Conclusions and Recommendations

Transport

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Energy Transition Hub

Roadmap for a climate-neutral, sustainable Ukrainian energy sector and its role in an integrated EU energy market

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Transport

The transport of people and goods is a mainstay of any society and economy. The faster and more efficiently it can be carried out, the more it facilitates a wide range of valuable activities. Transport infrastructure can also have a strategic value, as has been amply demonstrated by the heroic performance of Ukrainian railways in conveying people and goods – not least refugees, soldiers, and army equipment – around the country during wartime, especially after Ukraine's airspace was closed by the Russian invasion.

A country's economy cannot reach its full potential in terms of progress and prosperity without efficient transport infrastructure. For individual needs, this in most cases means passenger vehicles and ample roads within and between cities. However, everyone having their own personal vehicle which is used for most purposes can come at great cost in terms of efficiency, space, human health, climate, and building & maintenance expense. Where it can practically be built and maintained, comfortable and efficient public transport for individuals and rail for cargo can free up streets and freeways for situations where road transport is preferable, saving time and cost for individuals and society at large.

In situations where transport takes place via road, it should be decarbonized when possible to minimize effects on human health and the climate. There are essentially four options for decarbonizing road transport: battery-electric vehicles (BEVs), fuel-cell vehicles (FCEVs), vehicles with hydrogen-combustion engines and conventional combustion engines that use synthetic fuels – so-called e-fuels. There are major differences between these applications in terms of efficiency.

	[kWh_{el}]	Drive Technology [%: Utilisation rate]			Drive energy [kWh]
Battery electric vehicle (BEV)	1	Battery charge 95%	Battery discharge 90%	E-motor 90%	0.75
Fuel cell electric vehicle (FCEV)	1	Electrolysis 65%	Fuel cell 55% el.	E-motor 90%	0.3
Vehicle with H_2 combustion engine	1	Electrolysis 65%	Internal combustion engine 30%		0.2
Diesel vehicle with eFuels	1	Electrolysis 65%	Fischer-Tropsch synthesis 56%	Internal combustion engine 40%	0.15

Power · Hydrogen · eFuel

Comparison of average utilization rates of propulsion technologies (transport losses are not taken into account)

The use of BEVs is usually recommended for passenger cars, but they are impractical for long-distance truck traffic, which carries heavy payloads across long distances, requiring batteries to be very large and heavy, or recharging stops to be very many. Ukraine has a relatively low density of population and high distance between economic centers, which would make this impractical. For instance, Kyiv is almost 500 kilometers or 300 miles from the second and third largest cities in Ukraine (Kharkiv and Odesa). This cannot be covered with today's BEV trucks without a charging stop, and exports, for instance, would have correspondingly larger distances to go. Charging processes for FCEVs are roughly the same as for conventional vehicles, but significantly quicker (depending on the available charging infrastructure).

The extent to which future advances in battery technology will make up for these disadvantages is difficult to foresee. It is equally hard to predict whether fuel-cell vehicles or conventional trucks with synthetic-fuel drives will prevail in the future. The benefits of FCEVs are that they produce no local emissions of polluting nitrogen oxides or carbon dioxide, and are less noisy, while enjoying lower fuel costs and less maintenance, as electric motors have fewer moving parts than internal combustion engines. The advantages of conventional trucks are the broad availability of refueling and maintenance infrastructure, and lower upfront purchase costs. The future cost and availability of synthetic fuels are as yet uncertain, however. Hydrogen can also be expected to have some role in the decarbonization of road transport, but the precise extent cannot be predicted right now.

Recommendations

The streamlining, expansion and decarbonization of different types of transport will be crucial to Ukraine's postwar recovery and future prosperity. This should be bolstered by the deployment of innovative regulatory and financial instruments. Immediately after the war ends, the country should **repair its existing railroad network**, and ensure that its long-term strategies (such as the Energy Strategy of Ukraine until 2050 or the National Transport Strategy of Ukraine 2030) **foster public-transport** coverage and usage. It should also interlink **city planning** with sustainable transportation and put in place measures which support the **electrification** of individual transport and logistics. In the medium and long term, Ukraine should advance the **electrification of the railway** system and promote **green fuels** for non-electrifiable activities, as well as facilitate the use of vehicles which do not have combustion engines by, for instance, increasing the **availability of charging stations**.

The financial tools that can be deployed to bolster the use of modern and sustainable transport include:

- **municipal bonds** issued by local governments to fund local transportation infrastructure projects, such as public-transit systems and local infrastructure improvements;
- multilateral and bilateral financing through collaboration with **multilateral development banks** (World Bank, EBRD, EIB) and national development banks and agencies, e. g. KfW and USAID, which can provide access to loans and grants for transport projects;
- **public-private partnerships**, which can help mobilize private sector capital and expertise for transport infrastructure projects – private partners can invest in the construction, operation, and maintenance of transport facilities, such as toll roads or public transit systems, in exchange for revenue-sharing agreements;
- **green bonds**, which are an effective way to finance sustainable transport projects that prioritize reducing emissions and enhancing environmental sustainability; and
- **microfinance and crowdfunding**, which are suitable for smaller-scale transport transition projects, or initiatives focused on community-based solutions, microfinance and crowdfunding platforms.