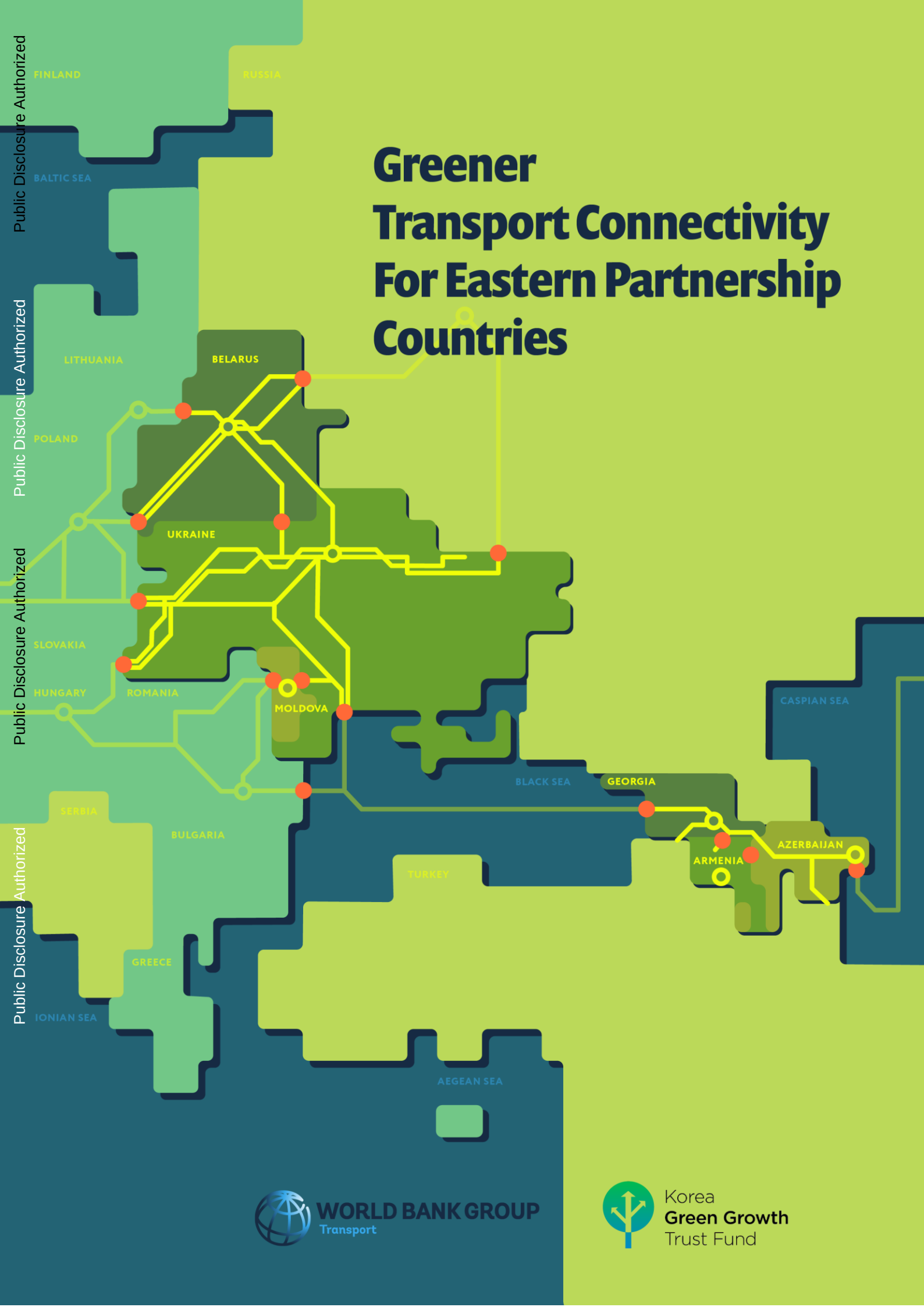
# Greener Transport Connectivity For Eastern Partnership Countries

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# Greener Transport Connectivity for Eastern Partnership Countries

Compiled by the World Bank
in collaboration with:

Integrated Transport Planning Ltd

Funded by:

Korea Green Growth Trust Fund

June 2020

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# Acknowledgment

This report was funded by a generous grant from the Korean Green Growth Trust Fund. It was prepared by a World Bank team led by Megersa Abate (Transport Economist, Task Team Leader) and Antonio Nunez (Co-Task Team Leader, Senior Transport Specialist), including Winnie Wang (Senior Transport Specialist), John A. Rogers (Senior Climate Change Specialist, Consultant), Chiara Amato (Consultant), Jamie Lee-Brown (Consultant), Elena Lungu (Transport Specialist), Nijat Valiyev (Senior Transport Specialist), Amali Rajapaksa (Senior Transport Specialist), Yevhen Bulakh (Transport Specialist) and Nora Mirzoyan (Consultant). The technical work in this report was developed by a team of consultants from Integrated Transport Planning (ITP) led by Nick Ayland, David Brenig-Jones, Robin Kaenzig and Alberto Brignone.

The report benefited from the comments of Peer Reviewers: Andrew Losos (Sr. Transport Specialist), Nick Bowden (Climate Finance Specialist), Matias Herrera Dappe (Sr. Transport Economist) and Jinseo Park (Senior Transport Specialist).

The Team is grateful for the guidance provided by Sebastian-A Molineus (Country Director), Alexander Kremer (Country Manager), Karla Gonzalez Carvajal (Practice Manager), Fiona Collins (Lead Transport Specialist), Cecilia M. Briceno-Garmendia (Lead Economist), Aymen Ahmed Osman Ali (Senior Transport Specialist), Baher El-Hifnawi (Program Leader) and Abdulaziz Faghi (Program Leader). The World Bank team would like to thank its counterparts in all the six Eastern Partnership countries for fruitful discussions, consultations, ideas and access to data and information. The Team also thanks group of experts at the Korean Transport Institute and other development partners in South Korea for providing insightful comments and recommendations, and the KGGTF staff Eun Joo Allision Yi (Program Manager) and John Hsung Lee (Operations Officer) for their guidance and support during implementation.

# Acronyms and Abbreviations

| | |
|---|---|
| BRI | Belt and Road Initiative |
| CDM | Clean Development Mechanism |
| CIF | Climate Investment Fund |
| CNG | Compressed Natural Gas |
| CTC | trans-Caucasus Transit Corridor |
| CTF | Clean Technology Fund |
| E5P | Eastern Europe Energy Efficiency and Environment Partnership |
| EaP | Eastern Partnership |
| EBRD | European Bank for Reconstruction and Development |
| EIB | European Investment Bank |
| ETS | Emission trading scheme |
| EU | European Union |
| EUR | Euro, currency |
| EV | Electric Vehicle |
| GCF | Green Climate Fund |
| GDP | Gross Domestic Product |
| GEF | Global Environment Facility |
| GFEI | Global Fuel Economy Initiative |
| GHG | Greenhouse gas |
| IDBs | International Development Banks |
| IFI | International Financial Institution |
| IKI | Internationale Klimaschutzinitiative |
| IRI | International Road-roughness Index |
| ITP | Integrated Transport Planning Ltd |
| ITS | Intelligent Transport Systems |
| JI | Joint Implementation |
| KGGTF | Korean Green Growth Trust Fund |
| MAC | Marginal Abatement Cost |
| NDC | Nationally Determined Contribution |
| NF | Nationally Appropriate Mitigation Actions Facility |
| NMT | Non-motorised transport |
| ODA | Official Development Assistance |
| SDG | Sustainable Development Goal |
| TA | Technical Assistance |
| TENT-T | Trans European Transport Network |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USD | United States Dollar, currency |
| VER | Verified Emission Reductions |

# Executive Summary

The Eastern Partnership (EaP) is a joint policy initiative, which aims to deepen and strengthen relations between the European Union (EU) and its six Eastern neighbours, Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. One of its four priority areas is **Stronger Connectivity** which includes the extension of the Trans European Transport Network (TEN-T) to the EaP region. On the policy front, it aims at achieving regulatory convergence across transport modes between member countries and with the EU to heighten the focus on energy efficiency and combat climate change.

The EaP countries experienced a large shock to their economies following the end of the Soviet Union in 1989. Even in 2019, their average GDP per capita is one-tenth of the EU average of EUR 28,000. To address this gap, the EaP is looking to strengthen economic growth through enhanced transport connectivity. At the same time, EaP countries are acutely aware of the need to converge with the EU in terms of energy efficiency, environment and climate change goals.

The EU is currently formalising its European Green Deal, which is a roadmap for making the EU's economy sustainable. In the transport sector, it aims to reduce greenhouse gas (GHG) emissions by 90% before 2050. EaP convergence would imply significant and timely investment outlays and prioritised policy actions. To date, however, the EaP countries have enabled very few policy actions to decarbonize transport and have assigned little funding.

Through the 2015 Paris Climate Agreement EaP countries commit to act to limit global warming to less than 2ºC above pre-industrial levels, and preferably 1.5ºC. This requires the complete decarbonization of transport, and all other sectors, by 2070 to meet 2ºC. or by 2050 for 1.5ºC[1]. The challenge should not be understated. As such there is an urgent need to begin decarbonization of the transport systems in the EaP for three reasons; i) to enable timely alignment with a zero-emission pathway, ii) to avoid a widening of the technological and regulatory gap with the EU, iii) to realise the significant economic and social benefits that green policies deliver on.

The objective of this study is to assist decision-makers in prioritizing strategic transport policies and infrastructure investments. It develops the evidence base and prioritisation framework for improving the transport sector of the region including improved energy efficiency and sustainability so that it is not left behind by advances in the EU. The methodology includes a strategic link-based transport model with a fleet and emissions model that covers the EaP and neighboring countries over a timeframe of 2017 to 2050.

The study has also developed an online visualization tool[2] to help policy makers explore and use the results of the modelling exercise. This is a powerful open source tool which can be re-deployed to visualize and analyze model results from other transport studies. This will help to

[1] IPCC 2018, *SR15 Global Warming of 1.5ºC*
[2] The tool is to be found at http://www.greenconnectivity.net/map/

communicate results from transport models, thereby building trust and encouraging the use of models in decision making.

The study team had close engagement with government agencies and other active stakeholders in each country to form a good representation of national priorities and the sustainable transport initiatives to be developed. For each evaluated policy package, the investment costs were calculated, and the economic and environmental impacts of implementation were modelled. A key output of this study is the development of investment proposals tailored to each EaP country, with projects prioritised based on alignment with economic and environmental objectives. The implications on government spending of the increased investment are contextualised against existing limitations of investment budget and borrowing constraints. The primary sources of finance are identified with a focus on the possible role of climate finance in leveraging investment from other sources.

## Transport connectivity challenges

Inadequate road conditions, rail and port capacity limitations, and border crossing delays severely limit the level of transport connectivity, and consequently, the size of the market that each EaP country can access. In 2019, the typical delay incurred by freight at borders was 5.8 hours. Poor road conditions contribute to long travel times. These are prevalent in central Ukraine, throughout Moldova and on Armenia's links to Georgia and Iran.

The railway network in many EaP countries is extensive but has low capacity and low travel speeds. All EaP countries operate on the broad track gauge, while bordering EU countries, Turkey and Iran operate on standard gauge. Much of the rail infrastructure and signaling equipment is old, especially in Ukraine, Georgia, Armenia, and Moldova, limiting both capacity and speed. There is also a general lack of technology to track trains, wagons, and conduct efficient timetabling which adversely impacts system capacity. Slow custom processes, old machinery and slow loading processes extend transshipment times to as long as 24 hours. In Ukraine, the critical ports of Odessa, Mykolaiv, Kherson and Mariupol are located within urban areas which restrict their ability to grow and operate.

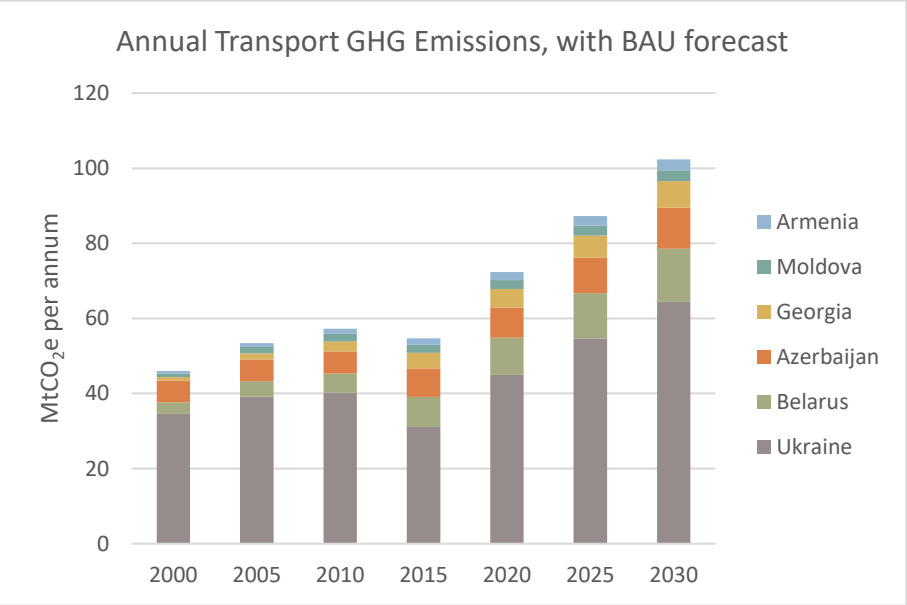
## Transport sustainability challenges

National government forecasts project transport emissions in the EaP to nearly double between 2015 and 2030 to over 100 million tons of $CO_2e$ per year (Figure 0-1). Modelling conducted by this study also forecasts local air pollutants from transport to increase by 10% by 2050 despite the adoption of modern EURO emissions standards. This may undercut government efforts to tackle poor air quality which is particularly prevalent in Armenia, Azerbaijan and Georgia.

Freight traffic is expected to increase by 30% to 50% by 2030 depending on country, and car ownership is expected to double as EaP countries begin to converge toward the EU average

of 503 cars per 1,000 people. Rising private transport activity will present tremendous pressures (both economic and environmental) caused by increasing congestion unless corrective policies are implemented. While the efficiency of vehicles will improve, this is not expected to outweigh the growth in activity (vehicle-km) in the Business as Usual (BAU) scenario. Therefore, even though average emissions per vehicle-km will drop, total emissions will increase unless additional policies to decarbonize passenger and freight traffic are implemented.

**Figure 0-1: Annual transport GHG emissions, forecast to 2030**




Source: National Government submissions to UNFCCC, with additional projections from Gota et al 2018, *Decarbonizing Transport to Achieve Paris Agreement Targets*

## Transport infrastructure investment challenges

Capital investment in transport infrastructure lies at 2 percent or less of national income in all EaP countries. While this is not out of line with the EU average, the extent and quality of their transport networks lag the EU, and thus would need higher investment in new infrastructure to catch-up. Maintenance expenditure sits below the EU average in all countries except Moldova. Inadequate maintenance can lead to deterioration of the existing infrastructure. To converge to EU's standards, the EaP region would have to allocate significant funding and take timely and prioritised policy actions.

The COVID-19 pandemic will make these investment challenges even more acute. According to recent estimates, worldwide $7.3 trillion has been allocated for rescue and recovery spending[3]. This presents a great opportunity to fund a 'green recovery', but so far only 4% of

[3] Hepburn, C., O'Callaghan, B., Stern, N., Stiglitz, J. and Zenghelis, D., 2020. *Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?. Oxford Review of Economic Policy, 36.*

the recovery money has been allocated to 'green' projects, as reported by Hepburn et al (2020). Therefore, there is significant risk that such spending will instead divert resources away from the longer-term objective of transitioning to a green economy. In response the green connectivity policies presented by this study can be used as part of a green recovery from COVID-19 by delivering economic growth while improving health and reducing emissions.

# Greener connectivity solutions

The study formulated two groups of policies: i) those with a focus on improving transport connectivity without increasing GHG emissions, and ii) those with a focus on emissions reduction, improving sustainability and reducing energy consumption.

## Connectivity policy analysis

The study tested strategies to tackle infrastructure and policy constraints and significantly improve regional and international connectivity. It took into account the regional policy of the EU under the TEN-T plans, segments of the Belt and Road Initiative (BRI), national strategies for each of the EaP countries and international best practices.

The policies finally selected are shown in Table 0-1 together with the study's baseline of the Indicative TEN-T plan adopted by the EaP in 2018[4]. The priorities combined the findings of extensive in-country consultation to match each country's short- and long-term planning priorities, with a multicriteria assessment. The aim was to promote efficient choices concerning mode shift and vehicle fleet composition, while improving road and rail connectivity, minimising travel delays and travel time, both across the region and with the major trading partners. Each policy package was ranked according to its economic and environmental impact, to provide a prioritised investment plan for each country.

[4] World Bank 2018, *Indicative TEN-T Investment Action Plan*

**Table 0-1: Description of connectivity polices**

| Policy | Description |
|---|---|
| TEN-T investment action plan | Priority TEN-T projects identified by the World Bank and EC in 2018. |
| Rail package | An upgrade of specific international TEN-T rail corridors including (i) dualling, electrification and speed improvements (ii) minimisation of delay at rail border control points, and (iii) gauge adaption measures. |
| Enhanced rail package, includes signal and logistic improvements | As above with (i) Signal and timetable improvements on all TEN-T rail links, (ii) 13 new multi-modal logistic centres with fast road-rail transhipment time and minor upgrades to all rail loading stations; and (iii) Enhanced rail access at TEN-T ports. |
| Toll roads in Belarus and Ukraine | Upgrade of critical highways in Belarus and Ukraine to dual carriageway with free-flow speeds of 130kph and installation of emissions differentiated tolling system |

The expected aggregate economic impact of these connectivity policy investments is substantial (Table 0-2). Even the do-minimum scenario, which is the TEN-T investment action plan, generates savings of up to 2% in travel time by 2030. Adding the policy packages defined in the current study, which consist of road and rail upgrades, port expansion, logistic centres and border improvements will result in up to 22% reduction in travel time and will shift up to 7% of passengers and freight to rail.

**Table 0-2: Impact of connectivity policies across the EaP, in 2030**

| Policy | Change in travel time | | Change in travel cost | | Increase in market access | Road to rail shift | | NOx emissions | GHG emissions |
|---|---|---|---|---|---|---|---|---|---|
| | Pass. | Freight | Pass. | Freight | | Pass. | Freight | | |
| Impact measured across all EaP countries | | | | | | | | | |
| Investment Plan (Do-minimum) | -2% | -1% | -1% | -0% | Small | 0% | 0% | 0% | 0% |
| Rail package: tracks & borders | -20% | -12% | -12% | -4% | High | 7% | 7% | -0.8% | -1.1% |
| Enhanced rail package, incl. signals & logistics | -21% | -17% | -13% | -5% | High | 7% | 7% | -0.3% | -1.4% |
| Impact measured in Belarus & Ukraine only | | | | | | | | | |
| Toll Roads in Belarus and Ukraine | -2% | -1% | -2% | -1% | Medium | 1% | 1% | -2.6% | -2.4% |

## Sustainability policy analysis

To the above connectivity measures, a set of green policy packages were added to reduce energy consumption together with local and GHG emissions (Table 0-3). Together all the policy packages could reduce GHG emissions over the period of 2020 to 2050 by 726 million tons of $CO_2e$ at an economic cost of minus €40 per ton of $CO_2e$. This negative economic cost signifies that there is a net benefit to society of investing in these policy packages in which any increase in initial investment is more than offset by fuel, operating cost and emissions savings. Much of the savings accrue to the transport operators and should result in more competitive transport fees, which in turn have a positive economic impact. However, several of the packages do require a higher initial investment than the alternative baseline scenario. Many of the economic benefits are accrued by the rail improvements - if these were not implemented, the economic cost of mitigation is minus €2.6 per ton of $CO_2e$.

The principal measures that reduce emissions are the promotion of electric vehicles, urban transport improvements, road freight improvements, fleet renewal of cars, buses and trucks and road user charging. Together, these five measures account for 84% of the achievable GHG emissions reduction. Four of the five measures have a marginal abatement cost of under €11 per ton of $CO_2e$. Urban transport improvements have a higher cost but generate many economic and social benefits that cannot be easily quantified in this metric.

**Table 0-3: Achievable mitigation and marginal abatement cost by policy package**

| Policy Package | Mitigation 2020-2050 (Mt $CO_2e$) | €/ton $CO_2e$ |
|---|---|---|
| Electric vehicle promotion | 217 | (2.5) |
| TEN-T road user charging | 179 | (0.4) |
| Urban transport improvements | 172 | 28.2 |
| Road freight improvements | 138 | (59.9) |
| Fleet renewal: cars, buses, trucks | 118 | 10.6 |
| Eco driving, ITS and speed limits | 86 | 2.8 |
| Select toll roads | 38 | 9.3 |
| Rail package: track & border upgrade | 23 | (1474.7) |
| Rail logistics improvements | 3.0 | (567) |
| Rail signal improvements | 1.9 | (599.9) |
| Green port improvements | 0.2 | (1467.0) |
| Application of policies all together, considering interaction effects | **726** | **(40.0)** |

The mitigation potential and marginal abatement cost (MAC) in each country of reducing GHG emissions through each policy package are shown in Table 0-4. This table also indicates the degree of ownership of each policy package by the country - this assessment is based on an extensive review of strategy, plans and guidance produced by national governments, multilateral donor organisations and through in-country consultation with relevant ministries and development agencies (See chapter 6). The table shows, for example that the 'Rail package' has a high level of country ownership in Azerbaijan, Belarus, and Moldova and in two of these, the marginal abatement cost is singularly negative (it is more costly in Moldova). However, the highest mitigation potential is in Ukraine (of 8.6 million tons $CO_2e$) which also exhibits a very negative MAC but does not have the same degree of country support as in the other countries.

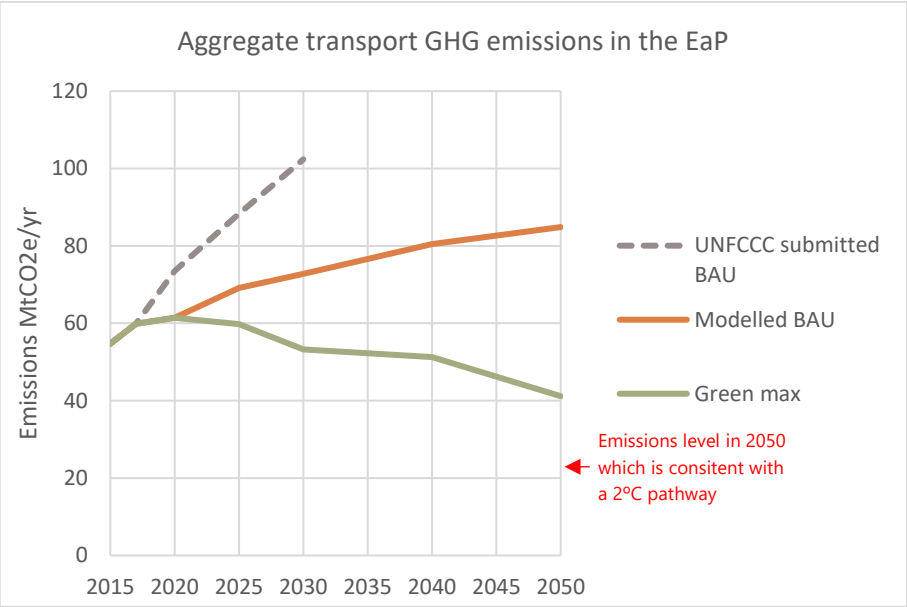
It is encouraging that the policy with the highest mitigation potential (promotion of electric vehicles) has a negative marginal abatement cost in all countries except Belarus where the higher motorization rate requires higher upfront costs. Urban transport improvements are uniformly more costly in all six countries (with a MAC in the range of €26 - 36 per ton of $CO_2e$). Whilst these cannot be justified solely on their ability to reduce $CO_2e$ emissions, their impact on transport systems in the metropolitan areas can be significant. Road freight improvements and fleet renewal of cars, buses and trucks have low marginal abatement costs in most countries which makes them highly viable for implementation.

**Table 0-4 - Mitigation potential and Marginal Abatement Cost of each policy, by country**

| Policy Package | Units | Armenia | Azerbaijan | Belarus | Georgia | Moldova | Ukraine |
|---|---|---|---|---|---|---|---|
| Electric vehicle promotion | Mton $CO_2e$ | 7.8 | 24.8 | 27.4 | 18.6 | 8.1 | 130.1 |
| | €/ton $CO_2e$ | (3.1) | (3.6) | 0.5 | (3.5) | (1.7) | (2.7) |
| TENT road user charging | Mton $CO_2e$ | 5.5 | 23.9 | 11.2 | 18.1 | 3.6 | 116.4 |
| | €/ton $CO_2e$ | 10.8 | (3.9) | 10.2 | (1.1) | 24.0 | (1.8) |
| Urban transport improvements | Mton $CO_2e$ | 5.4 | 18.2 | 18.9 | 8.6 | 4.5 | 116.1 |
| | €/ton $CO_2e$ | 30.2 | 30.1 | 36.4 | 27.8 | 30.3 | 26.5 |
| Road freight improvements | Mton $CO_2e$ | 2.8 | 12.3 | 15.2 | 7.6 | 6.0 | 93.9 |
| | €/ton $CO_2e$ | (37.6) | (61.2) | (13.6) | (75.2) | (68.0) | (66.2) |
| Fleet renewal: cars, buses, trucks | Mton $CO_2e$ | 3.9 | 14.0 | 15.6 | 9.2 | 4.9 | 70.4 |
| | €/ton $CO_2e$ | 8.2 | 4.6 | 21.7 | 7.3 | 13.1 | 9.7 |
| ITS, eco driving and speed limits | Mton $CO_2e$ | 2.7 | 9.9 | 11.3 | 6.4 | 3.6 | 51.8 |
| | €/ton $CO_2e$ | 28.7 | (4.3) | 9.0 | 8.0 | 14.8 | (0.0) |
| Toll roads in Belarus and Ukraine | Mton $CO_2e$ | N/A | N/A | 9.5 | N/A | N/A | 28.9 |
| | €/ton $CO_2e$ | N/A | N/A | 105.8 | N/A | N/A | (22.3) |
| Rail package: track & borders | Mton $CO_2e$ | 1.7 | 6.5 | 0.7 | 4.7 | 0.5 | 8.6 |
| | €/ton $CO_2e$ | 28 | (1059) | (5970) | (2463) | 13.9 | (1278) |
| Rail logistics improvements | Mton $CO_2e$ | 0.1 | 0.2 | 0.2 | 0.1 | 0.4 | 2.0 |
| | €/ton $CO_2e$ | 46.3 | (22.4) | (1188) | (216.7) | (169.3) | (670.7) |
| Rail signal improvements | Mton $CO_2e$ | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 1.7 |
| | €/ton $CO_2e$ | 1412 | 1430 | 0.0 | 701.8 | 1526 | (848.1) |
| Green port improvements | Mton $CO_2e$ | N/A | 0.2 | N/A | 0.0 | 0.0 | 0.0 |
| | €/ton $CO_2e$ | N/A | (48.7) | N/A | 0.0 | 0.0 | 0.0 |
| key | | | | | | | |
| Mitigation 2020 to 2050, Mt $CO_2e$ | 796 | | | | | | |
| Marginal abatement cost, €/t $CO_2e$ | (40.0) | Country ownership: | | | High | Medium | Low |

Figure 0-2 compares the modelled transport emissions with the emissions level in 2050 that could be needed to reach the global 2°C pathway, considering the same rate of decarbonization across all sectors. The combined impact of all policies, termed 'green max', is not sufficient to meet the 2°C pathway. Therefore more ambitious and novel policies that are not presented in this study are needed, unless emission reductions from other sectors can make up the shortfall. The European Green Plan is, however, more ambitious, and additional efforts would be required in the EaP to achieve convergence.

**Figure 0-2: Impact of the green max scenario in the EaP to 2050**




## Investment cost and benefits for connectivity and sustainability solutions

The scale of identified investment over the coming decade amounts to €41.6bn across all six EaP countries (present value of €28.9bn). This is comprised of €20.6bn for policies that focus on improving connectivity and €21.0bn for policies focused on enhancing sustainability, reducing energy consumption, local and GHG emissions. This represents a doubling of existing transport spend in the EaP over the next decade.

While the investment is large, so too are the economic benefits – the economic benefits could range from 0.3% to 3.5% of GDP while achieving substantial emission reductions and accommodating an overall increase in travel demand. Georgia would benefit the most from the improved connectivity policies (2.8% of GDP[5]) because its rail network is suited to upgrades which will help to serve passenger and freight growth. In contrast the costs to upgrade rail in Armenia and Moldova are high compared to the return.

Investment in policies focused on sustainability also have strong economic benefits, ranging from 0.3% to 0.9% of GDP in each country. This shows that investing in green transport will boost local economies in addition to delivering on social goals such as improved health and greater access to jobs and education.

[5] The scale of economic benefits are derived from the strategic transport model, drawing on time and vehicle operating cost savings. The full impact upon economic activity would be captured by a general equilibrium model which is outside the scope of this project.

**Table 0-5 - Green connectivity investment cost and benefit outcomes**

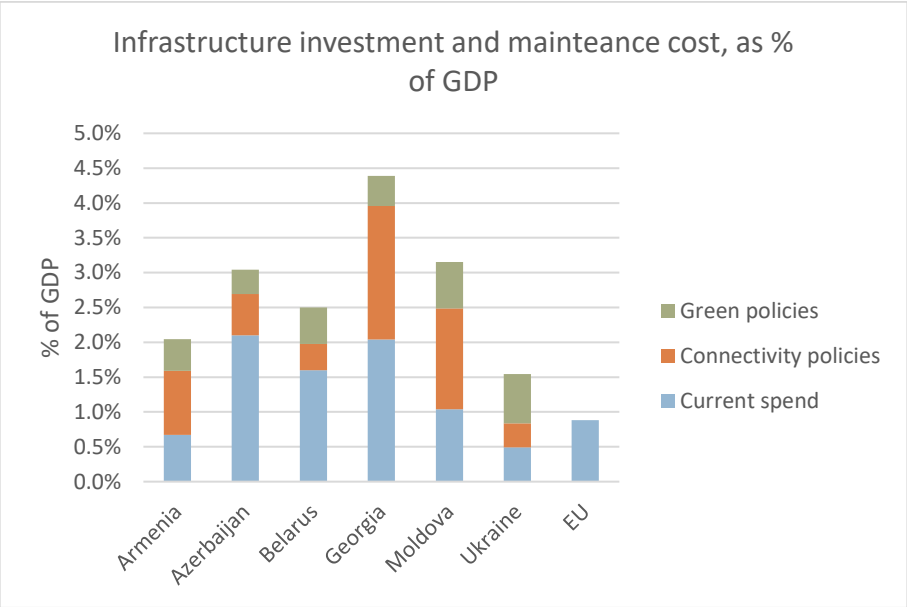
| Item | Units | Armenia | Azerbaijan | Belarus | Georgia | Moldova | Ukraine |
|---|---|---|---|---|---|---|---|
| Investments (2020-2030) | | | | | | | |
| Public investment Cost | € billion | 2.3 | 5.5 | 6.2 | 6.3 | 2.5 | 18.8 |
| Connectivity policies | € billion | 1.6 | 3.5 | 2.6 | 5.1 | 1.7 | 6.1 |
| Green policies | € billion | 0.8 | 2.0 | 3.6 | 1.2 | 0.8 | 12.6 |
| Economic impact on GDP (2020-2050) | | | | | | | |
| Economic benefits (discounted) | % of GDP | 0.3% | 1.2% | 0.7% | 3.5% | 0.7% | 1.4% |
| Connectivity policies | % of GDP | 0.0% | 0.7% | 0.4% | 2.8% | 0.0% | 0.5% |
| Green policies | % of GDP | 0.3% | 0.4% | 0.3% | 0.7% | 0.7% | 0.9% |
| Connectivity benefits (in 2030) | | | | | | | |
| Change in annual vehicle-kms, Cars and Trucks | % BAU | -7% | -13% | -5% | -11% | -10% | -11% |
| Change in travel time, Cars and Trucks | % BAU | -7% | -24% | -14% | -24% | -17% | -24% |
| Sustainability benefits (in 2030) | | | | | | | |
| Change in annual energy use | % BAU | -26% | -26% | -16% | -26% | -23% | -26% |
| Change in annual NOx emissions | % BAU | -26% | -27% | -18% | -27% | -22% | -27% |
| Change in annual PMx emissions | % BAU | -25% | -20% | -10% | -24% | -22% | -19% |
| Change in annual GHG emissions | % BAU | -26% | -26% | -18% | -28% | -23% | -29% |

The near-term benefits (in 2030) emerge from a reduction in travel time of 7 to 24%, which will widen market access, stimulate trade and promote agglomeration effects. Compared to BAU, vehicular traffic will reduce due to mode shift and higher occupancy. Energy use is expected to fall by 16% to 26% yielding lower costs for operators and enhancing energy security. The emission of local air pollutants would fall by 10% to 27% with the largest reductions experienced in Armenia, Azerbaijan and Georgia which today have the worst air quality in the EaP.

## Financing greener connectivity solutions

The prioritised investments are shown to bring economic and environmental benefits which far exceed their cost. Increasing levels of investment (Figure 0-3) will permit EaP countries to realise the economic benefits, meet binding environmental targets and to avoid further divergence with European neighbours.

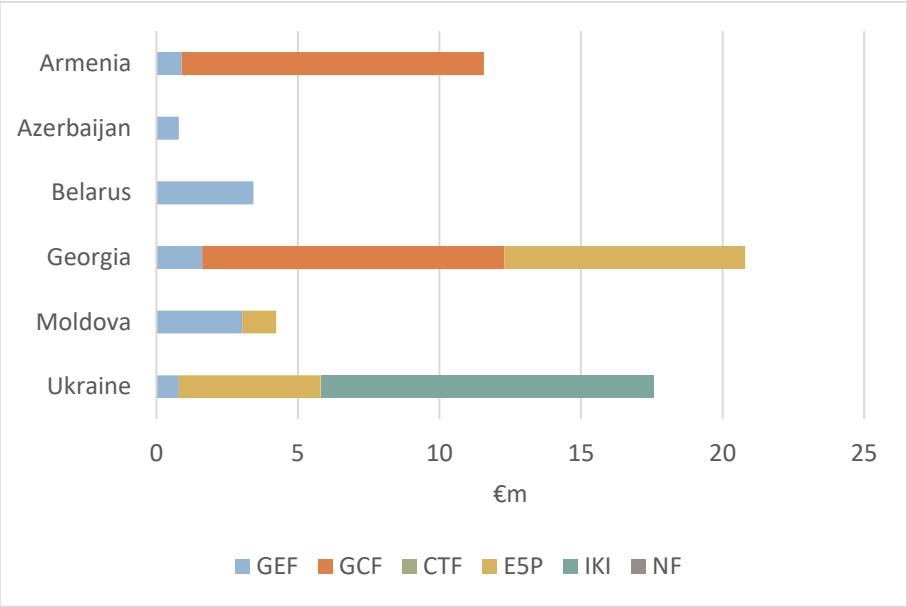
**Figure 0-3: Transport infrastructure spend, connectivity and green policies, as % of GDP**




Fiscal constraints present challenges to increasing national borrowing, limiting the scope for financing investment through traditional channels. As such, increasing the level of investment requires alternative, innovative sources of financing to be identified and leveraged. The environmental benefits of the prioritized 'green' transport initiatives offer the opportunity to attract climate finance. Indeed, the role that climate finance presently offers, and must increasingly play in delivering climate-conscious investment, presents a significant opportunity to enable financing to flow to prioritised green investments and to facilitate project implementation.

Climate finance has been used as a means of leveraging wider investment for a range of projects across different sectors within the EaP region, with a number of climate funds currently supporting mitigation and adaptation projects. However, as seen elsewhere in the world, support for transport related initiatives has been limited, with the transport sector under-represented in successfully accessing climate related financing. There are some limited examples of climate finance supported projects, or initiatives with a transport component, including green cities initiatives, freight efficiency and public transport fleet renewal. The value climate finance support attained for these projects totals €60m (see Figure 0-4), leveraging a further €220m in co-financing.

**Figure 0-4: Value of climate fund support for transport projects in EaP**

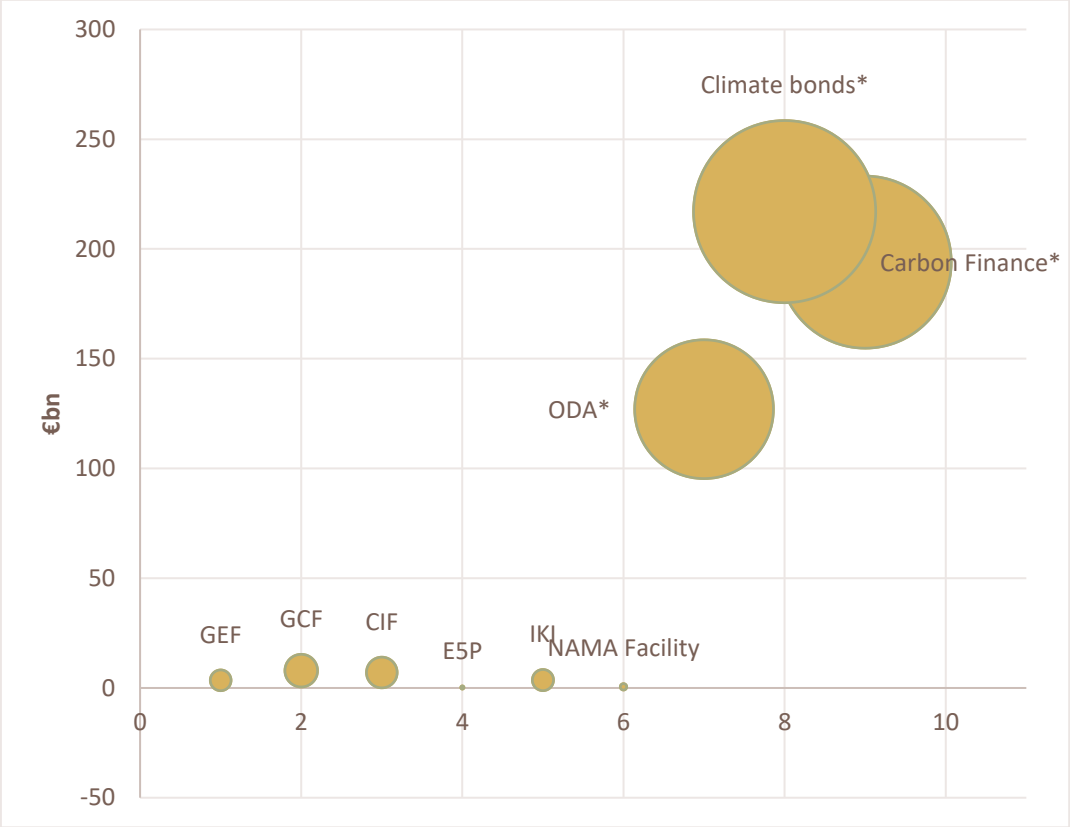



Source: Fund databases. Key: (GEF) Global Environment Facility, (GCF) Green Climate Fund, (E5P) Eastern Europe Energy Efficiency and Environment Partnership, (IKI) International Climate Initiative, (NF) NAMA Facility

Past success in accessing climate finance for transport projects is positive and provides established channels through which further support may be elicited. However, the pressing investment requirements necessitate a significant ramp-up in the level of support which green finance can bring to the region. The climate finance landscape is continually evolving, but international commitment to increasing the level of capitalisation of climate funds and accentuating the role that climate finance will play in supporting low-carbon development presents an opportunity for the EaP countries to tap into new and growing financing channels.

In addition to the main climate funds, the rapidly expanding role of climate bonds as a means of channelling private investment into sustainable investments and latest iterations of carbon financing mechanisms offer opportunity in the financing of transport investment (see Figure 0-5).

**Figure 0-5: Relative size of climate related financing streams worldwide**




* 2018 Net ODA flows, 2019 climate bond and carbon market size

Further review of the eligibility criteria for the different channels, disaggregation of portfolio by sector and the level of activity within the region provide an indication of the channels which may prove most fertile in the progression of the investment program. However, as the landscape evolves, it is important that the EaP countries conduct the necessary readiness activities to ensure that they remain well placed to leverage the new sources of finance as they emerge.

## Next steps and policy actions

As shown, there is a need to urgently begin decarbonization of the transport systems in the EaP to enable alignment with a zero-emission pathway, to avoid a widening of the technological and regulatory gap with the EU, and to realise significant economic and social benefits delivered by green policy.

The largest challenge for implementation is not necessarily the size of the financing required, but the speed at which governments and supportive International Financial Institutions can respond. An enabling environment needs to be created which empowers positive and joined-

up climate action at all levels of governance, from multi-national frameworks, such as the EaP, down to local authorities.

The findings from this study should be used to assist countries in this process in three ways:

1) For each country develop a national climate strategy and action plan for transport which is cohesive between EaP members and with the EU's Green Deal. Georgia has developed a '2030 Climate Action Plan' which could serve as a template.
2) Collaborate with climate funds and IFIs to create country programs that will enable significant and rapid inward investment.
3) Introduce enabling regulatory and institutional changes.

Specific actions include:

- Raising awareness within the EaP about the opportunity for decarbonized transport to improve connectivity, economic growth, health, and energy outcomes, using the visualization tool as a means of conveying the scale of impact achievable
- Working with EaP countries to deepen the analysis on green connectivity options to develop transport projects and programmes that are ready for financing. Conduct better project preparation to use demonstrable environmental and economic returns to entice and mobilize funding
- Supporting the EaP as a regional forum to coordinate strategy and cross-border implementation. Many policies rely on strong regional cooperation, for example reducing border friction, improving rail connections, and the establishment of an e-vehicle charging network that serves international trips.
- Advise on policy coordination between ministries responsible for transport infrastructure and the environment, and between local, regional and national government.
- Engage with the climate funds active within the EaP region, through identified the national institution/political partner agencies. Building on existing relationships with climate funds, IFIs, and supported programs within the region brings benefits in reduced lead times and greater understanding of the country's requirements and financing needs.
- Progress readiness activities to enable eligibility for financing including development of investment plan aligned to fund priorities, with the support of the identified implementing agency(ies)
- Advice on the adoption of EU directives such as the regulation of operators, vehicle inspections, technical standards and ecolabelling.

Significant early gains can be made through the revision of regulations and powers concerning transport in EaP countries. A set of enabling actions are presented at the end of chapter 8. Examples include reviewing the import regulations and tax regime for vehicle ownership, promoting public transport by facilitating e-ticketing and reviewing contract arrangements, and working to establish Integrated Transport Authorities within major cities that have the power to implement green transport interventions.

However, there are anticipated to be a number of complex policy decisions which necessitate consultation with the public, for example, the revision of fuel taxes. To assist in this space, a public dialogue should be promoted through national awareness campaigns that raise understanding of the climate crisis, potential solutions and their co-benefits. Furthermore, tools like deliberative democracy can be used to build public ownership of complex policy decisions.

Substantial assistance is needed to mobilise and lever innovative forms of finance. This includes engagement with the major climate funds to establish pathways to access support for green transport investments. Readiness activities are needed such as accreditation and the development of fund, and sector specific, country investment plans.

Expertise is also necessary to develop an enabling environment for the issuance of climate bonds as a component of national Sustainable Financing Roadmaps. It will also be necessary to identify and develop projects which present opportunities for private sector investment including revenue generating initiatives like road user charging and urban transport initiatives.

# 1. Introduction

1.1 The overall objective of this World Bank technical assistance (TA) is to boost economic growth in the six Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine) through the promotion of enhanced transport connectivity that also improves energy efficiency and decarbonizes the transport system. The TA was conducted in two phases with funding from the Korean Green Growth Trust Fund (KGGTF).[6] The first phase prioritized green transport investments and polices based on their ability to boost connectivity and reduce greenhouse gas (GHG) emissions. The second phase assessed the investment cost of these schemes and their fiscal implications in each of the Eastern Partnership (EaP) member countries.

1.2 The World Bank compiled this report, which summarizes both phases of the TA, in consultation with the six EaP countries and in collaboration with Integrated Transport Planning Ltd (ITP) which undertook the underlying technical analysis. It intends to assist decision-makers in prioritizing strategic transport policies and infrastructure projects based on their connectivity benefits and potential to reduce GHG emissions. For those projects and policies that are prioritized, the report assesses the use of both traditional and innovative instruments to finance them.

1.3 The report is structured in the following way:

- **Chapter 2** introduces the Eastern Partnership and its key objectives as well as the study methodology and the online model visualization tool that has been developed
- **Chapter 3** describes the socioeconomic background of the EaP, trends in GHG emissions, and the role of international transport strategy such as the TEN-T network and the Belt and Road Initiative
- **Chapter 4** looks at the demand in the EaP for improved regional and international transport connections to promote trade and economic growth. It identifies the key constraints in the transport network, and assesses policies to improve connectivity while reducing emissions
- **Chapter 5** assesses the impact of applying best practice green transport (low emission) policies within the EaP. It identifies that these policies deliver significant emission reductions while delivering co-benefits in economic growth, energy security and health via improved air quality

[6] In a related TA, the WB, through the support of the European Commission, produced an "Indicative trans-European Transport Network (TEN-T) Investment Action Plan" that identified priority TEN-T investment in the EaP comprising 4,800 km of road and rail, six ports, and eleven logistics centres costing € 13 bn

- **Chapter 6** applies a high-level prioritization framework to the identified policy areas. This considers marginal abatement cost, country ownership and co-benefits
- **Chapter 7** discusses the traditional and novel financing options available, the importance of emerging climate funds, and the actions that will assist countries to secure the scale of financing identified
- **Chapter 8** identifies the next steps that lead toward implementation, including a set of near-term enabling actions

# 2. Study background

## Eastern Partnership

2.1 The Eastern Partnership (EaP) was launched in May 2009 to enhance the cooperation between the European Union (EU) and six countries in Eastern Europe and the Southern Caucasus: Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine (Figure 2-1). This partnership provides support to the six countries from the European Union and international financial institutions (IFIs). The Partnership focuses on four areas of cooperation: 1) robust governance, 2) economic development and market opportunities, 3) better connectivity, and 4) stronger society, including improved people-to-people contacts. The key objectives are expanded in Figure 2-2.

2.2 'Better connectivity' relates to the promotion of transport, infrastructure and the increased mobility of passengers and goods. It also addresses regulatory convergence of transport systems between member countries and the EU.

**Figure 2-1: The six Eastern Partnership (EaP) countries**

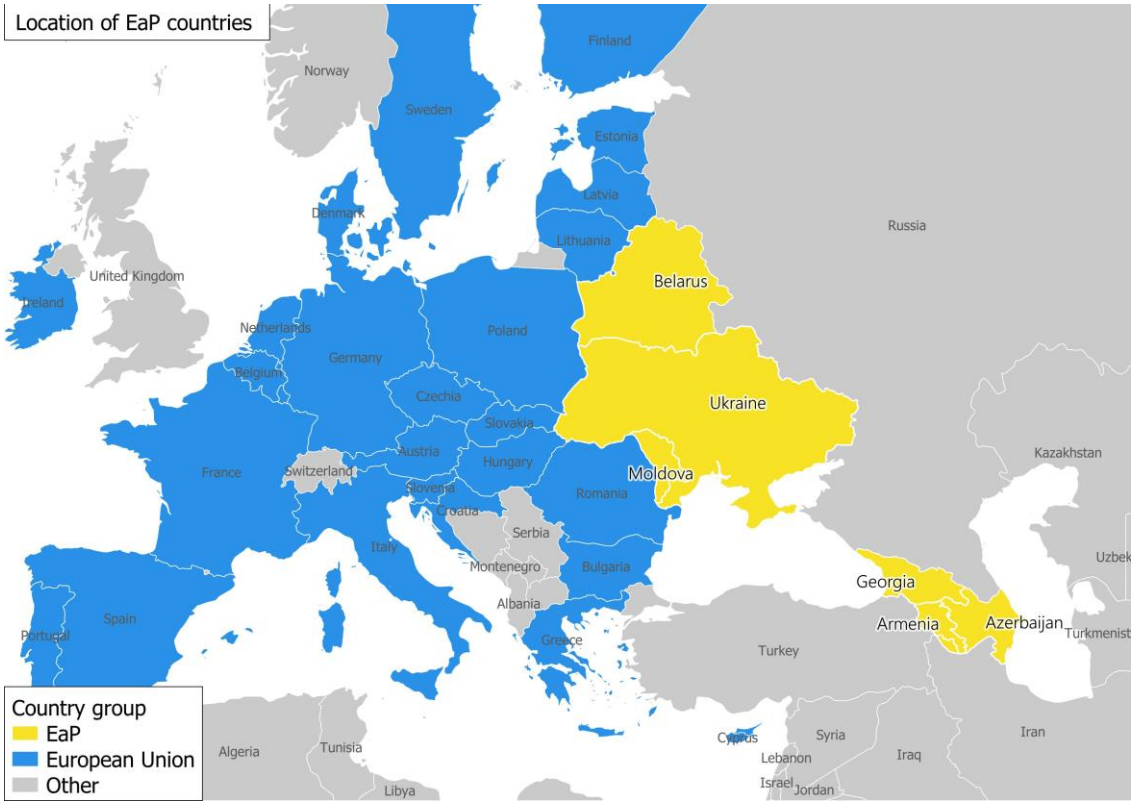


**Figure 2-2: Key objectives of the EaP**


Source: European Commission 2015, *Eastern Partnership*

2.3 While the member countries are looking to enhance transport connectivity, to strengthen economic growth and mobility, they are also aware of their commitment to the Paris Agreement to reduce GHG emissions. Under the 2015 Paris Agreement, each state has agreed to reduce their GHG emissions, as stated in their Nationally Determined Contributions (NDCs), to keep the global temperature rise to below 2°C. Limiting global temperature rise will require coordinated global action at an unprecedented scale. Transport has a crucial role to play because it accounts for 25% of global GHG emissions and has historically depended on the use of fossil fuels with a close coupling between economic growth and transport activity.

2.4 Currently, the EaP countries have implemented few policy actions or funding to decarbonize transport. This study aims to assist decision-makers to prioritize strategic transport policies and infrastructure based on the twin goals of increased connectivity and emission reduction.

## Methodology

2.5 This study used a novel method to evaluate green transport policies. This combines a strategic link-based transport model with a fleet and emissions model covering the EaP and neighboring countries over a time frame from 2017 to 2050.

2.6 Trip-based transport activity was modelled in Cube (a commercial software), using a traditional 'four-step' transport demand forecasting process. This model was tied to an Excel vehicle fleet and emissions model to incorporate the impact on GHG emissions, energy use and local air pollutants of transport policy choices. Appendix A provides a detailed description of the model.

2.7 A set of indicators were selected to evaluate both the connectivity and emissions dimensions of each policy, and an online visualization tool was explicitly developed for this project to facilitate the interpretation of model outputs at a wide range of regional, national and local scales.

## Online visualization tool

2.8 The online visualization tool has been developed to help policy makers to understand and use the results of the modelling exercise. Transport models are frequently used to develop transport strategies and projects, but non-modelers are often unable to investigate the results in detail.

2.9 The study team have therefore developed a generic open source platform which enables the online presentation and comparison of model scenarios. The visualization tool can be redeployed in a variety of spatial contexts such as a corridor, a city, a country, or continent regardless of modelling package, e.g. Cube, Visum, Transcad.

2.10 Development of the tool connects to an effort to democratize the transport modelling process. Its use will help to build trust in transport modelling, encourage the use of transport models in decision making, and enable non-modelers to access and use the results. To assist with consultation with policy makers, or the public, relevant 'views' can be selected and presented on a webpage, for example www.greenconnectivity.net/.

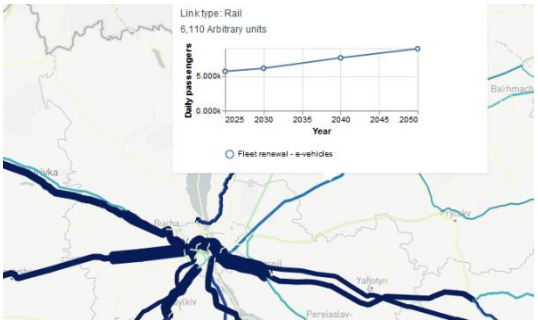
2.11 The green transport scenarios generated by the study are presented in the tool here: www.greenconnectivity.net/map. The tool is particularly useful in the context of the EaP because it can show where regional transport improvements induce benefits that are shared between counties.

2.12 A full user guide for the tool is presented in Appendix D and a summary of uses are presented in Table 2-1.

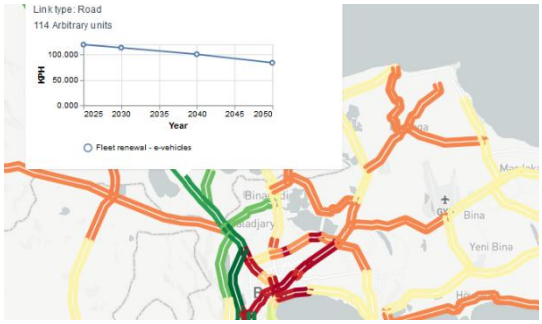
**Table 2-1: Capability of the online visualization tool**

## Explore data by link

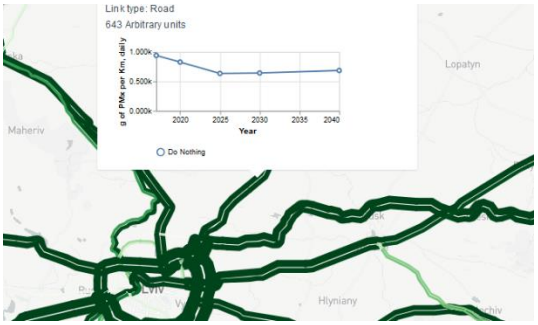
### Passenger volume, vehicle volume




### Speed, VCR, Road Roughness



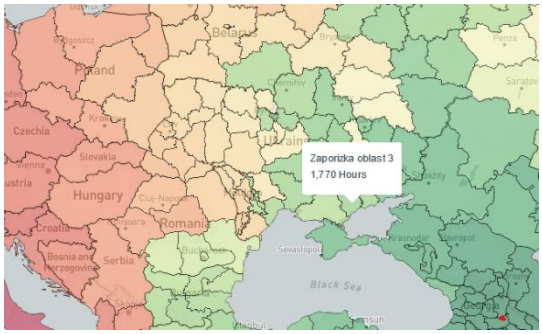

### Emissions and energy use



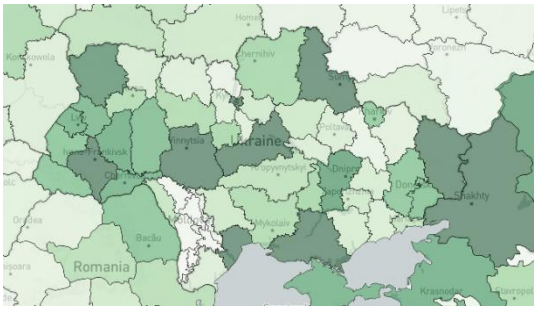

## Explore data by zone

### OD Pattern


### Travel time

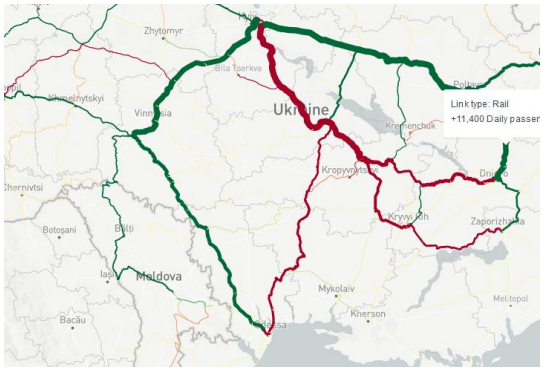



### Emissions and energy use

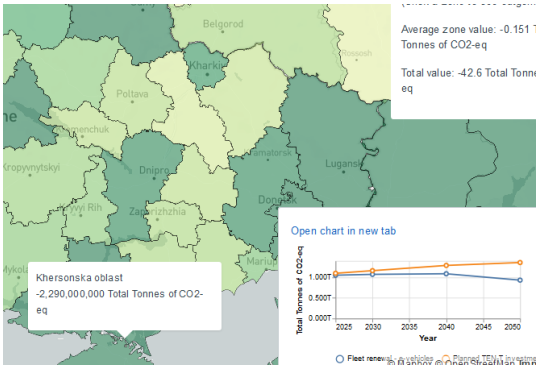


## Make comparisons between scenarios

For link data




For zonal data




2.13 The open source depositary for the visualization tool is located on GitHub: https://github.com/IntegratedTransportPlanning/gcvt. The tool was produced through a collaboration of ITP Ltd and the Institute of Transport Studies at Leeds University, and includes engineering and design by Colin Caine and Oliver Blanthorn.

# 3. Socio-economic and policy background

3.1 This chapter describes the historic and predicted socio-economic scenarios in each EaP country and their implications on transport emissions. It also looks at the international transport connectivity strategies and how these affect the region.

**Key messages**

Economic growth has been uneven among the EaP countires since 2000. All countries execpt Azerbaijan have expereinced a declining population.

Since 2000 GHG emissions have been rising in the EaP except for Ukraine - in part related to economic performance.

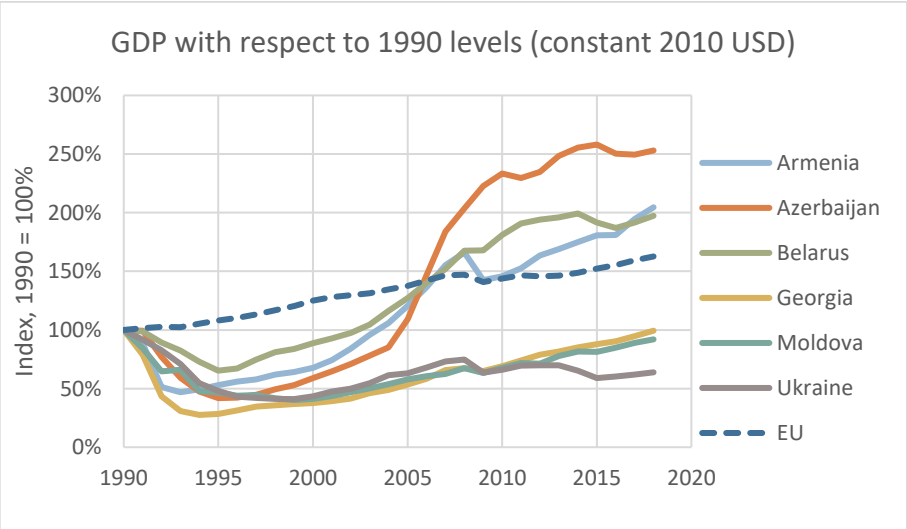
Transport emissions per capita are growing strongly, and this trend will continue without policy intervention.

Balancing economic growth ambitions with climate goals will be key to capitalize on the benefits from the TEN-T and Belt and Road Initiative strategies.

## Economic development

3.2 The EaP countries experienced a massive shock to GDP following the end of the Soviet Union in 1989. The economies of Armenia, Azerbaijan, and Belarus have shown steady growth since 2005. Ukraine, Georgia, and Moldova have been slower to regain lost GDP, but significant growth is now underway (Figure 3-1).

**Figure 3-1: GDP change relative to 1990 levels**

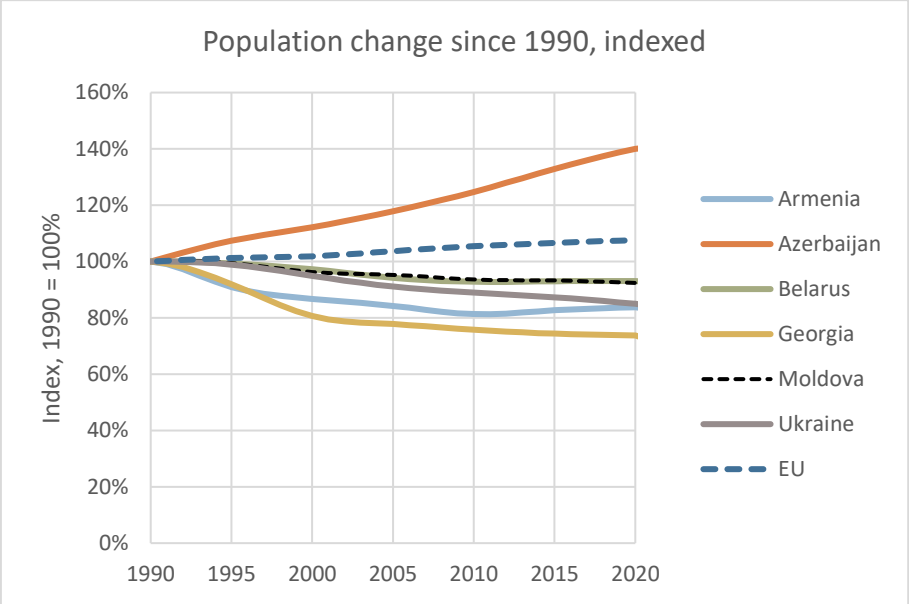



Source: World Bank 2020, WDI https://data.worldbank.org/indicator/NY.GDP.MKTP.KD

## Population

3.3 Population has been declining slowly in most EaP countries since 1990 due to outward migration. Azerbaijan is the only country that has seen its population increase, with a 40 percent rise since 1990 (Figure 3-2).

**Figure 3-2: Population change relative to 1990 levels**

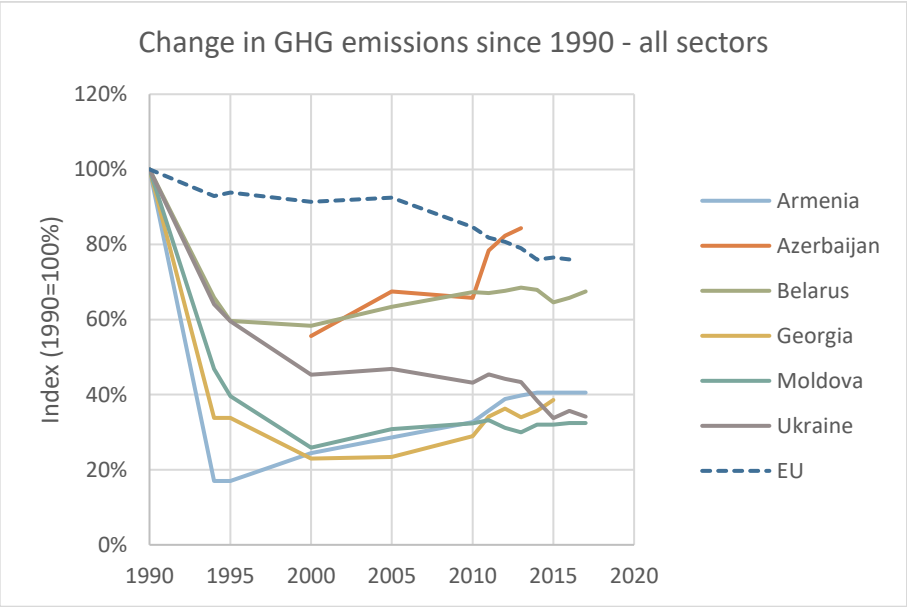



Source: World Bank 2020, WDI https://data.worldbank.org/indicator/SP.POP.TOTL

## GHG emissions

3.4 The end of the Soviet Union in 1989 brought about a fall in economic activity and the closure of many polluting practices causing GHG emissions levels to drop drastically (Figure 3-3). However, since the turn of the century, GHG emissions have been rising in all EaP countries except Ukraine, mostly in line with their economic upturn.

**Figure 3-3: GHG emissions change relative to 1990, all sectors**




Data: National Inventory Reports submitted to the UNFCCC

3.5 Table 3-1 presents the historic data on GHG emissions as submitted to the United Nations Framework Convention on Climate Change (UNFCCC). The table shows the annual emissions generated by all sectors as well as specific transport emissions. There is a broad range in emissions per capita between EaP countries due to significant differences in industry, energy mix, and level of production.

**Table 3-1: GDP and GHG emissions by country**

| Country | % Renewable electricity, incl. nuclear | GDP per capita* (USD 2018) | Total emissions** | | Transport emissions | | | Emission data reference | |
|---|---|---|---|---|---|---|---|---|---|
| | | | $MtCO_2e$ | Per capita $tCO_2e$ | $MtCO_2e$, | % of national | Per capita $tCO_2e$ | Date | Source |
| Armenia | 28% | 4,212 | 10.5 | 3.6 | 1.6 | 16% | 0.56 | 2014 | National Inventory Report 2017 |
| Azerbaijan | 2% | 4,721 | 61.8 | 6.6 | 7.4 | 12% | 0.79 | 2013 | 2nd Biennial Update Report 2018 |
| Belarus | 1% | 6,290 | 94.0 | 10.0 | 7.3 | 8% | 0.78 | 2014 | 6th Com. on Climate Change 2015 |
| Georgia | 77% | 4,717 | 17.6 | 4.4 | 4.2 | 24% | 1.03 | 2015 | National Inventory Report 2019 |
| Moldova | 2% | 3,227 | 14.6 | 3.6 | 2.4 | 16% | 0.59 | 2016 | 2nd Biennial Update Report 2018 |
| Ukraine | 55% | 3,095 | 320.6 | 7.2 | 34.9 | 11% | 0.79 | 2017 | National Inventory Report 2019 |
| Memo: EU | 51% | 36,570 | 4,291.3 | 8.4 | 931 | 22% | 1.83 | 2016 | Annual EU Inventory Report 2018 |

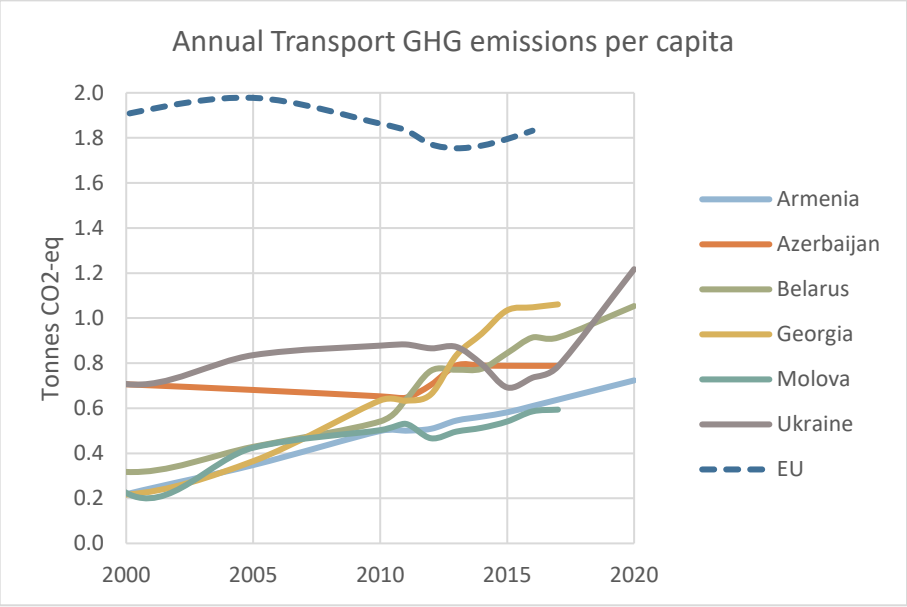
* Source: World Bank 2018, *WDI GDP Per Capita* https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

**Note: GHG emissions presented here exclude land use change

3.7 Transport emissions per capita are currently rising in all EaP countries (Figure 3-4). As these economies grow, transport emissions can be expected to increase at a rate that is similar to or higher than GDP, unless actions are taken. They can be expected to rapidly surpass EU transport emissions per capita, which are on a downward trend, driven by the Community's climate commitments. The transport sector will thereby play an increasingly important role in whether the future GHG reduction targets and NDCs can be achieved.

3.8 As ex-soviet countries, EaP members share a historically energy-intensive transport sector. Although they have taken different paths since becoming independent, there remain challenges to improving mobility and there has been little policy-focus on controlling GHG emissions. For Ukraine, recent increases in commodity prices and fluctuations in energy prices have revealed technological and structural weakness of its transport and connectivity systems. Transforming transport systems to be low carbon and energy efficient will generate opportunities for green growth and promote sustainable economic development.

**Figure 3-4: Transport GHG emissions per capita**



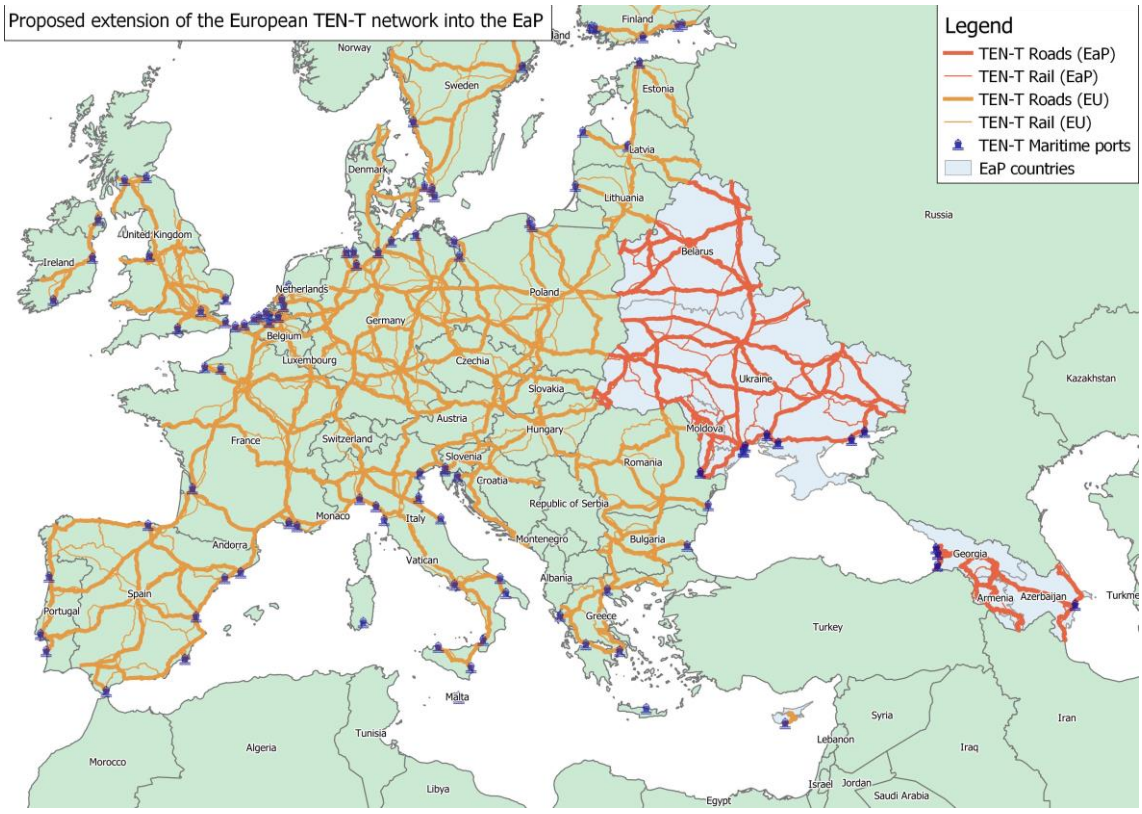

Source: National contributions to UNFCCC: National Inventory Reports. Projections from 2017 to 2020 from Communications on Climate Change.

## International transport strategies that affect the region

3.9 The EaP occupies a geographically strategic position between Europe and Asia. As a result, the region is the focus of transport development projects from both continents.

3.10 **The Trans-European Transport Network (TEN-T)** is a policy of the European Commission toward the development of a Europe-wide transport network. It aims to fill in missing links, alleviate bottlenecks, and eliminate technical barriers to mobility across all transport modes, ensuring seamless integration throughout member countries. To strengthen economic ties to its immediate east, the EU seeks to extend the TEN-T network into neighboring countries. Figure 3-5 shows the intended extension into EaP countries. The strategy aims to upgrade the transport network within the EaP to improve capacity, speed, service standards, and reduce barriers to movement.

**Figure 3-5: Proposed extension of the TEN-T into EaP counties**



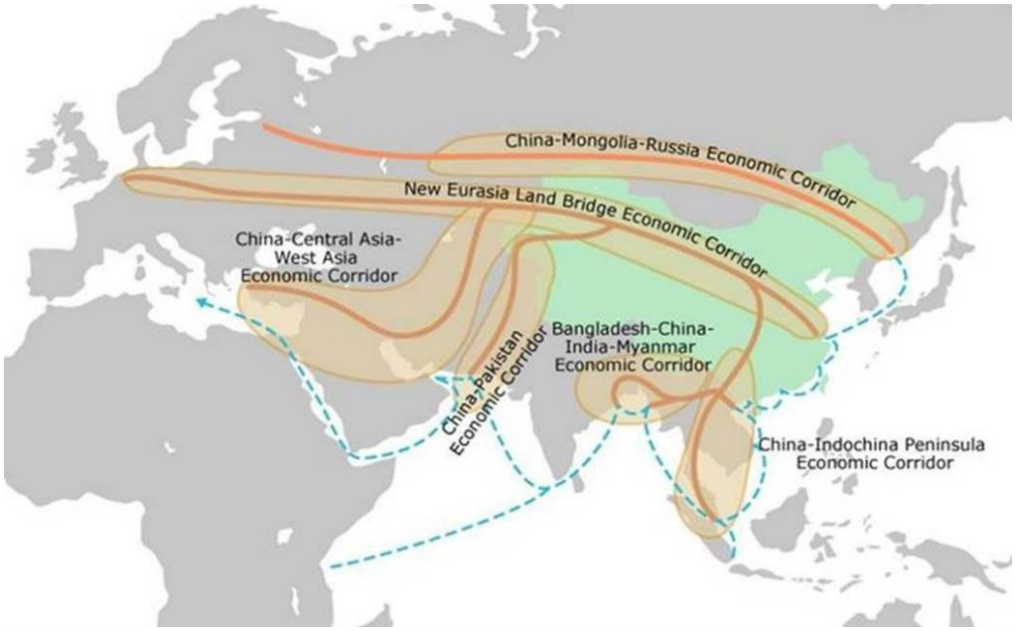

Source: Authors

3.11 **The Belt and Road Initiative (BRI)**, which is largely promoted by China, also impacts on the EaP region. The BRI's goal is to improve land and maritime connectivity between China and the rest of the Eurasian landmass and North Africa. The project is flagged to cost more than US$1tn, mainly in infrastructure investments, and impact more than 60

countries. Overall, the BRI will better link China to 62% of the world's population and 30% of global GDP[7]. Initial developments focus on railway and ports. Figure 3-6 shows the approximate alignments of the various corridors of the BRI, of which two are relevant to the EaP:

- New Eurasia-Land Band Bridge which incorporates the rail line through Belarus
- China-Central Asia-West Asia which incorporates the trans-Caspian International Transport route with branches through Azerbaijan, Georgia, and Ukraine. The element of the corridor in Azerbaijan and Georgia is also known as the trans-Caucasus Transit Corridor (CTC).

**Figure 3-6: Key BRI corridors**




Source: Centre for Financial Stability 2017, *One Belt One Road and Opportunities*

[7] London Stock Exchange Group 2018, *The Belt and Road Initiative (BRI)*

# 4. The demand for improved connectivity in the EaP

4.1 This chapter presents the demand for improved connectivity within the EaP and to promote international trade. After identifying current transport barriers and constraints, it evaluates specific connectivity policies and assesses their costs and benefits.

**Key messages**

Freight demand is expected to grow by 30% to 50% from 2017 to 2030, depending on country. But this growth might be tampered by inadequate road conditions, capacity limitations on rail and at port, and long border delays

Targeted rail investment can significantly improve capacity and travel time along international travel corridors. These measures significantly enhance access to ports, key trading partners and help to integrate the EaP into growing east-west trade.

Targeted rail improvements also provide large travel time reductions for passengers which will promote intercity and international travel.

Mode shift to rail supports a lager movement of goods and people while achieving GHG emission reduction.

The public cost of investment and maintenance for the connectivity policies is estimated to be €20.6 billion for all EaP countries in the next decade with a benefit cost ratio of 2.7.

## Trade patterns and connectivity ambitions

4.2 EaP countries currently conduct most of their trade with the EU and Russia (Table 4-1, Figure 4-1). While EaP countries generally have bilateral trading relationships with each other, they trade comparatively little with each other, limited by poor travel times.

4.3 Recent trade associations have been established between EaP countries and with either the EU or Russia:

- Georgia, Moldova, and Ukraine have an Association Agreement with the EU - including a Deep and Comprehensive Free Trade Area
- Armenia and Belarus are members of the Eurasian Economic Union, which facilitates trade with Russia

- Armenia also has a Comprehensive and Enhanced Partnership Agreement with the EU that reduces trade barriers for certain goods

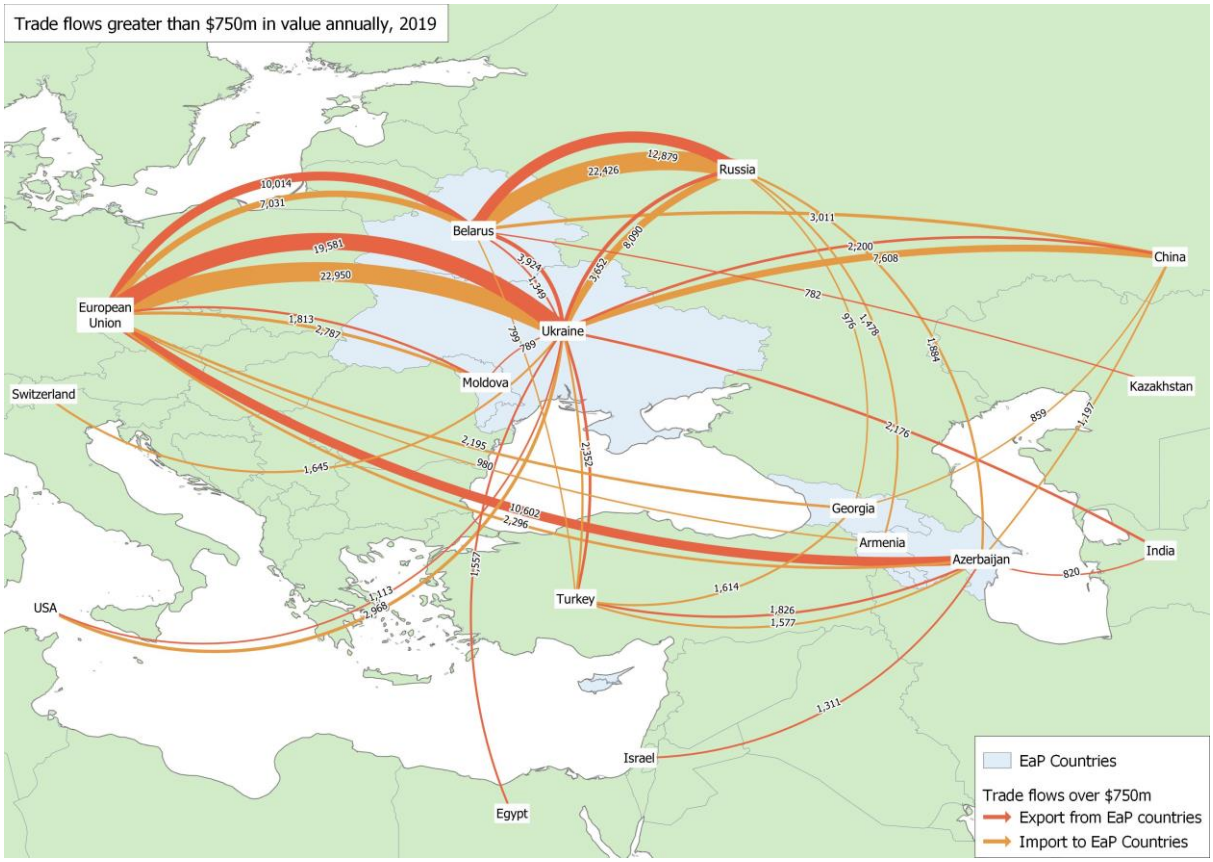
4.4 Trade is also growing between the EaP and East Asia. Figure 4-1 shows there was $10bn in trade between Ukraine and China in 2019. EaP countries also desire to host increasing levels of transit of goods which pass through from China to Europe. Key BRI corridors pass through the EaP (Figure 3-6). EaP countries are seeking to facilitate east-west movements by developing logistic infrastructure and supporting services to act as transit hubs.

**Table 4-1: Main trading partners by value of goods, 2019**

| Trading partner | Armenia | Azerbaijan | Belarus | Georgia | Moldova | Ukraine |
|---|---|---|---|---|---|---|
| European Union | 18% | 42% | 24% | 21% | 54% | 41% |
| Russia | 29% | 8% | 49% | 11% | 11% | 11% |
| EaP | 5% | 5% | 8% | 20% | 11% | 7% |
| Turkey | 3% | 11% | 1% | 14% | 5% | 4% |
| China | 12% | 4% | 5% | 9% | 7% | 10% |
| Rest of world | 33% | 30% | 13% | 24% | 11% | 27% |

Source: UN Comtrade Database. Data for 2018 presented if 2019 not available.

**Figure 4-1: Top trade flows by value of goods, 2019**




Source: Authors based on data from UN Comtrade Database. Data for 2018 presented if 2019 not available

4.5 Investment is needed to expand freight carrying capacity as the EaP transport model forecasts freight demand to grow by between 30% and 50% in EaP countries from 2017 to 2030 (Table 4-2).

**Table 4-2: Forecast increase in freight demand by 2030**

| Country | Increase in ton-kms, 2030 on 2017 levels |
|---|---|
| Armenia | 34% |
| Azerbaijan | 33% |
| Belarus | 41% |
| Georgia | 47% |
| Moldova | 43% |
| Ukraine | 51% |

Source: EaP transport model

4.6 EaP countries are therefore eager to improve connectivity with their main trading partners (EU and Russia), to host growing east-west trade, and to improve trade within the EaP. Based on the review of transport strategy documents, the following present key connectivity goals for each country:

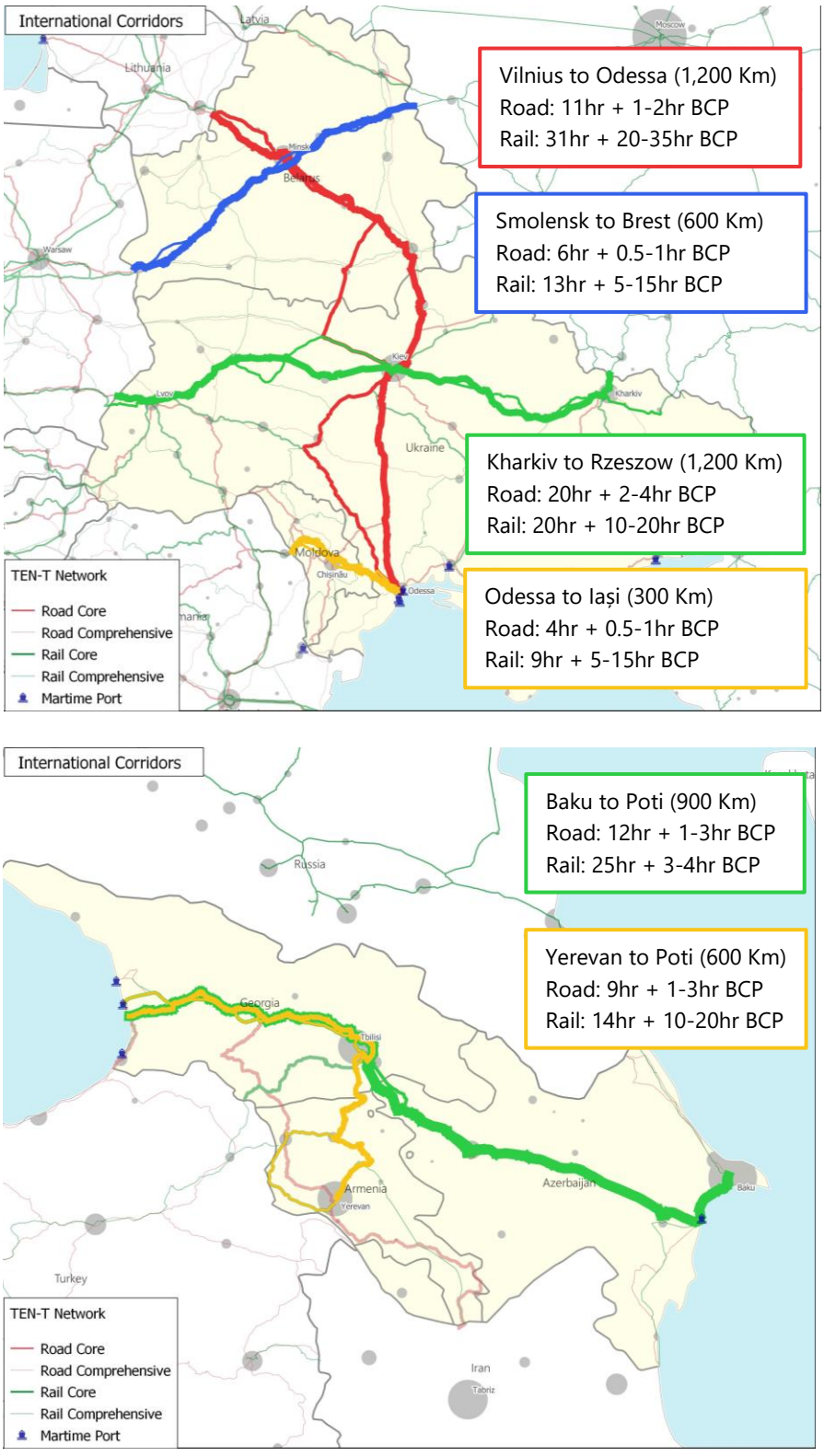
- Armenia seeks to upgrade north-south strategic connections and provide road and public transport connections to all settlements in the country[8].
- Azerbaijan seeks to integrate into the international transport system, developing the Trans-Caspian International Transport Route (and trans-Caucasus Transport Corridor) to become a vital trade route between Asia and Europe[9].
- Belarus seeks to modernize its railway stock and infrastructure along international corridors, upgrade highways and promote competition in logistics[10].
- Georgia seeks to deepen its role as a regional transport hub with new logistic centers, a deep seaport and rail modernization as part of the Trans-Caspian-Corridor[11].
- Moldova seeks to use transport and logistics as a catalyst for economic growth and trade and to integrate with the European transport network and standards[12].
- Ukraine seeks to improve its international corridors, minimize border friction, facilitate multi-modal freight. and better integrate with European networks[13].

## Barriers and constraints for improving connectivity

4.7 The main obstacle for increasing goods and passenger connectivity across the region is the excessive travel times between many EaP countries caused by underdeveloped or tired infrastructure, a lack of multi-modal facilities, inadequate system management, and long delays at country borders, or indeed closed borders. Figure 4-2 illustrates current travel times for freight along key international corridors. Road travel speeds are particularly slow east-west through Ukraine, while rail travel speeds are generally poor in all countries. Freight traffic typically takes a long time to pass through borders, which adds significantly to total travel time.

[8] Rep. Armenia Government, 2014. *Armenian Development Strategy for 2014-2025*
[9] Azerbaijan Republic, 2012. Azerbaijan *2020: Look into The Future*
[10] Ministry of National Resources and Environmental Protection, 2018. *7th Communication on Climate Change*
[11] World Bank, 2015. *Georgia's transport and logistics strategy*
[12] Government of Moldova 2012. *Transport and Logistics Strategy 2013-2022*
[13] Ministry of Infrastructure of Ukraine, 2016. *National Transport Strategy of Ukraine 2030*

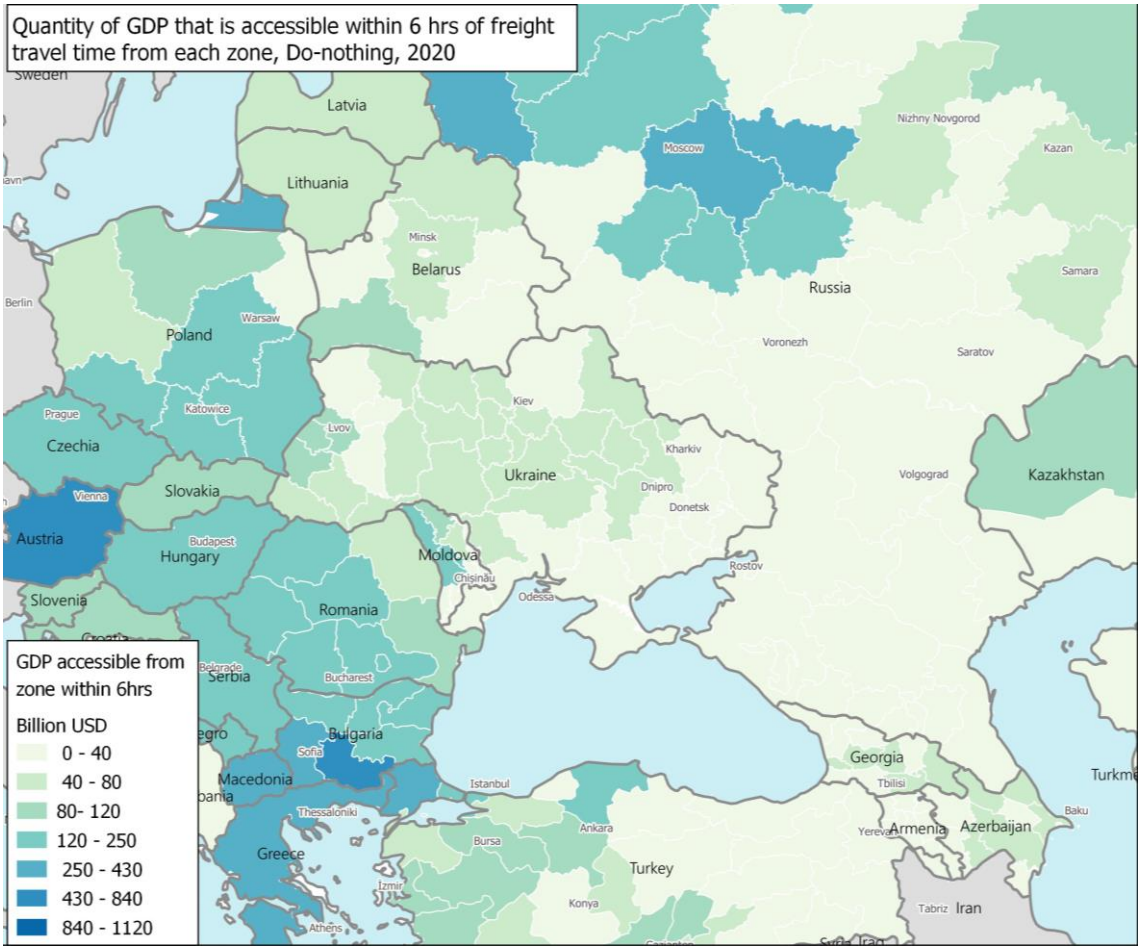
**Figure 4-2: International corridor freight travel time, 2020**




Note: BCP refers to the time incurred at Border Control Points. Rail speed and BCP delay information is provided by national rail companies where available. Road travel time is derived from the EaP transport model.

4.8 The impact of long travel times is a diminished market opportunity. Figure 4-3 shows an indicator of the market access opportunity. This indicator is the amount of GDP that can be accessed within six hours of travel time from each zone[14]. The indicator shows low market opportunity throughout the EaP compared to EU neighbors. There is particularly low market access in Armenia and east Ukraine. Areas with higher market access are those bordering the EU: west Ukraine, west Belarus, and west Moldova.

**Figure 4-3: Indicator of market access opportunity**




Note: GDP at a regional/zonal level was interpolated using night light data

[14] Six hours is considered a safe, achievable daily travel time limit for road freight.

## Border delays/control

4.9 The European Commission identifies long delays at borders to be a critical barrier to the successful extension of the TEN-T into EaP countries. Delays vary significantly by location; passengers can wait between 5 minutes and 3 hours while freight can be delayed by 10 minutes to 20 hours depending on transport mode, the capacity of the border control point, and the customs relationship between neighboring countries. Administration time can be particularly long. Furthermore, several border crossing points in the region are closed for political reasons.

4.10 Figure 4-4 shows the typical delays incurred by freight at borders in 2019. The typical delay incurred by freight was 5.8 hours, generating an annual cost to freight operators of €100bn.

4.11 The Belarus-Russia border is effectively free-flowing owing to both countries forming the Union State since 1996. However, there are several border restrictions in Caucasus countries:

- The border between Armenia and Turkey, and between Armenia and Azerbaijan are closed. This means that Armenia relies on transit through Georgia for most of their imports/exports. The port of Poti in Georgia is vital for Armenian trade with Russia.
- The rail line between Georgia and Russia is closed because it goes through the autonomous republic of Abkhazia. There is currently only one road connection between Georgia and Russia, and this is a constrained mountain pass which is often closed due to inclement weather[15].
- The only rail connection between the Caucasus countries and Russia is via Azerbaijan.
- Azerbaijan has been improving its international rail connections. This includes opening a rail link to Iran in 2019[16]; and working with Georgia to open a rail link to Turkey (Akhalkalaki-Kars) in 2017.

[15] Eurasianet 2019, *Georgia moves closer to transit deal with Russia*
[16] Caspian News 2019, *Iran-Azerbaijan Joint Railway Opens After Munch Anticipation*

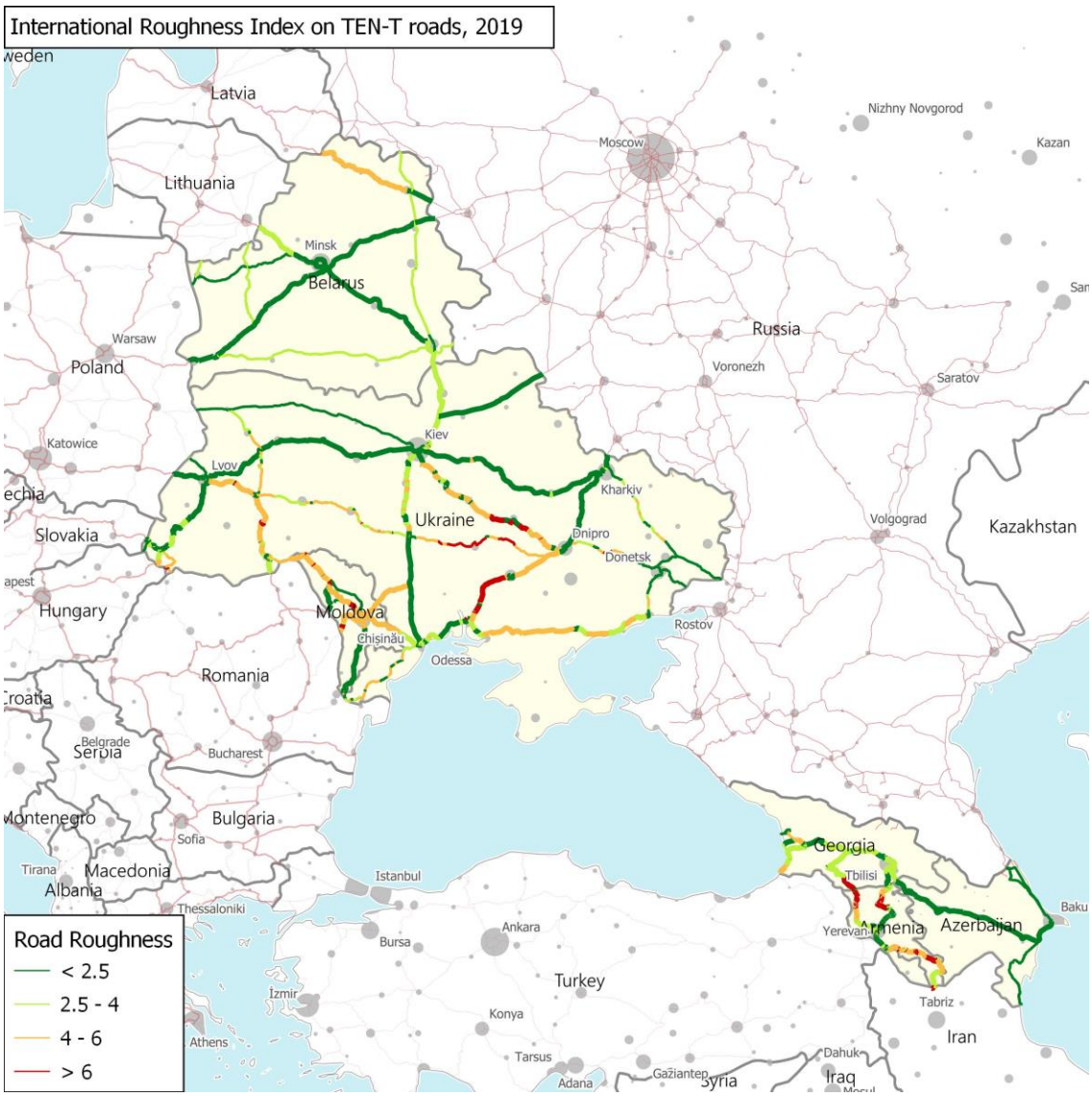
**Figure 4-4: Typical delay incurred by freight at borders in 2019**

## Road conditions

4.12 In specific locations, poor road conditions contribute to long travel times. Figure 4-5 shows the International Road-roughness Index (IRI) value for principal roads. Road roughness reduces speeds, adversely affects the ride quality, increases vehicle delay, fuel consumption, and vehicle maintenance costs.

4.13 Poor road conditions are present in central Ukraine, Moldova and on Armenia's links to Georgia and Iran. However, good road conditions are present on most core roads in Belarus (E30, M5), Azerbaijan (E60, E119) and Ukraine's east-west corridor (E40).

**Figure 4-5: Road roughness on TEN-T roads, 2019**



## Rail capacity

4.14 The railway network in many EaP countries is extensive (see Table 4-3) but has a low capacity and low travel speeds:

- There are several sections of the core TEN-T rail network that are single track (Figure 4-6), including almost all rail lines in Armenia, Georgia and Moldova. A single track, instead of a dual track, is the most significant limitation on capacity.
- EaP countries generally have a high degree of rail electrification, except for Moldova, and some core lines in Belarus.
- Much of the rail infrastructure and signaling equipment is old, especially in Ukraine, Georgia, Armenia, and Moldova, limiting both capacity and speed. There is also a general lack of technology to monitor the location and use of trains, wagons, and conduct efficient timetabling - which impacts system capacity.
- All EaP countries operate on the broad track gauge, while the bordering EU countries operate on standard gauge, as does Turkey and Iran[17]. The change of gauge requires goods and passengers to change trains, or use a bogie exchange. This adds at least 2 hours of travel time for freight, but it can be much more. Faster gauge change facilities have recently been added to the Belarus-Poland border[18].

**Table 4-3: Size of rail network**

| Country | Length of all rail track (km) | % Electrified | % Dual track |
|---|---|---|---|
| Armenia | 845 | 100% | 0% |
| Azerbaijan | 2,932 | 60% | 24% |
| Belarus | 5,491 | 21% | 29% |
| Georgia | 1,576 | 79% | 36% |
| Moldova | 1,156 | 0% | 3% |
| Ukraine | 20,948 | 48% | 33% |

Source: European Commission 2017, *Report of the phase III of the Euro-Asian Transport Links project*

[17] The railway track gauge of 5 ft (1,524 mm) is commonly called Russian gauge and was chosen for the Russian Empire and its neighbouring countries. The gauge was later redefined by Soviet Railways to be 1,520 mm. Russian gauge is the second most common gauge in the world, after 1,435 mm standard gauge used in Europe.
[18] Railway Gazette 2015, *Gauge-changer installed at Belarus-Poland border*, Rail Freight 2019, *Poland improves rail infrastructure near Mataszewicze*

**Figure 4-6: Characteristics of core TEN-T rail network, 2019**

## Port related challenges

4.15 It is common for transshipment times at ports to be as high as a 20 to 24 hours. This stems from capacity constraints on road and rail access, slow custom processes, old machinery and slow loading. In Ukraine, the key ports of Odessa, Mykolaiv, Kherson and Mariupol are located within urban areas. This restricts the ports' ability to grow, causes access problems, and encumbers the host towns with congestion and pollution.

4.16 The Port of Baku in Azerbaijan did experience similar challenges; therefore the port was moved to a modern site outside of the city in 2018 and the old location made available for urban redevelopment. The new site at Alat is well connected to the road and rail network and has room to expand to support an increased flow of goods from Asia.

4.17 Georgia has also been suffered from limited port capacity, in response a deep seaport is being developed at Anaklia which will facilitate greater trade from the Caucasus countries and transit along the trans-Caucasus Transport Corridor (CTC). This will assist Armenia which largely dependents on Georgian ports to trade with Russia.

## Strategic Accessibility

4.18 International travel time results from a combination of the above-mentioned travel characteristics: road conditions (or rail speeds), closed borders, border delays and transshipment times. The maps in Figure 4-7 show the travel time for road freight from Kyiv (top) and Yerevan (bottom). A comparison between the two highlights how Armenia's level of strategic accessibility is significantly curtailed due to poor road quality, closed borders, long border delays, and slow roads in the Caucasus.

4.19 Figure 4-8 shows the same analysis but for rail freight travel time. Accessibility maps for the other capital cities can be found in Appendix C.

**Figure 4-7: Road freight accessibility, Kyiv and Yerevan in 2019**

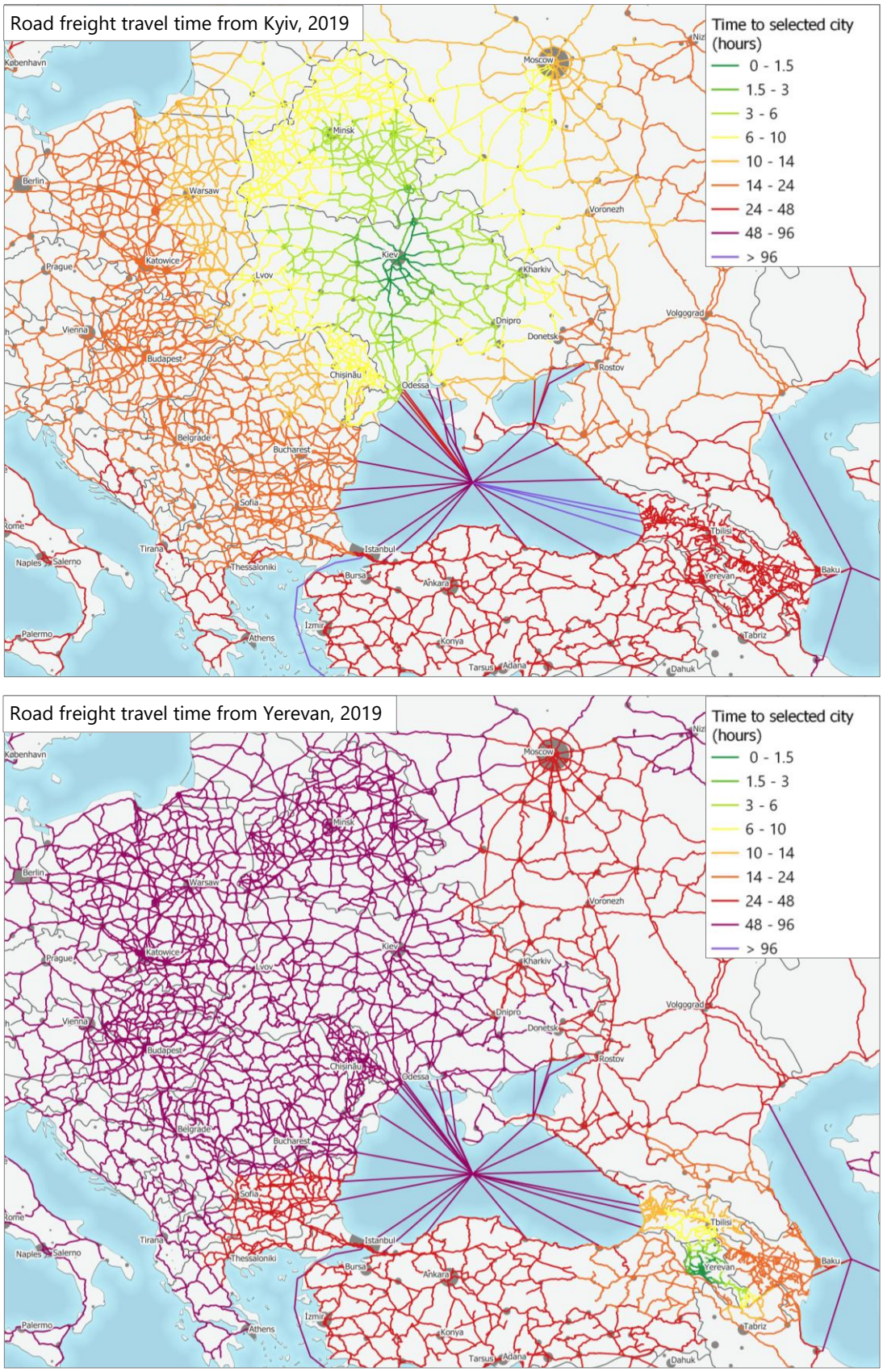
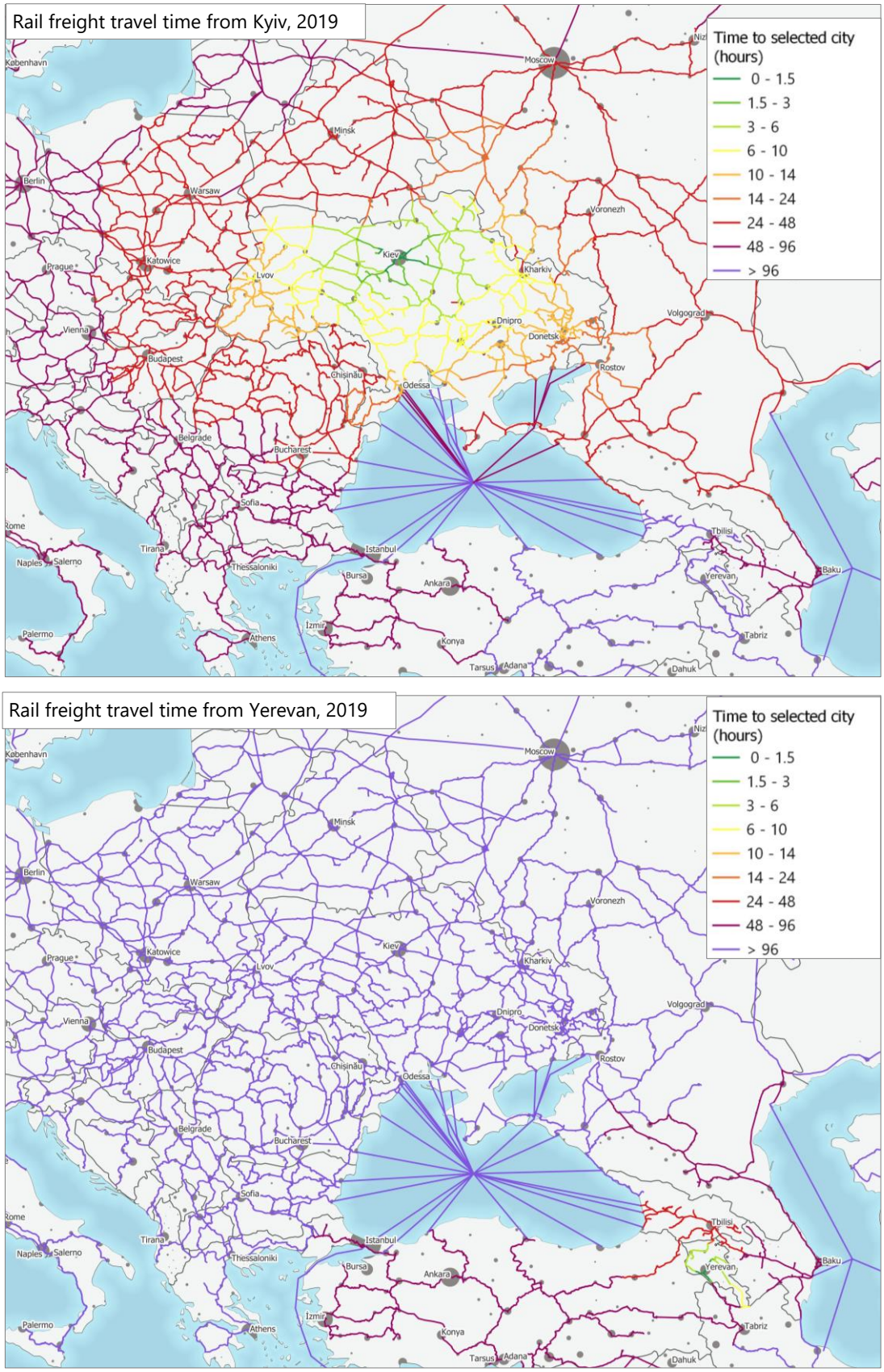


**Figure 4-8: Rail freight accessibility, Kyiv and Yerevan in 2019**



# Analysis of connectivity policies

## Identification of connectivity policies

4.20 This study tested a range of policies to reduce the main constraints for connectivity and significantly improve regional and international travel time. These scenarios were developed considering TEN-T and BRI strategy, national policy, and best practice. Phase 1 of this study presents the full range of policies tested, while this report focuses on those which are more practical for delivering economic benefits and emission reduction. Table 4-4 briefly describes the policies. A detailed explanation is presented in Appendix B, including the case studies on which they are based.

**Table 4-4: Description of connectivity polices**

| Policy | Description |
|---|---|
| Indicative TEN-T investment action plan | Selection of priority TEN-T projects identified by the World Bank and EC in 2018[19]. Includes road and rail upgrade, port expansion, logistic centers, inland waterway and border improvements. The impact is presented here to enable comparison. |
| Rail package: track and border upgrades | A cohesive package of rail upgrades to improve international travel time, including (i) upgrade of specific TEN-T links, (ii) minimization of delay at critical rail borders, and (iii) gauge adaption measures. The locations of the rail package upgrades are shown in Figure 4-9.<br>• Rail links upgraded to be dual and electrified if not already, and speed increased to 160kph for passenger services and 80kph for freight.<br>• Install variable gauge change facilities for passenger rail and purchase compatible rolling stock (e.g. Talgo). New freight transfer facilities at borders to increase capacity and speed of train change.<br>• Redevelop rail Border Control Points: upgrade and consolidate track, equipment, and facilities. Reduce administrative time through Digital Consignment Notes and certification of providence |
| Enhanced rail package, includes signal and logistic upgrade | As above with the addition of:<br>• Signal and timetable improvements on all TEN-T rail links<br>• 13 new multi-modal logistic centers with fast road-rail transshipment and minor upgrades to all rail loading stations<br>• Enhanced rail access at TEN-T ports<br>The locations of these upgrades are shown in Figure 4-10, and the green ports are listed in Table 4-5 |
| Toll roads in Belarus and Ukraine | Upgrade of certain highways to dual carriageway with free-flow speeds of 130kph. Supported by the installation of emissions differentiated tolling system. Concerns only roads in Belarus: E30, M5, E95; and Ukraine: E40, E95, E471 (See Figure 4-11) |

[19] World Bank 2018, *Indicative TEN-T Investment Action Plan*

**Figure 4-9: Location of rail package upgrades**

**Figure 4-10: Location of enhanced rail package which includes logistic upgrade**


**Table 4-5: Location of TEN-T ports that are appropriate for green port improvements**

| Armenia | Azerbaijan | Belarus | Georgia | Moldova | Ukraine |
|---|---|---|---|---|---|
| No ports | Port of Baku at Alat | No ports | Anaklia Port (New port)<br>Batumi<br>Poti | Giurgiulesti | Port of Berdyan<br>Chornomosrk<br>Izmail<br>Kherson<br>Mariupol<br>Mykolaiv<br>Odesa<br>Reni |

**Figure 4-11: Location of toll roads**


## Impact of connectivity policies

4.21 The modelled impact of the connectivity policies in 2030 is presented in Table 4-6. The rail package delivers significant time and cost savings for strategic travel and promotes a shift to rail resulting in a fall in GHG emissions. Similarly, the enhanced rail package, which has a focus on logistic improvements, delivers significant time benefits for freight while achieving a further reduction in GHG emission.

4.22 The addition of emissions differentiated toll roads in Belarus and Ukraine is also shown to reduce travel time, but not necessarily travel cost. A reduction in GHG emission and local air pollutants are forecast due to mode shift, higher occupancy, and the expectation that such tolls will encourage the purchase of cleaner vehicles.

**Table 4-6: Aggregate impact of connectivity policies across the EaP in 2030**

| Policy | Change in travel time | | Change in travel cost | | Increase in market access | Road to rail shift | | NOx emissions | GHG emissions |
|---|---|---|---|---|---|---|---|---|---|
| | Pass. | Freight | Pass. | Freight | | Pass. | Freight | | |
| Impact measured across all EaP countries | | | | | | | | | |
| Investment Plan (Do-minimum) | -2% | -1% | -1% | -0% | Small | 0% | 0% | 0% | 0% |
| Rail package | -20% | -12% | -12% | -4% | High | 7% | 7% | -0.8% | -1.1% |
| Enhanced rail package, incl. signals & logistics | -21% | -17% | -13% | -5% | High | 7% | 7% | -0.3% | -1.4% |
| Impact measured in Belarus & Ukraine only | | | | | | | | | |
| Toll Roads in Belarus and Ukraine | -2% | -1% | -2% | 1% | Medium | 1% | 1% | -2.6% | -2.4% |

Change is relative to business-as-usual in 2030

4.23 The rail package is shown to significantly reduce rail travel time along international corridors (Table 4-7). This will help to accommodate the forecast 30% to 50% increase in freight traffic by 2030 (Table 4-2).

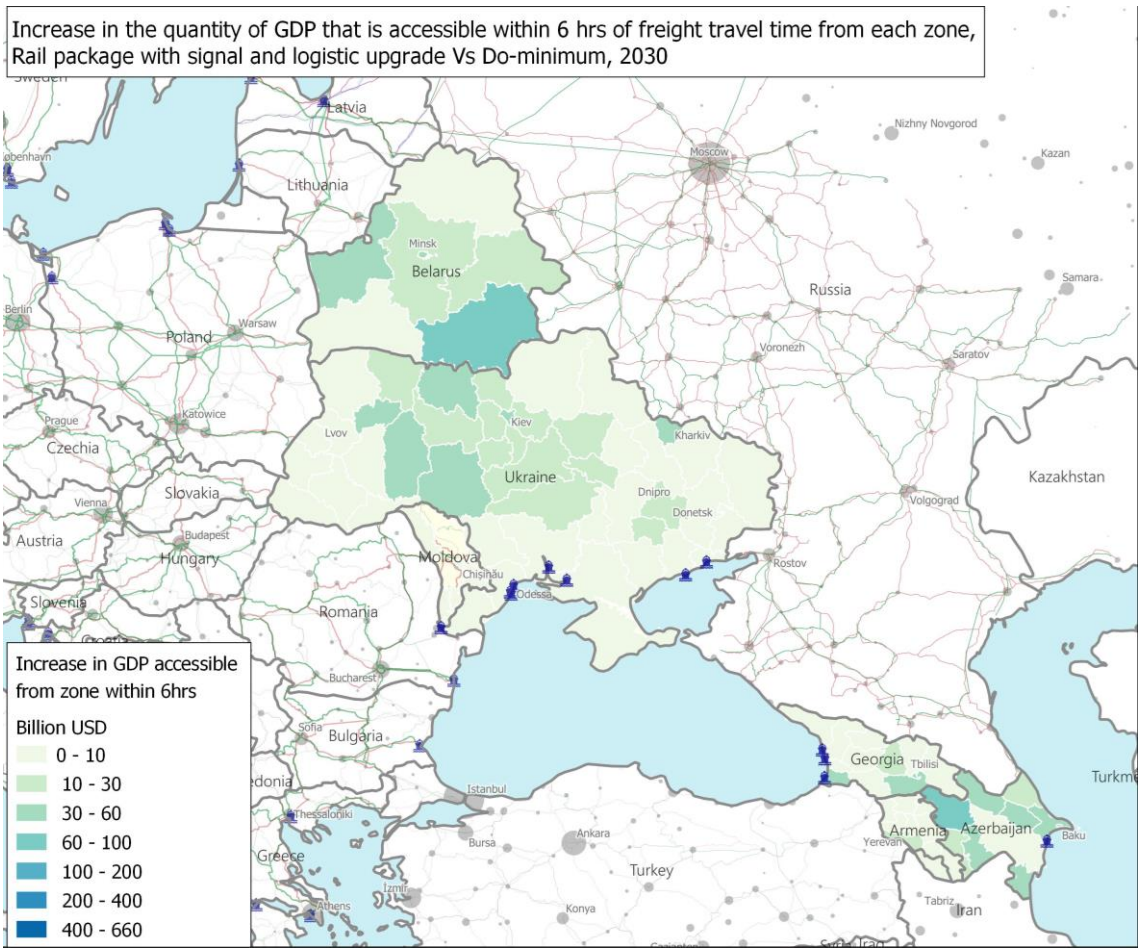
**Table 4-7: Impact of rail package upon international corridor rail travel time**

| Corridor | Start/end | Travel time, baseline 2020 | Travel time, rail package 2030 | Time saving |
|---|---|---|---|---|
| North-South: Belarus & Ukraine | Vilnius to Odessa | 31hr + 20-35hr BCP | 20hr + 0.5hr BCP | 30.5 to 45.5hr |
| East-West: Belarus | Smolensk to Brest | 13hr + 5-15hr BCP | 8hr + 0.5hr BCP | 9.5 to 19.5hr |
| East-West: Ukraine | Kharkiv to Rzesow | 20hr + 10-20hr BCP | 16hr + 0.5hr BCP | 13.5 to 23.5hr |
| East-West: Moldova | Odessa to Iași | 9hr + 5-15hr BCP | 6hr + 0.5hr BCP | 7.5 to 17.5hr |
| Azerbaijan & Georgia (CTC) | Baku to Poti | 25hr + 3-4hr BCP | 6hr + 0.5hr BCP | 21.5 to 22.5hr |
| E-W: Armenia & Georgia | Yerevan to Poti | 14hr + 10-20hr BCP | 8hr + 0.5hr BCP | 15.6 to 25.5hr |

Note: Figure 4-2 shows the location of the international corridors

4.24 The time reductions resulting from the enhanced rail package will increase market access opportunity across the EaP, with large benefits expected in southern Belarus, central Ukraine, and much of Azerbaijan (Figure 4-12)

**Figure 4-12: Increase in market access opportunity, enhanced rail package, 2030**

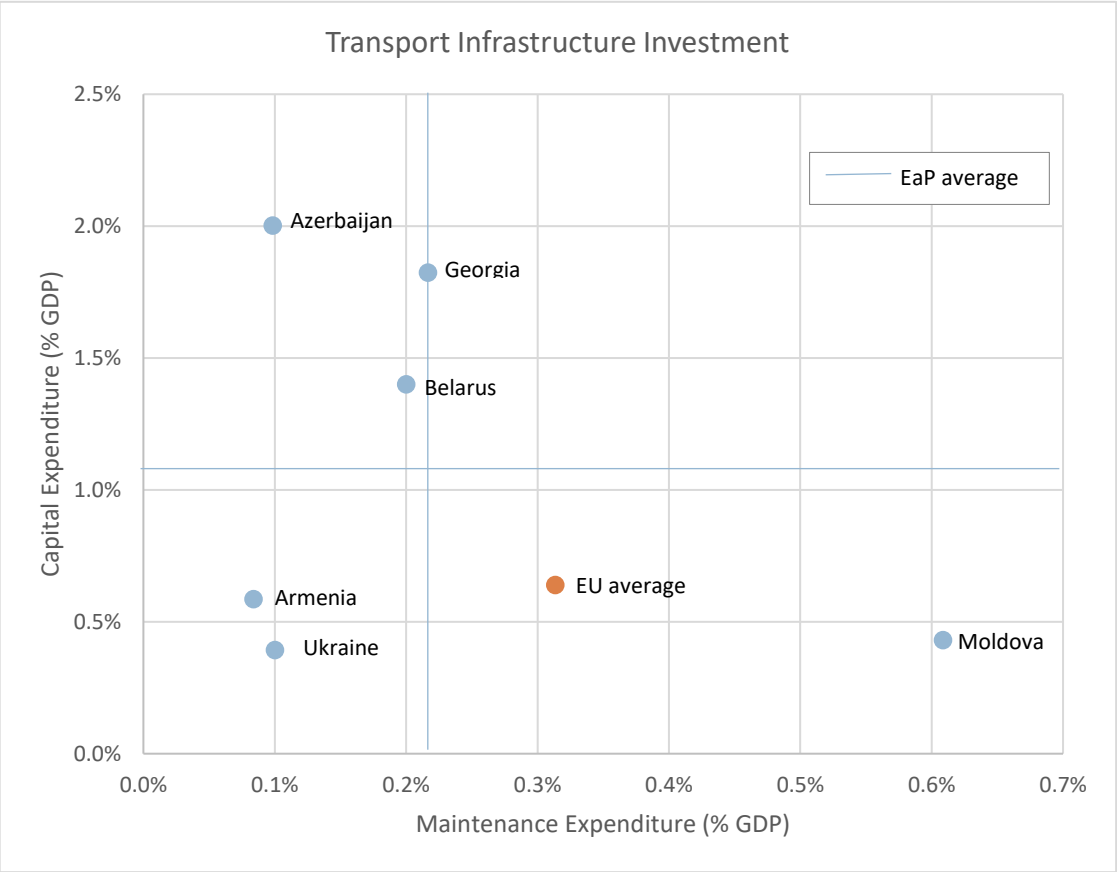



# Cost to improve connectivity

## Status quo in infrastructure investment in the EaP

4.1 Investment in developing and maintaining a country's transport infrastructure supports economic performance and contributes to social objectives. Before considering the investment needed to support greener connectivity in the EaP, it is useful to review the current levels of transport infrastructure spend. Economies with highly developed infrastructure typically spend proportionally more on maintenance, whilst developing economies that have insufficient infrastructure will invest proportionally more on construction. Figure 4-13 shows the present expenditure on transport infrastructure, in both categories, in each EaP country and compares this to the EU average.

**Figure 4-13: Transport infrastructure investment in the EaP as a proportion of GDP**




Source: OECD 2020, *Infrastructure Investment*, *Infrastructure maintenance*,. OECD 2018, *Maintaining the Momentum of Decentralization in Ukraine*

4.2 Capital investment lies at 2 percent or less of national income in all EaP countries. While this might not seem out of line with the EU average, it should be noted that the extent and quality of their transport networks lag many EU countries, and therefore the capital investment requirement should be higher. Maintenance expenditure sits below the EU average in all but Moldova. Insufficient maintenance can lead to deterioration of the infrastructure, causing a negative impact on GDP and social development.

4.3 Overall, there is a large range in the combined infrastructure and maintenance spend between the EaP countries. Ukraine and Armenia currently spend the least at 0.5% and 0.7% of GDP respectively, while Azerbaijan and Georgia spend the most at 2.0% of GDP. Low levels of spending in Armenia, Moldova, and Ukraine match the underdeveloped and tired transport infrastructure in these countries.

## Cost of connectivity policies

4.4 Cost estimates were developed for each of the connectivity policies. Costs were based on case studies of similar policies implemented around the world and the World Bank *EaP Indicative TEN-T investment plan*[20]. These costs were tailored to the characteristics of each country by considering network length, vehicle fleet size, modal share etc. Appendix B includes the case studies on which cost estimates were based.

4.5 The public cost of investment and maintenance for the connectivity policies is estimated to be € 20.6 billion for all EaP countries (Table 4-8). As a proportion of GDP the costs vary greatly from 0.3% in Ukraine to 1.9% in Georgia. The high cost of rail upgrade in Georgia stems from its large network which is predominately single track.

**Table 4-8: Cost to invest and maintain connectivity policies, 2020-2030**

| Policy | Armenia | Azerbaijan | Belarus | Georgia | Moldova | Ukraine | Total | BCR |
|---|---|---|---|---|---|---|---|---|
| Rail package: track and border improvements (€ m) | 1,457 | 3,106 | 1,923 | 4,787 | 1,561 | 4,648 | **17,483** | 3.4 |
| Additional cost for enhanced rail package: signals and logistics (€ m) | 106 | 376 | 664 | 321 | 159 | 1,497 | **3,124** | 2.2 |
| Toll roads in Belarus and Ukraine | | | | Assumed charges will cover costs | | | - | 1.2 |
| **Total (€ m)** | **1,563** | **3,482** | **2,588** | **5,108** | **1,720** | **6,145** | **20,606** | |
| **Cost as % of GDP** | **0.9%** | **0.6%** | **0.4%** | **1.9%** | **1.4%** | **0.3%** | **0.6%** | |
| BCR (2020-2050) | 1.0 | 3.5 | 1.9 | 3.8 | 1.0 | 3.0 | 2.7 | |
| Net economic benefits as % of GDP | 0.0% | 0.7% | 0.4% | 2.8% | 0.0% | 0.5% | | |

Note: costs are in 2019 prices

## Economic benefit of connectivity policies

4.6 Considerable economic benefits are expected to arise from travel time and operating cost savings achieved by the connectivity policies. Table 4-8 presents the Benefit Cost Ratio (BCR) by country and policy. Large benefits are expected in Azerbaijan, Belarus, Georgia and Ukraine where upgraded rail networks have the potential to serve intercity, regional and international travel/freight demand well. Rail upgrades in Armenia and Moldova do not perform as well economically because these countries have limited

[20] World Bank 2018, *Indicative TEN-T Investment Action Plan*

networks which have high upgrade costs because they are predominantly single track, and in Moldova's case, not yet electrified.

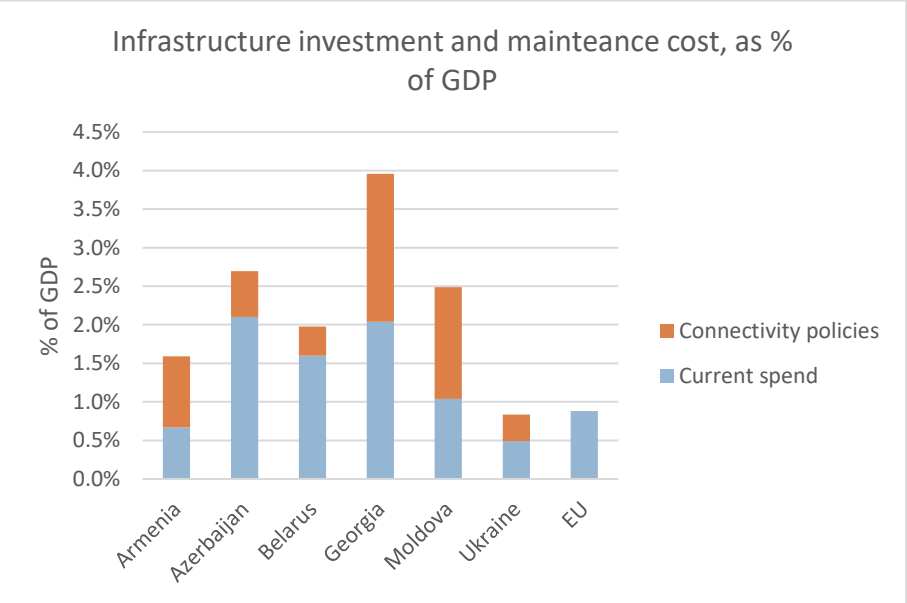
4.7 However, the strategic nature of this study's model does not capture all economic and social benefits. Additional benefits not quantified here could include:

- Improved journey quality
- Increased journey time reliability
- Accident reduction and wider health benefits
- Increased access to services and social inclusion
- Benefits to economic growth such as regeneration impact, land value uplift and agglomeration benefits.

## Comparison with current transport spend

4.8 To help understand the scale of this investment, we have compared the costs to the existing spend on transport, as presented earlier in Figure 4-13. Figure 4-14 below presents the sum of the current spend on transport investment and maintenance as well as the cost of the connectivity policies in terms of percent of GDP. If the policies are considered as additional spending, they would act to increase total transport spend across the EaP by 50%, but approximately double it in Armenia, Georgia, and Moldova.

**Figure 4-14: Transport infrastructure spend, connectivity policies, as % of GDP**




Source: OECD 2020, *Infrastructure Investment, Infrastructure maintenance*,. OECD 2018, *Maintaining the Momentum of Decentralization in Ukraine*

# 5. The nexus between transport connectivity and GHG emissions

5.1 This chapter evaluates the link between improving transport connectivity and the development of a green (low emission) transport system. It does so by discussing various emission pathways for the EaP region vis-à-vis their NDC targets, followed by the impacts, costs and benefits of implementing best practice transport emission mitigation policies.

**Key messages**

Transport emissions are expected to rise significantly without policy intervention. The timely implementation of green transport policy is needed to enable the EaP to align with a zero-emission pathway that is consistent with the Paris Agreement.

The application of the green connectivity policies presented in this study could cut transport GHG emissions by 27% in 2030 and 51% in 2050, compared to BAU. This will help the countries to achieve their NDC targets but is not sufficient to align with a 2ºC pathway.

The policies which deliver the largest GHG reductions are electric vehicle promotion, fleet renewal, urban transport improvements, road freight improvements and the application of road user changing to the TEN-T network.

Green transport policies simultaneously deliver large economic and health related benefits through reduced operating costs, improved air quality, green jobs and agglomeration benefits in cities, resulting in an aggregate BCR of 2.4.

The scale of the funding and financing required to implement the green policies is €21.0 billion in the next decade, which together with connectivity focused policies represents a doubling of transport infrastructure spend across the EaP.

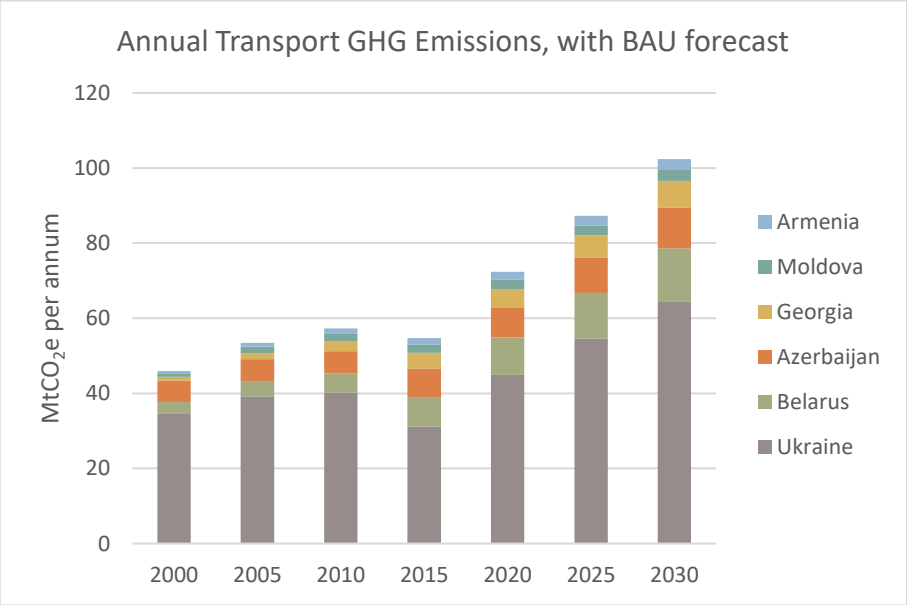
## The business-as-usual scenario

5.2 Reducing emissions in the transport sector is typically more challenging than in other sectors, because:

- The level of freight traffic is strongly correlated to economic growth
- Passenger mobility typically increases with per capita income
- Transport has been dependent on fossil fuels (except for electric rail)
- Transport infrastructure does not quickly evolve into lower carbon alternatives (due to the long life of infrastructure and the time needed to replace vehicles)

5.3 National government forecasts project transport emissions in the EaP to nearly double between 2015 and 2030, in the Business-As-Usual (BAU) scenario, to over 100 million tons of $CO_2e$ per year (Figure 5-1). Much of this real growth is attributable to Ukraine, which has by far the most significant levels of transport activity (vehicle-km), and associated GHG emissions. Therefore, even a small percentage change in emissions in Ukraine results in a large impact on regional emissions.

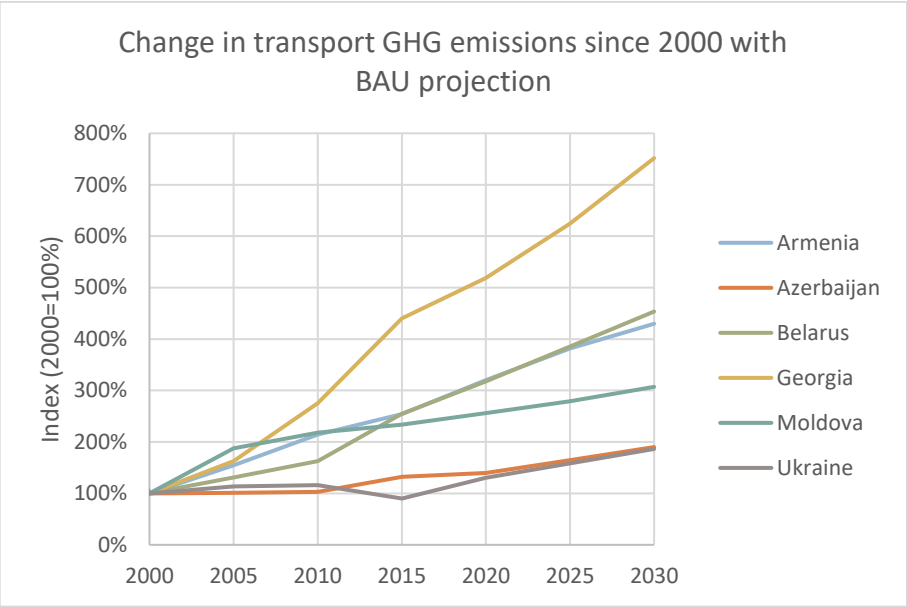
**Figure 5-1: National government projections of transport GHG emissions to 2030**




Source: National Government submissions to UNFCCC, with additional projections from Gota et al 2018, *Decarbonizing Transport to Achieve Paris Agreement Targets*

5.4 Figure 5-2 presents the same information as a percent change on 2000 levels. All countries expect their transport emissions to increase through to 2030 under a BAU scenario - in Georgia's case reaching 750% of 2000 levels.

**Figure 5-2: Historic and forecast growth in transport GHG emissions**



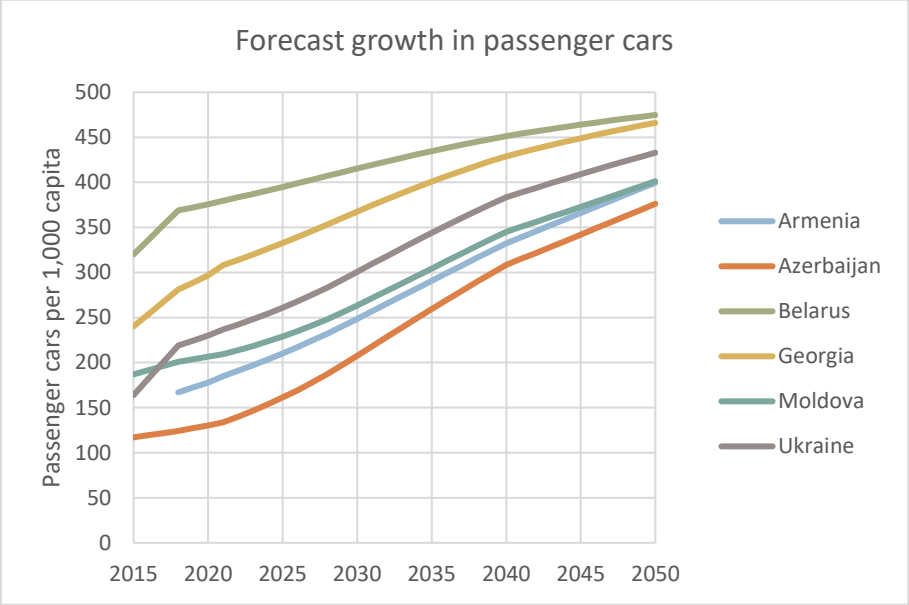

Source: National Government submissions to UNFCCC, with additional projections from Gota et al 2018, *Decarbonizing Transport to Achieve Paris Agreement Targets*

5.5 The main causes of the forecast increase in transport GHG emissions are (i) rising car ownership, (ii) an increase in trip rate and trip length, and (iii) an increase in freight movements. While the efficiency of vehicles will improve, this will not outweigh the growth in activity (vehicle-km). Therefore, emissions per vehicle-km will drop, but total emissions increase unless additional policies to decarbonize are implemented.

5.6 While freight traffic is expected to increase by 30% to 50% by country by 2030 (Table 4-2), car ownership is forecast to grow in relation to GDP per capita. Figure 5-3 illustrates how car ownership in the EaP may converge toward the EU average of 500 cars per 1,000 people[21]. Rising private transport activity will generate tremendous economic and environmental pressures caused by increasing congestion unless corrective policies are implemented. Urban congestion is already a significant problem in Tbilisi and Kyiv (Figure 5-4).

[21] Car ownership in the EU is 522 per 1,000 capita in 2018. Data from Eurostat, 2020. *Passenger cars, by type of motor energy and size of engine*

**Figure 5-3: Forecast growth in passenger car ownership**

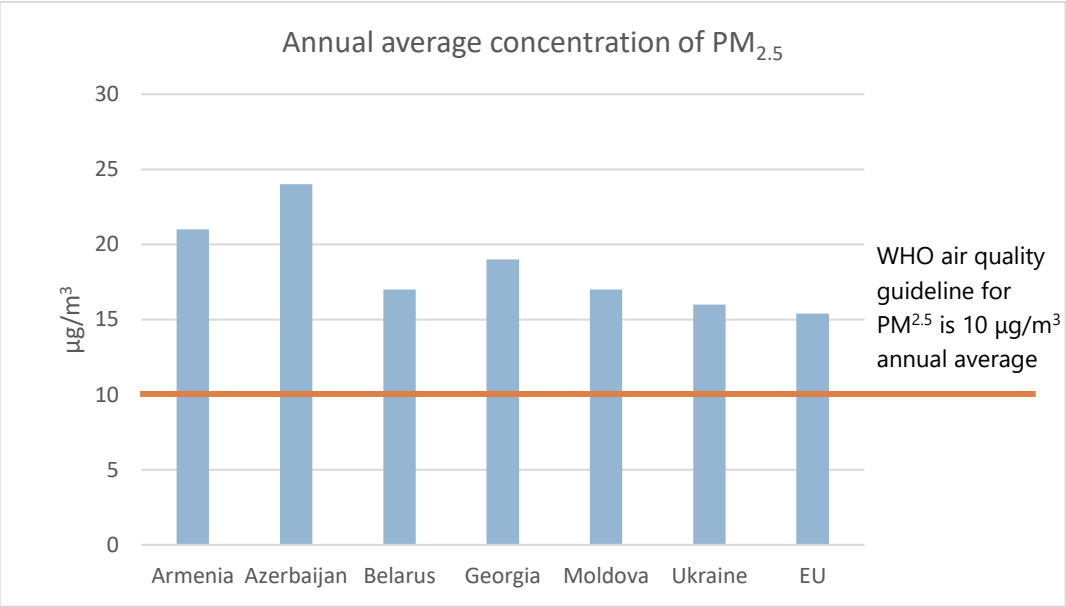



Source: Baseline from OCIA 2015, *Vehicles in Use*. Forecast is study team's estimation

**Figure 5-4: Congestion on Stepana Bandery Avenue, Kyiv, 2019**

5.7 Modelling conducted by this study expects local air pollution from transport to increase 10% by 2050 despite the adoption of modern EURO engine standards. This may undercut efforts to tackle poor air quality which is particularly prevalent in Armenia, Azerbaijan and Georgia (Figure 5-5).

**Figure 5-5: Local air quality by country, in 2016**

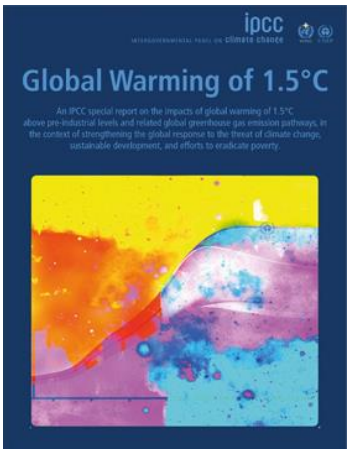



Source: World Health Organization 2016, *Ambient air pollution: A global assessment of exposure and burden of disease*

# International commitment to reduce GHG emissions

## Zero carbon pathways

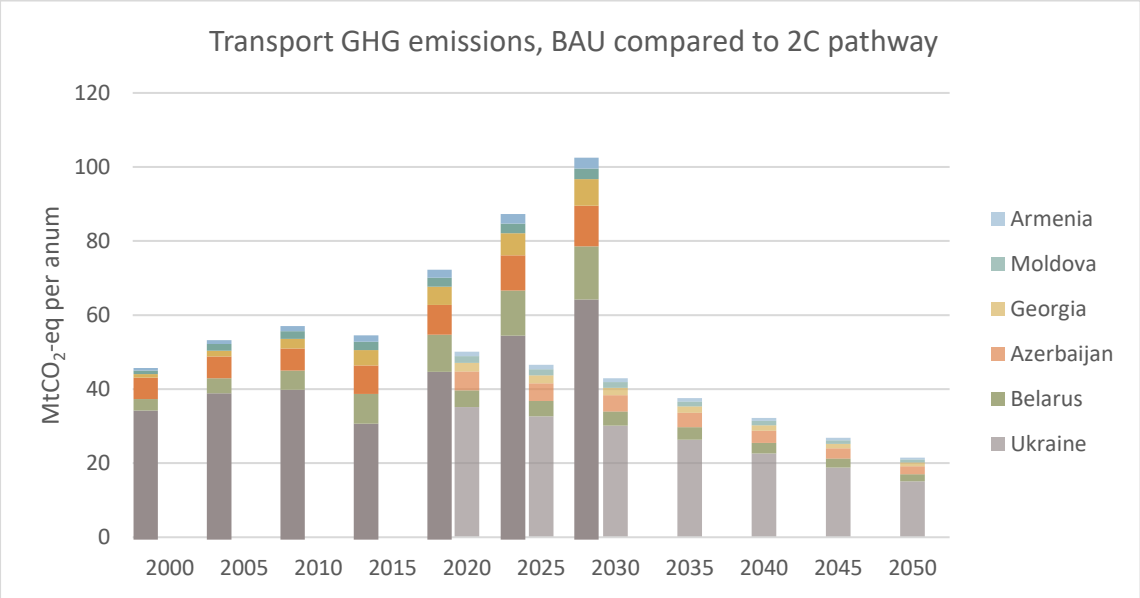
5.8 EaP countries are signatories to the 2015 Paris Agreement in which all countries commit to act to limit global warming to less than 2°C above pre-industrial levels[22], with differentiated responsibility in accordance with their national circumstances. The IPCC special report *'Global Warming of 1.5°C'* details the emission pathways needed to attain these warming limits[23]:




- To limit warming to 1.5°C, global $CO_2$ emissions need to decline by 45% from 2010 levels by 2030 and reach net zero by 2050
- To limit warming to 2°C, global $CO_2$ emissions should reduce by 25% by 2030 and reach net zero by 2070

5.9 This cannot be achieved without significant reductions in GHG emissions from the transport sector. Figure 5-6 illustrates the extent of this commitment. This is a challenge for EaP countries who forecast transport emissions to increase.

**Figure 5-6: Comparison of transport emissions between BAU and 2°C pathway**




Note: The second bar for each year presents the 2°C pathway

[22] UNFCCC. 2015. *The Paris Agreement*
[23] IPCC 2018, *SR15 Global Warming of 1.5°C*

## Nationally determined contributions and transport strategies

5.10 Each signatory country to the Paris Agreement, presents the actions that it is proposing to take in its "Nationally Determined Contribution" (NDC). Table 5-1 summarizes the commitments for each EaP country (as of April 2020). It is anticipated that these targets will become more ambitious over time as part of the UNFCCC process.

5.11 There is a large spread in ambition: Armenia, Azerbaijan, and Moldova must reduce their emissions from today's levels, but Belarus, Georgia, and Ukraine could permit their emissions to increase, because they have already met their 2030 target. However, these NDCs are not ambitious enough to achieve a 2ºC pathway (or better) as they do not accord with a 25% reduction on 2010 levels by 2030.

**Table 5-1: NDCs, as of April 2020**

| Country | Stated NDC | GHG emissions ($MtCO_2e/yr$) | | NDC target for 2030 | | |
|---|---|---|---|---|---|---|
| | | 2010 | Latest inventory | $MtCO_2e/yr$ | Change on 2010 | Change on latest inventory |
| Armenia | 2.07 tons per capita by 2050* | 8.4 | 10.5 (2014) | 9.1 | +8% | -13% |
| Azerbaijan | -35% on 1990 level by 2030 | 48.2 | 64.8 (2017) | 47.7 | -1% | -26% |
| Belarus | -28% on 1990 level by 2030 | 93.8 | 94.0 (2017) | 100.3 | +7% | +7% |
| Georgia | 25% below BAU by 2030* | 13.2 | 17.6 (2014) | 28.3 | +114% | +61% |
| Moldova | -78% on 1990 level by 2030* | 14.5 | 14.5 (2016) | 9.9 | -14% | -32% |
| Ukraine | -60% on 1990 level by 2030 | 405.1 | 320.6 (2017) | 375.4 | -7% | +17% |
| EU | -40% on 1990 level by 2030 | 4,776 | 4,291 (2016) | 3,388 | -29% | -21% |

Note: Each country presents their NDC target in a different way, therefore to aid comparison we have presented each NDC as the percent reduction in emissions by 2030 compared to 2010 levels
* Conditional target dependent on global technical cooperation, access to low-cost financial resources and technology transfer.
Source: UNFCC 2020, *NDC Registry*

5.12 EaP countries propose most emission reductions to be delivered by the energy and industry sectors where mitigation is easier to accomplish in the short term. Table 5-2 shows that only Azerbaijan, Georgia and Moldova cite specific transport measures in

their NDC plans. However, all EaP countries do mention transport GHG mitigation interventions in their national policies and strategies.

**Table 5-2: Transport emission mitigation features in NDC and national policy**

| Country | Does transport feature in NDC | National policy/strategy |
|---|---|---|
| Armenia | Mentioned, but no detail | • Electric vehicles<br>• Urban public transport |
| Azerbaijan | Cites electric vehicles, rail, metro | • Green port<br>• Rail upgrade |
| Belarus | Not mentioned | • Fleet renewal<br>• Vehicle standards<br>• Rail upgrade |
| Georgia | Cites urban transport | • Fleet renewal<br>• Vehicle standards<br>• Electric vehicles<br>• Sustainable Urban Mobility |
| Moldova | Requires a -15% reduction in transport emissions compared to BAU | • Fleet renewal<br>• Fuel standards<br>• Rail border upgrade<br>• Rail signalization/timetable |
| Ukraine | Mentioned, but no detail | • Vehicle standards<br>• Fuel standards<br>• Rail freight capacity<br>• Freight coordination<br>• Rail upgrade |

Source: UNFCC 2020, *NDC Registry*. National policy/strategy documents

# Emission mitigation policies for the transport sector

## Selection of emission mitigation policies

5.13 This study identified and tested a range of policies to mitigate transport emissions in the EaP while the demand for transport rises. These policies were developed by reviewing best practice from around the world, national transport strategies (see Table 6-3 to Table 6-8 for a summary of current national policy), and discussions with relevant authorities in the region. Examples of best practice in green transport come from Korea, Europe, the US, and Asia. Table 5-3 briefly describes each policy, while a detailed explanation is presented in Appendix B along with the related case studies.

**Table 5-3: Description of green transport policies**

| Policy | Description |
|---|---|
| Intelligent Transport Systems, eco-driving, and enforced speed limits | Encourages more efficient driving behavior through:<br>• Intelligent Transport Systems (ITS) that include road measuring stations, variable information signs, video cameras, traffic lights, and urban traffic monitoring centers<br>• Speed cameras installed to enforce speed limits<br>• Eco-driving training courses and driver awareness campaigns |
| Fleet renewal policies: cars, buses, and trucks | A package of measures to improve the efficiency of the vehicle fleet:<br>• More efficient vehicles enter the fleet using taxation or vehicle registration fee to reflect environmental impact. Minimum emission standards set for imports and manufacture.<br>• Fuel quality improvement as required to support higher vehicle technology<br>• Efficient vehicle operation is encouraged through vehicle inspection<br>• Scrappage scheme used to remove inefficient vehicles |
| Electric vehicle promotion | Installation of an Electric Vehicle (EV) charging network. Vehicle taxation/registration fee and emission standards to encourage uptake of EVs. |
| TEN-T road user charging (does not include highway upgrade) | Application of an emissions differentiated road user charging scheme to the core TENT-T road network for cars, vans, and trucks. This encourages an increase in occupancy/load factor, mode shift, and purchase of more efficient vehicles. Notably, road upgrade is not part of this policy. |
| Urban transport improvements | Range of public transport and non-motorized transport (NMT) improvements with Travel Demand Management such as parking and congestion charges, low emission zones and green freight policies. |
| Road freight improvements | Logistics coordination and freight consolidation using logistic centers and a universal dispatch program |
| Green port improvements | Package includes shore-to-ship power, electrification and modernization of port machinery, enhanced rail-to-berth access, re-surfacing, on-site renewable power |

## Impact of emission mitigation policies

5.14 The effect of each policy was modeled to 2050 using the strategic transport model and emissions model. All policies begin implementation between 2020 and 2025. Table 5-4 presents the impact of each policy upon annual GHG emissions to 2050. The 'green max' scenario is the application of all the green focused policies, which are described in this chapter, and the connectivity focused policies, which are described in chapter 4.

5.15 The impact of some policies increase over time. For example, electric vehicle promotion, where it takes time for the fleet to evolve. And urban transport improvements where ongoing investment in public transport and non-motorized transport delivers continued mode shift.

5.16 The policies which show the most scope to reduce emissions in the short term (to 2030) are road freight improvements, urban transport improvements, and TEN-T road user charging. It is important to note that this road user charging scenario refers to the application of charges without highway upgrades. After 2030 electric vehicle promotion drives the largest emission reduction, but enabling policies need to be implemented early to achieve the shift to electric vehicles.

5.17 Interaction effects between policies mean that the combined impact of applying all policies together (green max) is less than the sum of each policy on their own. For example, road freight improvements, which reduce vehicle-km by reducing empty running, have less of an impact if the truck fleet is more efficient.

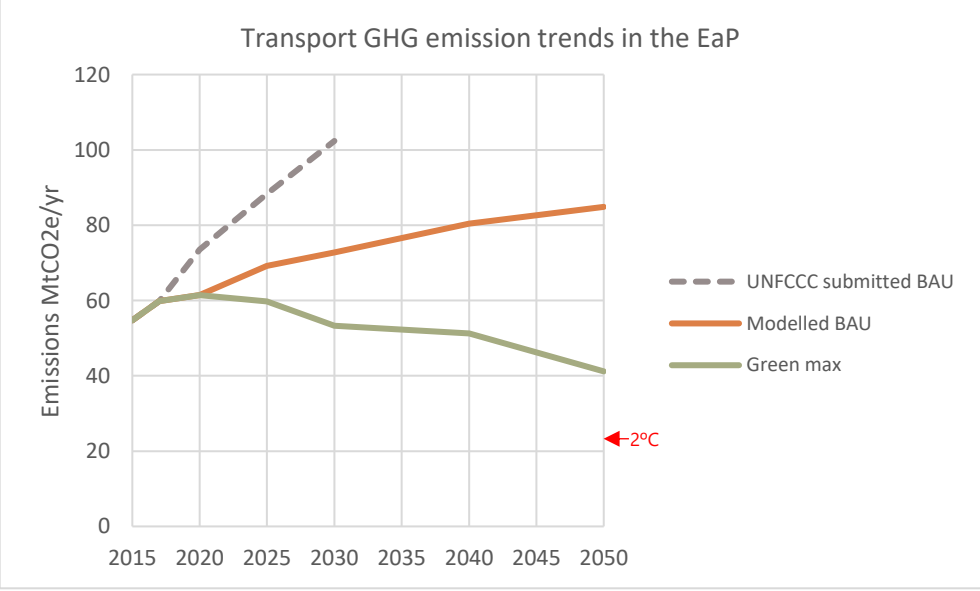
5.18 The green max policy achieves a reduction in GHG emissions of 27% by 2030 compared to BAU and 51% by 2050. However, because BAU transport emissions will increase, this translates into a reduction of only 11% on 2017 levels by 2030 and 31% by 2050.

5.19 Figure 5-7 presents the modeled BAU and green max trends for the EaP region to 2050. This is compared to the emission reduction needed to align with the global 2ºC pathway, when considering the same rate of decarbonization across all sectors. The 'green max' scenario is not sufficient to meet the 2ºC pathway, therefore more ambitious and novel policies, that are not presented in this study, are needed to align with a 2ºC pathway.

**Table 5-4: Impact of green transport policies upon GHG emissions, 2025 to 2050**

| Policy | Change in annual GHG emission (compared to BAU) | | | |
|---|---|---|---|---|
| | 2025 | 2030 | 2040 | 2050 |
| Green focused policies | | | | |
| ITS, eco driving, and speed limits | -2.3% | -4.5% | -4.5% | -4.5% |
| Fleet renewal: cars, buses, trucks | -3.4% | -4.4% | -6.6% | -7.7% |
| Electric vehicle promotion | -1.2% | -4.0% | -10.8% | -27.3% |
| TENT road user charging | - | -10.2% | -10.3% | -10.4% |
| Urban transport improvements | -3.2% | -5.6% | -9.7% | -13.7% |
| Road freight improvements | -3.7% | -7.3% | -7.2% | -7.1% |
| Green port improvements | - | -0.01% | -0.01% | -0.01% |
| Connectivity focused policies (presented in Chapter 4) | | | | |
| Rail package: tracks & borders | - | -1.1% | -1.3% | -1.6% |
| Enhanced rail package, incl. signals and logistics | - | -0.1% | -0.1% | -0.1% |
| Toll roads in Belarus and Ukraine | - | -0.2% | -0.2% | -0.2% |
| Green max | -14% | -27% | -36% | -51% |
| Green max, compared to 2017 emissions | -0% | -11% | -14% | -31% |

**Figure 5-7: Impact of the green max scenario upon GHG emissions to 2050**



5.20 The BAU forecast presented by this study is lower than, and not directly comparable to, the BAU forecast provided by each country in their UNFCCC submissions (presented in Figure 5-1). This is because the strategic transport model does not fully capture the increase in local trips (intrazonal), and countries include off-road transport within their UNFCC submissions, which are not captured by this study. Georgia, for example, forecasts a substantial increase in off-road emissions[24]. Furthermore, some UNFCCC submissions expect a high growth in emissions than some independent studies - the projection for transport emissions provided by the Ukraine government, for example, is very high compared to EBRD forecasts[25]. Thus, total transport sector emissions will be higher than our modeled results. But this could indicate that the policies presented here will generate even larger real reductions in emissions.

5.21 The impact of green policies also varies by country. The differences arise from:

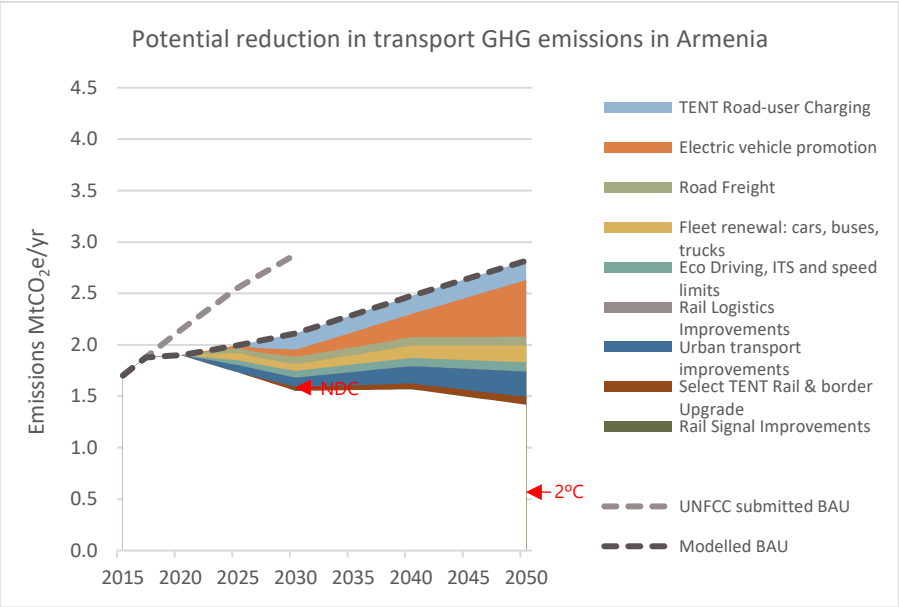
- Supply: condition and extent of road, rail, inland waterway, shipping networks, and border restrictions; and,
- Demand: different levels of passenger and freight activity, mode share, and different sizes of urban populations.

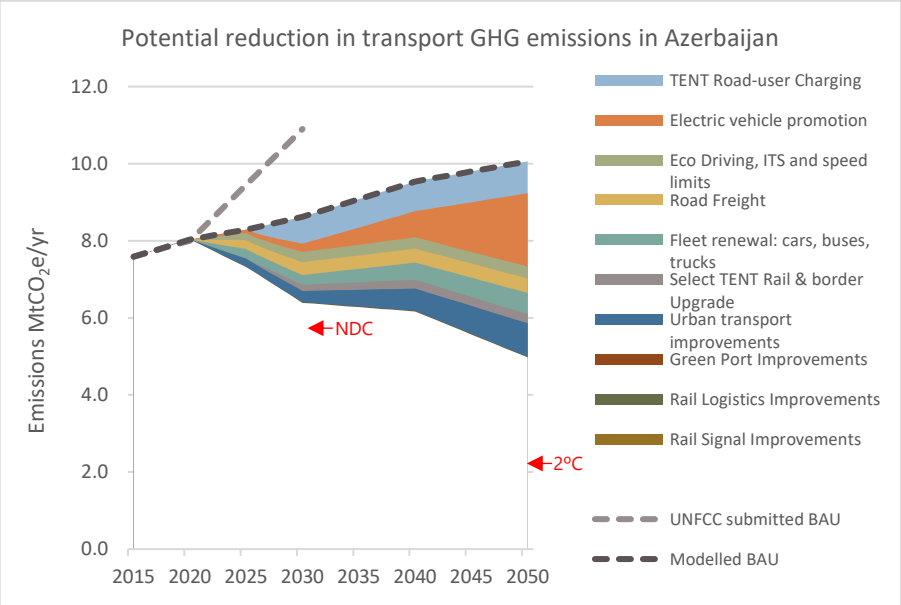
5.22 Figure 5-8 presents a series of graphs that split out the impact of the green max scenario into its constituent policies for each country. The NDC target for 2030 is also shown based on the assumption that emissions in all sectors reduce at the same rate.

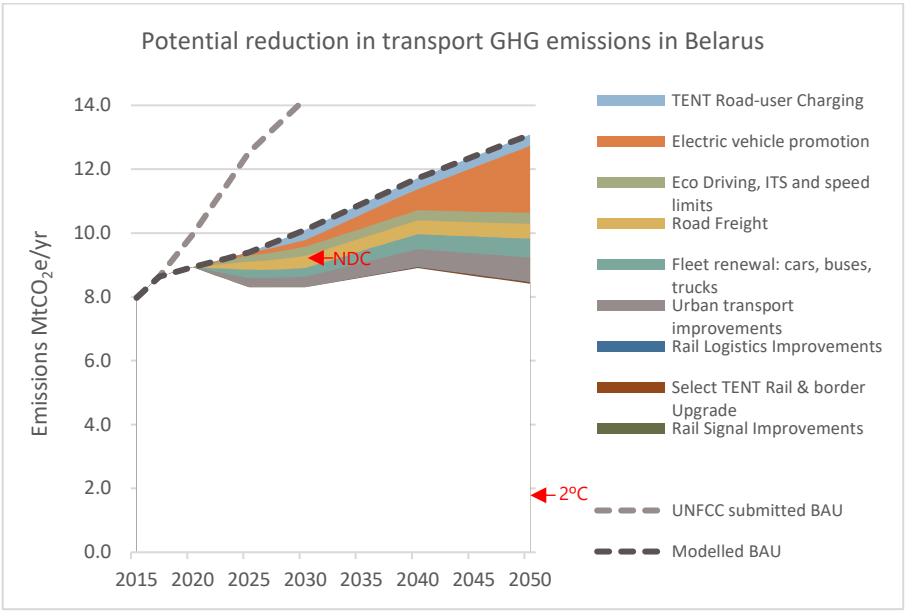
5.23 If all sectors were to reduce emissions at the same rate, then the green transport policies match the NDC targets for four countries, but additional interventions would be needed in Azerbaijan and Moldova. However, more ambitious and novel interventions in transport are required to deliver the scale of emission reductions consistent with a 2ºC pathway.

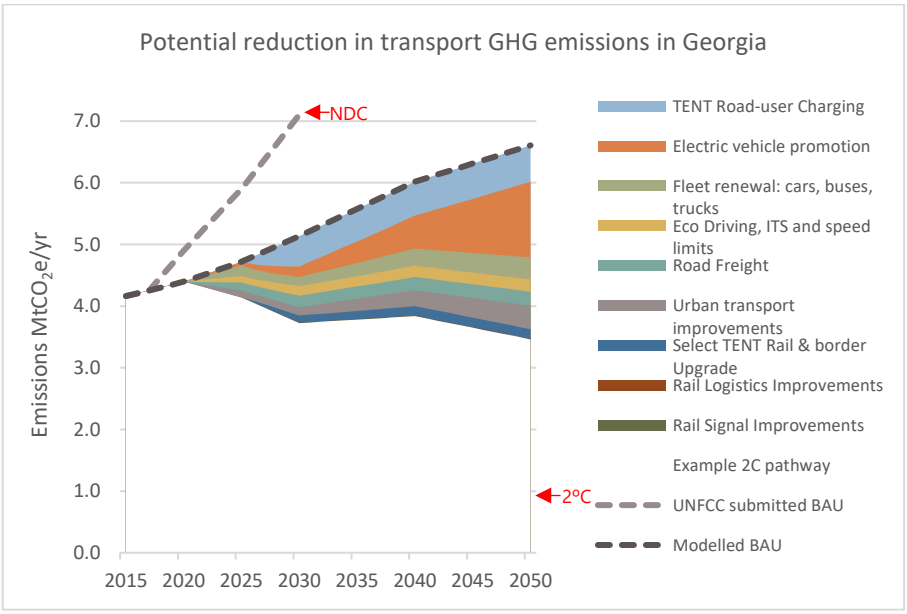
[24] Georgian Ministry of Environment Protection 2020. *Georgia's 2030 Climate Action Plan* [unpublished]
[25] EBRD 2011. Greenhouse gas emissions projections for Ukraine p25

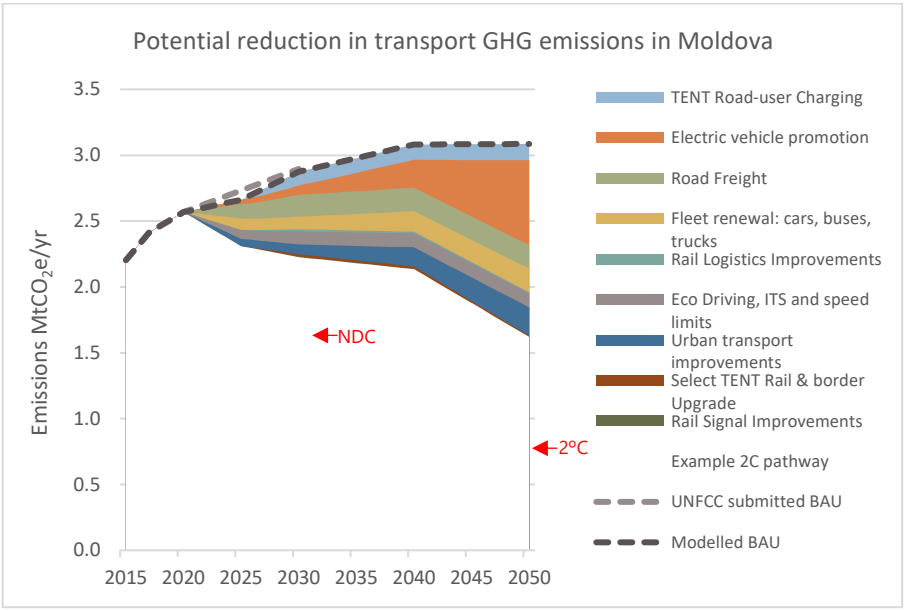
**Figure 5-8: Cumulative impact of green transport policies in each country**

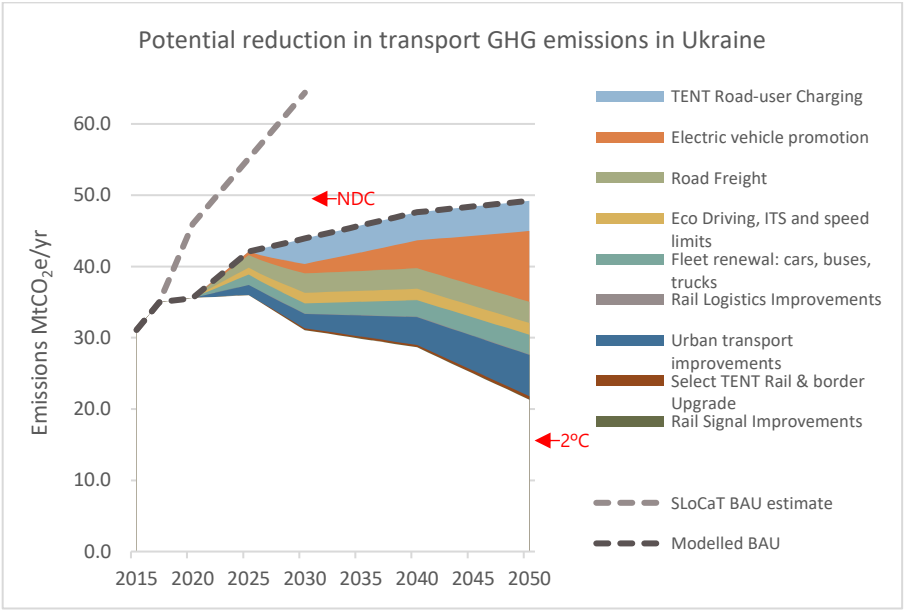



Potential reduction in transport GHG emissions in Belarus
Emissions MtCO2e/yr
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2015 2020 2025 2030 2035 2040 2045 2050
NDC
2ºC
TENT Road-user Charging
Electric vehicle promotion
Eco Driving, ITS and speed limits
Road Freight
Fleet renewal: cars, buses, trucks
Urban transport improvements
Rail Logistics Improvements
Select TENT Rail & border Upgrade
Rail Signal Improvements
UNFCC submitted BAU
Modelled BAU


Potential reduction in transport GHG emissions in Georgia
Emissions MtCO2e/yr
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2015 2020 2025 2030 2035 2040 2045 2050
NDC
2ºC
TENT Road-user Charging
Electric vehicle promotion
Fleet renewal: cars, buses, trucks
Eco Driving, ITS and speed limits
Road Freight
Urban transport improvements
Select TENT Rail & border Upgrade
Rail Logistics Improvements
Rail Signal Improvements
Example 2C pathway
UNFCC submitted BAU
Modelled BAU


Potential reduction in transport GHG emissions in Moldova
Emissions MtCO2e/yr
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2015 2020 2025 2030 2035 2040 2045 2050
NDC
2ºC
TENT Road-user Charging
Electric vehicle promotion
Road Freight
Fleet renewal: cars, buses, trucks
Rail Logistics Improvements
Eco Driving, ITS and speed limits
Urban transport improvements
Select TENT Rail & border Upgrade
Rail Signal Improvements
Example 2C pathway
UNFCC submitted BAU
Modelled BAU


Potential reduction in transport GHG emissions in Ukraine
Emissions MtCO2e/yr
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2015 2020 2025 2030 2035 2040 2045 2050
NDC
2ºC
TENT Road-user Charging
Electric vehicle promotion
Road Freight
Eco Driving, ITS and speed limits
Fleet renewal: cars, buses, trucks
Rail Logistics Improvements
Urban transport improvements
Select TENT Rail & border Upgrade
Rail Signal Improvements
SLoCaT BAU estimate
Modelled BAU

## Co-benefits of green transport

5.24 The green policies presented here not only significantly reduce GHG emissions they also deliver strong economic and social co-benefits. In relation to the UN's Sustainable Development Goals these include:

- SDG3 'Good health and wellbeing' through,
  - reduced emissions of harmful local air pollutants, and;
  - improved mental and physical health from more walking and cycling
- SDG 8 'Decent work an economic growth' through,
  - travel time savings,
  - operating cost savings,
  - reliable delivery times for just in time industry,
  - green jobs,
  - agglomeration benefits within cities,
  - improved access to jobs.
- SDG 7 'Affordable and clean energy' through a reduction in energy use
- SDG 10 'Reduce inequalities' through improved access to employment, education and services
- SDG 11 'Sustainable cities and communities' through sustainable urban transport and a reduction in congestion
- SDG 17 'Partnerships for the goals' through enhanced international and local cooperation

5.25 Modelling conducted by this study cannot quantify all of the above co-benefits, however Table 5-4 presents those which have been captured (in part) by the model for the year 2030. This includes a reduction in travel time, travel cost, local air pollutants (NOx and PMx), energy use and mode shift signifying a reduction in congestion. A breakdown of co-benefits for each policy by country is presented in Table 6-9 to Table 6-14.

**Table 5-5: Co-benefits of green transport policies across the EaP, against BAU in 2030**

| Policy | Change in travel time (freight) | Change in travel cost (freight) | Change in NOx emission | Change in PMx emission | Change in energy use | Mode shift to rail | |
|---|---|---|---|---|---|---|---|
| | | | | | | Pass. | Freight |
| Green focused policies | | | | | | | |
| ITS, eco driving and speed limits | - | - | -5% | -4% | -4% | - | - |
| Fleet renewal: cars, buses, trucks | - | - | -5% | -3% | -4% | - | - |
| Electric vehicle promotion | - | - | -6% | -4% | -4% | - | - |
| TEN-T road user charging | - | - | -9% | -7% | -8% | 0.7% | 0.1% |
| Urban transport improvements | - | - | -2.5% | -3.4% | -6.5% | - | - |
| Road freight improvements | -4% | -6% | -9% | -6% | -7% | - | - |
| Green port improvements | -2% | -1% | -0.1% | -0.4% | -0.1% | - | - |
| Connectivity focused policies (presented in Chapter 4) | | | | | | | |
| Rail package: tracks & borders | -12% | -4% | -0.8% | - | -1.1% | 6.7% | 6.7% |
| Rail signals and logistics | -5% | -1% | -0.3% | -0.1% | -0.3% | 0.3% | 0.3% |
| Toll roads in Ukraine & Belarus | -1% | 1% | -1.3% | -0.9% | -1.3% | 0.7% | 0.7% |
| Green Max | -24% | -11% | -26% | -19% | -25% | 7% | 7% |

Note: Mode shift is measured through passenger-km and freight kms

# Cost of greening the transport sector

## Cost of green transport policies

5.26 Cost estimates were developed for each green policy based on case studies of similar policies implemented around the world. These costs were tailored to the characteristics of each country by considering network length, vehicle fleet size, modal share etc. The case studies are presented in Appendix B.

5.27 The public cost of investment and maintenance for the green transport policies in the next decade are shown in Table 5-6. This totals € 21.0 billion across the EaP. 60% of the cost applies in Ukraine, reflecting its extensive transport network and geographic size.

On cost per GDP basis, however, the EaP countries have a more comparable burden ranging 0.3% in Azerbaijan to 0.7% in Moldova and Ukraine. Some aspects of the policies are likely to be revenue neutral – for example regulatory changes such as new vehicle import standards and road user charging where charges collected are expected to cover the operating costs. The TEN-T road user charging policy does not include upgrading the roads, only charging users for their use.

**Table 5-6: Cost to implement green policies, 2020- 2030**

| Policy | Armenia | Azerbaijan | Belarus | Georgia | Moldova | Ukraine | Total | BCR |
|---|---|---|---|---|---|---|---|---|
| ITS, eco-driving, speed limits (€ m) | 100 | 48 | 203 | 108 | 86 | 473 | **1,017** | 5.0 |
| Fleet renewal: cars, buses, trucks (€ m) | 66 | 184 | 495 | 148 | 110 | 1,333 | **2,336** | 2.7 |
| Electric vehicle promotion (€ m) | 17 | 44 | 119 | 35 | 24 | 308 | **547** | 11.4 |
| TEN-T road user charging (€ m) | | | | Assumed charges will cover costs | | | - | 6.8 |
| Urban transport improvements (€ m) | 497 | 1,462 | 1,988 | 612 | 463 | 8,230 | **13,253** | >1.0 |
| Road freight improvements (€ m) | 88 | 264 | 788 | 230 | 94 | 2,109 | **3,574** | 5.5 |
| Green Port Improvements (€ m) | - | 28 | - | 17 | 15 | 167 | **227** | 3.0 |
| **Total (€ m)** | **768** | **2,029** | **3,592** | **1,151** | **792** | **12,621** | **20,954** | |
| **Cost as % of GDP** | **0.5%** | **0.3%** | **0.5%** | **0.4%** | **0.7%** | **0.7%** | **0.6%** | |
| BCR (2020-2050) | >1.7 | >2.5 | >1.6 | >2.9 | >2.2 | >2.5 | >2.4 | |
| Net economic benefits as % of GDP | 0.3% | 0.4% | 0.3% | 0.7% | 0.7% | 0.9% | | |

Note: Costs are in 2019 prices

## Economic benefits of green transport

5.28 Green transport policies also deliver significant economic benefits, as initially identified by the discussion on co-benefits above. An assessment of the economic Benefit Cost Ratio (BCR) has been conducted for each policy and is presented in Table 5-6 above. Economic benefits captured by this study include journey time savings, operating cost

savings, a reduction in local air pollution emissions, and benefits associated with a reduction in GHG emissions via the shadow price of carbon[26].

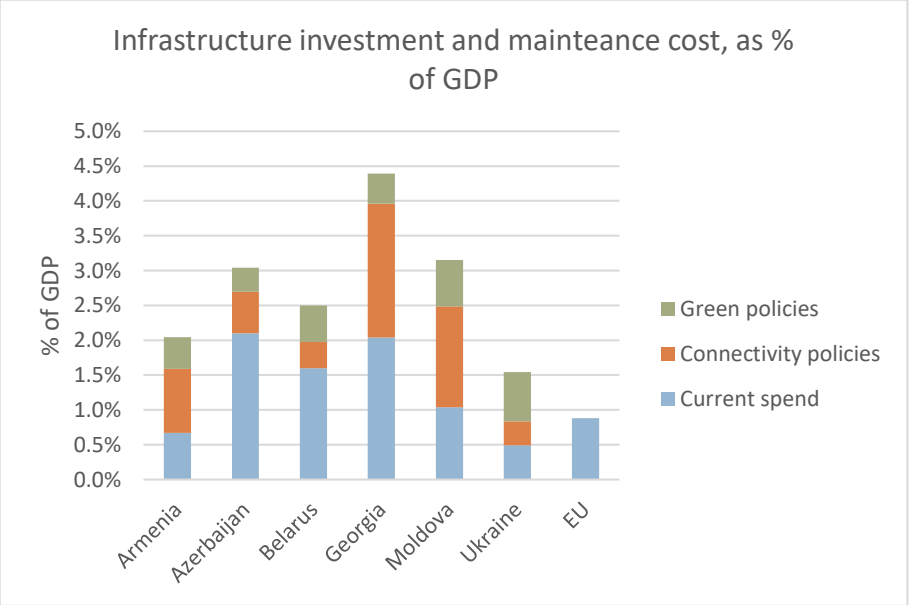
5.29 The policies with the strongest economic performance include the promotion of electric vehicles, road user charging, road freight improvements, ITS, eco-driving, and the enforcement of speed limits. However, the strategic nature of the transport model does not fully capture urban benefits - but the urban transport improvement package is highly ambitious involving a substantial increase in spending and policy to enable a transition to sustainable transport. To be conservative we have assumed urban benefits match costs, while in practice urban transport projects often exhibit much higher BCRs.

5.30 The implementation of green transport policies in each country yields a BCR ranging from 1.6 in Belarus to 2.9 in Georgia, but because of the likely under-estimation of urban benefits, these BCR values could be much higher in practice.

## Comparison with current transport spend

5.31 Figure 5-9 presents the annual cost of implementing the green transport policies as percent of GDP in addition to current spend on transport infrastructure and the cost of the connectivity policies presented in Chapter 4. A doubling of existing spend in the EaP is required to implement of the green and connectivity policies together.

**Figure 5-9: Transport infrastructure spend, connectivity and green policies, as % of GDP**




Source: OECD 2020, *Infrastructure Investment*, *Infrastructure maintenance*,. OECD 2018, *Maintaining the Momentum of Decentralization in Ukraine*.

[26] [26] World Bank 2017. Guidance note on shadow price of carbon in economic analysis

## Barriers to implementation

5.32 Despite NDC targets having been set, there has been relatively little action to date in implementing large scale green transport projects in the EaP countries. As often seen in other countries, other sectors have taken priority in mitigation activities, with the energy and industrial sectors offering 'quick wins' in terms of emission reduction. However, this approach is not consistent with a zero-emission pathway to limit warming to 2ºC or 1.5ºC, both because of the projected growth in emissions in the transport sector, and the longer lead time for green transport policies to have an effect.

5.33 The challenges in implementing emission reduction policies are linked to transport's important role in wider economic activity, with low price-elasticities of demand for freight and personal mobility[27] undermining the effectiveness of pricing mechanisms to encourage modal shift or higher efficiency. Effective strategies therefore typically rely on strong government policy and regulations. The implementation of strong policy and regulation has proven challenging in some EaP counties, with political instability, public resistance to increased transport costs and skepticism of public-private initiatives in some countries. Public dialogue is needed to raise awareness of the climate crisis, potential solutions and their co-benefits. Broad public consultation, such as deliberative democracy, can be used to build public ownership of complex policy decisions.

5.34 Poor quality public transport is encouraging private motorization, while low public transport fares and high public operator subsidies have inhibited improvements. Poorly regulated regional public transport has also made collective transport unattractive.

5.35 The connectivity policies rely on strong regional co-operation, with many of the benefits from reduced border friction and trade route improvements lying beyond the borders of the country of implementation. Closer political, technical, and administrative collaboration though the EaP framework is necessary.

5.36 The ageing and polluting vehicle fleets seen in most EaP countries have been in part driven by stricter emissions and roadworthiness regulations enacted in EU countries, promoting the export of older vehicles into the EaP countries. A lack of infrastructure, both in charging and mechanical aftersales support is limiting the desired increase in penetration of electric vehicles despite most EaP countries bringing in supportive fiscal measures to encourage uptake.

[27] Dahl 2012. Measuring global gasoline and diesel price and income elasticities

# 6. Prioritization of green transport options

6.1 This chapter assesses the economic performance of green transport policy options using a prioritization framework consistent with climate fund eligibility. It utilizes a high-level multi-criteria appraisal to prioritize the green transport policies for each county and proposes enabling policy actions for each EaP country to achieve them.

**Key messages**

To prioritize green transport policy areas we have assessed the marginal abatement cost, the level of country ownership and the scale of co-benefits such as reduced air pollution, reduced energy use and economic benefits.

There is generally good country ownership for interventions in urban transport and fleet renewal and generally low country ownership for road user charging, eco-driving, ITS and speed limit enforcement.

The policy areas of highest priority are electric vehicle promotion, road freight improvements and urban transport improvements. These areas show large emission reductions, moderate to good country ownership and large economic benefits.

Rail improvements are prioritized for Belarus and Azerbaijan where significant economic benefits match good country ownership. In Georgia and Ukraine rail improvements would also yield significant economic benefits, but country ownership is not as strong here.

The policies which are often found to be lower priority are green port improvements, because they have little impact on GHG emissions, and road user charging which suffers from low levels of country ownership despite a large potential to reduce emissions.

## Establishing a prioritization framework consistent with climate fund eligibility

6.2 Chapter 5 shows that the green policies identified in this study can achieve significant reductions in GHG emissions. But together they are still not sufficient to place countries on a zero-emission pathway that is consistent with the Paris Agreement goals. Therefore, it could be argued that *all* the green transport policies presented here need to be implemented as well as additional measures that are even more radical.

6.3 Even if all the policies are eventually implemented, there is still a need for prioritization to secure financing. Traditional prioritization of transport investment centers on

economic and financial cost-benefit analysis. However, the overarching requirement to reduce GHG emissions means that climate funds and green finance opportunities have broader eligibility criteria.

6.4 The framework presented in Table 6-1 provides a foundation for a prioritization framework, covering all of the elements of the traditional scheme appraisal and climate investment priorities. The traditional framework was followed in the WB's recent study on the "Indicative trans-European Transport Network (TEN-T) Investment Action Plan." Also, the IDEA II Project included a component related to the development of a prioritization methodology, as part of the TRACECA Program[28].

6.5 Climate funds typically require the addition of three new concepts 1) Paradigm shift potential; 2) Sustainable development potential; 3) Additionality.

**Table 6-1: Prioritization criteria**

| Criteria | Traditional Framework | Climate Fund | Comments |
|---|---|---|---|
| Country ownership | ☑ | ☑ | National 'buy-in' and alignment with policy |
| Impact potential - Environmental | ☑ | ☑ | CO2 mitigation potential |
| Impact potential – Economic/social | ☑ | ☑ | Economic and social benefits of increased accessibility |
| Cost-Effectiveness/ Efficiency | ☑ | ☑ | Financial/economic viability Marginal abatement cost |
| Paradigm shift potential | | ☑ | Demonstrate catalytic and transformative impact which extends beyond what is delivered by the one-off investment |
| Sustainable development potential | | ☑ | Captures Economic, social, and environmental co-benefits such as poverty alleviation, social exclusion, gender empowerment, air quality |
| Additionality | | ☑ | A demonstration that the project would not have been delivered in the absence of climate funds |

[28] IDEA II was a project funded by the EU from 2013 to 2016 to strengthen economic relations, trade and transport links between the EU and countries in Eastern Europe, Caucasus and Central Asia http://www.traceca-org.org

6.6 It is not the place of this study to conduct a detailed prioritization process because the study is high level and the process should be led by national governments Instead of a detailed prioritization process, this study utilizes a high-level multi-criteria appraisal to prioritize the green transport policies for each county.

## Multi-criteria appraisal

6.7 The appraisal utilized in this study includes six criteria which consider the eligibility requirements for climate funds. The criteria and their metrics considered are presented in Table 6-2. The multi-criteria appraisal outputs a priority score for each policy from 1 (high priority) to 5 (low priority). The score is developed by ranking the performance of each policy for each criterion, and sums together the rankings using weightings that consider the correlation between metrics. The resulting score is then rebased to be marked 1 to 5 for easier understanding.

6.8 The results of multi-criteria appraisal process are presented in Table 6-9 to Table 6-144 following the evidence base which is presented next.

**Table 6-2: Multi-criteria appraisal framework**

| Criteria | Appraisal metric | Weighting |
|---|---|---|
| Total GHG mitigation by 2050 | Cumulative Million Tons of $CO_2e$ mitigated by 2050 | 2 |
| Cost effectiveness of GHG mitigation | Economic cost of mitigation expressed as € per Ton of all $CO_2e$ mitigated by 2050 | 1 |
| Country ownership | Scheme inclusion in Country Program or action plan, transport strategy or policy document, alignment with the NDC, or championing of the project by national or local government | 3 |
| Social co-benefits: Good health (SDG 3) | Annual NOx emissions saved in 2030 in Tons, weighed for greater positive impact in urban areas | ½ |
| Social co-benefits: Affordable energy (SDG 7) | Annual energy use saved in 2030 in GwHs | ¼ |
| Economic co-benefits (SDG 8) | Economic Benefit Cost Ratio and qualitative description of economic benefits | 1 |

## Marginal abatement cost curve analysis

6.9 Marginal Abatement Cost (MAC) curves report on the first two criteria: 1) Total GHG mitigation by 2050, and; 2) Cost effectiveness of GHG mitigation. For each measure, the marginal abatement cost (MAC) is based on the incremental cost of emission savings, and the potential total amount of emissions saved during the period of analysis. See Equation 1, below:

$$MAC_M = NPV_{INC,MM} \div E_{MM}$$

6.10 Where:

- $MAC_M$ = Marginal abatement cost of the mitigation measure over the analysis period, comparing the cash flow of implementing the measure to an alternative counterfactual scenario in which this measure is not implemented. It is expressed in Euros per Ton of $CO_2e$ reduction
- $NPV_{INC,MM}$ = Net present value of the difference in cash flow (costs and benefits) of implementing the mitigation measure over the analysis period when compared to an alternative counterfactual scenario in which this measure is not implemented. It is expressed as the Net Present Value (in EURO, 2019) of the difference in cash flows of the two scenarios. It is important to note that the shadow price of carbon does *not* from part of the economic benefits in MACC analysis as this would lead to double counting.
- $E_{MM}$ = Reduction in GHG emissions over the analysis period when compared to the counterfactual scenario in which this measure is not implemented, in Tonne $CO_2e$

6.11 The MACC analysis for each country is presented in Figure 6-1. A number of these policies consider the application of best practice in full as a large package. Therefore, they can appear relatively costly compared to more targeted interventions.

6.12 The rail policies that focus on improving connectivity tend to show substantial economic benefits due to reduced travel time and cost, but they decrease GHG emissions by relatively little. This is especially true in Azerbaijan, Belarus, Georgia, and Ukraine. While rail upgrade may present considerable economic benefits, it should be remembered that this is a large package of improvement measures which work together to reduce long-distance rail journey times. The package includes select rail line upgrades, rail gauge adaption, and border improvements policies. Therefore, the financial investment is high (Table 4-7).

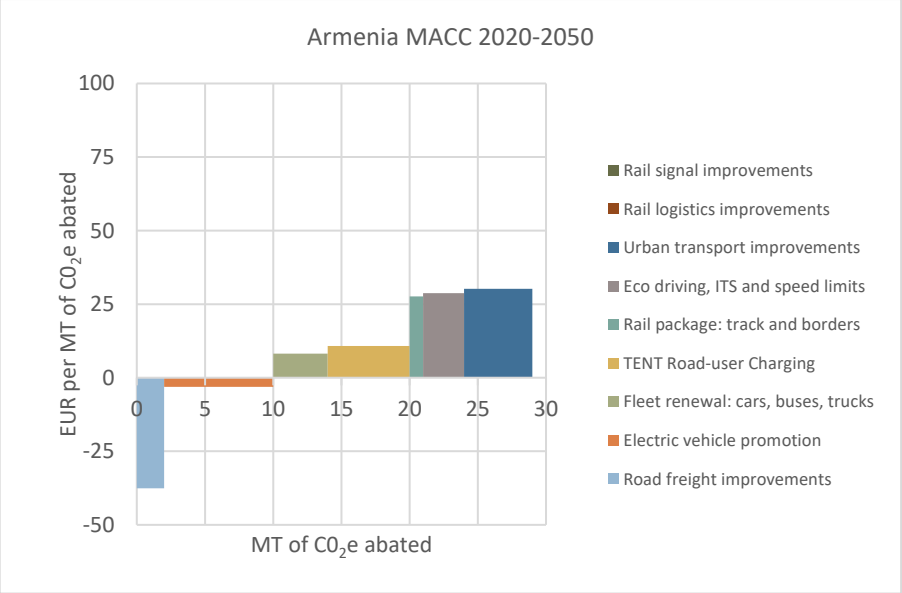
6.13 Azerbaijan and Belarus have been upgrading their rail network in recent years, and this study found that continued improvement will be beneficial. For Ukraine and Georgia,

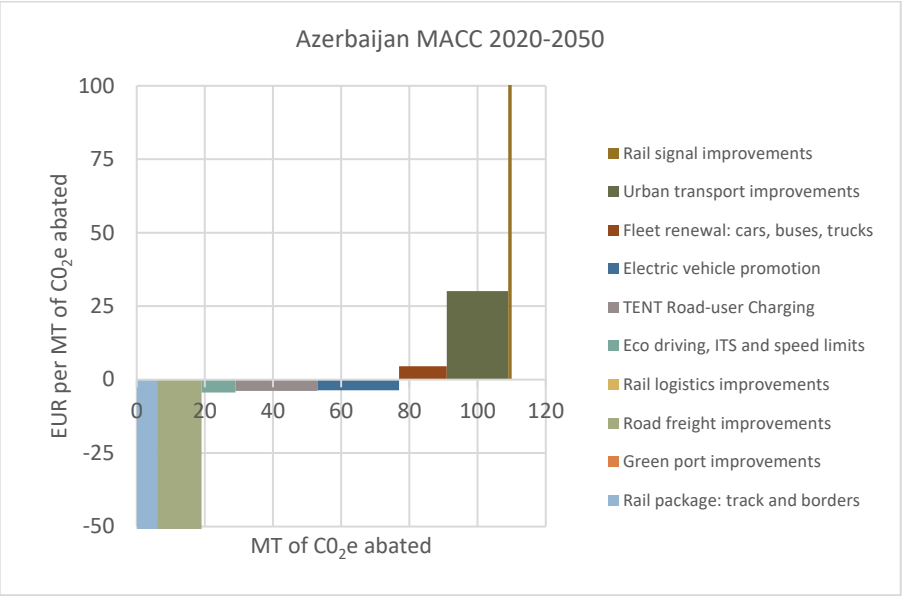
non-economic barriers have prevented recent rail improvement – this relates to institutional capacity and political barriers where rail border upgrades are beneficial.

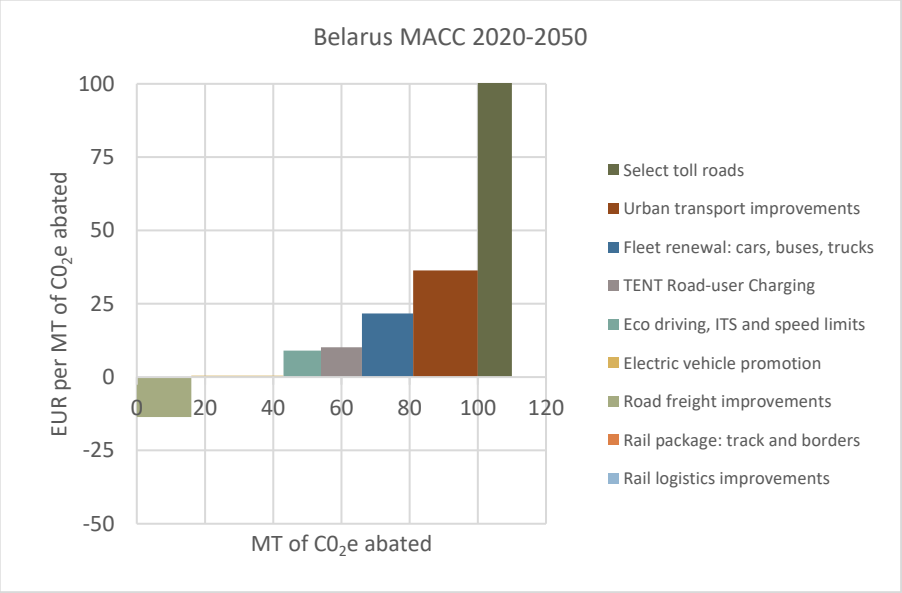
6.14 Following rail improvements, the policies which are typically the most cost-effective are road freight improvement, electric vehicle promotion, and the package of ITS, eco-driving, and speed limit enforcement.

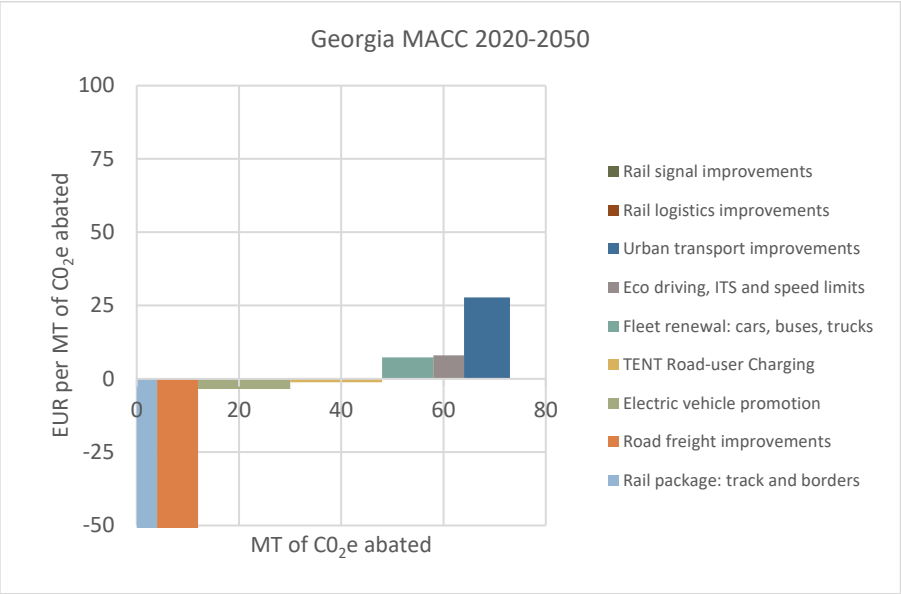
6.15 Urban transport improvements are shown to mitigate significant amounts of GHG emission but appear costly within this MACC analysis. However, the economic benefits of urban transport improvements are likely to be significantly underestimated because this study does not capture time savings arising from this investment. The time savings could be substantial, as the urban policies are expected to avert a significant increase in car use and hence congestion.

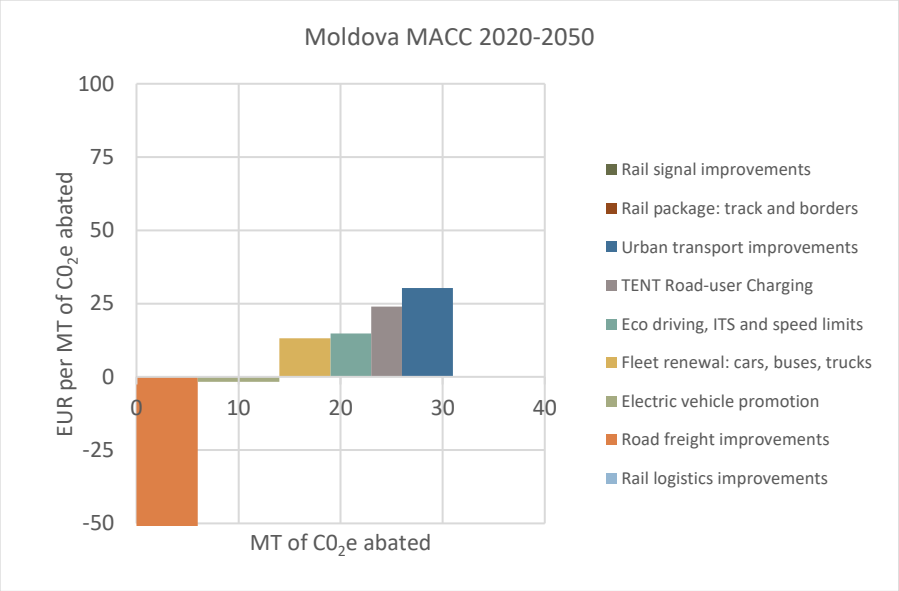
**Figure 6-1: Green transport policy MACCs for each EaP country**

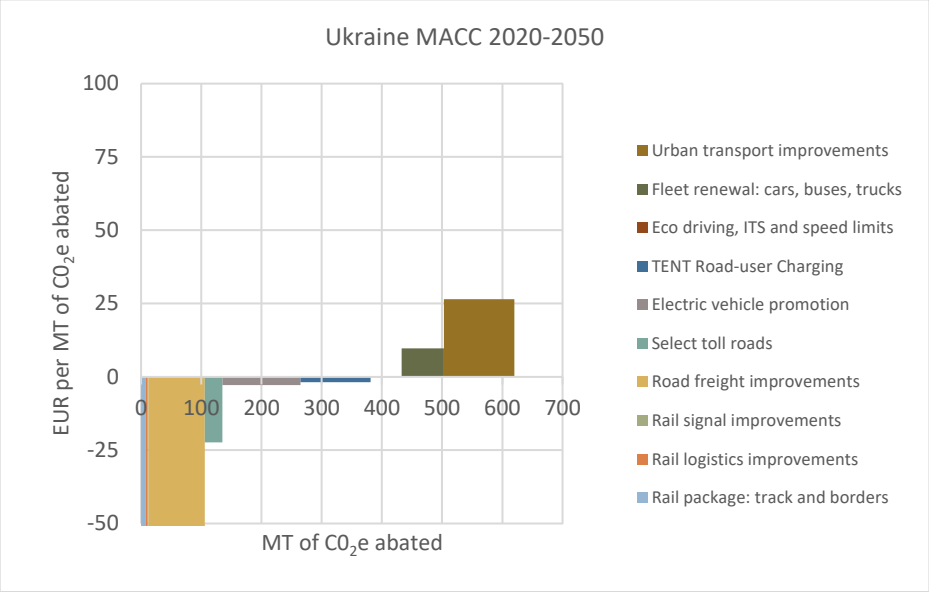



Azerbaijan MACC 2020-2050
EUR per MT of $CO_2$e abated
100
75
50
25
0
-25
-50
0
20
40
60
80
100
120
MT of $CO_2$e abated
Rail signal improvements
Urban transport improvements
Fleet renewal: cars, buses, trucks
Electric vehicle promotion
TENT Road-user Charging
Eco driving, ITS and speed limits
Rail logistics improvements
Road freight improvements
Green port improvements
Rail package: track and borders


Belarus MACC 2020-2050
EUR per MT of $CO_2$e abated
100
75
50
25
0
-25
-50
0
20
40
60
80
100
120
MT of $CO_2$e abated
Select toll roads
Urban transport improvements
Fleet renewal: cars, buses, trucks
TENT Road-user Charging
Eco driving, ITS and speed limits
Electric vehicle promotion
Road freight improvements
Rail package: track and borders
Rail logistics improvements


Georgia MACC 2020-2050
EUR per MT of $CO_2e$ abated
100
75
50
25
0
-25
-50
0
20
40
60
80
MT of $CO_2e$ abated
Rail signal improvements
Rail logistics improvements
Urban transport improvements
Eco driving, ITS and speed limits
Fleet renewal: cars, buses, trucks
TENT Road-user Charging
Electric vehicle promotion
Road freight improvements
Rail package: track and borders


Moldova MACC 2020-2050
EUR per MT of $CO_2e$ abated
100
75
50
25
0
-25
-50
0
10
20
30
40
MT of $CO_2e$ abated
Rail signal improvements
Rail package: track and borders
Urban transport improvements
TENT Road-user Charging
Eco driving, ITS and speed limits
Fleet renewal: cars, buses, trucks
Electric vehicle promotion
Road freight improvements
Rail logistics improvements




## Country ownership

6.16 To ascertain the current level of aspiration for different green transport policies to be implemented the study team reviewed three sources of information:

- National strategy and policy that relate to transport and low carbon plans
- Strategies, plans, and recommendations provided by international institutions, e.g. World Bank, EBRD, and UNDP; and
- Study team consultation with relevant ministries and international institutions within each EaP country

6.17 This review determined (i) whether a country is already implementing projects within the policy area, (ii) whether they wish to implement policy in this area, or (iii) whether little interest has been shown.

6.18 A summary of the policy aspirations for each EaP country is shown in Table 6-3 to Table 6-8. A traffic light color-coding system is used to indicate the level of ambition as well as a description of what elements of each policy area are under consideration:

- Green shows high ambition and commitments to delivering policies
- Yellow shows medium enthusiasm for policies and limited commitments
- Red shows low mention of policy

6.19 Each country is shown to have differences in their policy emphasis. Presently:

- Armenia is focused on domestic travel, urban transport, and fleet renewal

- Azerbaijan is pushing in the areas of rail and international logistics but has not pursued many fleet renewal policies
- Belarus has been developing its rail network and cross-border freight facilities
- Georgia shows most interest in urban transport, fleet renewal, electric vehicles, and logistic centers, including a new port
- Moldova shows strong interest in urban transport, border improvements, specific rail upgrades, and fleet renewal
- Ukraine shows interest in all policy areas with significant interest in rail gauge adaption, electric vehicles, urban transport and green ports

**Table 6-3: Current green transport policy in Armenia**

| Policy area | Description of policy positions | Source |
|---|---|---|
| Rail upgrade | Desire to develop north-south rail axis. But line to Iran is on hold. | Study team consultation |
| Rail gauge adaption | Not applicable unless railway line to Iran is upgraded | |
| Rail border upgrade | World Bank recommends rail operator to cooperate with Georgian Railways to maintain a block train service to Poti Port and for the State Revenue Committee to fully implement Single Window concept to serve cross-border movements. | World Bank 2019, *Armenia: Transport Logistics Policy Note* |
| Rail signals | Limited reference | |
| Rail logistics | World Bank recommends a Public Service Contract for a rail ferry connection between the Port of Poti (Georgia) and Port of Kavka (Russia), to better connect Armenia with Russia. | World Bank 2019, *Armenia: Transport Logistics Policy Note* |
| Eco driving, ITS and speed limits | Limited reference | |
| Fleet renewal: cars, buses, trucks | Modernization of public fleet and expansion of electric transport in cities and use of biofuels. Revisions of vehicle regulation and taxation policy to assist in changing behaviors. Vehicle inspections, incl. emissions, to achieve better maintenance | Min of Natural Protection 2015, *3rd Comm. on Climate Change* |
| Electric vehicle promotion | Extend a tax exemption to all electric vehicles. Facilitating the development of charging infrastructure in Yerevan. Proposing 25% of public transport in Yerevan will be fueled by electricity and hydrogen by 2025. | City Yerevan 2017, *Green City Action Plan*<br>Study team consultation |
| Road user charging | An aspiration to tax heavy trucks by distance travelled or a vignette, because transiting overloaded trucks are a major source of highway deterioration. | Study team consultation |
| Urban transport improvements | Public transport fleet modernization (CNG and trolleybuses) in Yerevan while restricting marshrutka. Pilot electric buses. Public transport route rationalization and optimization (2025). Aspiration for a 'Unified Public Transport System" to reach all towns in Armenia. Development of a cycle network in major conurbations (initially in Yerevan). 35km of bike lanes for 100,000 inhabitants by 2025. HGV restrictions around Yerevan. | City of Yerevan 2017, *Green City Action Plan*<br>Min of Natural Protection 2018, *2nd Biennial Update Report* |
| Road freight improvements | World Bank recommends a Corridor Management Information System to offer a single window for commercial, operational and financial purposes. | World Bank 2019, *Transport Logistics Policy Note* |
| Green port Improvements | Not applicable | |

**Table 6-4: Current green transport policy in Azerbaijan**

| Policy area | Description of policy positions | Source |
|---|---|---|
| Rail upgrade | Reconstruction of Bilajari-yalama line, Baku-Sumgait line & power supply for Alat-Astara line. Full electrification of railways by 2050. Structural repair of 600 km of railway lines under Phase 2 of 'Reconstruction of Azerbaijani Railroads'. Line construction to Iran and improve the railway infrastructure to facilitate express trains | Azer. Govt. 2016, *Roadmap for Logistics & Trade*<br>Min of Ecology and Natural Resources 2015, *3rd Comm. on climate change* |
| Rail gauge adaption | Replacement of the wheels of the trains on the Baku-Tbilisi-Kars railway that crosses the Turkey-Georgia border and on the Astara-Astara Railway on the Iran border. | Azer. Govt. 2016, *Roadmap for Logistics & Trade* |
| Rail border upgrade | PPP to expand railway wagons and locomotive park at borders. Facilitate international transportation relations to reduce delays and expenses at borders. Harmonize operational procedures and equipment to enable multimodal operations along the CTC corridor. Including customs clearance, immigration procedures and increased containerization. Common data standards and information systems across shippers, carriers, border authorities | CAREC 2019, *Transport Strategy 2030*<br>World Bank 2018, *Improving Freight Transit and Logistics Performance of the CTC* |
| Rail signals | PPP to invest in signaling, recovery of rail track and compliance with international rail management systems. Signaling and communications improvements for suburban trains. | Min of Ecology and Natural Resources 2015, *3rd Comm. on climate change* |
| Rail logistics | Creation of logistic hubs and free trade zones. With Georgian railways, modernize locomotive fleet to increase cargo flow. 50 new AC locomotives planned in 2018 | Azer. Govt. 2016, *Roadmap for Logistics & Trade* |
| Eco driving, ITS and speed limits | ITS in targeted areas such as ports, borders and cities. Expansion of Baku's existing Intelligent Transport Management Centre/ Eco-driving program for SOCAR's vehicle fleet. | Min of Ecology and Natural Resources 2015, *3rd Comm. on climate change* |
| Fleet renewal: cars, buses, trucks | Expand the use of energy-efficiency vehicles and the gradual phasing out of old vehicles (Euro-4 standards) for all new light/medium duty passenger vehicles from 2014 | Min of Ecology and Natural Resources 2015, *3rd Comm. on climate change* |
| Electric vehicle promotion | Limited reference | |
| Road user charging | Limited reference | |
| Urban transport improvements | World Bank recommends park and ride sites, pedestrian safety improvements, better parking enforcements, better regulation and enforcement of private taxi operators, rehabilitation of suburban rail system, Baku Metro expansion, rationalization of bus network and operationalization of priority lanes. And e-ticket expansion. | World Bank. *Baku Urban Mobility Policy Note* |
| Road freight improvements | Creation of logistic hubs and free trade zones. Modernizing and professionalization of the trucking sector through a combination | Azer. Govt. 2016, *Roadmap for Logistics & Trade* |
| Green port Improvements | IT systems and automation for Port of Baku to boost capacity. Increase the loading capacity of vessels. Improve customs procedures, forecasting and tracking. On site renewable electricity generation, electric handling equipment, extension of cold ironing. | Azer. Govt. 2016, *Roadmap for Logistics & Trade*<br>CAREC 2019, *Transport Strategy 2030* |

**Table 6-5: Current green transport policy in Belarus**

| Policy area | Description of policy positions | Source |
|---|---|---|
| Rail upgrade | Electrification of 836km by 2030 and additional 1,142km between 2030-2045 | Min of Natural Resources 2018, *7th comm. on climate change* |
| Rail gauge adaption | Constructed transshipment site on Polish border. Acquire new rolling stock with standard gauge compatibility - passenger locomotives and moto car rolling stock to reduce passenger and freight journey times | Min of Natural Resources 2018, *7th comm. on climate change* |
| Rail border upgrade | World Bank recommends inter-railway cooperation, including customs services in neighboring countries to use electronic documents to reduce freight border delays. | World Bank, *Country partnership framework for Belarus Y18-22* |
| Rail signals | Increase the average speed of passenger trains and introduce information technologies and a control center to coordinating the network | Min of Natural Resources 2018, *7th comm. on climate change* |
| Rail logistics | World Bank recommends the development of international terminals and distribution centers, working with local railway operators to develop quick and reliable services for longer hauls between countries. Increase collaboration between BCh and freight forwarders, including improving freight terminal capacity and efficiency | World Bank, *Country partnership framework for Belarus Y18-22* |
| Eco driving, ITS and speed limits | Give power to local administrative bodies to deploy ITS to improve traffic demand management. Introduce automated systems of supervisory control and management in the transportation of goods and passengers (urban and regional traffic flows | Belarus Government 2016, *Strategy for sustainable socio-economic development to 2030* |
| Fleet renewal: cars, buses, trucks | Fleet renewal including scrappage of worn vehicles above a certain age. Introduce modern equipment for diagnostics and maintenance to enhance vehicle roadworthiness and to comply with new regulations. Incentives to produce and use low emission fuel and vehicles. Expansion of biodiesel. | Min of Natural Resources 2018, *7th comm. on climate change* |
| Electric vehicle promotion | Develop charging infrastructure and support so that EV sales are 5 to 15% of new vehicles by 2025. Introduce electric buses in Belarus by 2025. Increase the use of EVs and scrap gasoline/diesel vehicles to reduce vehicle GHG emissions by 28% by 2030 on 1990 levels. | Min of Natural Resources 2017, *Green economy in the Republic of Belarus* |
| Road user charging | EBRD recommends that road rehabilitation and maintenance can be funded through tolling on major highways | EBRD 2016, *Strategy for Belarus* |
| Urban transport improvements | Increase in share of low-emission public transport in urban areas larger than 100,000 people by 2030. Follow a green city approach to urban development in small and medium sized cities. Promote bicycle use for short distances and construct cycle paths | Belarus Govt 2016, *Strategy for sustainable socio-economic development, 2030.* |
| Road freight improvements | Limited reference | |
| Green port Improvements | Not applicable | |

**Table 6-6: Current green transport policy in Georgia**

| Policy area | Description of policy positions | Source |
|---|---|---|
| Rail upgrade | Improve rail and its integration with other modes of transport. Shift intercity passenger trips onto rail by improving services and purchase modern trains. | Min. of Env. 2019, *Georgia Country Programme.* And *2030 Climate Action Plan.* |
| Rail gauge adaption | Limited reference | |
| Rail border upgrade | Limited reference | |
| Rail signals | Limited reference | |
| Rail logistics | Shift freight from road to rail. Use an integrated and coordinated freight tariff policy to make rail more attractive. Desire for rail freight capacity reach 80% of freight traffic. Exploring options for trains to carry trucks | Min. of Env. 2019, *Georgia Country Programme.* And *2030 Climate Action Plan.* |
| Eco driving, ITS and speed limits | Traffic management systems in cities. Eco-driving courses to be implemented before 2030. | Move Mobility 2017, *Sustainable Low-Carbon Urban Transport* |
| Fleet renewal: cars, buses, trucks | Promote a cleaner fleet through scrappage, incentives and tax exemptions for the least polluting vehicles, increase import taxes for old and high emission vehicles. Increase biodiesel production and sales. Technical inspection of vehicles roadworthiness linked to vehicle registration. | Georgia Govt. 2019, *2030 Climate Action Plan*<br>Min of Env. Protection 2019, *2nd Biennial Update Report* |
| Electric vehicle promotion | Increase charging points Tax incentives and cheap financing for consumers to purchase EVs. Establish assembly line for e-buses and bus charging points. Encourage EV for public sector fleets. Pilot EV introduction through Green Eco City Demonstration Project | Min. of Env. 2019, *Georgia Country Programme*<br>Georgia Govt. 2019, *2030 Climate Action Plan* |
| Road user charging | Consideration of road pricing and low emission zones in urban areas | Move Mobility 2017, *Sustainable Low-Carbon Urban Transport* |
| Urban transport improvements | Awareness campaigns and behavior change measures to promote shift form car to sustainable modes. Introduce urban traffic management systems. National framework to fund sustainable urban mobility. Expand Tbilisi metro. Introduce CNG and e-buses in Tbilisi and Batumi. Invest cycle pathways, signage and cycle parking. Develop Integrated Sustainable Urban Transport Plans in Batumi and export a best practice model. | Min. of Env. 2019, *Georgia Country Programme.*<br>EBRD 2017, *Tbilisi Green City Action Plan*<br>Min of Env. 2019, *2nd Biennial Update Report* |
| Road freight improvements | Development logistic centers in Tbilisi and Kutaisi. Share of electric trucks to increase to 30% by 2030 | Georgia Govt. 2019, *2030 Climate Action Plan*<br>CAREC 2019, *Transport Strategy 2030* |
| Green port Improvements | Construct Anaklia Deep Sea Port. | CAREC 2019, *Transport Strategy 2030* |

**Table 6-7: Current green transport policy in Moldova**

| Policy area | Description of policy positions | Source |
|---|---|---|
| Rail upgrade | Lower energy costs, increasing speeds and improving the cost effectiveness of railway operations. Harmonize with EU technical standards, modernize locomotives and electrify rail line from Bender to Ungheni. Short extension of the rail line from Ceadir-Lunga to Ukraine. Short rail line east of Giurgiulești to avoid the transit through Ukraine. Rehabilitate parts of Southwest corridor which has gross train weight limits. | Min of Env. 2018, *4th Comm. on Climate Change*<br>Moldova Govt. 2012, *Transport and Logistics Strategy: 2013-2022*<br>Study team consultation |
| Rail gauge adaption | Transshipment terminal in Ungheni to transfer cargo/containers across gauge. | Moldova Govt. 2012, *Transport and Logistics Strategy: 2013-2022* |
| Rail border upgrade | Modernize borders and train staff to increase customs efficiency. IT infrastructure and software for customs transactions. Construct additional clearance facilities for rail to reduce bottlenecks. | Study team consultation |
| Rail signals | Limited reference | |
| Rail logistics | Multi-modal logistics center, with added value services in Chisinau. Implement the first EU railway package: restructuring, rationalization and liberalization of international freight | Moldova Govt. 2012, *Transport and Logistics Strategy: 2013-2022* |
| Eco driving, ITS and speed limits | Urban traffic management center in Chisinau | Chisinau Green Cities: Objective One 2019 |
| Fleet renewal: cars, buses, trucks | Ongoing fleet modernization, RABLA project. Encourage uptake of CNG, LPG and biofuels. Fuel and energy efficiency standards across modes (2016-2025). Tire and vehicle eco-labelling with tax and custom incentives for low emission products | Min of Agriculture and Env. 2018, *4th Comm. on Climate Change* |
| Electric vehicle promotion | Creating fiscal incentives for importing cars with electric or hybrid engines, as well as developing the national infrastructure necessary for electric cars | *Moldova Govt. 2018, Program on the Promotion of Green Economy Y18-20* |
| Road user charging | World Bank recommends maintenance of the existing public road network using tolls, shadow-tolling and user charges through PPP. | World Bank 2008, P*rep. of a transport sector strategy* |
| Urban transport improvements | Promote public transport, waling and cycling to reduce urban transport GHG emissions by 30% by 2030 on 1990 levels. Bus and trolleybus fleet modernization. Route rationalization and bus priority. Aspiration for a Chisinau Sustainable Urban Mobility Plan for Chisinau. Parking management and control. Traffic calming and footpath upgrade. Pedestrianization and cycle paths. Regulate vehicle access into cities. | *Moldova Govt. 2018, Program on the Promotion of Green Economy Y18-20*<br>Chisinau Green Cities: Objective One 2019<br>Study team consultation |
| Road freight improvements | Logistics center in Chisinau and additional logistics facilities at Giurgiulești and Ungheni. Enhance professional knowledge of transport sector staff in international logistics, warehousing etc. | Moldova Govt. 2012, *Transport and Logistics Strategy: 2013-2022* |
| Green port Improvements | Enhance rail access to Giurgiulesti port is a necessary pre-requisite for a new transshipment terminal | Moldova Govt. 2012, *Transport and Logistics Strategy: 2013-2022* |

**Table 6-8: Current green transport policy in Ukraine**

| Policy area | Description of policy positions | Source |
|---|---|---|
| Rail upgrade | Modernize international transport rail corridors to operate high speed and electrified passenger and freight traffic. Connect regional centers by rail of speeds >160kph by 2030 via PPP. Rehabilitate passenger and freight cars. | Min. of Ecology 2012. *6th Comm. on Climate Change*<br>Min Infra. 2016. *National Transport Strategy 2030* |
| Rail gauge adaption | Ensure interoperability of the Ukraine rail network with the standard gauge. Construct dual gauge railway from Lviv to Poland. | Min Infra. 2016. *National Transport Strategy 2030* |
| Rail border upgrade | Simplify administration for international traffic and ensure technology compatibility across modes. IT systems to span modes, cargo owners, freight forwarders, customs and regulatory bodies. World Bank recommends a risk management system at customs and border agencies, Customs Single Window, a clear tariff system | Min Infra. 2016. *National Transport Strategy 2030*<br>World Bank 2018, *Sus. Logistics Strategy 2030* |
| Rail signals | Optimize transportation schedules and improve the railway condition by conducting relevant work | UNFCC 2017. *Ukraine 2050 Low Emission Strategy* |
| Rail logistics | Network of container/intermodal freight trains synchronized with EU trains for TEN-T integration. Economic incentives to shift of cargo transport to rail and water. New multimodal logistics centers and advanced IT systems. Inter-mode load carrying technologies. | Min Infra. 2016. *National Transport Strategy 2030*<br>World Bank 2018, *Sus. Logistics Strategy 2030* |
| Eco driving, ITS and speed limits | Introduce educational programs and training of the transport sector staff. Introduce smart infrastructure, smart mobility and ITS | UNFCC 2017. *Ukraine 2050 Low Emission Strategy* |
| Fleet renewal: cars, buses, trucks | Incentives to scrap polluting vehicles and purchase cleaner vehicles. Promote gas and biofuel in cars. Introduce commercial operator licenses, registration, inspection and enforcement. GEFI recommends new fuel efficiency standards and fuel taxes. | UNFCC 2017. *Ukraine 2050 Low Emission Strategy*<br>GEFI 2018. *Automotive Fuel Economy in Ukraine* |
| Electric vehicle promotion | Already installing charging points in cities and desire for a country wide network. Encouraging electric public transport development. | Study team consultation |
| Road user charging | Introduce fees system for motorway users based on the vehicles emission standards. Introducing e-governance in order to reduce the burden and simplify administrative procedures for businesses, including provision of electric services (e-tolling for example) | Min. of Eco. Development 2017, *Sus. development goals.* ENERCEE 2014, *Energy Strategy, 2035* |
| Urban transport improvements | Public transport rationalization and passenger transport system management technologies. Multimodal passenger transport and e-ticketing. Bus priority lanes. Promotion of low emissions modes. Modernize urban railway, tram and bus systems. | UNFCC 2017. *Ukraine 2050 Low Emission Strategy*<br>Min Infra. 2016. *National Transport Strategy 2030* |
| Road freight improvements | Increase efficiency of domestic freight by eliminating obstacles and enhance infrastructure. Road carrier licensing in accordance with European best practice. World Bank recommends electronic management of logistics activity and data. Develop new transport corridors and a network of logistic centers that avoid Russia. | Min Infra. 2016. *National Transport Strategy 2030.*<br>World Bank 2018, *Sustainable Logistics Strategy 2030* |
| Green port Improvements | Modernize maritime and IWW ports. Use of energy efficient technologies. IFIs recommend unlocking capacity bottlenecks and introducing faster turnaround at ports. Long term commitment (up to 2038) for synergy of maritime ports with inland waterways | Min Infra. 2016. *National Transport Strategy 2030*<br>USPA 2019, *Development of the Ukrainian Port Sector* |

## Prioritization of policies

6.20 The multi-criteria appraisal framework used to conduct a high-level prioritization of policies is specified in Table 6-2. The metrics for the multi-criteria appraisal are presented in Table 6-9 to Table 6-14 alongside the resulting ranking which is scored from 1 (high priority) to 5 (low priority).

6.21 The policy areas which are often found to be high priority are:

- Electric vehicle promotion because this policy delivers the largest emission reduction over the 30 years to 2050 with a typically negative marginal abatement cost and has moderate levels of country ownership.
- Road freight improvements because they deliver large emissions reductions as well as significant savings in operating costs.
- Urban mobility improvements which deliver large emission reductions, have high country ownership, improve health through improved air quality and will generate agglomeration benefits.

6.22 The connectivity focused rail package plays a relatively smaller role to reduce GHG emissions, however the significantly improved intercity and international travel time yields substantial economic benefits in Belarus and Azerbaijan which is matched with strong country ownership. Economic benefits are also large in Georgia and Ukraine, but country ownership is weaker here.

6.23 The policies that are often found to be lower priority are:

- Green port improvements, because although they yield good economic benefits, they have only a minor impact on GHG emissions
- Road user charging which can act to significantly reduce GHG emissions but have low levels of country ownership.

**Table 6-9: Prioritization of policies, Armenia**

| Policy area | Mt $CO_2e$ abated, to 2050 | €/Ton | country ownership | SDG 3 Good health: NOx emissions saved in 2030 (Tons) | SDG 7 Affordable energy: Energy use saved in 2030 (GwH) | SDG 8: Economic growth | | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BCR | Trade, industry and jobs | |
| Rail package: track & borders | 1.7 | 28 | Low | 117 | 191 | 1.0 | 3% reduction in travel time will encourage increased trade. Green jobs | 4 |
| Rail signal improvements | 0.0 | 1412 | Low | 1 | 5 | 0.3 | | 5 |
| Rail logistics improvements | 0.1 | 46 | Low | 12 | 8 | 1.0 | | 4 |
| ITS, eco driving and speed limits | 2.7 | 29 | Low | 327 | 344 | 1.5 | More reliable delivery times for just-in-time industry. Green jobs | 3 |
| Fleet renewal: cars, buses, trucks | 3.9 | 8 | Medium | 315 | 331 | 2.9 | Reduced operating costs, economic stimulus | 2 |
| Electric vehicle promotion | 7.8 | -3 | High | 377 | 282 | 11.9 | Reduced operating costs. Green jobs | 1 |
| TEN-T road user charging | 5.5 | 11 | Low | 837 | 816 | 2.5 | Reduced operating costs | 3 |
| Urban transport improvements | 5.4 | 30 | High | 236 | 469 | >1.0 | Agglomeration benefits | 1 |
| Road freight improvements | 2.8 | -38 | Low | 466 | 370 | 3.9 | Reduced operating costs | 2 |

**Table 6-10: Prioritization of policies, Azerbaijan**

| Policy area | Mt $CO_2e$ abated, to 2050 | €/Ton | country ownership | SDG 3 Good health: NOx emissions saved in 2030 (Tons) | SDG 7 Affordable energy: Energy use saved in 2030 (GwH) | SDG 8: Economic growth | | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BCR | Trade, industry and jobs | |
| Rail package: track & borders | 6.5 | -1059 | High | 423 | 827 | 3.7 | 21% reduction in travel time will encourage increased trade. Green jobs | 1 |
| Rail signal improvements | 0.0 | 1997 | High | 3 | 7 | 0.4 | | 5 |
| Rail logistics improvements | 0.2 | -22 | High | 25 | 25 | 1.1 | | 4 |
| ITS, eco driving and speed limits | 9.9 | -4 | Medium | 1,354 | 1,343 | 12.0 | More reliable delivery times for just in time industry. Green jobs | 3 |
| Fleet renewal: cars, buses, trucks | 14.0 | 5 | Low | 1,308 | 1,293 | 3.9 | Reduced operating costs, economic stimulus | 5 |
| Electric vehicle promotion | 24.8 | -4 | Low | 1,563 | 1,092 | 15.5 | Reduced operating costs. Green jobs | 2 |
| TEN-T road user charging | 23.9 | -4 | Low | 3,750 | 3,601 | 13.6 | Reduced operating costs | 4 |
| Urban transport improvements | 18.2 | 30 | Medium | 793 | 1,532 | >1.0 | Agglomeration benefits | 2 |
| Road freight improvements | 12.3 | -61 | Medium | 2,125 | 1,690 | 6.5 | Reduced operating costs | 1 |
| Green Port Improvements | 0.2 | -49 | High | 16 | 36 | 1.8 | Enhance trading capacity | 3 |

**Table 6-11: Prioritization of policies, Belarus**

| Policy area | Mt $CO_2e$ abated, to 2050 | €/Ton | country ownership | SDG 3 Good health: NOx emissions saved in 2030 (Tons) | SDG 7 Affordable energy: Energy use saved in 2030 (GwH's) | SDG 8: Economic growth | | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BCR | Trade, industry and jobs | |
| Rail package: track & borders | 0.7 | -5970 | High | 322 | 7 | 3.6 | 18% reduction in travel time will encourage increased trade. Green jobs | 2 |
| Rail signal improvements | 0.0 | 0 | Medium | 2 | - 21 | 0.7 | | 5 |
| Rail logistics improvements | 0.2 | -1188 | Medium | 29 | 22 | 3.3 | | 3 |
| ITS, eco driving and speed limits | 11.3 | 9 | Low | 1,592 | 1,472 | 3.2 | More reliable delivery times for just in time industry. Green jobs | 4 |
| Fleet renewal: cars, buses, trucks | 15.6 | 22 | High | 1,542 | 1,421 | 1.7 | Reduced operating costs, economic stimulus | 1 |
| Electric vehicle promotion | 27.4 | 1 | Medium | 1,843 | 1,187 | 6.7 | Reduced operating costs. Green jobs | 1 |
| TEN-T road user charging | 11.2 | 10 | Low | 1,527 | 1,657 | 2.5 | Reduced operating costs | 4 |
| Select Toll Roads | 9.5 | 106 | Medium | 1,483 | 1,391 | 0.7 | 2% reduction in travel time | 5 |
| Urban transport improvements | 18.9 | 36 | Medium | 1,403 | 1,686 | >1.0 | Agglomeration benefits | 2 |
| Road freight improvements | 15.2 | -14 | Low | 2,464 | 1,960 | 2.3 | Reduced operating costs | 3 |

**Table 6-12: Prioritization of policies, Georgia**

| Policy area | Mt $CO_2e$ abated, to 2050 | €/Ton | country ownership | SDG 3 Good health: NOx emissions saved in 2030 (Tons) | SDG 7 Affordable energy: Energy use saved in 2030 (GwH's) | SDG 8: Economic growth | | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BCR | Trade, industry and jobs | |
| Rail package: track & borders | 4.7 | -2463 | Medium | 309 | 625 | 4.0 | 12% reduction in travel time will encourage increased trade. Green jobs | 3 |
| Rail signal improvements | 0.1 | 948 | Low | 4 | 10 | 0.6 | | 5 |
| Rail logistics improvements | 0.1 | -217 | Medium | 36 | 18 | 1.7 | | 5 |
| ITS, eco driving and speed limits | 6.4 | 8 | Medium | 839 | 834 | 3.3 | More reliable delivery times for just in time industry. Green jobs | 4 |
| Fleet renewal: cars, buses, trucks | 9.2 | 7 | High | 810 | 803 | 3.1 | Reduced operating costs, economic stimulus | 2 |
| Electric vehicle promotion | 18.6 | -3 | High | 969 | 678 | 13.7 | Reduced operating costs. Green jobs | 1 |
| TEN-T road user charging | 18.1 | -1 | Low | 2,793 | 2,619 | 7.5 | Reduced operating costs | 3 |
| Urban transport improvements | 8.6 | 28 | High | 255 | 716 | >1.0 | Agglomeration benefits | 2 |
| Road freight improvements | 7.6 | -75 | High | 1,251 | 995 | 5.3 | Reduced operating costs | 1 |
| Green Port Improvements | 0.0 | 0 | High | 50 | - 11 | 3.1 | Enhance trading capacity | 4 |

**Table 6-13: Prioritization of policies, Moldova**

| Policy area | Mt $CO_2e$ abated, to 2050 | €/Ton | country ownership | SDG 3 Good health: NOx emissions saved in 2030 (Tons) | SDG 7 Affordable energy: Energy use saved in 2030 (GwH's) | SDG 8: Economic growth | | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BCR | Trade, industry and jobs | |
| Rail package: track & borders | 0.5 | 14 | High | 17 | 92 | 1.0 | 11% reduction in travel time will encourage increased trade. Green jobs | 3 |
| Rail signal improvements | 0.0 | 1664 | Low | 31 | 29 | 0.4 | | 5 |
| Rail logistics improvements | 0.4 | -169 | High | 99 | 82 | 13.2 | | 2 |
| ITS, eco driving and speed limits | 3.6 | 15 | Low | 559 | 503 | 2.5 | More reliable delivery times for just in time industry. Green jobs | 4 |
| Fleet renewal: cars, buses, trucks | 4.9 | 13 | High | 541 | 486 | 2.4 | Reduced operating costs, economic stimulus | 2 |
| Electric vehicle promotion | 8.1 | -2 | Medium | 647 | 405 | 10.1 | Reduced operating costs. Green jobs | 1 |
| TEN-T road user charging | 3.6 | 24 | Low | 381 | 532 | 1.3 | Reduced operating costs | 5 |
| Urban transport improvements | 4.5 | 30 | High | 192 | 374 | >1.0 | Agglomeration benefits | 2 |
| Road freight improvements | 6.0 | -68 | Medium | 1,059 | 843 | 9.0 | Reduced operating costs | 1 |
| Green Port Improvements | 0.0 | 0 | Medium | 17 | 14 | 2.7 | Enhance trading capacity | 4 |

**Table 6-14: Prioritization of policies, Ukraine**

| Policy area | Mt $CO_2e$ abated, to 2050 | €/Ton | country ownership | SDG 3 Good health: NOx emissions saved in 2030 (Tons) | SDG 7 Affordable energy: Energy use saved in 2030 (GwH's) | SDG 8: Economic growth | | Rank |
|---|---|---|---|---|---|---|---|---|
| | | | | | | BCR | Trade, industry and jobs | |
| Rail package: track & borders | 8.6 | -1278 | Medium | 1,080 | 1,008 | 3.9 | 19% reduction in travel time will encourage increased trade. Green jobs | 3 |
| Rail signal improvements | 1.7 | -635 | Medium | 96 | 233 | 2.2 | | 5 |
| Rail logistics improvements | 2.0 | -671 | Medium | 487 | 312 | 7.5 | | 3 |
| ITS, eco driving and speed limits | 51.8 | 0 | Medium | 8,277 | 7,131 | 6.7 | More reliable delivery times for just in time industry. Green jobs | 2 |
| Fleet renewal: cars, buses, trucks | 70.4 | 10 | Medium | 8,034 | 6,900 | 2.9 | Reduced operating costs, economic stimulus | 4 |
| Electric vehicle promotion | 130.1 | -3 | High | 9,600 | 5,702 | 12.4 | Reduced operating costs. Green jobs | 1 |
| TEN-T road user charging | 116.4 | -2 | Low | 17,389 | 15,007 | 8.8 | Reduced operating costs | 2 |
| Select Toll Roads | 28.9 | -22 | Medium | 3,711 | 3,282 | 1.6 | 2% reduction in travel time | 4 |
| Urban transport improvements | 116.1 | 26 | High | 2,364 | 8,637 | >1.0 | Agglomeration benefits | 2 |
| Road freight improvements | 93.9 | -66 | Medium | 16,335 | 12,994 | 6.5 | Reduced operating costs | 1 |
| Green Port Improvements | 0.0 | 0 | High | 280 | 189 | 3.2 | Enhance trading capacity | 5 |

# 7. Financing options and challenges

7.1 This chapter addresses the following questions:

- How has infrastructure spending been financed in the EaP region to date and what are the present challenges in increasing levels of investment?
- What role has climate finance played in supporting transport sector investment and what are the future opportunities in leveraging green finance to support the identified greener connectivity investments?
- What actions need to be taken to enable the identified investments to progress to implementation?

**Key messages**

Limited fiscal headroom presents challenges to financing the identified investment through increasing national borrowing. More innovative forms of financing must be explored including private sector involvement and new and innovative climate finance channels.

Success in accessing green finance has been limited to date. The relationships with major climate funds are at early stages in some counties, whilst more generally, the transport sector has historically struggled to access these funds. Country readiness to tap into the growing climate bond market also requires further development.

Specific actions identified to mobilize and leverage innovative forms of finance to support the identified investment requirements include:

- Engaging with the major climate funds most active in the region to establish pathways to accessing support for green transport investments, including readiness activities such as accreditation and development of fund and sector specific country investment plan
- Developing an enabling environment for the issuance of climate bonds as a component of national Sustainable Financing Roadmaps
- Identifying and developing projects which present opportunities for private sector investment including revenue generating initiatives such as road user charging and urban transport initiatives.

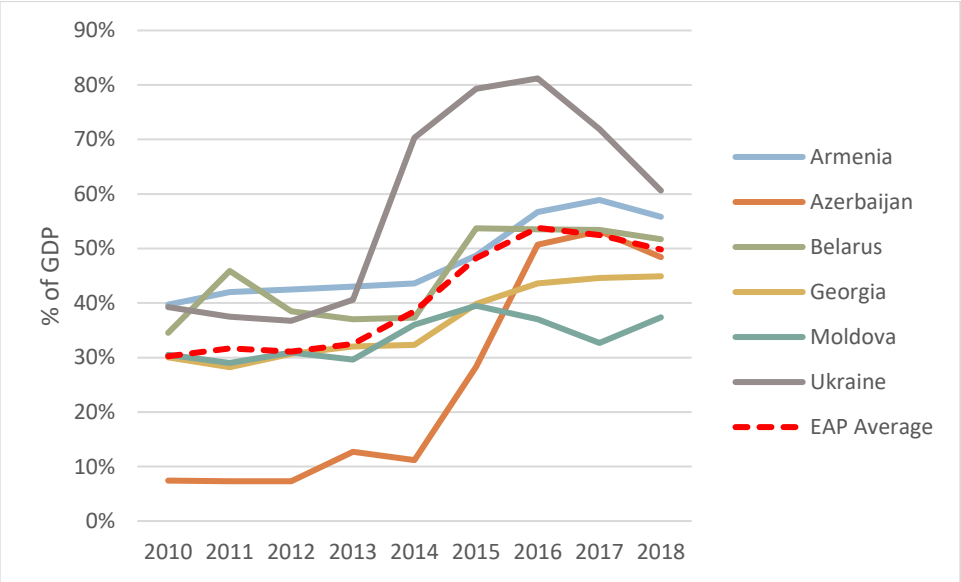
# Financing of Investment

## Status quo

7.2 Much of the capital investment in transport and other national infrastructure is funded through the national budget, directly from taxation revenues or financed through a range of sources of external borrowing.

7.3 Within most EaP countries, the level of public debt has increased over the past decade, with the average external debt stock exceeding 50% of national income across EaP countries. Higher debt levels place fiscal constraints on further borrowing.

**Figure 7-1: Public and Publicly-Guaranteed Debt Stock as % of GDP**

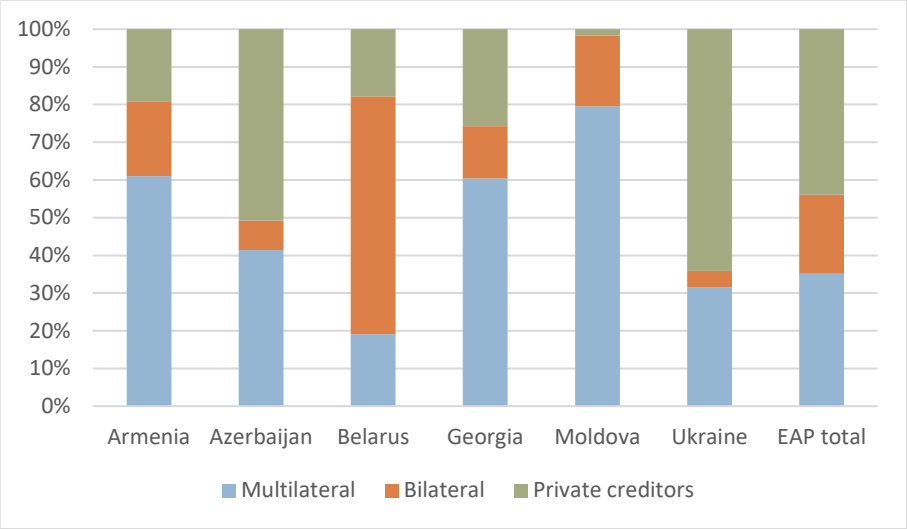



Source: International Monetary Fund Country Reports

### *Sources of financing*

7.4 A range of financial institutions are active in the region, offering support in the financing of infrastructure investment and activities in EaP countries. The source of public debt may be disaggregated into official creditors (multilateral and bi-lateral institutions) and private creditors (government bondholders and loans from commercial banks or others) (see Figure 7-2). On average, official creditors account for just over half of public debt holdings, with the remaining held by private creditors. Private investment therefore plays a significant role in supporting national investment, particularly in Ukraine and Azerbaijan.

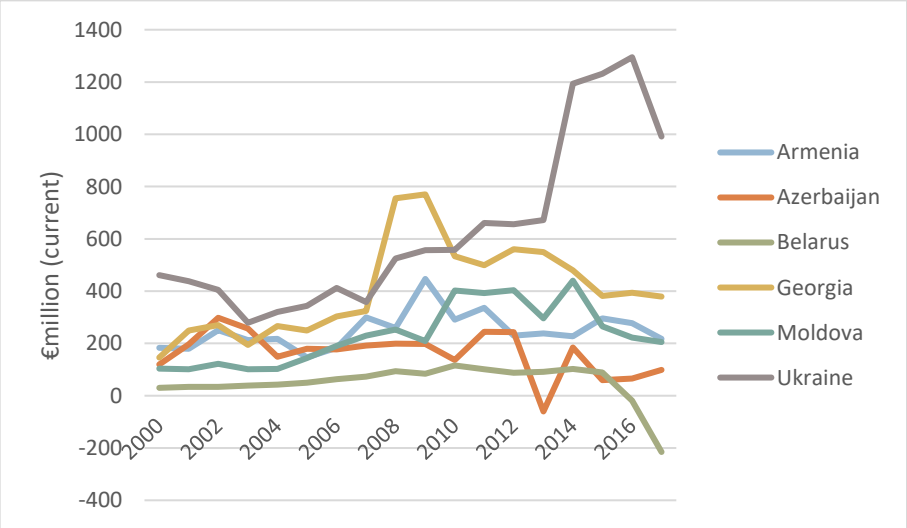
**Figure 7-2: External Public and Public Guaranteed Debt by creditor type in EaP countries**




Source: World Bank Debtor Reporting System[29]

7.5 The EaP countries all fall within the classification of middle-income countries and are therefore eligible for development assistance, and access to finance for the promotion of economic development and welfare of the country. Indeed, the EaP countries have relied strongly on Official Development Assistance (ODA) as a means of supporting national investment, with a significant proportion of the official creditor support taking the form of ODA. The net flow of assistance and official aid to the region (see Figure 7-3) has totaled over €30bn since 2000.

**Figure 7-3: Net ODA and development aid received in EaP countries since 2000**




Source: World Bank World Development Indicators

[29] World Bank International Debt Statistics available here https://datatopics.worldbank.org/debt/ids/

7.6 ODA may take the form of aid or concessional loans, offered by international development banks (IDBs) and bilateral lending institutions. Recent actions conducted by the major lending institutions to the EaP include, (details in Appendix E):

- The World Bank - extending in excess of €30bn in the form of loans or grants in the region (across all sectors), with €4bn relating to transport projects
- European Bank for Reconstruction and Development (EBRD) – a cumulative investment in EaP countries of €27bn, including 90 transport-related projects
- European Investment Bank - with total lending to the Eastern Partnership approaching €12bn for projects including road-building projects to improve connectivity in the region
- Asian Development Bank - active in Armenia, Azerbaijan and Georgia, supporting over 380 projects of with cumulative lending of €12bn, of which 112 were transport projects, representing 40% of the overall portfolio
- Asian Infrastructure Investment Bank (AIIB) - a new institution supporting infrastructure investment in the Asia Pacific region including the Belt and Road (BRI) initiative. Its largest loan to date has been €510m for a gas pipeline in Azerbaijan, and it has also supported a bypass road in Batumi, Georgia

## Climate Finance

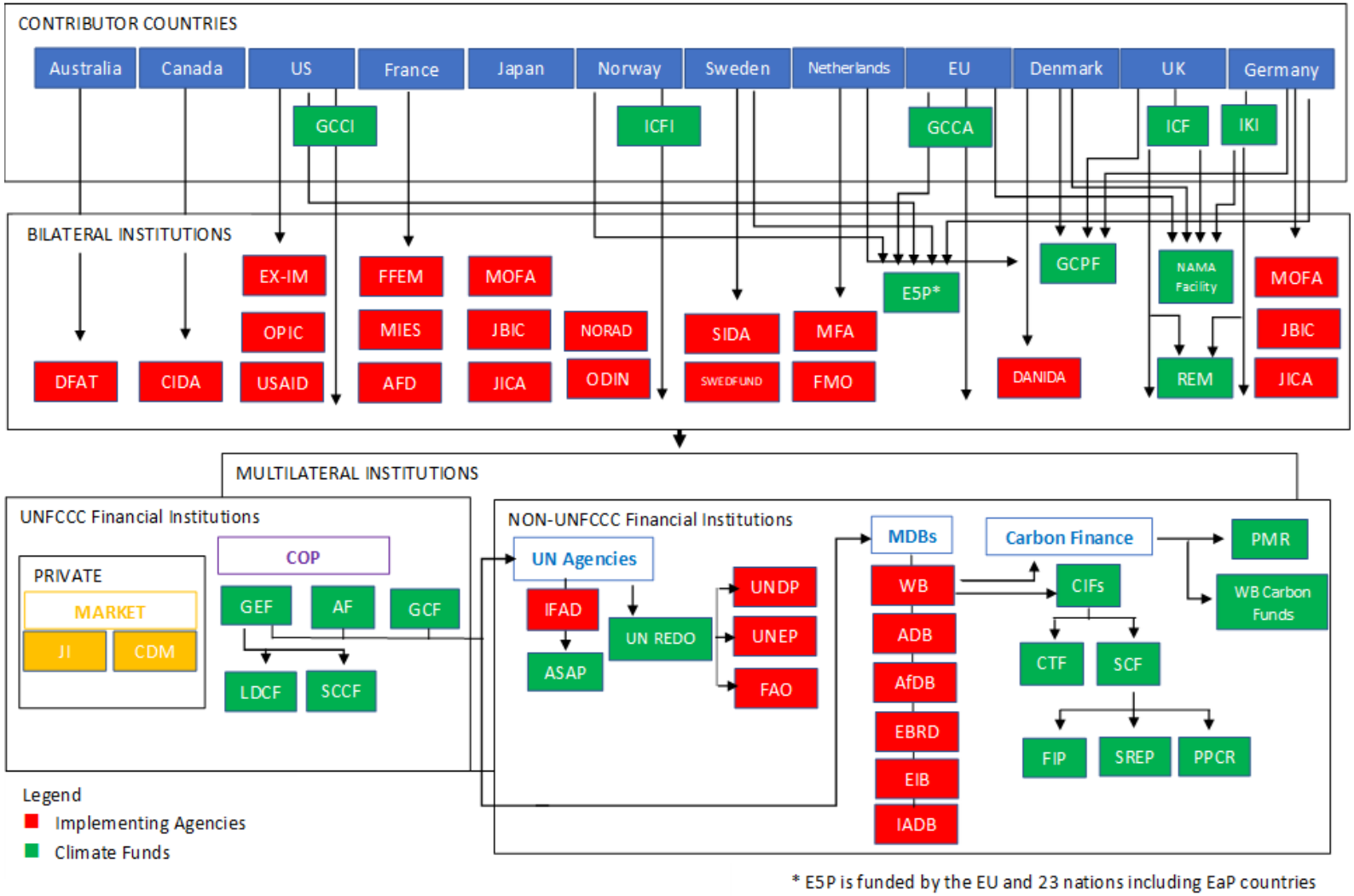
7.7 With growing awareness of the action needed to tackle the climate crisis and the scale of the investment required, there has been a mobilization of financing targeted towards projects and initiatives relating to climate mitigation or adaptation, with such financing streams referred to as 'climate finance'. The UNFCCC provides the following definition:

> *'Climate finance refers to local, national or transnational financing—drawn from public, private and alternative sources of financing—that seeks to support mitigation and adaptation actions that will address climate change'*

7.8 Climate finance may be accessed through a wide range of channels. There are, however, some major actors and an evolving architecture supported by national and international institutions focused explicitly on scaling up the climate available to support climate-related projects, including initiatives developed under the Kyoto and Paris agreements.

7.9 Figure 7-4 presents a summary of these actors and the present climate financing architecture in relation to public financing streams. There is additionally a range of private sector-led financing channels and mechanisms which fall within the broad definition of climate finance.

**Figure 7-4: Climate Finance Architecture**




Source: Adapted from World Resources Institute Figure

## Climate Finance in the transport sector

7.10 The climate funds and other green financing channels outlined above support climate related projects, covering mitigation and climate adaptation across different sectors. Historically, the transport sector has struggled to access significant climate finance, with only a small proportion of the overall green finance channelled towards the sector. This is largely a reflection of the eligibility criteria defined by the climate funds and emission trading schemes. The main challenges include:

- The difficulty in accurately **calculating the potential mitigation impacts**. The impact of a transport program or project is dependent on the decision making of a large number of individual emission sources (ie vehicle users) which adds more uncertainty to the projection than for example a clean energy power generator, for example.
- The complexity of demonstrating **additionality.** That is, what could have been expected to have happened in the absence of support from the climate fund. Programs such as fleet renewal would occur in any event (albeit perhaps over a longer timeframe and maybe to less efficient vehicles), and constructing a counterfactual development scenario can be time-consuming and complex.
- The problem to demonstrate that access to climate funding facilitated a '**paradigm shift'** in behavior or through the use of innovative technology that brought about a transformative change as compared to the status quo.

7.11 The underrepresentation of transport schemes within climate finance supported activities in general is also reflected in the sectoral distribution of activity of the climate funds within the EaP countries. That said, there have been some past success in accessing climate funding for transport related initiatives in the EaP. Below we examine funds that have been active in the region, with particular emphasis on the leveraging of climate finance relating to the green transport initiatives and investments.

### *Global Environment Facility (GEF)*

7.12 GEF, one of the longest standing climate funds, has to date committed over $25bn in funding to support climate-related projects and programs, the majority of which is extended in the form of grants in project co-financing and for technical assistance. GEF has supported transport-related projects worldwide, including bikeway projects, low-carbon urban transport systems, BRT systems, and regional programs on sustainability and fuel economy. GEF's transport portfolio stands at €425m, with 80 projects with committed financing.

7.13 EaP countries have had past success in accessing this funding channel, with GEF supporting over 150 national and regional projects within EaP, with grant funding of €500m acting as co-financing to total project value of €2.5bn.

7.14 GEF has a sustainable cities program which has supported activities in small and medium-sized cities in Belarus of which sustainable transport has been a component. The fund has provided grant funding for transport-related projects including:

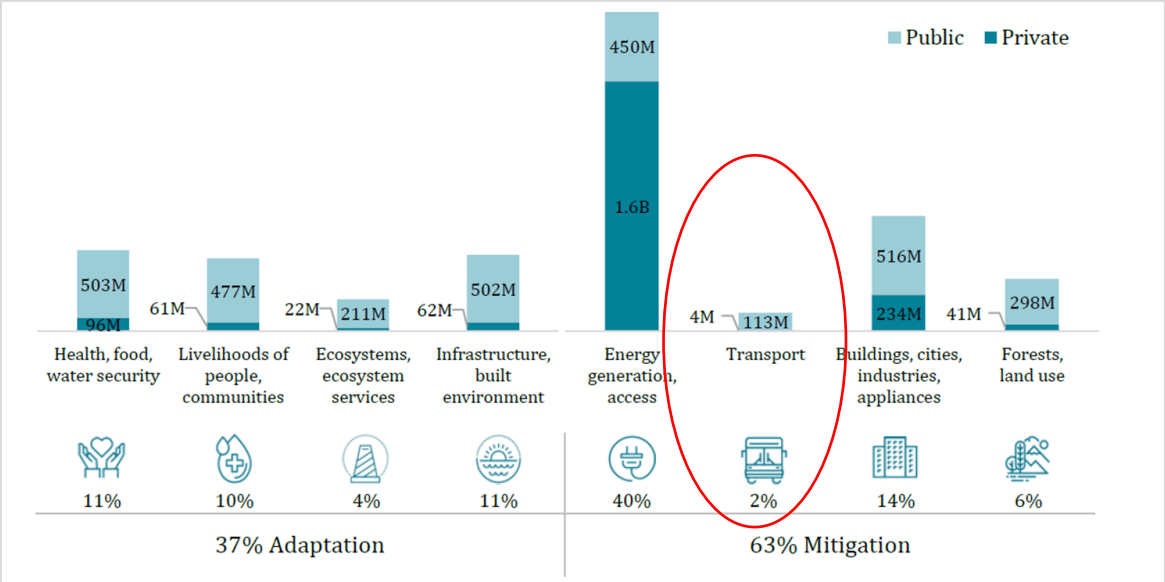
- Integrated sustainable transport in Batumi and the Achara Region - €725k grant as part of a €9m co-financed project value
- Belarus Green Cities - €2.6m grant, €10.5m project value
- Regional Global Fuel Economy Initiative (GFEI) as part of an international program with baseline activities in Armenia, Azerbaijan, and Georgia

### *Green Climate Fund (GCF)*

7.15 Established in 2010, GCF is the largest climate fund by portfolio size, with committed funding of c. €4.75bn. It is now considered the favored vehicle for future finance pledges from donor countries to flow through to support mitigation and adaptation projects.

7.16 The GCF typically provides enabling finance in the form of concessional loans to meet the financial viability gap in projects which would otherwise not be able to proceed. Recent GCF supported projects in the EaP region include renewable energy schemes and energy efficiency programs. Historically, the scale of financing extended to the transport sector has represented just a small proportion of the international lending portfolio (see Figure 7-5).

**Figure 7-5: GCF funding by sector**




Source: GCF

7.17 However, the future outlook for support to the transport sector related initiatives is more positive. In partnership with the EBRD, the GCF is supporting the Green Cities Program, which has been adopted in several cities in Armenia and Georgia, which includes focus on a range of initiatives relating to sustainable urban transport.

**It should be noted that as ANNEX I countries under the Kyoto Protocol, Ukraine and Belarus are not presently eligible for GCF support.** Also, based on fund principles, no support will be extended to transport projects still reliant on fossil fuel (for example CNG bus fleet renewal).

## Climate Investment Fund (CIF) and the Clean Technology Fund (CTF)

Founded in 2008, CIF incorporates four specific branches of financing which support developing and emerging economies to scale up mitigation and adaptation action in developing and middle-income countries. Supported by fourteen donor countries who have contributed almost €7bn to date, CTF is a non-UNFCCC fund with any ODA eligible country able to apply for project financing. Therefore projects in any EaP country may be eligible for support.

7.18 The largest of the sub-funds is the Clean Technology Fund (CTF). This is also the most relevant to the transport sector, supporting the move to greener vehicle technology. While project support within the region has to date been limited, the CTF can boast the largest transport-related climate finance contribution to date, with an investment

totaling €128m for the Vietnam Metro Line Projects, leveraging a total investment of €870m.

7.19 Given universal eligibility amongst EaP countries and the alignment with low carbon transport objectives, the fund should not be overlooked as a potential source of financing for greener connectivity policies. However, with funding shifting towards other areas of the climate finance architecture the role of CTF is anticipated to diminish in coming years. Opportunity therefore rests with schemes ready for short-term implementation, and where existing channels are already established such as Ukraine's CTF Climate Investment Plan.

## Eastern European Energy Efficiency and Environment Partnership (E5P)

7.20 The E5P is a EUR220m climate fund specifically focused on improving energy efficiency and environmental projects in the Eastern Partnership region. Supported by the EU and 23 nations, it provides grants to municipal sector projects, enabling the leveraging of investment for supported projects.

7.21 Urban transport represents one of the eight identified sectors which may benefit from the fund. To date, the following transport-related initiatives have been supported:

- Mariupol and Kremenchuk Trolleybus projects - €5m grant
- Batumi and Tblilisi buses - €8.5m grant

## International Climate Initiative (IKI)

7.22 IKI (or Internationale Klimaschutzinitiative) is a funding instrument of the BMU, the German environment ministry. That has been financing climate and bio-diversity related projects in developing and newly industrialized economies since 2008.

7.23 IKI has been actively supporting projects in the Eastern Partnership counties, with seven projects to date, and a total funding volume of over EUR 500m. Unlike the other climate funds, the IKI supported projects within the EaP are skewed towards transport projects (in number, if not in total financing extended), with more than half of the projects supported being transport-related:

- Decarbonizing transport in emerging economies (Azerbaijan and others) - €5m
- Energy-efficient Extension and Modernization of Public Transport in Lviv – €500k
- Modernization of Public Transport in Lviv (Phase II) – €5m
- Climate-smart sustainable mobility in Ukraine – €1m

## NAMA Facility

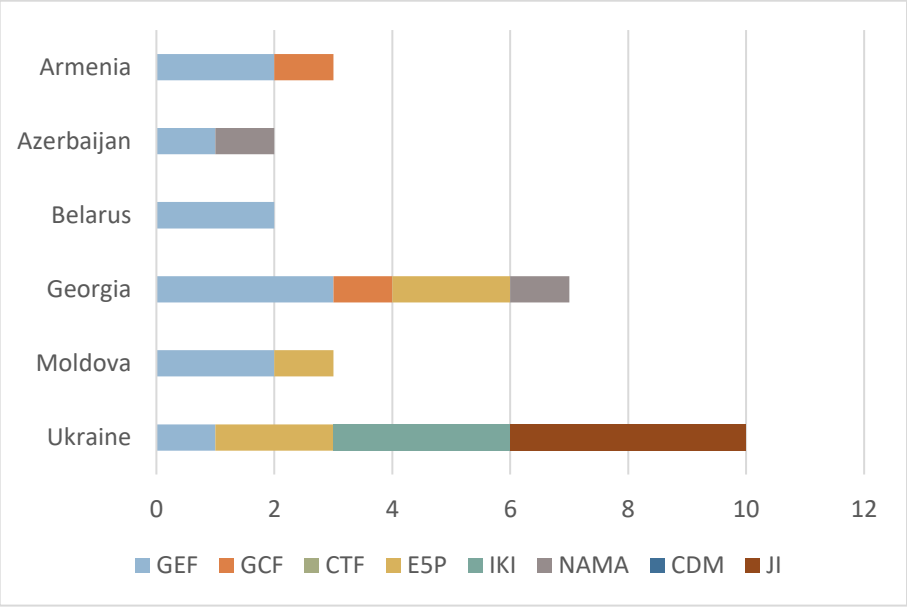
7.24 A Nationally Appropriate Mitigation Action (NAMA) is an action that aims to reduce carbon emissions. Proposed under a national government initiative, a NAMA can be defined for any sector, and implemented at the national or individual activity level. Many transport NAMAs have been developed, including fleet renewal, public transport initiatives, and the promotion of alternative fuels. Transport-related NAMAs developed within the wider eastern region include the Low Carbon End-Use Sectors in Azerbaijan, and Georgia is in the process of developing a Vertically Integrated NAMA for the Urban Transport Sector.

7.25 The NAMA Facility is a multi-donor program that provides financing to support countries in implementing their NAMAs. Now issuing its 7th call for support projects, the facility is available to any ODA eligible country which has is preparing a NAMA. To date, no EaP country has applied for NAMA project funding through the facility (Azerbaijan's NAMA was supported through $3.6m GEF funding).

## Summary of climate finance supported transport projects

7.26 Figure 7-6 summarizes the number of transport projects supported to date by climate funds and green financing mechanisms within each of the EaP countries. Emission trading scheme (ETS) projects under Clean Development Mechanism (CDM – no projects in EaP) and Joint Implementation (JI) are included and discussed in further detail below)

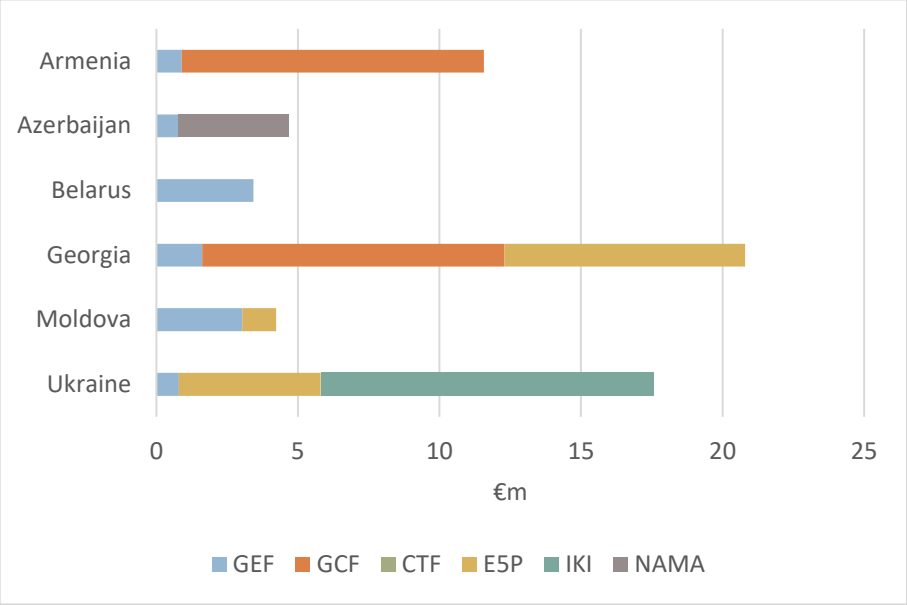
**Figure 7-6: Number of climate fund supported transport projects in EaP to date**




Source: Climate fund project databases

7.27 The total scale of financing approved is €62m, leveraging c. €220m in co-financing to deliver projects to the value of c. €280m.

**Figure 7-7: Value of climate fund support for transport projects in EaP**




Source: Climate fund project databases[30] , no data available for JI

7.28 The overall number of climate fund supported projects remains modest but demonstrates some success in leveraging climate finance for the delivery of transport projects.

## Other sources of climate finance

7.29 In addition to the donor capitalized climate funds identified above, we identify the following sources of climate financing, including market-based financing instruments to enable investment in projects with positive environmental credentials.

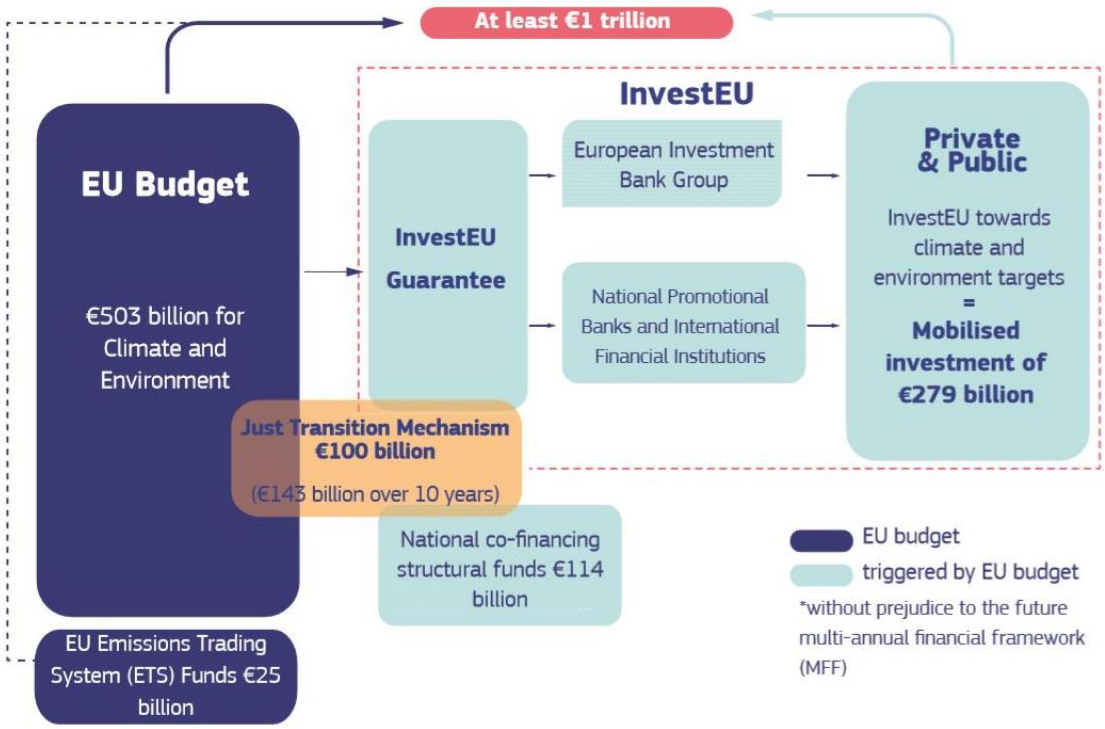
### *EU 'Green Deal'*

7.30 The European Investment Bank (EIB) will play an important role in the delivery of the recently announced 'Green Deal,' the EU's roadmap towards tackling climate change and which aims to mobilize at least EUR1 trillion for investment in a low carbon future over the coming decade.

[30] NB. Country financing for regional projects have been estimated through equal allocation of financing across participating countries

7.31 The EU has announced its intention to increase the proportion of EU budget spending on climate-related activities from 20% to 25%. However, much of the aspired EUR1trillion must be leveraged from sources beyond the EU budget, as the total EU budget for 2020-2027 itself only just tops €1trillion. The proposed mechanism for leveraging of this financing is shown in Figure 7-8.

**Figure 7-8: Financing the EU Green Deal**




Source: European Commission, Jan 2020

7.32 It should be noted that most of this funding is likely to be inwardly focused. Presently, around 10% of the EU budget is spent outside EU borders, with a focus on the poorest regions and accession countries. Anticipated expenditure on transport within the 2021-27 spending envelope amounts to less than 3% of the overall EU budget.

7.33 There is, however, a recognition that to achieve maximum impact towards the climate objectives of the program, the investment must also extend beyond EU borders, enabling decarbonization and the transfer of technology to EU neighbors. The scale of this potential financing in relation to the EaP remains uncertain at present.

### *Climate Bonds*

7.34 Climate bonds, or green bonds, are a rapidly growing asset class and a potential source of finance for climate related projects. Climate bonds can be issued by governments,

multi-banks or corporations, providing investors the opportunity to generate returns on investment to support projects with positive environmental/climate benefits.

7.35 Since the first green bond issued by the European Investment Bank back in 2007, the market has grown significantly, with green bond issuance in 2019 estimated to have reached €255bn[31]. To provide improved credibility and transparency for investors, climate bond standards and certification process have been developed. These include the Green bond principles, the Climate Bonds Standards and the Green Financial Bond Directive.

7.36 Bond finance could benefit the efforts of EaP countries in scaling up investment in climate related transport projects and especially in infrastructure-based projects. Bonds typically have a size of above US$200m (€175m) to be relevant to institutional investors.

7.37 Accreditation principles have been developed for transport sector related projects, enabling promotors of green transport projects to transparently demonstrate the project credentials to potential investors. Under the climate bonds Initiative, certification criteria have been developed and approved for the following transport sub-areas:

- Private transport
- Public passenger transport (including mass transit and bus rapid transit)
- Freight rail
- Water-borne transport (criteria still under development)

7.38 Many low carbon transport projects are automatically eligible for certification under the Climate Bonds Standard and Certification Scheme. This includes urban trams and metro systems, bike transport and electric or hydrogen cell vehicle initiatives. Other schemes may be eligible, depending on scheme characteristics and in particular the demonstration that passenger or freight ton km emissions would fall below the required thresholds.

## Carbon Finance

7.39 Carbon finance is a generic term for revenue streams that can be generated by the sale of project-based carbon emission reductions. [32] Emissions trading systems (ETS) have played an important role in the financing of climate projects in recent years, reaching a high of €194bn in 2019 in accessing carbon credits due to the aforementioned

31 Source: Climate Bonds Initiative https://www.climatebonds.net/files/reports/2019_annual_highlights-final.pdf

[32] See World Bank (2010b): Ten years of experience in carbon finance - insights from working with the Kyoto mechanisms. World Bank, Washington, DC.

challenges, although the transport sector has been almost totally excluded in accessing carbon credits due to the aforementioned challenges. [33]

7.40 The monetization of emissions reductions has demonstrated its potential to mobilize climate finance through market mechanisms, delegating part of national emission reduction targets to market mechanisms enabling a private source of capital to deliver support for mitigation projects.

### *CDM and Joint Implementation*

7.41 The largest of such market-based instruments has been the Kyoto Protocol's Clean Development Mechanism (CDM), which enables developed countries to implement emissions-reduction projects in developing countries, earning credits towards their GHG reduction targets. Joint Implementation (JI) enables a similar arrangement between fellow developed countries. As such, Ukraine and Belarus have been eligible to participate in JI projects, and Ukraine has to date been a beneficiary of three such rail-related projects in the transport sector. These role for these mechanisms is however likely to be superseded by other initiatives in the near future.

7.42 Voluntary or Verified Emissions Reductions (VERs), sitting outside the Kyoto Protocol, represent another market for carbon credits. While subject to verification requirements also, including the requirement for independent third-party verification, this channel may offer greater opportunity for the transport sector.

### *Emerging carbon financing schemes*

7.43 The current emission trading schemes generate emission reduction payments based on verified emission reductions. In addition to the challenges that the transport sector faces in providing strong evidence on the scale of mitigation attributable to the transport scheme, such payments are by nature ex-post, ie only received once the scheme is in operation. Many transport projects require significant upfront investment, and it the financing of this initial investment where financing gaps are most pertinent.

7.44 International donor agencies are working on the development of climate financing mechanisms which look beyond CDM and JI, and which aim to address the shortcomings of existing financing streams in their ability to support greener transport initiatives.

7.45 The World Bank is considering a transport sector specific Carbon Finance Window. The eligibility criteria will place emphasis on results-based financing (RBF). An important

[33] Source: Refinitiv Carbon Market Year in Review. https://www.refinitiv.com/content/dam/marketing/en_us/documents/reports/global-carbon-market-emission-trading-system-review-2019.pdf

aspect of this approach is that carbon finance can form part of the financing mechanism from the outset.

## Optimal balance between financing channels

7.46 A range of different sources of financing of investment in transport infrastructure and activities have been explored above, both traditional channels and more innovative financing opportunities. The range of different greener connectivity measures, and the increased investment requirement to realize the benefits of these investments requires the identification of optimal and attainable sources of financing to support implementation.

7.47 Within this strategic study, we cannot define the appropriate financing mechanism for individual interventions within each of the EaP countries. The optimal financing mechanism will necessarily be scheme and context specific, reflecting the unique nature of each scheme, the differing financial landscape within each country, and the opportunities and barriers that this presents.

7.48 However, having explored the financing options and their attributes, we can draw conclusions as to the most fertile areas of financial support for the investment packages. Considerations include:

- Scheme/project eligibility for financing under the differing channels
- Country eligibility and readiness to progress applications for financing
- Scale of finance available
- Nature of support and cost of financing

### Project eligibility for alternative financing channels

7.49 Each of the identified financing agencies and climate funds operates to its own policies, financing objectives, and eligibility criteria. The primary considerations relating to the assessment of project alignment with climate fund objectives have been presented in the previous chapter under the prioritization criterion. In some cases, schemes are automatically eligible, for example electric vehicle initiatives under the climate bond certification, whilst for other schemes, consideration will be given on a case-by-case basis by the applicable fund or IFI, ensuring the project meets the necessary environmental impact requirements.

7.50 Drawing on the eligibility criteria defined for each of the channels of finance, Table 7-1 indicates which of the schemes and projects defined within prioritised investment

package for each EaP country may be likely to be eligible for these different financing sources.

**Table 7-1: Scheme/Project eligibility for financing**

| Policy area | ODA/IFI financing | Climate Funds | EU Green Deal | Climate bonds | Carbon Finance | Private Finance / PPP |
|---|---|---|---|---|---|---|
| Rail package: track & borders | /x | /x | ?x | X | /x | X |
| Rail signal improvements | /x | /x | ?x | X | /x | X |
| Rail logistics improvements | /x | /x | ?x | /x | /x | X |
| Eco driving, ITS and speed limits | /x | /x | | /x | /x | X |
| Fleet renewal: cars, buses, trucks | /x | /x | | /x | /x | X |
| Electric vehicle promotion | /x | /x | ?x | X | /x | X |
| TEN-T road user charging | /x | | | /x | | X |
| Urban transport improvements | /x | /x | ?x | /x | /x | X |
| Road freight improvements | /x | /x | ?x | /x | /x | X |
| Green Port Improvements | /x | /x | ?x | /x | /x | X |

Key: X – eligible, /x - eligibility assessed on case by case basis, ?x - likely to be eligible, blank – likely ineligible

Source: Study team

7.51 We see that the prioritized set of green transport policies are likely to meet eligibility requirements under some or all of the identified financing channels. It is therefore then important to examine other factors differentiating the support offered by the different channels.

7.52 Below, we consider the administrative aspects of project submission, including institutional eligibility criteria, the engagement process, and the project requirements.

## Country eligibility and supported activities

7.53 Beyond the types of project supported, the following considerations relating to eligibility for finance include the following:

- Country eligibility – whether the applicant country is eligible for support from a particular financing source.
- Recipient entity – certain IFIs and funds restrict their lending activities to specific types of recipient. The World Bank deals exclusively with national governments, whilst EBRD engages also with municipal governments and private actors.
- Supported activities – financing can be offered for different stages of project development, from planning, to implementation.
- Type of support – a range of financial instruments can be used to support project delivery. Different financing channels specialize in different instruments; for example, GEF typically extends support in the form of grants, while the majority of GCF support takes the form of concessional loans. IFIs may offer both grant and concessional loans to support project financing.

7.54 An overview of the criteria and eligibility for the main climate funds is presented in Table 7-2.

**Table 7-2: Recipient and eligibility criteria of main climate funds and funding sources**

| Eligible Countries | IFIs<br>Any (ODA countries for ODA) | GEF<br>Developing & Countries in Transition | GCF<br>Non-Annex I countries | CTF<br>ODA Eligible Countries | E5P<br>EaP countries | IKI<br>Developing & newly industrializing countries | NAMA Facility<br>ODA Eligible Countries | Climate bonds<br>Any | Carbon Finance<br>Developing countries/ economies in transition | Private<br>Any |
|---|---|---|---|---|---|---|---|---|---|---|
| **Recipient Status** | | | | | | | | | | |
| National Government | X | X | X | X | | X | X | X | X | X |
| Regional Government | /x | X | X | X | X | X | X | X | /x | X |
| Local Government | /x | X | X | | X | X | X | X | /x | X |
| Private Sector | /x | X | X | | | X | X | X | /x | X |
| **Actions Supported** | | | | | | | | | | |
| Concepts & Planning | X | X | X | X | | X | X | | X | |
| Capital Investment | X | X | X | X | X | X | X | X | | X |
| Operations & Maintenance | /x | X | X | X | X | | X | X | X | X |
| Technology Transfer | X | X | X | X | X | X | X | | | |
| Capacity Building | X | X | X | X | X | X | X | | X | |
| **Types of Support** | | | | | | | | | | |
| Grants | X | X | X | X | X | X | X | | X | |
| Debt | | | X | X | | | | X | | X |
| Technical Assistance | | X | X | | | | X | | | |
| Results Based Payment | | | | | | | | | X | |

Key: X – eligible, /x - eligibility varies by source

Source: Study Team

## Optimal balance of financing

7.55 Once the sources of available financing for a specific project or scheme are identified, the optimal financing structure will seek to minimize the cost of finance from the financing instruments available to the project.

### *Cost of finance*

7.56 The types of financing instrument offered by different channels have been presented above. The exact financing terms vary by institution and project circumstance, but the following matrix provides an indication of the likely characteristics of different financing streams:

**Table 7-3: Cost of finance by different instruments**

| Instrument | Institution | | | | |
|---|---|---|---|---|---|
| | IFIs | Climate Funds | Climate bonds | Carbon Finance | Private |
| Grant | Zero | Zero | | | |
| Concessional Finance | Low | Low | | | |
| Market Rate Finance | Low/Med | | Low/Med | | Med/High |
| Equity | Med | | | | High |
| Emission Reduction Payments | | | | Zero | |

7.57 While grant funding and concessional finance are clearly more attractive than market rate finance, another closely related consideration is scale of available financing. Inevitably, the lower cost channels are more limited in scale and availability.

### *Availability of finance*

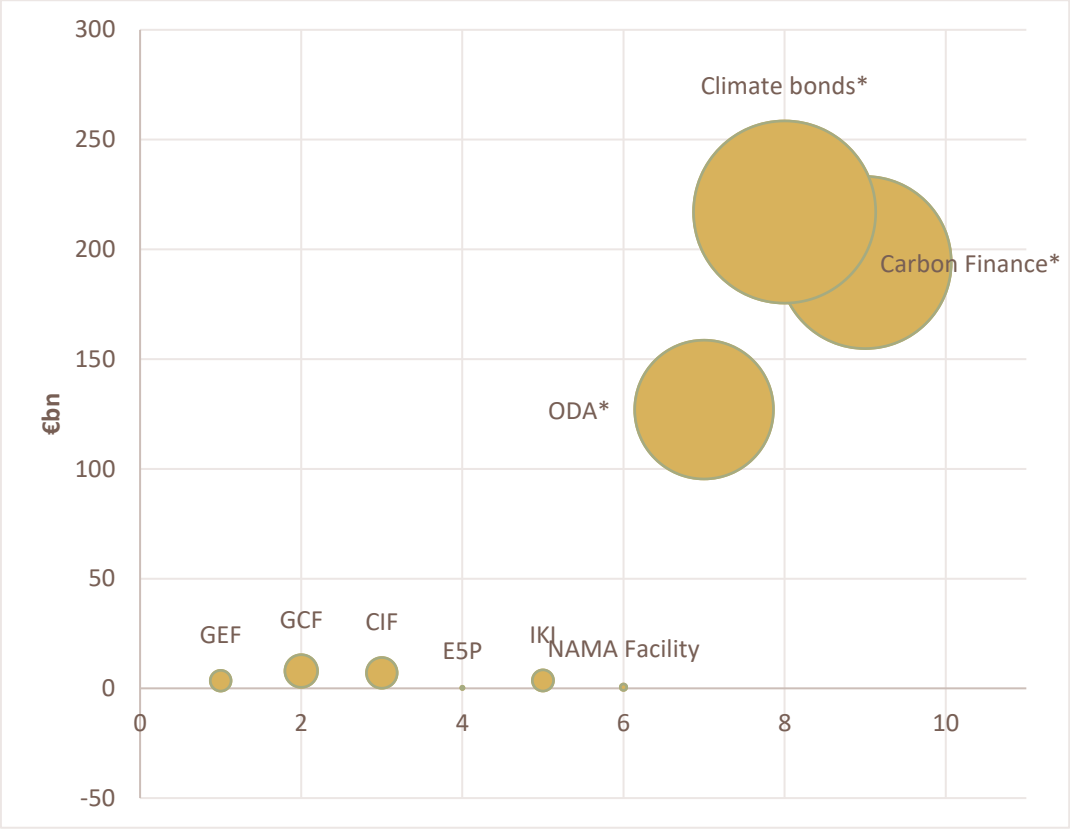
7.58 It is difficult to provide robust estimates as to the likely scale of finance available from different channels to the EaP countries, and particularly to the transport sector projects within each country, as in most cases funds are allocated based on successful applications received, rather than through defined country and sector specific credit lines.

7.59 Some indication of the funding available for individual projects and on aggregate can however be drawn from the following evidence:

- Total value of available funding by financing channel
- The proportion of funds allocated to the transport sector
- Size of the financial support offered for individual transport projects (in any region), both in absolute terms and as a proportion of total project value

7.60 As Figure 7-9 clearly depicts, the relative size of the different sources of climate funding varies significantly.

**Figure 7-9 : Relative Scale of Climate Finance Channels**




***** 2018 Net ODA flows, 2019 climate bond and carbon market size.
Source: Study team estimate based on Climate fund databases, Climate Bonds Initiative[34], Refinitiv[35]

7.61 In addition to fund size, the allocation of funding by region and by sector is important in assessing likelihood of accessing finance, and also the size of individual project support available. Table 7-4 presents details of the current allocation of funding from the major financing channels. Characteristics which are positive relative to EaP prioritized

[34] 2019 Green Bond Market Summary https://www.climatebonds.net/resources/reports/2019-green-bond-market-summary
[35] Carbon Market Year in Review, Refinitiv https://www.refinitiv.com/content/dam/marketing/en_us/documents/reports/global-carbon-market-emission-trading-system-review-2019.pdf

investments are highlighted in green, whilst adverse fund allocation patterns are flagged in orange.

**Table 7-4: Allocation of major climate financing channels by region, sector and value**

| | GEF | GCF | CIF/CTF | E5P | IKI | NAMA Facility | Climate bonds | Carbon Finance |
|---|---|---|---|---|---|---|---|---|
| % of funding allocated to transport sector | 12% | 2% | <15% | 6% | 4%# | 19%# | 20% | Negligible |
| % of portfolio allocated to region* | 11% | 6% (Eastern Europe) | 13% | 100% | 6%# | <5% | N/A | N/A |
| Typical size of project financing €m | 0.5- 28 | <10 - >300 | <130 | Up to 50 | No min or max | 5-20 | 180+ | No limit |

* EaP region typically included within Europe and Central Asia

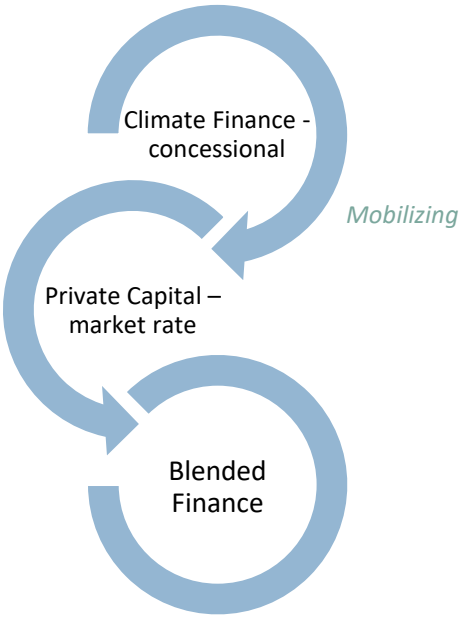
# by number of projects supported

Source: Study team estimate based on Climate fund databases, Climate Bond Initiative[34]

## Blending financing streams

7.62 With the scale of the investment requirement for the prioritized measures, no single financing channel is likely to fill the financing gap. It is anticipated therefore that financing of the package of investments will draw on a range of sources, of which climate finance can form a valuable component within the financing mechanism.

7.63 With regard to the role climate funds play in project delivery, analysis of the ratio of climate fund support (whether grant funding or concessional loan) to overall project value finds that for larger projects (€100m+) on average represents no more than 10% of total project value (see analysis in Appendix E). wider investment, with the preferential terms of the climate financing component making the project more attractive to potential co-financiers. The result is a blended financing mechanism which enables project delivery.




7.64 The role of private finance as part of a blended financing solution should not be overlooked. By the latest estimate, private sector actors accounted

for 56% of total climate finance flows in 2018 (€275bn of the total €492bn[36]). This underlines the scale of importance of the role of the private sector in the move towards a low carbon future. A recent IFC report[37] estimates that at present, of all private sector finance to the transport sector, only 10% is channeled to green transport activities and therefore there is scope for significant further growth.

7.65 The leveraging of private sector investment is often more feasible where the investment generates revenue streams, offering an opportunity for a return on investment to private investors. Of the prioritized investments, policies and schemes which offer the potential to generate future revenue schemes include the TEN-T road user charging, sustainable urban transport initiatives (public transport farebox revenues and parking levies), and rail upgrade initiatives. Fleet renewal programs also often include an element of private funding from the vehicle manufacturers.

## Application for Climate Financing

7.66 The various financing channels have differing requirements to apply for project finance. The majority provide extensive eligibility and application process documentation which cannot be fully reproduced here. However, the main points are briefly set out below.

### *Climate funds*

7.67 Climate funds typically disburse through accredited entities, ensuring that the project partner has the necessary capacity and compliance procedures in place to ensure the most effective use of funds. The accreditation process and the type of accredited entity differs by fund, but typically national or international bodies act as intermediaries, whether multilateral development banks, accredited national commercial banks, or bodies such as UNDP. In some cases, national government agencies can gain accreditation to promote projects on their own behalf. If not, the appropriate national agency will act as the political partner to the accredited entity, as a demonstration of political 'buy-in' is often an essential component of a successful funding bid.

7.68 Table 7-5 summarizes the present status of the identified implementing and political agencies in the EaP countries for the main climate funds.

[36] Global Landscape of Climate Finance 2019, Climate Policy Initiative https://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2019/

[37] Green Finance: A Bottom-up Approach to Track Existing Flows, 2017

**Table 7-5: Implementing agencies within the EaP for the major Climate Funds**

| Fund/Institution | National Institution responsible for co-ordination | Implementing Agency | Designated Authority in EaP country |
|---|---|---|---|
| Global Environment Facility (GEF) | Operational Focal Point (OFP) and Political Focal Point | GEF Agencies<br>EBRD acting as implementing agency under the Green Cities Program. | Armenia – MoE<br>Azerbaijan – MENR<br>Belarus - MNREP<br>Georgia - MEPA<br>Moldova - MARDE<br>Ukraine - MEEP |
| Green Climate Fund | National Designated Authority (NDA)<br>*N/A – Not eligible as an 'Annex I' Country | Accredited Entity<br>UNDP currently acting on behalf of Armenia, Azerbaijan, Georgia and Moldova. | Armenia – MoE<br>Azerbaijan – MENR<br>Belarus – N/A<br>Georgia - MEPA<br>Moldova - MARDE<br>Ukraine – N/A |
| Climate fund - CTF | Funds channeled through MDBs only | | |
| E5P | Municipal client | Implementing Agencies | City municipalities and City transport operators |
| NAMA FACILITY | Political partner | Implementing partner | Azerbaijan – MENR |
| IKI | Political partner | Executing organization (national implementing entities, NMDA, DB and UN bodies) | Armenia – MoE<br>Azerbaijan – MENR<br>Belarus – N/A<br>Georgia - MEPA<br>Moldova - MARDE<br>Ukraine – N/A |

MoE – Ministry of Environment, Armenia
MENR – Ministry of Ecology and Natural Resources, Azerbaijan
MNREP - Ministry of Natural Resources and Environmental Protection, Belarus
MEPA - Ministry of Environmental Protection and Agriculture, Georgia
MARDE - Ministry of Agriculture, Regional Development and Environment, Moldova
MEEP - Ministry of Energy and Environmental Protection, Ukraine

7.69 The following actions can be taken within each country to actively pursue opportunities for financing through the major climate funds in order to identify the scope for financing support for the identified green transport investments:

- Engage with the climate funds active within the EaP region, through the national institution/political partner agencies identified above. Building on existing relationships with climate funds, IFIs, and supported programs within the region brings benefits in reduced lead times and greater understanding of the country's requirements and financing needs.
- Actively share the outputs of the research conducted with existing financing sources, giving emphasis to the prioritized investments and the schemes which demonstrate alignment to the objectives of the climate financing sources. Use the analytical outputs of the study to demonstrate the scale of mitigation potential of the policies and the associated co-benefits.
- Progress readiness activities to enable eligibility for financing including development of investment plan aligned to fund priorities, with the support of the identified implementing agency(ies)

### *Green/Climate Bonds*

7.70 As outlined earlier, Climate Bonds can be issued by public entities, both national government and local government (depending on fiscal powers), and by private institutions, for example commercial banks or private rail operators.

7.71 The certification framework for bond issue is well defined and offers investment channels for eligible projects. Each country must ensure that the national fiscal landscape is conducive to fully benefit from this growing financing channel for climate friendly projects.

7.72 Led by the respective Ministries of Finance, countries should consider the development of a sustainable financing strategy, defining the role which climate bonds and other financing sources should play in supporting national investment and ensuring that the legislative framework is in place to facilitate the issuance of green/climate bonds.

### *Carbon Finance*

7.73 With existing emissions trading mechanisms soon to be replaced by new, more innovative forms of carbon finance, the opportunities for increased access to finance through this channel looks increasingly positive for the transport sector. The nature of the new channels is as yet not fully developed, and therefore activities to ensure readiness to access this funding are not straightforward to define.

7.74 After the adoption of the Paris Agreement in December 2015, the future policy landscape for Carbon Finance is most likely to change. This is made more complex by the emergence of new market mechanisms under the Paris Agreement's Articles 6.4 ("Article

6.4 mechanism") and 6.2 (Cooperative Approaches). In anticipation of such policy change and as a part of efforts to identify options for supporting programs so they are compatible with the post-2020 climate framework, the World Bank started developing the concept for Standardized Crediting Frameworks (SCF). The SCF is a new approach to crediting emission reductions, owned and managed by the country, which allows for more comprehensive geographic coverage, flexibility, has lower transaction costs, and encourages private sector engagement.

7.75 The SCF is important for several reasons. First, the framework proposes a systematic approach to counting carbon credits. Second, making things simple and standardized helps improve transparency of the carbon market and reduce transaction costs. Finally, country-owned and managed frameworks like SCF would help with capacity building of host country institutions, improve coordination among domestic entities, and help align climate change policy goals with the sectoral ones.

7.76 The SCF approach would support greater private sector engagement by providing simplified, predictable approaches to crediting. As the SCF is further developed, it may be the best solution to support the smooth transition of carbon finance to post-2020. Initially, the World Bank's work on SCF is focused on energy access programs in Africa, but it is instrument-neutral and open to usage under the CDM and expected to be open to use under Article 6.2 or 6.4 mechanisms and suitable for delivering verified results required by results-based climate finance (RBCF) delivery vehicles globally.

# 8. Next steps and enabling policy actions

8.1 This study shows there is considerable opportunity to improve regional and international connections within the EaP while delivering on climate action obligations. Coordinated and targeted transport investment can significantly increase market access, encourage intercity travel and integrate the EaP into growing east-west trade. With the support of green focused policies this can deliver economic benefits (ranging from 0.3% to 3.5% of GDP), improved health outcomes and improved access to jobs and education.

8.2 Urgent action is needed to begin decarbonisation of transport systems for the following reasons; i) to enable timely alignment with a zero-emission pathway, ii) to avoid a widening of the technological and regulatory gap with the EU, as the EU is moving toward net-zero by 2050, iii) to realise the significant economic and social benefits that green policies deliver on.

8.3 The largest challenge for implementation is not necessarily the size of the financing required, but the speed at which governments and supportive International Financial Institutions can respond. An enabling environment needs to be created which empowers positive and joined-up climate action at all levels of governance, from multi-national frameworks, such as the EaP, down to local authorities.

8.4 The findings from this study should be used to assist countries in this process in three ways:

1) For each country develop a national climate strategy and action plan for transport which is cohesive between EaP members and with the EU's Green Deal. Georgia has developed a '2030 Climate Action Plan' which could serve as a template.
2) Collaborate with climate funds and IFIs to create country programs that will enable significant and rapid inward investment.
3) Introduce enabling regulatory and institutional changes.

8.5 Specific actions include:

- Raise awareness within the EaP about the opportunity for decarbonised transport to improve connectivity, deliver economic growth and improved health, and energy outcomes
- Work with EaP countries to deepen the analysis on green connectivity options to develop transport projects and programmes that are ready for financing. Conduct better project preparation that uses demonstrable environmental and economic returns to entice and mobilize funding

- Support the EaP as a regional forum to coordinate strategy and cross-border implementation. Many policies rely on strong regional cooperation, for example reducing border friction, improving rail connections, and the establishment of an e-vehicle charging network that serves international trips.
- Advise on policy coordination between ministries responsible for transport infrastructure and the environment, and between local, regional and national government.
- Engage with the climate funds active within the EaP region, through the identified national institution/political partner agencies. Building on existing relationships with climate funds, IFIs, and supported programs within the region brings benefits in reduced lead times and greater understanding of the country's requirements and financing needs.
- Progress readiness activities to enable eligibility for financing including development of investment plan aligned to fund priorities, with the support of the identified implementing agency(ies)
- Advise on the adoption of EU directives

8.6 Significant early gains can be made through the revision of regulations and powers concerning transport in EaP countries. Deeper convergence with EU standards should be sought, particularly in relation to:

- Technical standards on rail which encourage interoperability including elements of the European Rail Traffic Management System
- Fuel quality standards
- GHG emission labelling for for cars and tyres
- GHG emission standards for Heavy duty vehicles
- Regulation of passenger transport operators
- Regulation of road freight operators
- Vehicle inspection for road worthiness
- Procedures to facilitate cross-border freight movements
- Regulation to monitor, report and verify GHG emissions in shipping

8.7 There are a number of enabling actions which can be undertaken in the short term to assist countries to implement green connectivity policies. Table 8-1 presents suitable actions specific for each country, and actions which are common across EaP members, indeed some will benefit from cross-border collaboration.

8.8 However, there are anticipated to be a number of complex policy decisions which necessitate consultation with the public and require public support. For example, a revision of fuel taxes. To assist in this space it is recommended that, national awareness campaigns are pursued to raise understanding amongst of the climate crisis, potential solutions and their co-benefits. And that a public dialogue is established to develop a zero-emission pathway that is consistent with the Paris Agreement. A key tool could be deliberative democracy which can build public ownership of complex policy decisions.

8.9 EaP members can then transition from Intended Nationally Determined Contributions to Nationally Determined Contributions (NDCs) including legally binding transport emission reduction targets consistent with the Paris Agreement.

8.10 Significant technical assistance will be needed to mobilise and lever innovative forms of finance. This includes engagement with the major climate funds to establish pathways to access support for green transport investments. Readiness activities are needed such as accreditation and the development of fund, and sector specific, country investment plans.

8.11 Expertise will also be necessary to develop an enabling environment for the issuance of climate bonds as a component of national Sustainable Financing Roadmaps. As well as to identify and develop projects with opportunities for private sector investment including revenue generating initiatives like road user charging and urban transport initiatives.

**Table 8-1: Enabling actions**

| Policy area | Applicable in all EaP countries | Country specific |
|---|---|---|
| Rail upgrade including borders, signalling and logistics | - Continue rail liberalization, railway safety improvements and<br>- Enhance cross border railway cooperation to schedule run-thru services to ports<br>- Cooperation with neighboring custom services to use electronic documents<br>- Implement a Freight Corridor Management Information System (CMIS) to offer a single window for commercial, operational and financial purposes<br>- Simplify visa procedures/requirements for EU bound transit freight<br>- Establish a Digital Development Plan for Rail network, including ICT and control centres to better co-ordinate rail network<br>- Implement a competitive and clear tariff-setting system<br>- Review tariffs to promote shift of freight from road to rail and IWW | - Armenia: Armenian Rail cooperate with Georgian Rail to maintain a regular train service to Poti Port at competitive tariffs.<br>- Azerbaijan and Georgia: Integrate ICT technologies to facilitate CMIS for the trans-Caucasus Transit Corridor (CTC)<br>- Azerbaijan and Georgia: Create a common border crossing with close collaboration between custom agencies<br>- Azerbaijan and Georgia: Harmonize transport tariffs for intermodal transport on CTC<br>- Azerbaijan and Georgia: Implement "open access" policy on CTC to ensure all clients have fair and transparent access to capacity and tariffs<br>- Belarus: review aging railway rolling stock<br>- Moldova Expedite implementation of the Railways Code<br>- Moldova: Enhance IT systems of customs clearance to enable Single Window System<br>- Ukraine: Develop a risk management system at Customs and border agencies<br>- Ukraine: Implement action plan to update railway rolling stock<br>- Ukraine: Establish a network of regular container/intermodal freight trains, synchronized with trains of the EU countries |
| Eco Driving, ITS and speed limits | - Introduce eco driving training for trucks and as part of commercial driver's license. Set requirements of qualification.<br>- Establish information campaign about the environmental and economic benefits of anti-idling, proper tyre inflation, and regular vehicle maintenance | - Azerbaijan: Use existing Baku ITS system to identify traffic violations and issue fines<br>- Belarus: Learn from experience of ITS in Minsk, to apply in secondary cities<br>- Georgia: Expand speed cameras to a wider road transport network under the "smart motorways" program |

| Policy area | Applicable in all EaP countries | Country specific |
|---|---|---|
| | - Implement tyre Eco-labelling scheme in line with EU standards<br>- Implement policy to restrict used tyre importation<br>- Introduce and enforce minimum safety standards for public transport operators<br>- Enhance fuel quality monitoring system | |
| Fleet renewal: cars, buses, trucks | - Raise vehicle import standards to Euro V minimum<br>- Implement emissions differentiated vehicle taxes/fees including registration tax, registration fee, annual ownership tax, circulation tax<br>- For commercial fleets establish an integrated technical inspection system to elicit transparent information on fleet emissions and mix.<br>- Converge with EU fuel quality standards, including use of biodiesel<br>- Regulate and inspect fuel quality<br>- Review fuel taxes to promote shift to cleaner fuels<br>- Converge with EU regulations on road worthiness test (annual vehicle inspection regime)<br>- Introduce eco-labelling to inform purchase of vehicles, in line with EU standards<br>- Converge with EU regulations on the regulation of passenger transport operators<br>- Develop restrictions on the use of vehicles older than 15 years | - Armenia: Fully implement fleet modernization initiatives as part of European Partnership Agreement |
| Electric vehicle promotion | - Develop plan for a national charging network for electric cars<br>- Develop plan for replacement of whole municipal fleet with electric vehicles<br>- Maintain fiscal incentives to import electric and hybrid vehicles | |

| Policy area | Applicable in all EaP countries | Country specific |
|---|---|---|
| Road user charging and toll Roads | - Pilot tolls and other road user charges on strategic roads<br>- Explore introduction of HGV road-user charges | - Moldova: Revise the Road Fund to have extra-budget for the environment through introduction of toll roads and other road user charges |
| Urban transport improvements | - Establish local educational campaigns about benefits of sustainable and active travel<br>- Revise public transport fares, concessions and contracting arrangements to enable financial stability of PT operators and investment in industry.<br>- Establish and maintain open data platform for information on public transport services and the travel demand<br>- Develop delivery/freight management plans for cities including consolidation<br>- Require municipalities to develop SUMPs and associated PT optimization, fleet modernization and NMT strategies<br>- Establish Integrated Transport Authorities in major cities empowered to coordinate, plan and implement public private and NMT transport<br>- Decentralize power to cities to enable them to enforce enhanced parking regimes/fines, low emission zones, vehicle movement restrictions and congestion charging<br>- Introduce nationwide multi-operator e-Ticketing standards and implementation plan for adoption by all PT services<br>- Enhanced regulation and enforcement of private taxis, including options for cities to tax ride hailing app-based systems<br>- Change building code and master-planning practice to ingrain sustainable development principles, including TOD<br>- Develop a national Sustainable Urban Transport knowledge exchange center to share best practice and conduct training | - Armenia: Ease subnational borrowing limits on Yerevan municipality for its planned bus fleet modernization program<br>- Azerbaijan: Promote “green” gas fuelled buses in Baku by tightening regulation that private operators to follow suit in modernizing and greening their fleet.<br>- Azerbaijan: Expand and complete sub-urban rail schemes in Baku<br>- Georgia: Empower the land transport regulatory agency to conduct safety and emissions checks on private operators which are operating in a deregulated regional public transport market<br>- Georgia: National framework agreed between cities and national government to promote low emission transport and a funding instrument for supporting sustainable urban mobility<br>- Moldova: Speed up implementation of Low Emissions Development Strategy (LEDS)<br>- Moldova: Pass air protection strategy as part of the new air quality law |

| Policy area | Applicable in all EaP countries | Country specific |
|---|---|---|
| | - Consider employer contributions paid by local businesses directly to local authorities for supporting local urban transport.<br>- Develop street design standards that support walking and cycling by reducing vehicle speeds and providing space for NMT<br>- Conduct social research to identify local barriers for cycling and walking | |
| Road Freight | - Introduce freight operator licenses, registration, inspections and enforcements to meet terms of EU Association Agreement<br>- Develop an integrated and coordinated fair tariff policies for freight<br>- Training and knowledge sharing to enhance professional knowledge of transport sector<br>- Develop a national logistics plan: plans for private companies to obtain quality certification, public-private dialogue on logistics, policy measures to create clustering of logistics activities, incentives to promote consolidation in the industry<br>- Enhance professional knowledge of transport sector staff through knowledge sharing, training and accreditation in international transport, warehousing and logistics<br>- Develop plans to introduce electronic management at all stages of the logistics chain | - Azerbaijan: Review of regulations concerning cross border road freight traffic following Georgia's lead to meet EU requirements<br>- Azerbaijan: Implement the Green Corridor concept for transit freight which involves fair and transparent access, high integration of transport modes, regulatory harmonization, development of transshipment facilities at strategic locations, and use of intelligent transport systems<br>- Ukraine: increase the number of mobile dimension and weight control systems<br>- Ukraine: Implement a security and cargo insurance system |
| Green Port Improvements | - Develop plans to implement Green Port approach at all TEN-T ports<br>- Contingency management and planning for bad weather | - Convergence with EU standards to monitor, report and verify GHG emissions from shipping |

# Appendices

Appendix A: Model description

Appendix B: Policy descriptions, case studies and costs

Appendix C: Accessibility maps

Appendix D: User guide for online visualization tool

Appendix E: Relevant financing activity in the EaP