Sustainable Asset Valuation (SAVi)

The Benefits of a Net-Zero Transport Strategy to Stimulate Sustainable Mobility in Indonesia

SUMMARY OF RESULTS

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Indonesia is an emerging economy with the fourth largest population in the world—273 million inhabitants. The country is exposed to significant climate change risks, experiencing high air pollution levels and having much of its population living in low-lying areas prone to flooding. In addition, Indonesia's population and urbanization rates are expected to significantly increase in the coming decades.

The transport sector, particularly road transport, is the most energy-intensive sector in Indonesia (and also among the most polluting sectors). Transforming the transport sector in Indonesia is therefore crucial for reducing greenhouse gas emissions and improving energy efficiency. The electrification of transport, coupled with a high renewable energy share in electricity generation and a shift from individual, motorized transport modes to public transport and non-motorized modes, could decarbonize the transport sector in Indonesia.

National and regional governments in Indonesia can have significant roles in supporting the decarbonization of the transport sector and achieving net-zero targets by mid-century through the development of supporting policies and infrastructure. Likewise, the private sector has an important role to play in investing in and improving vehicle electrification technologies: success also depends on private individuals adopting more sustainable transport practices.

Our research demonstrates that an integrated strategy on net-zero transport—encompassing various interventions—is critical to supporting sustainable mobility in Indonesia. Isolated interventions, such as the electrification of private vehicles alone, will not result in an inclusive transition toward sustainable mobility.

We used the Sustainable Asset Valuation (SAVi) methodology to calculate the environmental and social costs and benefits of different mobility scenarios for Indonesia. We then compared them with the investment costs they require. The full scope of the results is discussed in an accompanying technical report.

We assessed three main scenarios, each corresponding to a different mix of avoid, shift, and improve interventions for sustainable transport. Scenario 1 included investments in public transportation, teleworking, and non-motorized transport (NMT) systems. Scenario 2 included full private vehicle electrification, powered with renewable energy, in addition to teleworking. Scenario 3 is a combination of the Scenario 1 and 2 interventions. In the full analysis, available in the technical report, we also undertook further sensitivity analysis of Scenario 2 to demonstrate the impact of different energy mixes for electricity generation.

Table 1. Three main scenarios modelled in the assessment and the results

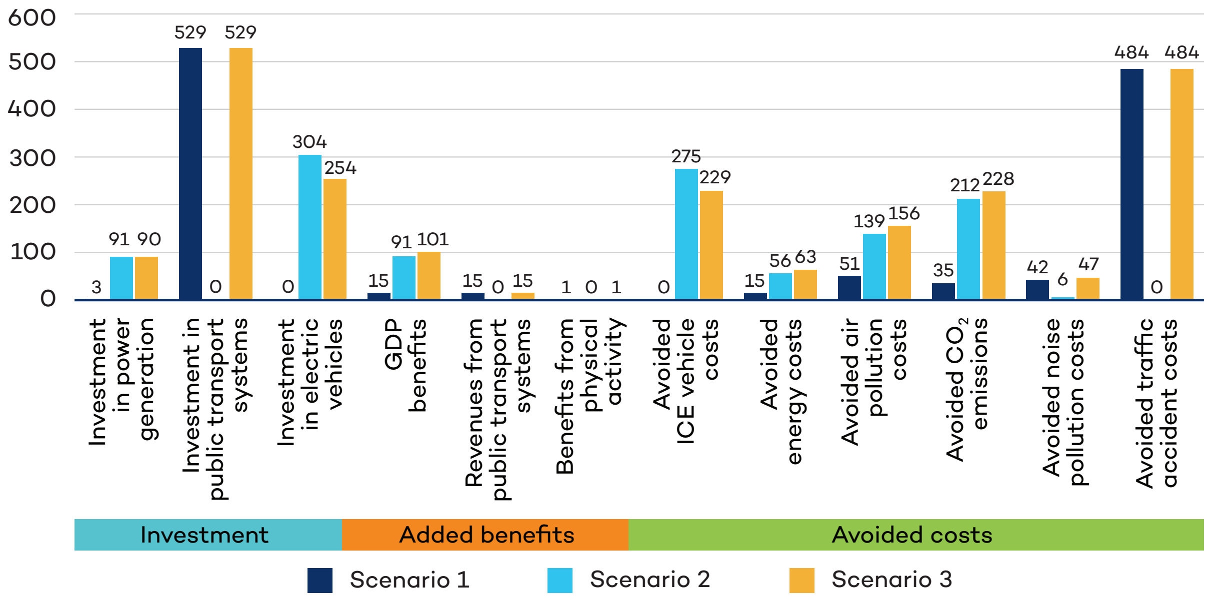
Net-zero scenario	Description	Assumptions	Main results
Scenario 1 (avoid and shift)	Investment in public transportation systems such as bus rapid transit (BRT) and mass rapid transit (MRT) transport networks that are 100% electric, a drop in demand for mobility due to teleworking, and introduction of non-motorized transport systems. This scenario alone does not reach net-zero by 2050.	• 50,000 km of NMT infrastructure built annually • 10,000 km of BRT infrastructure built annually • 150 km of MRT infrastructure built annually • 100% electrification of MRT and BRT • 100% renewable energy • 15% of transportation demand avoided due to teleworking	• USD 126.7 billion cumulative discounted (at 11.33% and 3.5%) benefits over the project period (2022–2050)
Scenario 2 (avoid and improve)	100% private vehicle electrification powered by 100% renewable energy and teleworking. This scenario reaches net-zero by 2050.	• 100% private vehicle electrification rate • 100% renewable energy • 15% of transportation demand avoided due to teleworking	• USD 383.8 billion cumulative discounted (at 11.33% and 3.5%) benefits over the project period (2022–2050)
Scenario 3 (avoid, shift, and improve)	A combination of all of the above interventions with 100% renewable energy. This scenario reaches net-zero by 2050.	• 50,000 km of NMT infrastructure built annually • 10,000 km of BRT infrastructure built annually • 150 km of MRT infrastructure built annually • 100% private vehicle electrification rate • 100% renewable energy • 15% of transportation demand avoided due to teleworking	• USD 450.1 billion cumulative discounted (at 11.33% and 3.5%) benefits over the project period (2022–2050)

Source: Authors' calculations.

Scenario 3, which combines all transport interventions, yields discounted values of IDR 6,926.03 trillion (USD 450.1 billion) cumulatively until 2050, followed by Scenario 2 with IDR 5,905.54 trillion (USD 383.8 billion) and Scenario 1 with IDR 1,949.02 trillion (USD 126.7 billion).

Figure 2 shows the breakdown of investment costs, revenues, added benefits, and avoided costs for the three scenarios. Across the three scenarios, the added benefits and avoided costs with the highest values are the avoided costs of air pollution, the avoided costs of traffic accidents, the avoided internal combustion engine (ICE) vehicle costs, and the avoided CO_2 emissions.

Figure 1. Investment and costs, revenues, added benefits, and avoided costs across the three main scenarios (cumulative discounted USD billion)



Source: Authors' calculations.

The benefit-cost ratio (BCR) of the net-zero transport scenarios is also calculated. The BCR determines the overall value for money of a project. It illustrates the return for every unit invested by comparing the project's total benefits (including avoided costs) with the total costs. Scenario 2 provides the most attractive BCR with 1.97 USD for every USD invested. This is because the investment costs related to public transport interventions, which are included in the other two scenarios, are much higher. Some benefits of public transport, such as time savings and wider access to mobility options, could not be quantified for the purposes of this assessment but are providing additional societal benefits. The benefits of Scenario 1 and 3 are, therefore, likely an underestimation.

While Scenario 2 looks most attractive from a BCR perspective, the net benefits of Scenario 3 remain the largest for society, as illustrated above.

The benefits of sustainable transport are shared across several economic actors. For instance, households/citizens benefit from reduced air pollution, lower energy costs, and fewer accidents; businesses benefit from reduced time of travel and employment creation; and the government benefits from increased tax revenues and avoided investments in conventional transport infrastructure.

When we look at the BCR calculation from the perspective of these different economic actors (government on the one hand and households/society on the other), a more nuanced picture indeed emerges. From a government perspective, the BCRs are lower than 1, and only Scenario 2, which relies heavily on the willingness of households to invest in private electric vehicles, looks attractive. However, the greatest benefits from a societal perspective will be captured under Scenario 3, with a BCR of 4.93.

Another approach to the BCR is to differentiate between tangible and intangible impacts of the net-zero transport scenarios. The former is based on estimations of only tangible economic indicators and the latter includes only intangible indicators, such as social and environmental added benefits and avoided costs. The BCR that considers tangible impacts leads to significantly lower values than the BCR that considers intangible impacts across all scenarios.

This means that the value of these externalities is meaningful, and excluding them in cost-benefit analysis and BCR calculations leads to an underestimation of the investment worthiness of these transport interventions. For example, the BCR for Scenario 3 (which considers only tangible impacts) is 0.47, whereas when tangible impacts are considered, it amounts to 1.52.

Table 2. BCRs across the three main scenarios modelled in the assessments

BCRs (based on discounted values)	**Main scenarios** **Scenario 1. Investment in public transport systems**	**Scenario 2. Private vehicle electrification**	**Scenario 3. Mixed net-zero transport scenario**
BCR	1.24	1.97	1.52
BCR – Government	0.07	1.31	0.25
BCR – Households/society	N/A	2.31	4.93
BCR – Tangible impacts only	0.08	1.07	0.47
BCR – Intangible impacts only	1.15	0.90	1.05

Source: Authors' calculations.

In conclusion, there are several key messages emerging from this assessment.

First, decarbonizing the energy supply is a pivotal step in attaining net-zero transport in Indonesia. The symbiotic relationship between energy and transport reforms underscores the critical importance of decarbonizing the energy sector. These efforts are not only crucial to reducing carbon emissions but also hold the key to unlocking the transformative potential within the transport sector.

Second, the synergy between electrifying private vehicles with renewable energy sources and concurrently bolstering public transport infrastructure yields the most substantial societal benefits. This dual approach not only addresses air pollution and CO_2 emissions—it also lays the foundation for a sustainable and efficient transportation system.

Third, to comprehend the breadth of necessary investments and their varied benefits across society, adopting a systemic view and conducting scenario analysis is helpful. This comprehensive approach, encapsulated in the "avoid, shift, improve" framework, reveals that it maximizes development outcomes. The BCR, reaching close to USD 5 per dollar invested, underscores the efficiency and impact of such a strategic approach.

Fourth, the transformation of Indonesia's transport sector requires a twofold commitment: behavioural shifts and investments from both the public and private sectors. Achieving sustainability in transportation demands a collective effort to reshape behaviours while mobilizing resources for critical investments. This collaborative approach is fundamental to the successful evolution of the transport sector.

Finally, a notable facet of achieving net-zero in Indonesia's transport sector is linked to the avoidance of health and noise costs, and the cost of accidents. Policy-makers must recognize and emphasize this connection between transport reforms and the health agenda. Aligning these priorities not only contributes to enhanced public health but also results in substantial savings in public budgets. Integrating health considerations into the broader framework of transport reforms enhances the overall impact on both societal well-being and economic efficiency.

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Why Use SAVi?

SAVi calculates the environmental, social, and economic risks and externalities that impact the financial performance of infrastructure projects. These variables are typically ignored in traditional financial analyses.

SAVi is a simulation tool that is customized to individual infrastructure projects. It is built on project finance and systems dynamics simulation.

Visit the SAVi webpage: iisd.org/savi

About SAVi

SAVi is a simulation service that helps governments and investors value the risks and externalities that affect the performance of infrastructure projects.

The distinctive features of SAVi are:

- Valuation: SAVi values, in financial terms, the material environmental, social and economic risks and externalities of infrastructure projects. These variables are ignored in traditional financial analyses.
- Simulation: SAVi combines the results of systems thinking and system dynamics simulation with project finance modelling. We engage with asset owners to identify the risks material to their infrastructure projects and then design appropriate simulation scenarios.
- Customization: SAVi is customized to individual infrastructure projects.

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