constructed, shall be maintained in such condition, and shall be so driven, and used that there not be emitted therefrom any smoke visible vapour, grit, spark, ashes, cinders, or oily substance”.<sup>38</sup> These guidelines grant copious interpretative leeway to automotive manufacturers, as they do not mention measurable statistics or industry standards. Cases like the Volkswagen (“VW”) DieselGate scandal are a testament to what happens when a government takes a lenient approach to automotive manufacturing guidelines and their enforcement. In 2015, the United States Environmental Protection Agency issued a notice of violation to VW under the Clean Air Act,<sup>39</sup> in which the automobile manufacturer had intentionally programmed their turbocharged direct injection engines to only switch on emission controls during laboratory-controlled emission tests. This meant that outside of lab conditions, these vehicles released illegal levels of GHG; VW was therefore sued for billions.

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<sup>33</sup> European Committee for Standardization, ‘European Standardization’ (*European Standardization*) <<https://www.cencenelec.eu/european-standardization/>> accessed 25 April 2022.

<sup>34</sup> Hart Energy, ‘International Fuel Quality Standards and Their Implications for Australian Standards’ 1, 10 <<https://www.scribd.com/document/338533924/international-feul-quality-standards-pdf>> accessed 25 April 2022.

<sup>35</sup> DieselNet, ‘EU: Fuels’ (*Fuels: European Union*) <<https://dieselnet.com/standards/eu/fuel.php#:~:text=Three%20standards%20cover%20automotive%20fuels,mandatory%20reductions%20in%20sulfur%20content>> accessed 25 April 2022.

<sup>36</sup> Motor Vehicle Rules 1969 (hereinafter ‘MVR 1969’).

<sup>37</sup> *Ibid.*, s 158.

<sup>38</sup> *Ibid.*, s 163.

<sup>39</sup> Clean Air Act 2015.

Unlike America, Pakistan has no definite detailed standards for exhausts, fuel systems and crankcases (the three primary sources of automobile emissions)<sup>40</sup> nor lab testing standards equivalent to the United States Environmental Protection Agency's,<sup>41</sup> which could be catastrophic for the environment.

Recently, the Government of Pakistan introduced the Automotive Development Policy 2016 ('ADP').<sup>42</sup> The policy details an action plan for compliance with international standards by requiring an amendment to Motor Vehicle Rules 1969<sup>43</sup> and an introduction of this legislation on a provincial level. Notable standards advocated by the policy are a vehicle certification system in Pakistan based on various United Nations regulations,<sup>44</sup> the creation of an emissions standard for vehicles and the formulation of tests that can be used to see whether vehicles fall within international emissions standards.<sup>45</sup> Notably, corresponding legislation, namely the Motor Vehicles Ordinance 1965 (which reiterates the above-mentioned section of the Motor Vehicle Rules 1969 in Chapter VI "Construction, Equipment and Maintenance of Motor Vehicles"),<sup>46</sup> Motor Vehicle Rules 1969,<sup>47</sup> and the Highway Safety Ordinance 2000 (which, in Section 50, reiterates the above-mentioned section of the Motor Vehicle Rules 1969)<sup>48</sup> would be reviewed and amended.<sup>49</sup> The proposed policy represents a massive leap forward, as more definite parameters are provided – this ensures greater transparency in how emissions testing in Pakistan is taking place and what identifiers the testing is based on, leading to more efficient testing. The ADP has also mandated the creation of a new government institution called the Pakistan Automotive Institute ('PAI'), whose sole responsibility will be to test automotive products "from the raw materials up to the finished product"<sup>50</sup> to ascertain the products' quality. The PAI will achieve this through a merger

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<sup>40</sup> John H. Johnson, 'Automotive Emissions' in Ann Y. Watson, Richard R. Bates, Donald Kennedy (eds), *Air Pollution, the Automobile, and Public Health* (National Academy Press 1988).

<sup>41</sup> The United States Environmental Protection Agency, 'Engine Certification & Compliance Testing' (*The United States Environmental Protection Agency*, 22 February 2022) <<https://www.epa.gov/vehicle-and-fuel-emissions-testing/engine-certification-and-compliance-testing>> accessed 7 September 2022.

<sup>42</sup> Auto Development Policy 2016-2021 (hereinafter 'ADP 2016-2021').

<sup>43</sup> *Ibid.*, 73

<sup>44</sup> *Ibid.*, 74-5.

<sup>45</sup> *Ibid.*

<sup>46</sup> Motor Vehicles Ordinance 1965, Chapter VI.

<sup>47</sup> MVR 1969 (n 38).

<sup>48</sup> National Highway Safety Ordinance 2000, s 50.

<sup>49</sup> ADP 2016-2021 (n 44) 74.

<sup>50</sup> *Ibid.*, 79.



with the Automotive Testing and Training Centre, another government institution which the ADP itself concedes has remained inactive in its role of research in the automotive sector.<sup>51</sup>

The creation of this new body, along with the fact that the ADP also aims to introduce the Pakistan New Car Assessment Program,<sup>52</sup> leads to the conclusion that emission standards have a bright future in Pakistan, especially if they can adopt international standards, such as those mentioned in the subsequent sections. The only recommendation is that upon implementation, the policy takes special measures to curtail GHG emissions from motorcycles and auto-rickshaws. The two-stroke engines in these vehicles are much less efficient than their four-stroke counterparts, leading to greater amounts of dangerous emissions<sup>53</sup> – two-stroke engines create 5,500 parts per million (ppm) of hydrocarbon compared to 4 stroke engines' 850 ppm.<sup>54</sup> Moreover, 74% of all registered vehicles in Pakistan in 2018 were motorcycles,<sup>55</sup> and from 2018 to 2019, there was an 11.5% increase in motorcycles in Pakistan.<sup>56</sup> Thus, the need to shift motorcycle production from two-stroke to four-stroke is extremely dire. This is a much-anticipated development, as, among its recommendations, the 2007 Punjab Clean Air Commission proposed shifting auto-rickshaws from two-stroke to four-stroke engines.<sup>57</sup> Hence, when the ADP is brought to full force, one of the first orders of business should be the amendment or introduction of legislation to ban the production of two-stroke engine motorbikes and auto-rickshaws.

### 3.2. International Standards

Pakistan's import of carbon dioxide amounts to 2.26% of its domestic emissions,<sup>58</sup> with its manufacturing industry and construction sub-sector contributing the most emissions within the

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<sup>51</sup> *Ibid.*

<sup>52</sup> *Ibid.*

<sup>53</sup> Habib and others (n 6) 3.

<sup>54</sup> Koshy and Mehrunkar, 'Two Stroke or Four Stroke?' *Down To Earth* (India, 31 January 1993).

<sup>55</sup> Habib and others (n 6) 3.

<sup>56</sup> CEIC, 'Pakistan Number of Registered Vehicles' (CEIC, 1 December 2019) <<https://www.ceicdata.com/en/indicator/pakistan/number-of-registered-vehicles#:~:text=Pakistan%20Number%20of%20Registered%20Vehicles%20data%20is%20updated%20yearly%20C%20averaging,of%201%2C411%2C226%20Unit%20in%201990>> accessed 24 April 2022 (hereinafter 'CEIC I').

<sup>57</sup> *Mansoor Ali Shah v Pakistan* (n 8).

<sup>58</sup> Hannah Ritchie, 'How do CO2 Emissions Compare when We Adjust for Trade?' (*Our World in Data*, 7 October 2019) <<https://ourworldindata.org/consumption-based-co2>> accessed 26 April 2022.

energy sector.<sup>59</sup> Therefore, the transformation of the automotive manufacturing industry to be more environmentally-friendly is pertinent – adopting guidelines on the use of recycled materials in automotive manufacturing would help reduce GHG emissions from the industry.

### 3.2.1. Recycled materials used in manufacturing

There are no universal international standards for recycled materials used in car manufacturing, with specifications differing from country to country. Although Pakistan does not currently require automotive manufacturers to utilise a certain percentage of recycled materials in the manufacturing process, it could refer to third countries' requirements, such as those of the EU, and tailor them to its purpose.

#### *a. The EU*

Numerous European directives and decisions have entered into force to deal with recycled materials from end-of-life vehicles. It was estimated that out of the 6.9 million tonnes of waste generated from end-of-life vehicles in 2019, 95.1% of the scrapped materials were reused and recovered, with a further 89.6% reused and recycled.<sup>60</sup>

This subsection will consider the End-of-Life Vehicles Directive (the '**ELV Directive**'), Directive 2005/64/EC and Commission Decision 2005/293/EC.

#### *i. The ELV Directive*

The ELV Directive was adopted in 1997 to combat the waste generated from end-of-life vehicles, as a considerable percentage of these scrapped wastes could be reused, recovered and recycled. It establishes the requirements for the reusability and/or recyclability and reusability and/or recoverability of passenger vehicles and small trucks. Under Article 7(2), the Directive specifies two deadlines for satisfying specific percentages of reuse and recovery, and reuse and recycling. Notably, it requires the percentage of reuse and recovery and the percentage of reuse and recycling for end-of-life vehicles to be at least 85% and 80%, respectively, by the average weight per vehicle

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<sup>59</sup> Government of Pakistan, 'Updated Nationally Determined Contributions 2021' (2021) 1, 73 <<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Pakistan%20First/Pakistan%20Updated%20NDC%202021.pdf>> accessed 26 April 2022.

<sup>60</sup> Eurostat, 'End-of-Life Vehicle Statistics' (*Statistics Explained*, November 2021) <[https://ec.europa.eu/eurostat/statistics-explained/index.php?title=End-of-life\\_vehicle\\_statistics](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=End-of-life_vehicle_statistics)> accessed 26 April 2022.

by 1 January 2006, and at least 95% and 85% respectively by the average weight per vehicle by 1 January 2015.<sup>61</sup> However, the Directive does not dictate how Member States should meet these targets, other than mandating them to undertake measures to promote the reusability, recovery and recycling ('3R's') of end-of-life vehicle materials. Therefore, the ELV Directive's wording is vague enough to allow Member States the policy freedom to meet the targets described above whilst being specific enough to ensure the outcome would be satisfied.

On top of the 3R's targets, the ELV Directive bans certain hazardous substances from vehicles.<sup>62</sup> Member States must also report to the Commission triennially regarding end-of-life vehicles and their dismantlement.<sup>63</sup> Finally, to minimise the impacts that end-of-life vehicles have on the environment, the Directive establishes guidelines on the collection and treatment of end-of-life vehicles<sup>64</sup> and requires Member States to comply with minimum technical standards in the treatment of these vehicles under Annex I.<sup>65</sup> These thus allow the minimisation of adverse impacts from end-of-life vehicles.

ii. *Directive 2005/64/EC*

Pursuant to and complementing the ELV Directive, Directive 2005/64/EC specifies the requirements for reusing, recycling and recovering vehicles with up to eight passenger seats and small vehicles used for carrying goods and with a maximum weight of no more than 3.5 metric tonnes.<sup>66</sup> Similar to the ELV Directive, although it establishes the minimum percentage by mass by which these vehicles are to be reusable and/or recyclable and reusable and/or recoverable, Directive 2005/64/EC does not govern how Member States should accomplish these targets. This offers Member States sufficient policy space, whilst the explicit targets clarify what Member States are to achieve.

The Directive also obliges Member States to confer EC type-approval to vehicle types that comply with the 3R's requirements as stipulated in Annex I<sup>67</sup> upon the satisfaction of a preliminary

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<sup>61</sup> Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles – Commission Statements [2000] OJ L 269/34, arts. 7(2)(a) and 7(2)(b).

<sup>62</sup> *Ibid.*, art. 4(2)(a).

<sup>63</sup> *Ibid.*, art. 9.

<sup>64</sup> *Ibid.*, arts. 5-6.

<sup>65</sup> *Ibid.*, arts. 6(1) and (3) and Annex I.

<sup>66</sup> Directive 2005/64/EC of the European Parliament and of the Council of 26 October 2005 on the type-approval of motor vehicles with regard to their reusability, recyclability and recoverability and amending Council Directive 70/156/EEC [2005] OJ L 310/10, art. 1 and Annex I.

<sup>67</sup> *Ibid.*, art. 5.

assessment of the automotive manufacturer.<sup>68</sup> In prescribing the documentation model format for the preliminary assessment and the type-approval, instead of giving Member States free-rein over their content and format, the Directive offers a better sense of consistency and predictability to the Member States, thus enabling a better execution of the Directive and its objectives.

*iii. Commission Decision of 2005/293/EC*

Commission Decision of 2005/293/EC seeks to clarify the Commission's obligation to monitor Member States' compliance with the 3R's targets established in Article 7(2) of the ELV Directive. In doing so, the Decision establishes tables that Member States are required to complete in its Annex. It details how they are to be filled in, how Member States should calculate the ELV Directive Article 7(2) targets and the deadlines for their submissions.<sup>69</sup> This provides policy clarity to Member States.

#### **4. LEGISLATION ON EMISSIONS**

##### 4.1. Legislation in Pakistan

Pakistan has no effective policing of emissions from vehicles. Regular testing of vehicles on the road is necessary to ascertain real-world emission values and ensure that inefficient vehicles are taken off the road. Currently, the standards for vehicle emissions testing in Pakistan are those mentioned above, in that no visible soot, oil or smoke, etc, should come out of a vehicle's exhaust.<sup>70</sup> This standard is vague and fails to establish a timeline for yearly emissions testing or mandate traffic police officers to carry special apparatus to test vehicle emissions. Between December 1990 and 2019, a total of 6.2 million cars were registered in Pakistan,<sup>71</sup> and the Euro V standard for new motor vehicles was only introduced in 2020.<sup>72</sup> However, there is no testing to ensure that older cars comply with the Euro II standard, the oldest standard to be introduced in Pakistan. This harms the environment because non-compliant vehicles burn fuel less efficiently. Section 15(2) PEPA is relevant here – it empowers the Federal Agency to require any motor vehicle to install pollution control devices to meet National Environmental Quality Standards,<sup>73</sup> thus allowing for

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<sup>68</sup> *Ibid.*, art. 6.

<sup>69</sup> 2005/293/EC: Commission Decision of 1 April 2005 laying down detailed rules on the monitoring of the reuse/recovery and reuse/recycling targets set out in Directive 2000/53/EC of the European Parliament and the Council on end-of-life vehicles (notified under document number C(2004) 2849) [2005] OJ L 94/30, arts. 1-3 and Annex.

<sup>70</sup> MVR 1969 (n 38) s 163.

<sup>71</sup> CEIC (n 58).

<sup>72</sup> Kiani 2020 (n 11).

<sup>73</sup> PEPA (n 17) s 15(2).

the enforcement of lower vehicle emissions and their compliance. Moreover, PEPA forbids the driving or use of such vehicles<sup>74</sup> and is ahead of its time in policing non-compliance through the imposition of levies<sup>75</sup> and penalties.<sup>76</sup>

The problem is that PEPA's implementation has been left to the provincial governments, which have yet to implement any of these recommendations. An illustration of this is the city of Lahore, which has an extremely dangerous Air Quality Index ('AQI') score of 148 or higher.<sup>77</sup> In the past, when the AQI was alarmingly high, rather than adopting a long-term solution mandating the installation of emission control devices as promulgated in Section 199 PEPA,<sup>78</sup> the provincial government chose to ban Euro II fuel in the city.<sup>79</sup> Consequently, there is a dire need for provincial governments to incorporate PEPA as it is the only workable solution to vehicle testing; as mentioned above, there are more than 6.2 million Euro II-compliant vehicles in Pakistan, and the only way to control their emissions is to incorporate federal legislation, like PEPA, into provincial laws. Notably, the ADP, in its action plan, also aims to introduce a vehicle emission testing system.<sup>80</sup> This, coupled with PEPA, could create a tight-knit policing system that could, to a large extent, cull extreme environmental effects brought on by obsolete vehicles on the road.

Legislative development regarding Pakistan's freight economy is also required. 96% of all cargo in Pakistan is transported by road,<sup>81</sup> with most transporters overloading their trucks to increase profits.<sup>82</sup> The overloading of commercial vehicles leads to a 74.13% increase in carbon dioxide emissions.<sup>83</sup> The policy response has been to issue fines under the Tenth Schedule of the National Highway Safety Ordinance 2000.<sup>84</sup> These fines are in the thousands of rupees, which is not severe enough to cull the malpractice of overloading. Although freights are at the very edifice of any good

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<sup>74</sup> *Ibid.*, s 15(1).

<sup>75</sup> *Ibid.*, s 11.

<sup>76</sup> *Ibid.*, s 17.

<sup>77</sup> IQAir, 'Air Quality Index In Lahore' (*IQAir*, 26 April 2022) <<https://www.iqair.com/pakistan/punjab/lahore>> accessed 26 April 2022.

<sup>78</sup> PEPA (n 17) s 199.

<sup>79</sup> The Express Tribune, 'Euro-2 Fuel Banned in Lahore to Combat Worsening Air Pollution' *The Express Tribune* (Lahore, 16 November 2021).

<sup>80</sup> ADP 2016-2021 (n 44) 75.

<sup>81</sup> Government of Pakistan, 'Pakistan Economic Survey' (first published 2008, Ministry Of Finance) 224.

<sup>82</sup> Omer Masood Qureishi, Sajad Afzal Afridi, Muhammad Ahmed Hafeez, 'Geometric Loading Patterns of Goods Vehicles in Pakistan' [2019] <[https://adcr.com.pk/wp-content/uploads/2020/08/NTRC\\_Report\\_24\\_April\\_19-IST-online.pdf](https://adcr.com.pk/wp-content/uploads/2020/08/NTRC_Report_24_April_19-IST-online.pdf)> accessed 24 April 2022.

<sup>83</sup> Wahid Wahyudi, and others, 'Effect of Overloading Freight Vehicles to Increased Carbon Dioxide Emissions' (2014) 3 IRJES 30, 36–7.

<sup>84</sup> National Highway Safety Ordinance 2000 (n 50) schedule 10.

economy, the environmental effects of the current freight system in Pakistan are ominous. Therefore, Pakistan desperately needs intermodal freight transport, which has proven to be much more environmentally efficient.<sup>85</sup>

#### 4.2. International Legislation on Fuel Economy

Fuel economy legislation is vital to combat climate change, as it reduces fuel consumption and vehicular GHG emissions.<sup>86</sup> Presently, however, no standardised international guidelines on fuel economy exist, with countries devising their own standards and approaches for measuring fuel efficiency.<sup>87</sup> For example, in the EU, Directive 1999/94/EC mandates the display of each vehicle model's fuel economy and carbon dioxide emissions<sup>88</sup> and a poster containing its specific carbon dioxide emissions data.<sup>89</sup> Correspondingly, Regulation (EU) 2019/631 imposes EU fleet-wide carbon dioxide emissions targets for 2020, 2025, and 2030<sup>90</sup> and specific emissions targets for different vehicle categories that are to be met by automotive manufacturers.<sup>91</sup> Member States, automotive manufacturers and the Commission must also comply with various monitoring, reporting, and publishing obligations, with excess emissions premiums imposed on automotive manufacturers whose average specific GHG emissions surpass the stipulated targets.<sup>92</sup> Crucially, the Commission must publish an annual list indicating manufacturers' performance in reaching their designated emission targets.<sup>93</sup> These requirements promote transparency and accountability. The Regulation also acknowledges the importance of eco-innovation and allows the Commission to introduce implementing acts to approve environment-related innovative technologies.<sup>94</sup> Finally, the Commission must keep abreast with real-world GHG emissions data and evaluate the

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<sup>85</sup> Ekki Kreutzberger and others, 'Is Intermodal Freight Transport more Environmentally Friendly than All-road Freight Transport? A Review.' (2003) 7 Nectar Conference 1, 19.

<sup>86</sup> Fuel economy measures the distance that an automobile has travelled using a particular amount of fuel. Often, automobile manufacturers will measure this parameter in lab conditions, using tests that may be stipulated by law. The better a car's fuel economy is, the more distance it can travel within a given amount of fuel. Therefore, a car with good fuel economy will use less fuel and emit fewer emissions, compared to a car with bad fuel economy.

<sup>87</sup> A.E. Atabani and others, 'A Review on Global Fuel Economy Standards, Labels and Technologies in the Transportation Sector' (2011) 15 Renewable and Sustainable Energy Reviews 4586.

<sup>88</sup> Directive 1999/94/EC of the European Parliament and of the Council of 13 December 1999 relating to the availability of consumer information on fuel economy and CO<sub>2</sub> emissions in respect of the marketing of new passenger cars [2000] OJ L 12/16, art. 3.

<sup>89</sup> *Ibid.*, art. 5.

<sup>90</sup> Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 is setting CO<sub>2</sub> emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011 [2019] OJ L 111/13, art. 1.

<sup>91</sup> *Ibid.*, art. 4.

<sup>92</sup> *Ibid.*, art. 8.

<sup>93</sup> *Ibid.*, art. 9.

<sup>94</sup> *Ibid.*, art. 11(2).

Regulation's effectiveness. This enables the EU to be flexible in its fuel economy, and GHG emissions policy, which will be crucial as the fight against climate change is continuously evolving.

## **5. THE UNFCCC AND PAKISTAN'S ELECTRIC VEHICLE ('EV') POLICY**

EVs are electricity-powered vehicles.<sup>95</sup> An increasing focus on environmental protection and sustainable development has led to the growing global usage of EVs. In 2020, over 10 million EVs were estimated to be on the road globally – this was a 43% increase compared to data from 2019.<sup>96</sup> 2020 also saw a 70% increase in worldwide EV sales share to 4.6%, with car registrations from approximately 3 million new EVs.<sup>97</sup>

Although EVs are not the cure-all for climate change,<sup>98</sup> they are still widely promoted to reduce oil use and combat climate change.<sup>99</sup> This is due to their relatively lower fuel and maintenance costs than non-EVs, reducing fuel dependency. Additionally, battery-powered EVs emit no tailpipe GHGs when operating and, thus, are more environmentally friendly than fossil fuel-powered vehicles.<sup>100</sup>

### 5.1. The EV Policy in Pakistan

There is already a considerable market for hybrid cars in Pakistan,<sup>101</sup> with high potential existing in the market for bringing EVs into the country.<sup>102</sup> Consequently, the Automotive Industry Development and Export Policy 2021-26 ('**AIDEP 2021-26**')<sup>103</sup> was officially introduced in 2021, forming the bulk of the EV policy in Pakistan.

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<sup>95</sup> Australian Renewable Energy Agency, 'Electric Vehicles' (*Australian Renewable Energy Agency*) <<https://arena.gov.au/renewable-energy/electric-vehicles/>> accessed 24 April 2022.

<sup>96</sup> International Energy Agency, 'Global EV Outlook 2021' [2021] Global EV Outlook 1, 19.

<sup>97</sup> *Ibid.*

<sup>98</sup> Saheli Roy Choudhury, 'Are Electric Cars 'Green'? The Answer is Yes, But It's Complicated' (*CNBC*, 26 July 2021) <<https://www.cnbc.com/2021/07/26/lifetime-emissions-of-evs-are-lower-than-gasoline-cars-experts-say.html>> accessed 24 April 2022.

<sup>99</sup> Hiroko Tabuchi and Brad Plumer, 'How Green are Electric Vehicles?' (*The New York Times*, 2 March 2021) <<https://www.nytimes.com/2021/03/02/climate/electric-vehicles-environment.html>> accessed 24 April 2022.

<sup>100</sup> Alternative Fuels Data Center, 'Emissions from Hybrid and Plug-in Electric Vehicles' (*Alternative Fuels Data Center*) <[https://afdc.energy.gov/vehicles/electric\\_emissions.html](https://afdc.energy.gov/vehicles/electric_emissions.html)> accessed 26 April 2022.

<sup>101</sup> Isha Lodhi, 'Future of Electric Vehicles in Pakistan' (*TechJuice*, 1 June 2017) <<https://www.techjuice.pk/future-of-electric-vehicles-in-pakistan/>> accessed 26 April 2022.

<sup>102</sup> *Ibid.*

<sup>103</sup> Auto Industry Development and Export Policy 2021-26 (hereinafter 'AIDEP 2021-26').

The AIDEP 2021-26 addresses the promotion of environmentally friendly technologies in the transport sector, including EVs and hybrid vehicles. In promoting the use of EVs, the policy adopts a multifaceted approach by providing tax and non-tax incentives for the manufacturing of EVs<sup>104</sup> and an action plan on how infrastructure is to be developed to promote the use of EVs<sup>105</sup> – these are incorporated from the National Electrical Vehicle Policy 2019.<sup>106</sup> Correspondingly, the AIDEP 2021-26 action plan aims to increase the accessibility of charging infrastructure by installing and employing various charging facilities and technologies.<sup>107</sup>

## 5.2. Relationship between the Pakistani EV Policy and the UNFCCC

The UNFCCC, to which Pakistan is a Party, was adopted in 1992 to stabilise atmospheric GHG levels in such a way that would prevent anthropogenic climate change.<sup>108</sup> Although not legally binding, the treaty plays a significant role in the global fight against climate change – not only does it establish the Conference of the Parties, which meets annually, but it also forms the backbone for subsequent climate change treaties and protocols, including the Kyoto Protocol and the Paris Agreement. Whilst the UNFCCC neither establishes specific emission targets nor specifies what it means by “at a level that would prevent dangerous anthropogenic interference with the climate system”,<sup>109</sup> it creates commitments for Parties to the Convention in Article 4. These apply to all Parties of the Convention.<sup>110</sup>

Although the AIDEP 2021-26 does not explicitly mention the UNFCCC, references are made to mitigating the adverse impacts of climate change in the policy’s stated objectives.<sup>111</sup> This mirrors Article 4(1)(f) of the UNFCCC, where Parties to the Convention must take into consideration

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<sup>104</sup> *Ibid.*, 31-2.

<sup>105</sup> *Ibid.*, 33-4.

<sup>106</sup> See Ministry of Climate Change, Government of Pakistan, ‘National Electric Vehicle Policy’ [2019] 1 <<https://policy.asiapacificenergy.org/sites/default/files/National%20Electric%20Vehicle%20Policy%20%282019%29.pdf>> accessed 25 April 2022 (hereinafter ‘NEVP’). It is important to note, however, that progressive targets on the usage of certain EV types under the NEVP were not incorporated into the AIEDP 2021-26.

<sup>107</sup> *Ibid.*, 32-3.

<sup>108</sup> United Nations Framework Convention on Climate Change (adopted 9 May 1992, entered into force 21 March 1994) 1771 U.N.T.S. 107 (UNFCCC), art. 2 (hereinafter ‘UNFCCC’).

<sup>109</sup> *Ibid.*

<sup>110</sup> Patricia Birnie, Alan Boyle and Catherine Redgwell, ‘The Climate Change Regime,’ *International Law and the Environment* (3rd edn, Oxford University Press 2009) 356, 359.

<sup>111</sup> AIDEP 2021-26 (n 105) 30. Such an objective is also reflected in the Updated National Determined Contributions 2021 and the Living Indus Initiative.



climate change concerns in their “social, economic and environmental policies and actions”.<sup>112</sup> Similarly, Article 4(1)(c) relates to the sector-wide promotion and cooperation “in the development, application and diffusion”<sup>113</sup> of technology and other aspects that relate to the mitigation of anthropogenic GHG emissions. This is reflected in the AIDEP 2021-26, where the Pakistani government seeks to promote EVs, hybrid vehicles and other new technologies in the transport sector by initiating tax and other incentives<sup>114</sup> and developing the necessary infrastructure to accommodate these new technologies.<sup>115</sup> In this regard, the EV policy in Pakistan, by extension of the AIDEP 2021-26, introduces specific proposals that reflect the more general UNFCCC Article 4 obligations.

### 5.3. Generation of Electricity – Renewable Energy?

Successful implementation of the AIDEP 2021-26 and the EV policy will create a higher electricity demand, which will have to be satisfied. Yet, additional generation of electricity through the burning of fossil fuels would defeat the purpose of both the policy and the UNFCCC. This raises the question of how the increased demand for electricity can be satisfied. The answer to this lies in renewable energy.

In 2020, fossil fuels generated 57% of all energy from Pakistan’s total installed power generation capacity, with 31% generated via hydropower.<sup>116</sup> This contrasts the percentages of electricity generated through renewable energy sources and nuclear power, which were a mere 4% and 8%, respectively.<sup>117</sup> Thus, there is potential for developing and using other renewable energy sources to generate electricity.

Considering these low percentages, it may be inferred that the low use of renewable resources to generate electricity is due to the unavailability of renewable energy. Yet, existing literature has concluded that Pakistan is a renewable resources-rich country, with hydropower, wind, solar and

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<sup>112</sup> UNFCCC (n 110) art. 4(1)(f).

<sup>113</sup> *Ibid.*, art 4(1)(c).

<sup>114</sup> AIDEP 2021-26 (n 105) 31-2.

<sup>115</sup> *Ibid.*, 33.

<sup>116</sup> International Trade Administration, ‘Pakistan – Renewable Energy’ (*International Trade Administration*, 27 January 2022) <<https://www.trade.gov/country-commercial-guides/pakistan-renewable-energy#:~:text=According%20to%20National%20Electric%20Power,and%208%20percent%20from%20nuclear>>, accessed 26 April 2022.

<sup>117</sup> *Ibid.*

biomass as the main harnessable renewable energy sources.<sup>118</sup> In this respect, the Pakistani Government has acknowledged the importance of generating electricity through renewable resources. Under the Alternate Renewable Energy Policy 2019, the government has set a target of a minimum of 20% generation by capacity via renewable energy sources by 2025 and a minimum of 30% by 2030<sup>119</sup> and has sought approval from various organisations, including the World Bank,<sup>120</sup> in the country's transition to renewable energy. It has also launched multiple initiatives to promote the use of renewable energy, including financial incentives like tax exemptions,<sup>121</sup> exchange protection,<sup>122</sup> and debt financing.<sup>123</sup>

#### 5.4 The Efficacy of the EV Policy in Pakistan

At first glance, given the considerations mentioned in Section 5.3 of the article, the EV policy would help Pakistan achieve its goals of reducing fuel dependency and transitioning to renewable energy. However, the EV policy may be less efficient and popular given (i) the realities of the Pakistani environment and (ii) the adverse environmental impacts that EVs pose.

##### 5.4.1. The Reality of Pakistan's Environment

Pakistan is deemed a lower-middle-income country<sup>124</sup> with a poor investment climate<sup>125</sup> and infrastructure quality<sup>126</sup> and an ongoing and deepening energy crisis caused by inadequate energy generation and procurement from cheap sources.<sup>127</sup> This crisis has been exacerbated by increasing

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<sup>118</sup> See Abdul Raheem and others, 'Renewable Energy Deployment to Combat Energy Crisis in Pakistan' (2016) 6 Energy, Sustainability and Society 1, 2.

<sup>119</sup> Alternative and Renewable Energy Policy 2019, 2, 6 (hereinafter 'AREP 2019').

<sup>120</sup> Support provided by the World Bank to the Government of Pakistan is evident in the former loaning \$100 million to finance the Sindh Solar Energy project in January 2019 and an approval of \$450million in September 2020 to finance the Khyber Pakhtunkhwa Hydropower and Renewable Energy Development Project.

<sup>121</sup> AREP 2019 (n 121) 26-7.

<sup>122</sup> *Ibid.*, 27.

<sup>123</sup> *Ibid.*

<sup>124</sup> World Bank, 'Pakistan' (*The World Bank*) <<https://data.worldbank.org/country/pakistan>> accessed 26 April 2022.

<sup>125</sup> ANI, 'Pakistan Foreign Investment slip 33 PC in February' (*ANI*, 18 March 2022) <<https://www.aninews.in/news/world/asia/pakistan-foreign-investment-slip-33-pc-in-february20220318192008/#:~:text=The%20Pakistani%20publication%20added%20that,218.7m%20in%20December%202021>> accessed 26 April 2022.

<sup>126</sup> Asian Development Bank, 'Economic Corridor Development in Pakistan: Concept, Framework, and Case Studies' [2022] 1, 35 <<https://www.adb.org/sites/default/files/publication/768396/economic-corridor-development-pakistan.pdf>>.

<sup>127</sup> Abdul Rehman and others, 'Energy Crisis in Pakistan and Economic Progress: Decoupling the Impact of Coal Energy Consumption in Power and Brick Kilns' (2021) 9 Mathematics 1, 13.

fuel prices due to the war in Ukraine, leading to hours-long electricity shutdowns across the country.<sup>128</sup> Months into the Ukrainian-Russian war, there are no signs that it will be alleviated or end soon. Therefore, at least in the short run, Pakistan's energy crisis is unlikely to be quickly relieved. These problems are relevant as the execution of the EV policy largely hinges on a good investment climate, infrastructure, and electricity availability. For example, the 85 charging points in motorways across Pakistan<sup>129</sup> are largely performative, and any electricity shutdown from the energy crisis will prevent efficient EV charging. Moreover, the high summer temperatures in Pakistan require frequent use of air-conditioners inside EVs – this decreases the car's driving range and leads to higher EV charging frequencies. Thus, unless these problems are resolved, owning an EV rather than a conventional vehicle may be more cumbersome, and promoting these vehicles could further worsen the energy crisis.

Furthermore, in 2019, the average monthly income in Pakistan was 21,326 PKR.<sup>130</sup> Yet, the average price of a car in Pakistan is estimated to be 4 million PKR,<sup>131</sup> with EVs costing 140% more than non-EVs.<sup>132</sup> Consequently, the unaffordability of EVs will pose an extremely high barrier for an ordinary Pakistani earning an average wage to purchase an EV. Even if an average Pakistani purchases an EV, they will still face significant problems with a lack of electricity to charge their car. The National Electric Power Regulatory Authority's approval of an increase of power tariffs to 4.8 PKR per unit of electricity<sup>133</sup> does not help either.

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<sup>128</sup> Faseeh Mangi, 'Pakistan is Cutting Electricity to Homes, Industry. It Can't Afford Fuel' (*NDTV*, 18 April 2022) <<https://www.ndtv.com/world-news/cash-strapped-pakistan-cuts-power-to-households-on-fuel-shortage-2897642>> accessed 26 April 2022.

<sup>129</sup> Jawwad Rizvi, '85 Locations Identified for EV Charging Stations at Motorways' (*The News International*, 4 January 2022) <<https://www.thenews.com.pk/print/922257-85-locations-identified-for-ev-charging-stations-at-motorways>> accessed 26 April 2022.

<sup>130</sup> CEIC, 'Pakistan Average Monthly Wages' (*CEIC*) <<https://www.ceicdata.com/en/pakistan/average-monthly-wages-by-industry/average-monthly-wages#:~:text=Pakistan%20Average%20Monthly%20Wages%20data,to%202019%2C%20with%209%20observati ons>> accessed 26 April 2022.

<sup>131</sup> Waleed Shah, 'Here's How Much Car Prices Have Gone up in Pakistan since 2015 [Updated]' (*Propakistani*, 22 January 2022) <<https://propakistani.pk/2022/01/22/heres-how-much-car-prices-have-gone-up-in-pakistan-since-2015/>> accessed 26 April 2022.

<sup>132</sup> Shahbaz Rana, 'Electric Vehicles 140% Pricier than Conventional Cars' (*The Express Tribune*, 19 January 2021) <<https://tribune.com.pk/story/2280470/evs-pricier-than-conventional-cars>> accessed 26 April 2022.

<sup>133</sup> FP Explainers, 'Explained: After Political Upheaval, Why Pakistan is Facing an Energy Crisis' (*Firstpost*, 19 April 2022) <<https://www.firstpost.com/world/explained-after-political-upheaval-why-pakistan-is-facing-an-energy-crisis-10573781.html>> accessed 26 April 2022.

Consequently, the realities in Pakistan may disincentivise people to switch to an EV, despite the incentives included in the EV policy. It would also seem counterintuitive to introduce a policy encouraging EV use when the country is already plagued with electricity shortages.

#### 5.4.2. Environmentally-(Un)friendliness of EVs

Whilst EVs are generally regarded as more environmentally friendly than their conventional counterparts, there are also significant environmental issues to consider when implementing an EV policy.

The EV manufacturing process has high life-cycle emissions and is energy-intensive<sup>134</sup> due to its lithium-ion battery.<sup>135</sup> Depending on the type of lithium compounds extracted and lithium sources, the GHG emissions per tonne of lithium extracted can range from 0.08g to 20.4 tonnes of carbon dioxide.<sup>136</sup> High temperatures of 800 to 1000 degrees Celsius are necessary for the calcination of cathode materials made from lithium.<sup>137</sup> Therefore, to be cost-effective, cheap but highly-polluting fuels, such as coal and fossil fuel, are used to reach such high temperatures.<sup>138</sup>

Crucially, although EVs are powered by electricity, the latter may be generated by burning fossil fuels.<sup>139</sup> Thus, the environmental benefits stemming from introducing an EV policy will depend on the type of power grid used in the country. In Pakistan, the majority of electricity is generated from fossil fuels. This may cancel out any environmental benefits stemming from the EV policy, thus undermining its effectiveness.

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<sup>134</sup> Choudhury (n 100).

<sup>135</sup> The International Council on Clean Transportation, 'Effects of Battery Manufacturing on Electric Vehicle Life-Cycle Greenhouse Gas Emissions' [2018] 1, 5 <[https://theicct.org/sites/default/files/publications/EV-life-cycle-GHG\\_ICCT-Briefing\\_09022018\\_vF.pdf](https://theicct.org/sites/default/files/publications/EV-life-cycle-GHG_ICCT-Briefing_09022018_vF.pdf)> accessed 26 April 2022.

<sup>136</sup> Jarod C. Kelly and others, 'Energy, Greenhouse Gas, and Water Life Cycle Analysis of Lithium Carbonate and Lithium Hydroxide Monohydrate from Brine and Ore Resources and Their Use in Lithium Ion Battery Cathodes and Lithium Ion Batteries' (2021) 174 Resources, Conservation and Recycling 1, 11.

<sup>137</sup> Kanthal, 'Lithium-Ion Battery Production' (*Kanthal*) <<https://www.kanthal.com/en/applications/energyrenewablesustainability/lithium-ion-battery-production/>> accessed 26 April 2022.

<sup>138</sup> Iris Crawford, Shao-Horn Yang and David Keith, 'How much CO<sub>2</sub> is Emitted by Manufacturing Batteries?' (*MIT | Climate Portal*, 16 February 2022) <<https://climate.mit.edu/ask-mit/how-much-co2-emitted-manufacturing-batteries>> accessed 26 April 2022.

<sup>139</sup> Joseph Glandorf, 'On the move: Unpacking the Challenges and Opportunities of Electric Vehicles' (*EESI*, 5 November 2020) <<https://www.eesi.org/articles/view/on-the-move-unpacking-the-challenges-and-opportunities-of-electric-vehicles>> accessed 26 April 2022.

## 5.5. The Way Forward

Given the harms of EVs identified above, other alternatives can be used to power vehicles, including hydrogen, solar and biofuel. However, unlike EVs, vehicles powered by these sources have yet to be materialised or popularised in mainstream vehicle markets. Hence, within the transport sector, despite the misgivings in their manufacturing process, EVs are still currently the best way to move away from conventional vehicles.

Consequently, introducing the EV policy in Pakistan is still a step forward. However, for the policy to have maximum efficacy, the Pakistani Government must address the inaccessible pricing of cars, the country's high carbon power grid system, and energy shortages. Creating a friendly investment climate will encourage domestic and foreign investments in Pakistan's renewable energy and EV markets. This will have knock-on and spill-over effects, as investments, especially foreign direct investments, are often regarded as drivers for economic growth, development,<sup>140</sup> and higher employment and wages.<sup>141</sup>

## 6. CONCLUSION

Moving into the second decade of the 21<sup>st</sup> century, Pakistan has made massive progress in its automotive policies. However, legislation in Pakistan has not consistently been implemented nor developed to encompass all vehicles. Regulating the fuel standards used in Pakistan will require legislation inspiration, which can be drawn from standards and regulations, such as the European Standards and the EU directives analysed in Section 2.2 of the article – this will allow Pakistan to make up for lost time. Pakistan will also benefit from adopting regulations on end-of-life vehicles, similar to those considered in Section 3.2 of the article, to transition into entirely built vehicle production. To improve its vehicle emissions standards, Pakistan will need to prioritise the provincial enactment and incorporation of federal legislation, such as PEPA and the ADP, insofar as the regulation and production of vehicles are concerned. There is also an urgent need to conduct further research in the field of vehicular emissions, as shown by the discussion on Pakistan's motorcycle policy, freight economy and EV policy. Simply put, Pakistan's legislation in many areas

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<sup>140</sup> Division for Employment Analysis and Policy, Directorate for Employment, Labour and Social Affairs, 'The Impact of Foreign Direct Investment on Wages and Working Conditions' [2008] OECD Social, Employment and Migration Working Papers 1.

<sup>141</sup> Galina Hale and Mingzhi Xu, 'FDI Effects on the Labor Market of Host Countries' [2016] Federal Reserve Bank of San Francisco, Working Paper Series 1, 2.

does not reflect reality. Finally, there is a need to increase the automotive sector's efficiency. This cannot be achieved by merely focusing on a particular vehicle class, such as promoting EV use.

Ultimately, Pakistan is on the right track towards lowering vehicle emissions. However, to make further progress in reducing GHG emissions, Pakistan must introduce and enforce automotive legislation of a more aggressive nature.