

The other side of the road

Electric vehicles in the developing world

Electric vehicles (EVs) are one of the innovations shaping the future of mobility and could offer many improvements to the transport sector in the developing world, but the road to the adoption of the EVs in developing countries is still very bumpy...

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Traffic in India.
Source: Alex Graves

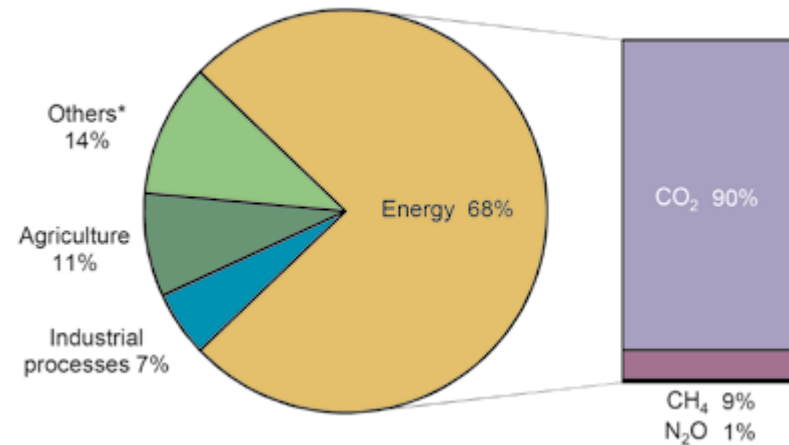


Setting the scene

The transport sector is a key component of economic development and welfare and its pervasiveness and high energy intensity make it the most energy-consuming sector of the global economy. It is the second largest sector in terms of global emissions. It predominantly depends on fossil-derived fuels, with 95% of transport energy coming from petroleum-based fuels, largely gasoline and diesel¹.

Transport is facing one of the most challenging evolutions when compared to other sectors of the economy. This will require a holistic sectorial transformation. Firstly, through urbanization policies, which will have an impact on

Figure 1: World CO2 emissions by sector in 2013



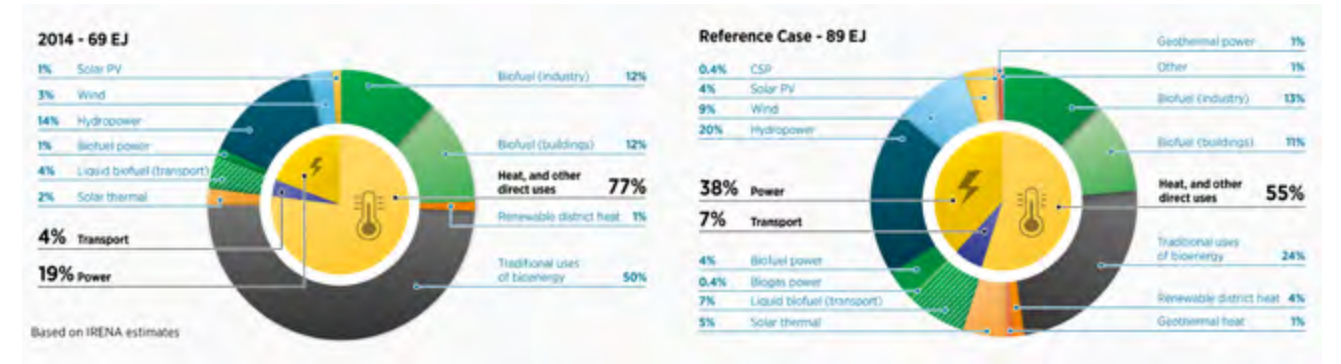
Transport contributes to approximately 23% of total greenhouse gas (GHG) emissions, which are expected to grow up to 50% by 2030

Source: IEA, CO2 Emissions From Fuel Combustion, Highlights, 2015

Night Traffic in Bangladesh. Source: Sam Nasim



Figure 2: Renewable energy use in 2014 and 2030 (Reference Case)



Transport has the lowest renewable energy share of any sector, with little expected growth by 2030

Source: IRENA, Roadmap for a Renewable Energy Future, 2016

transport needs and infrastructure. Secondly, through the introduction of clean energy fuels policies promoting use of electricity (electric vehicles), hydrogen (fuel cell vehicles) and biofuels (blended with diesel).

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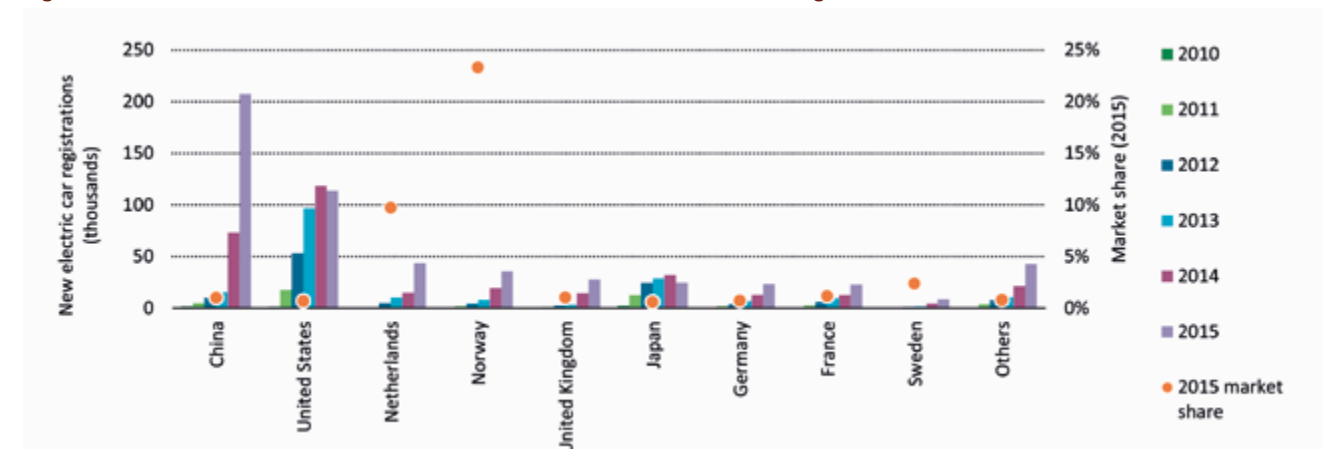
Among these options, electric vehicles (EVs) have strong and concrete potential to reduce dependence on fossil fuels by relying on a source of electricity that is mostly domestic and relatively inexpensive. EVs have the ability to trigger innovation, create new and advanced domestic manufacturing industries, which in turn boost job growth and ultimately foster economic development.

Over the past two years, markets for EVs, including two- and three-wheelers, have witnessed an impressive growth worldwide according to an IEA report². This increase has been in terms of sales, with over 550,000 vehicles being

sold worldwide in 2015 representing a 70% growth relative to the year 2014, as well as in terms of the number of vehicle models being offered. All this has been possible thanks to policy support. However, advancements have been concentrated in a relatively limited number of EVs markets: the United States, the Netherlands, Norway, the United Kingdom, Japan, Germany, France and China³. Except for China, the rest of the countries belong to the so-called: 'developed world'.

So what about developing countries?

Figure 3: EV sales and market share in a selection of countries and regions, 2015



Source: IEA, Global EV Outlook 2016, Beyond one million electric cars, 2016

An electric start

The challenges posed by transportation in developing countries are unprecedented. When developed countries were building their transportation infrastructure, their populations were significantly smaller compared to those in today's developing world. Similarly, vehicle ownership rates in developing nations are lower when compared to developed ones. Motorization is increasing rapidly. Limited infrastructure and institutional capacity are being stretched to their limit with populations' rates growing at a fast pace.

The problems are not uniform – each city and country faces different circumstances – but all countries seem to display the same types of barriers with different levels of intensity. These can be grouped into three main categories: Policy, Infrastructure and Grid requirements.

Firstly, developing countries still lack concrete and comprehensive support regimes, in the form of regulatory policies to frame the EVs market and boost its development. Policy interventions include introducing policy instruments to promote EVs, setting up infrastructure, incentivizing automobile manufacturers to produce EVs, and inducing consumers to switch to EVs. Having a comprehensive view of the status and potential of the regional renewable energy industries as a source of power for EVs could act as a starting point for any policy/regulatory intervention.

Secondly, EVs macroeconomic and infrastructure challenges are a major impediment to market development specifically in developing countries: EVs require a well-functioning road infrastructure, which is often lacking in the developing world, and having the possibility of installing the hardware and software charging

infrastructure, which ensures energy is transferred from the electric grid to the vehicle.

Thirdly, the adoption of EVs adds additional requirements on the grid. Charging EVs causes the grid and generating capacity to be heavily loaded during

Despite these barriers, expanding electric mobility in developing countries can offer environmental benefits.

times when domestic power consumption is traditionally rather low, and in places where such quantities of power are not currently available. Grid systems in developing countries do not have the power infrastructure to carry capacity to deal with this extra need of energy simultaneously.



Despite these barriers, expanding electric mobility in developing countries can offer environmental benefits. Most cities in developing countries have severe air pollution problems caused by a significant number of old and inefficient vehicles on the road. Electric vehicles, coupled with broader clean transport and urban development strategies, can be key in reducing emissions from the transport sector and achieving climate change goals.

EV deployment can also be seen as a key component of wider targets for developing local renewable energy technologies and clean energy solutions. Lastly, the development of EVs could be seen as a critical social opportunity and serve wider social development objectives. Local automobile manufacturers and industries can be developed, which would lower the reliance on imported EVs. Most importantly new jobs could be created boosting local economic and social development.

Customized electric rickshaws in Comilla, Bangladesh. Source: Tawsif Salam

Regional realities – driving back seat or front seat?

Asia

In Asian markets there clearly is a trend towards electric two- and three-wheelers. They are often the primary means of transportation for low income people, because they are cheap, easy to operate and can navigate crowded conditions more smoothly than a full-size car.

An emblematic example of the Asian market's development of electric two-wheelers is China, which is by far the major market for electric two-wheelers, currently representing about 40% of the Chinese two-wheeler stocks⁴. With the expansion of urbanization, motorization has been challenging the country through traffic jams, as well as through air and noise pollution. In this context, electric

two-wheelers serve as a high level mobility alternative. These vehicles present an affordable alternative to private car ownership, with a lower environment impact. Additionally, they are more flexible and efficient for personal use, standing in contrast to public transport systems. Two wheelers can circulate easily through congested streets and can be charged easily both outdoors, through traditional charging stations, as well as indoors, as they often have a removable battery. Finally, they have one of the lowest emissions of any type of motorized transportation.

The rise of electric two-wheelers has been stimulated since 1999 by govern-

ment policies, which were drastically banning conventional two-wheelers in urban areas. However, two-wheelers are not left without critics, and the correct implementation of regulations for their production and operation is still questionable. In particular, their increased speed, power and size creates a three-fold problem: i) confusion about how to classify (bikes or motorcycles?) and regulate them; ii) safety concerns, as they drive beyond speed limits and they are noiseless, thus less noticeable; and iii) diminished environmental benefits, related to their uncontrolled number in the roads, as well as to the lack of regulations in the recycling of the vehicles' batteries.

Africa

Transport is a perpetual problem in Africa: bumpy and potholed roads, unhealthy transport solutions, lack of accessibility, improper planning, an increase of privately owned cars, unreliable power supplies, and poor (if not inexistent) infrastructure. These are just a few examples of the basic problems that the whole continent is facing when it comes to transportation. In this challenging context, mass transport, complemented by cycling and walking, is the best option for getting around.

It is not surprising then that there are indeed strong doubts about whether Africa is ready for EVs.

Out of all the continents, Africa has the least activity surrounding EV development, despite the potential benefits it may bring to its population. In recent years some African countries have shown signs

of development toward EV adoption, however, these isolated cases exemplify the necessity of solid policy frameworks.

In 2014, a large French investment company introduced electric busses in Cameroon. These run on renewable energy produced by solar panels connected to Lithium Metal Polymer (LMP) electric bat-

teries, enabling solar energy to be stored and used 24/7. Similarly, Uganda produced its first solar-powered bus earlier this year. The bus prototype was developed by Kiira Motors Corporation, a local automobile manufacturing company, with hopes of expanding production and generating local employment.

Kayoola Solar Bus Launch, Uganda. Source: Malaika Media Uganda





Islands

Islands lend themselves perfectly to electric vehicle technology.

Most island regions in the world are extremely dependent on fossil-derived resources for their socio-economic development. Imported petroleum-derived fuels can represent up to 98% of the primary energy use in island nations. In this context, the development of EVs can act as

driver to increase renewable energy penetration. Electric vehicles have a range of around 70 miles per charge, which is sufficient for most transportation needs in island nations.

Barbados stands as the best case study for EVs in the Caribbean region. Barbados is a relatively small, flat island with a great abundance of solar and wind energy

Electric car Nissan LEAF.
Source: Megapower

throughout the entire year. Despite this, the country is 100% reliant on imported petroleum products. As such, EV development is a compelling political, environmental and economic case. Barbados' first EV enterprise began in 2013 by a local, privately-owned company called Megapower which started importing and selling EVs. Currently, there are 160 privately owned EVs on the road and 40 charging stations installed throughout the whole island.

Despite improvements and plans to expand adoption, full EV deployment faces significant barriers in public policy institutions. There is still some reluctance within the government which has yet to fully embrace EVs, seeing them as a luxury items rather than an opportunity for development. As these products are not incentivized, and the upfront costs and taxes on high weight imported cars are high, the shift towards EVs presents many obstacles.

Latin America

The transport sector is one of the largest sources of energy-related emissions in Latin America, and while their EV market is still at an incipient stage, these vehicles are becoming a critical element in many of the countries' transportation agendas. Energy production in Latin America is generally very clean, as it relies on hydro-power and limited coal-fired generation, strengthening the environmental case for the adoption of EV technologies in the region.

Colombia is a representative example of this expansion and one of the leaders in the region in widespread EV adoption. Since 2012, the country has undertaken significant efforts to develop sustainable transportation, both in creating a solid policy framework and strategy, as

well as electrifying the country's fleet of buses and taxis. Despite challenges related to infrastructure and bureaucratic hurdles, this plan is particularly promising for the reduction of GHG emissions, as Colombia's electricity is primarily generated from hydraulic energy. Private light

duty vehicles are projected to increase in Colombia's vehicle fleet from 16% in 2009 to 36% by 2040⁵, and the country is currently planning to go beyond public transportation and expand to private adoption of EVs.

Charging station for electric taxis in Salitre, Colombia.
Source: Bogota.gov.co



A Practical Guide to boosting EVs development and deployment

There are 3 critical elements that local governments must address to boost EVs adoption:

1. Policy & regulatory framework

Policy-makers need to show a stronger commitment to creating favourable legislative and regulatory frameworks for EVs. Fiscal measures are needed because EVs still have high up-front purchase prices compared to internal combustion vehicles (ICVs) and most of consumers cannot afford one. Even if EVs offer long-term fuel saving opportunities, most consumers do not have a long-term mind-set. They tend to focus on current-gain maximization and heavily discount future cost savings. Subsidies, upfront grants and tax exemptions can help them to afford an EV and foster a future-oriented perspective. Because the


industry is still in a state of infancy, EVs should be granted favourable treatment through reduced licensing requirements or sales tax incentives in order to be able to compete with ICVs.

2. Infrastructure and grid

Massive investments will be needed not only to provide developing countries with adequate infrastructure to support smooth flowing of vehicle traffic, but also to re-shape urban space and how the cities are evolving. Installing charging infrastructure should go hand in hand with grid reconstruction, as well as modernization and transformation for the inclusion of renewable energy sources into the electrical mix. This is

where governments and institutional investors can come in to back large scale and long-term investments into EV infrastructure.

3. Informed customers

Designing policies to target the industry at large is just one part of the story. Specialized forums such as workshops between policy-makers and industry groups can serve to fast-track effective policies. Similarly, detailed information on the life cycle costs and environmental benefits should be made available to consumers to familiarize them with the beneficial aspects of the technology. 



Electric vehicle in Agra, India.

Notes:

1. Data from the United States Environmental Protection Agency (EPA)
2. IEA, Global EV Outlook 2016, Beyond one million electric cars, 2016. Available here: https://www.iea.org/publications/freepublications/publication/Global_EV_Outlook_2016.pdf
3. IEA, Global EV Outlook 2016, Beyond one million electric cars, 2016. Available here: https://www.iea.org/publications/freepublications/publication/Global_EV_Outlook_2016.pdf
4. IEA, Global EV Outlook 2016, Beyond one million electric cars, 2016. Available here: https://www.iea.org/publications/freepublications/publication/Global_EV_Outlook_2016.pdf
5. Ministry of the Environment and Sustainable Development "Colombia MRP Preparation phase: outline of progress," Government of Colombia, May 2013.



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