ASIAN INFRASTRUCTURE INVESTMENT BANK

Guidance Note on Cost-Benefit Analysis of Projects

July 2023

I. BACKGROUND

1. Cost-benefit Analysis (CBA) forms a key component of project economic assessment as per the requirements under the *Operational Policy on Financing (OPF)*.[1] As a bank operating on lean principles and responsiveness to clients, the Bank has, as a matter of practicality, been guided by the CBA methodologies of co-financing partner Multilateral Development Banks (MDBs). As AIIB embarks on more standalone projects or takes the lead in transactions, it is imperative that it maintains a high standard of project economic analysis. This *Guidance Note on Cost-Benefit Analysis of Projects* (the Note) provides guidance for project teams undertaking project CBA.

2. CBA methodologies are well-established in most instances but is also evolving in response to new insights and practice. This Note does not seek to revisit all technical matters. Rather, this Note lays out the high-level principles underpinning the conduct of CBA in the Bank, providing a general guide while allowing for flexibility at the project level, and brings together relevant resources to assist project teams through the CBA process.

3. Experiences from other MDBs[2] highlight the importance of CBA:

    - CBA forms a key part of project economic assessment and is critical in the design and selection of projects that contribute to the welfare of a country.

[1] The requirement to conduct economic assessment is outlined in Section 3.3 of the *Operational Policy on Financing* and can also refer to *Administrative Guidance on Sovereign-backed Financing* and *Administrative Guidance on Non-Sovereign-Backed Financing*. This note focuses on project cost benefit analysis (CBA), which is a key component of economic assessment. A holistic economic assessment will also go beyond the CBA of the specific project and include other aspects such as sector analysis and debt sustainability analysis (DSA).

[2] Given that CBA methods are well-established, this Note draws on guidelines from other MDBs, including the World Bank, ADB, EBRD, and EIB, which are Bank's main co-financing partners.

- CBA is most useful when used early in the project cycle to decide between project alternatives, or to identify poor projects and poor project components. When properly conducted, the analysis can inform and guide each stage of the project. Including project preparation and beyond.

- CBA provides assurance that the project to be financed is economically viable and generates sufficient economic value. It is important to obtain information on project options being considered, make transparent the key assumptions and risks to the project, demonstrate soundness of the project to various stakeholders, and provide the basis for subsequent project comparison, evaluation, and learning.

- In contrast to the financial analysis, CBA includes economic costs and benefits, beyond those that directly affect the project's finances. For example, it considers both positive and negative externalities, which can be important even for private sector projects.

- CBA results should not be discussed in isolation, and ought to be complemented by wider macroeconomic, institutional, and sectoral economic assessments. With the Bank engaging in newer areas, for e.g., nature-based solutions, CBA will need to be complemented with innovative methodologies to better value biodiversity and natural capital.

II. SCOPE AND PURPOSE

4. The Note defines the key features, considerations, and lays out the minimum requirements for conducting CBA in projects financed by the Bank (Section III). These minimum requirements include defining the "without project" scenario and consideration of alternatives; correctly valuing the prices, costs, and benefits of the project; adjusting for market distortions; and estimating the costs of externalities such as local pollution and carbon emissions.

5. In projects led by other MDBs, project teams may rely on the CBA assessment prepared by the lead MDB, provided that project teams are satisfied that these are materially consistent with the principles stated in this Note. In instances where there are material deviations, project teams will need to highlight them in AIIB's project documents and explain why the Bank can accept the analysis of co-financiers.

6. In cases where project CBA has been undertaken by clients, the role of project teams can be more streamlined to reviewing and adjusting (where necessary) to make the analysis consistent with the principles laid out in this Note.

7. The Note should be also seen in the context of the *Administrative Guidance on Project Prioritization and Quality (PPQ) Framework* as a package of guidance to project teams. The Note adheres to the *G20 Principles for Quality Infrastructure*

Investment (issued June 9, 2019), which specifies that cost-benefit analysis should be used over the life cycle of infrastructure projects in ensuring economic efficiency.

8. The Note also refers to resources to assist project teams to improve the quality of analysis and adopt good practices (Section IV). Going forward, the Bank will continue to build up institutional capacity to conduct good CBA. Experience obtained through standalone projects, and the application of well-established methodologies to meet the specific conditions of its operations and client countries, will help to develop this capacity. This will be important to ensure continued high quality and strong development impact of projects financed by the Bank. As required, this Note will be updated periodically to consider changes in CBA methodologies and further refined based on the Bank's project experience.

III. MINIMUM REQUIREMENTS, KEY FEATURES AND CONSIDERATIONS

The OPF requirement for economic assessment applies to all financing, including sovereign and non-sovereign projects

9. As a default, a CBA should be conducted for

- All Bank-financed sovereign projects[3]; and
- Select non-sovereign projects where there are large externalities (*e.g.,* environmental or social)[4], and/or when there is large utilization of public resources.[5]

10. For other non-sovereign projects, a full CBA will not be required, but project teams need to confirm that the financial assessment can capture the key features of the economic assessment, and hence determine that the project is economically viable and contributes to the welfare of client countries. This includes Bank financing through on-lending or investment in private funds.

11. A CBA shall state all major benefits and costs associated with a project, based on economic prices. An Economic Rate of Return (ERR) should be calculated for all assessed projects.

[3] In cases where the scope and full details of sub-projects are not yet confirmed, such as FI (financial intermediary) operations, CBA can focus on a set of representative subprojects and/or form part of the project selection criteria.

[4] An example of a large externality would be climate impact measured in greenhouse gas emissions. For other large externalities in specific cases, it is suggested to discuss with the Environmental & Social team as needed.

[5] For example, the public sector may provide land concession to a private sector project. This improves private financial returns but comes with a public cost. A CBA will make this cost explicit and highlight the net benefit of the project, which is part of good governance.

12. In projects where it is difficult to accurately quantify the benefits and monetize them, a cost-effectiveness analysis (CEA) could be more appropriate. CEA compares the costs of different reasonable project alternatives to achieve a given outcome. CEA could also be used in other cases, as per the guidelines of other MDBs, including (i) alternatives are relatively homogenous and easily measurable; and/or (ii) the service is deemed too basic a necessity (e.g., electricity, water, or sanitation) and must be supplied.

13. The decisions on the application of economic assessment and the methodology proposed by the project team should be confirmed by the Concept stage at the latest. For the treatment of difficult cases, the project team should discuss options with the Economics Department (ECON).

Defining the "without project" scenario and consideration of alternatives

14. Comparing the proposed project to the "without project" scenario is integral to undertaking CBA. This requires defining and developing the "without project" scenario, and in general, there are two types:

    - "Do nothing" - this scenario assumes that in the absence of the project, no investment takes place at all, and the situation may deteriorate. For example, in a capacity rehabilitation project, the baseline scenario would be letting the capacity gradually deteriorate.

    - "Do the minimum" – this scenario assumes that there will be sufficient investment to maintain the status quo. For example, in a capacity expansion or upgrade project, the baseline scenario would be carrying out the minimum investment necessary to keep the existing capacity just operational.

15. As a default, project teams should spell out the economic consequence of the "without project" scenario, and use "do nothing" or "do the minimum" as the baseline for this scenario. In addition to the "without project" scenario, a fuller and more robust CBA would typically also consider feasible alternative options to achieve the same project objective – "do something else":

    - "Do something else" – this scenario would consist of a project alternative option (e.g., different project design, scale, or technology) to achieve the same objective or outcome sought by the proposed project. For example, providing increased electrical power may be achieved by generation projects, use of new technologies, or the import of electricity; urban traffic congestion may be addressed by improving the existing road network or by building a new subway system; and regional connectivity can be enhanced by investing in waterways, roads, or railways.

16. Project teams are encouraged to provide information on whether alternatives to the proposed project have been considered by client countries or project sponsors. This

information supports the requirement outlined in the PPQ Framework, namely that the Bank explores alternative options with the client and justifies why the proposed investment is chosen among the options.

17. The choices of the "without project" scenario and/or project alternatives will be project-specific. Project teams are responsible for validating the reasonableness of such choices and reflecting the rationale in project documentation, with support from ECON.

Getting the flows and the prices right

18. Once the proposed project and relevant baseline scenario are identified, the CBA will proceed with two key steps:

- Identifying the key component flows of costs and benefits and quantifying them; and

- Valuing the costs and benefits in monetary terms.

19. While the available methods are well known, the analysis often requires making judgements on the underlying assumptions, which may materially impact results. To better inform decision-making, transparency on methods being applied and assumptions being used is important. Project teams should provide the information on methods and assumptions in an annex of the PD.

20. In revenue generating projects, the projected financial flows (such as revenues, costs) are often a good starting point to carry out CBA, but adjustments are needed. Financial analysis assesses the project's impact on the financial flows of the project entity, while economic analysis focuses on the impact of the project on the society. Some costs and benefits items need to be included or excluded given the different perspectives of the project entity and of the society. For example:

- Taxes and subsides are transfers between the government and the project entity and should be excluded in CBA.

- An adverse environmental effect (such as air or water pollution) not accounted at the project entity level may represent major economic costs to the society and these costs must be included in CBA.

- Consumer payments to the developer for infrastructure services represents financial flows that cannot be directly used for CBA in the case of market failure or distortion. One would need to convert these financial flows into the actual economic benefits received by the consumers (e.g., time savings, consumer surplus of having cheaper and more electricity etc.)

- Land cost can be a transfer or represent a true economic cost or benefit. For example, land acquisition cost (where the developer or the government pays existing owners) is largely a financial cost. On the other hand, land used for infrastructure can represent an opportunity or economic cost. Project teams should take care in distilling whether land acquisition costs in project represent financial flows or true economic costs.[6]

21. Getting the prices right in CBA needs to convert financial prices into economic prices that reflect the true economic value or opportunity cost of a project. The adjustments can be made respectively for project specific inputs and outputs (e.g., tradable goods and services, labor), and for the economy as a whole. In practice, for ease of calculation, conversion factors (CFs) can be used to derive economic prices of project outputs and inputs from their financial prices. Some differences between economic prices and financial prices stem from market distortions created either by the government, the macroeconomic context, or the private sector. There could be many market distortions – including monopoly or monopsony power, trade tariffs, local content requirements, misaligned exchange rates.

22. In recent years, several institutions have dropped the use of CFs as globalization led to opening markets and distortions were significantly reduced in most countries. The CFs used in some of the projects reviewed show the adjustments are low. It is normally not required to use CFs where financial prices are not significantly different from economic prices for labor, goods, and services. However, project teams can use CFs in particular circumstances where significant market distortions are identified and can seek help from ECON.

23. Where there is no market for the benefits to be estimated, methods for valuing nonmarket impacts need to be used, such as stated preferences (e.g., contingent valuation), revealed preferences (e.g., hedonic pricing), transfer valuation etc. If there is a need to use any of these methods, it is suggested to refer to guidelines of other MDBs, for instance Appendix 5 of ADB *Guidelines for the Economic Analysis of Projects* (2017), or to discuss with ECON.

24. Willingness to pay (WTP) is often used to estimate project's incremental benefits. WTP methods are used when there are nonmarket transactions, or when transaction market prices are distorted. While WTP is a recognized method in economic literature and several methods have been developed to estimate it, its application can be highly contextual and needs to be done with care. Many studies have shown that the methods estimating WTP may be biased towards hypothetical rather than actual results. For example,

- Consumers may state a high (hypothetical) valuation for electricity in surveys or when electricity is supplied in limited quantities. Project teams should be careful

[6] As a default, land price appreciation that results from a project should not be included as a benefit in CBA. Firstly, including land price appreciation could lead to the double counting of project benefits, since land price appreciation will in principle reflect economic benefits such as time savings, reduced healthcare costs etc., associated with projects. Secondly, observed land price could be the result of financial speculation, rather than clear economic benefits. Nevertheless, there are instances where direct project benefits are harder to quantify, and land price appreciation can be used as a proxy. To discuss with the ECON if land price appreciation is included in CBA.

to extrapolate high WTP values to a large expansion of infrastructure services, as such expansion will include users with lower marginal benefits.

When estimating incremental project benefits by using WTP, project teams should provide proper justification and methods used for such estimation.

25. Generally, CBA needs to be conducted for the whole project. In a case where the Bank's project (or financing) forms only part of a larger project (or with other co-financiers or government putting in additional investments), the project team should consider in CBA all relevant cost and benefits of the whole project, and not be partitioned due to administrative reasons.

26. The accrual of project costs and benefits occurs at different times with the capital cost being concentrated at the beginning of the evaluation period, while benefits and operation and maintenance costs are spread out over the life of the project. Some of the assets created under a project may not be fully worn out at the end of the life of the project. The remaining value of these assets is then entered as a negative investment cost (positive benefit) in the final year of the project.

27. The stream of benefits and costs are made comparable by converting them into a present value, which requires the use of discount rate. There is some variation in the use of discount rate across projects. Discount rates ranging from 9 percent to 12 percent have been commonly used by MDBs for infrastructure projects, although projects with social, and environmental benefits can argue for lower discount rates. Project teams can use a different discount rate provided they provide a robust justification.

Externalities

28. CBA of Bank-financed projects should take externalities into account. Externalities exist when an economic activity affects other agents than those engaged in the economic activity and the effects are not reflected fully in market prices.

29. For some very catalytic or transformative projects, economic benefits often go well beyond the project itself. In such cases, input-output multipliers may be used to compute overall benefits. However, such multipliers often do not factor in constraints to the economy. Hence, when applying such multipliers, there will be the need to consider supply side constraints, additional investment needed to realize the benefits and opportunity costs.

30. Environmental impact is another form of externality. Examples include air and water pollutions, greenhouse gases (GHGs) emissions, and other environmental hazards. Externalities can be both positive and negative.

31. Economic valuations of local environment externality costs are country- and even sub-region-specific for different projects. Project teams should use results of local studies, such as detailed studies of the negative impacts of pollution on the economy and health of the population, from reliable sources and/or credible institutions. Where such local studies are not available, it is recommended that project teams use the transfer method to estimate economic impacts of externalities, based on transferring information from studies carried out in other locations and under carefully determined assumptions. In cases where such local environment externalities cannot be adequately quantified, project teams can also highlight qualitatively the intangible benefits or costs alongside CBA calculation.

32. On estimating the externality cost of GHGs emissions, it is specified in the Energy Sector Strategy that the Bank will use an appropriate shadow carbon price in its economic evaluation of projects to determine economic viability.[7] In 2017, the High-Level Commission on Carbon Prices, led by Joseph Stiglitz and Nicholas Stern, concluded after an extensive review that a range of USD 40-80 per ton (metric ton) of CO2e in 2020, rising to USD 50-100 per ton of CO2e by 2030, is consistent with achieving the core objective of the Paris Agreement.[8] Beyond 2030, the prices will be increased by 2.25 per cent per year leading to a range of USD 78-156 per ton of CO2e by 2050. All values are in real terms and in constant 2017 prices. This recommendation has been adopted in the recent practices of the World Bank (2017) and EBRD (2019).[9]

- On shadow carbon prices, project teams should use the values based on the ranges recommended by the High-Level Commission on Carbon Prices. As a default, project teams should use the midpoint values when using shadow carbon prices in CBA and include low and high values in sensitivity analysis (Table 1).

    - If the jurisdiction has a domestic carbon pricing scheme (carbon tax or carbon payments/credits via the carbon market), and where these are already reflected in financial analysis, project teams should make the necessary adjustments to convert these to a full shadow carbon cost.

[7] Debates have been ongoing during the past years on the appropriate shadow carbon price to assess the impacts of CO2 emissions, with wide range of prices considered in different studies.

[8] Different terms have been used to refer to the price of carbon used in economic analysis (shadow price of carbon, social cost of carbon, social value of carbon). These terms refer to different approaches to calculate the price of carbon. This guidance note uses the term "shadow price of carbon," which is the price of carbon consistent with a given climate objective. N. Stern and J. E. Stiglitz (2017). *Report of the High-Level Commission on Carbon Prices*. World Bank. Available at: www.carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices.

[9] World Bank, Guidance note - shadow price of carbon in economic analysis, issued on Nov 12, 2017; EBRD, Methodology for the economic assessment of EBRD projects with high greenhouse gas emissions, issued in January 2019.

- On net carbon emission, this will be calculated by comparing emissions under the "with project" (a.k.a., gross emissions) scenario with emissions under "without project" (a.k.a., baseline emissions) scenario.

    - Economic analysis with a shadow carbon price is required for both sovereign backed financing (SBF) and non-sovereign backed financing (NSBF) with large climate externality, i.e., the project gross CO2e emissions that exceed 100,000-ton CO2e per year for the energy sector, while other sectors will be determined on a case-by-case basis.

    - For the energy sector projects, the Energy Sector Strategy (ESS) recognizes the importance of providing a rigorous economic evaluation to ensure the long-term economic viability and compatibility with the transition to low carbon. The choice of baseline is necessarily context-specific, and appraisal of energy sector projects will consider the country's Paris-aligned long-term carbon trajectories. For power generation, it is recommended that a dynamic baseline to be estimated to evaluate GHG emission savings, taking into account, the country's climate commitments, the relevant national and/or international studies, as well as the experience and lessons learned from deploying low carbon technologies in recent years. In short, the GHG emissions from energy generation projects should be measured against a dynamic (rather than static) baseline that reflects the country's transition path.

    - The grid emission factor (GEF) for the respective countries developed by the IFIs can be used to represent the power carbon intensity today.[10] Project teams should discuss with SPB and ECON to set a dynamic baseline which reflects how carbon intensities are likely to develop going forward.

        - For replacement (non-incremental) power projects, the level of emissions of the existing plant being replaced will be the baseline up to the end of the lifetime of that plant, beyond which the approach of setting a dynamic baseline (detailed above) should apply.

    - In many other cases, the "without project" emissions in CBA can be calculated by referring to the same baseline scenario as the calculation for all other benefits and costs. If the considered costs and benefits include indirect costs and benefits (outside of the project scope financed by the Bank), the GHG emissions generated outside the project (i.e., scope 3 emissions) also need to be considered in the analysis for consistency.

    - The calculated net GHGs emissions in CBA may not necessarily be the same as the net emission data used for the general climate reporting

[10] Specifically, the operating margin (OM) of the GEF. For more details, please refer to Harmonized Grid Emission factor data set, https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting/ifi-twg-list-of-methodologies

purposes (e.g., the GHGs emissions reduction included in the Results Monitoring Framework)[11]. Project teams should treat with care given the results of two different net GHGs emission numbers.

Table 1. Recommended shadow price of carbon in USD per ton of CO_2e

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Midpoint	60	61	63	64	66	67	69	70	72	73	75	77	78	80	82	84
Low	40	41	42	43	44	45	46	47	48	49	50	51	52	53	55	56
High	80	82	84	86	87	89	91	93	96	98	100	102	105	107	109	112

Year	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Midpoint	86	88	90	92	94	96	98	100	102	105	107	109	112	114	117
Low	57	58	60	61	62	64	65	67	68	70	71	73	75	76	78
High	114	117	119	122	125	128	131	134	137	140	143	146	149	153	156

Note: beyond 2030, the prices are calculated by assuming the increase of 2.25% per year, leading to a range of USD 78-156 per tCO2e by 2050.

Source: Stern and Stiglitz (2017), *Report of the High-Level Commission on Carbon Prices*.

Robustness

33. Sensitivity analysis should be carried out for all CBA. The analysis is commonly used to assess the robustness of the project outcomes with respect to changes in values of key variables that would affect them, as well as key underlying parameters (e.g., shadow carbon price or low pollution externality cost). The analysis could also estimate the switching values of key variables, i.e., values of considered variables below which the economic outcome of the project or NPVs would turn negative. Examples of typical considered variables usually include delays in implementation, cost overruns, etc. Where key parameters and variables specified by client governments or co-financiers are available, they should also be tested through the sensitivity analysis.

34. This deterministic sensitivity analysis approach is sometimes inadequate when parameters affecting the project are highly correlated. Sensitivity analysis can be carried out using Monte Carlo simulations, taking into account probability distributions and correlations of underlying parameters. When cross-correlations are accounted, such analysis can allow the risk of project failure to be better understood, adding to the robustness of CBA. Such simulation should only be carried out when necessary.

[11] Other examples can also be found in World Bank (2017) Guidance note on shadow price of carbon in economic analysis; ADB (2019) Greenhouse Gas Emissions Accounting for ADB Energy Project Economic Analysis; or discuss with the ECON and the SPB Climate team.

IV. GENERAL GUIDANCE & INSTITUTIONAL SUPPORT

35. Project teams should follow some general good practices

- Focus on the major costs and benefits, and the key parameters affecting the CBA. Aim to be broadly correct rather than to be overly precise.
- Be clear and transparent on key assumptions and risks to the project. Where assumptions are required, cite from credible sources and cross-check accordingly.
- Present all relevant information in the PD or in a PD annex.

36. Institutional-level resources and support will be provided by the Bank to assist project teams adopt good practices and improve the quality of project CBA. They include:

- The list of documents available to project teams as useful guidance on project cost benefit analysis (Annex 1), which are available on the intranet.
- The list of illustrative CBA benefits and cost items for different project archetypes (Annex 2).
- Questions related to GHG emissions may be addressed to ECON (EconDept@aiib.org) and SPB (SPBClimateTeam@aiib.org). For other queries and the treatment of difficult cases project teams are welcome to reach out to ECON.

Annex 1. Annotated List of Useful Guidance on Project Cost-Benefit Analysis

Institutions	List of documents and sources
MDBs	
World Bank	*Economic Analysis of Investment Operations (2001)* http://documents.worldbank.org/curated/en/792771468323717830/pdf/298210REPLACEMENT.pdf *Investment Project Financing Economic Analysis Guidance Note (2013)* http://siteresources.worldbank.org/PROJECTS/Resources/40940-1365611011935/Guidance_Note_Economic_Analysis.pdf *Discounting Costs and Benefits in Economic Analysis of World Bank Projects (2016)* *Guidance note on shadow price of carbon in economic analysis (2017)* http://pubdocs.worldbank.org/en/911381516303509498/2017-Shadow-Price-of-Carbon-Guidance-Note-FINAL-CLEARED.pdf
ADB	*Guidelines for the Economic Analysis of Projects (2017)* https://www.adb.org/sites/default/files/institutional-document/32256/economic-analysis-projects.pdf Cost-Benefit Analysis for Development – A Practical Guide (2013) https://www.adb.org/sites/default/files/institutional-document/33788/files/cost-benefit-analysis-development.pdf Greenhouse Gas Emissions Accounting for ADB Energy Project Economic Analysis (2019) https://www.adb.org/sites/default/files/institutional-document/547351/ghg-emissions-accounting-guidance-note.pdf
EBRD	*Methodology for the economic assessment of EBRD projects with high greenhouse gas emissions (2019)* https://www.ebrd.com/news/publications/institutional-documents/methodology-for-the-economic-assessment-of-ebrd-projects-with-high-greenhouse-gasemissions.html
EIB	*The Economic Appraisal of Investment Projects at the EIB (2013)* https://www.eib.org/attachments/thematic/economic_appraisal_of_investment_projects_en.pdf
MDB Group	*Joint Methodology for Tracking Climate Change Adaptation Finance* *Joint Methodology for Tracking Climate Change Mitigation Finance* *Available in Annex of the 2018 Joint Report on MDBs' Climate Finance*

	http://www.ebrd.com/2018-joint-report-on-mdbs-climate-finance *Harmonized Grid Emission factor data set (2019)* *https://unfccc.int/sites/default/files/resource/Harmonized_Grid_Emission_factor_data_set.xlsx*
Other useful sources	
Jenkins G. P, C. Y. K Kuo and A.C. Harberger	*Cost-Benefit Analysis for Investment Decision (2012)*
Harry Campbell, Richard Brown	*Cost-Benefit Analysis: Financial and Economic Appraisal using Spreadsheets (2016)*

Annex 2. Illustrative CBA benefits and cost items for different project archetypes

The benefit and cost items are normally project specific, and they need to be assessed in the context of each project. For illustration purpose only, it is included here typical cost and benefit items for energy, transport, urban and water sector project archetypes. This list is indicative and not comprehensive.

Power T&D	Benefits: increased consumer or business benefits; improved reliability of supply and avoidance of downstream economic losses; reduction of generation or transmission losses Costs: construction, operation & maintenance, generation cost where relevant
Renewable energy	Benefit: generated electricity output, GHG emission reduction, other environmental benefits, security of supply benefit Cost: construction, operation & maintenance, transmission connection cost (e.g. curtailment)
Energy efficiency	Benefits: energy saved valued by economic value (may incl. CO_2 reduction and other environmental benefits) Costs: investment cost
Gas T&D, including storage	Benefits: sales of energy (as a proxy for economic benefit), security of supply, value of peak shaving Cost: construction, operation & maintenance cost to mitigate negative environmental effects (e.g. on air, water, land or CO_2 emission)
Fossil fuel power generation	Benefit: generated electricity output Cost: construction, operation & maintenance, fuel cost, environmental externalities (e.g. GHG emission, air pollution)
Roads; Railways	Benefits: savings in vehicle operating costs; savings in travel time; reduction in traffic accidents; improved quality of transport services; positive or negative environmental impact (e.g. air pollution, GHG emission); Costs: construction, operation & maintenance #Note: for low-volume rural roads (for example with less than 200 motorized vehicle per day), cost-effectiveness analysis can be used (e.g. number of rural people or households served per $1,000 investment)
Seaport; Airport; Transport hub; Logistics park	Benefits: savings in travel time and costs due to new transport options; reduced traffic congestion and delays (i.e. travel time savings) due to capacity expansion; reduced transport related energy consumption; better access to international markets; increased investments and

	economic activity; positive or negative externalities (e.g. GHG emission, air pollution, noise) Costs: construction, operation & maintenance, additional superstructure costs
Urban public transport	Benefits: time saving for users (diverted passengers and generated passengers); reduction in congestion for non-users; improved road safety; positive externalities (e.g. reduced air pollution and GHG emission) Costs: construction, operation & maintenance #Note: highly complicated to estimate cost savings and traffic diversion due to transport demand shifts across transport modes and network effect
Urban rehabilitation; Urban and regional development	Benefits: new economic activity from urban renewal and regeneration, improved accessibility to services, improved energy efficiency Costs: investment cost, operation & maintenance #Note: typically comprising different sub-projects; normally conduct CBA for example sub-projects and sometimes cost-effectiveness analysis can be used
Water supply	Benefits: consumer benefits of improved services (reliability, quality) or availability (quantity); reduction of water use from higher costs sources; increased supply through the reduction of technical losses; health benefits accruing from provision of clean water to replace lower quality supplies; cost savings from replacing and often unsafe water source Cost: investment cost, operation & maintenance #Note: water should be valued at its opportunity cost, and it will depend on whether the water resource is abundant or scarce (zero to a very high figure).
Sanitation; wastewater treatment; solid waste management	Benefits: improved services (usually considered as incremental), health related cost savings from avoided health damage, environmental benefits, avoided cost related to time and resources for cleaning Cost: investment cost, operation & maintenance #Note: these projects often lead to increases in land value and estimating the expected change in land value provides an approximate way of estimating project benefits
Water resource management, e.g. multi-purpose dams	Benefits: irrigation and agricultural productivity; hydropower benefits; avoided household property losses; avoided dam replacement or rehabilitation cost; avoided emergency response costs. Costs: investment cost, operation & maintenance