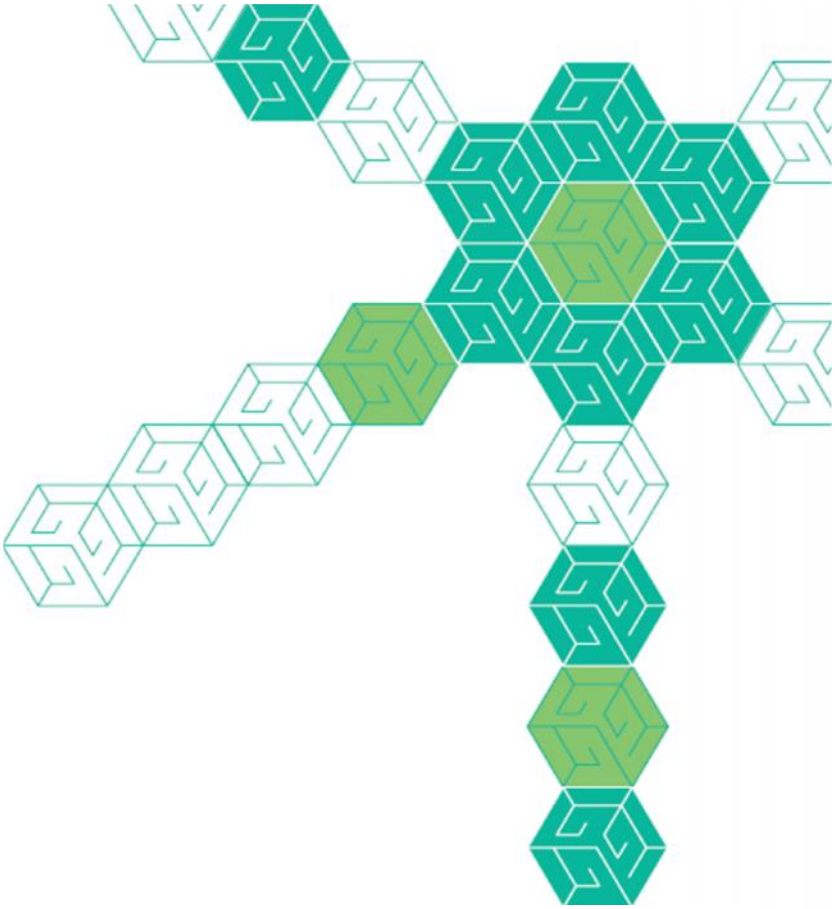

Extended Cost Benefit Analysis Scoping Paper

October 2014

Component 1B: Green Growth Tools
Government of Indonesia - GGGI Green Growth Program

1. The role and objectives of ECBA as a public policy and planning tool

Introduction

Left to its own devices, the private sector will typically invest in opportunities that maximize financial returns. In contrast, the public sector has an obligation to take account of the political economy while ensuring investments are affordable. Therefore, conventional economic and political models tend to focus on one or other of these aspects, and thereby often miss both the wider costs and opportunities generated by investments.

Economic appraisal is designed to overcome these biases in decision making and resource allocation. Economic appraisal takes a broader view of benefits and costs accruing to all stakeholders, whether social, economic or environmental. This is essential in a world where externalities[1], public goods[2] and other market failures are often not taken into account.

Such appraisal naturally supports the design of economic incentives and market-based solutions to market failure[3] problems. By accounting for wider costs and benefits, and internalizing them in decision making, we can hope to ensure social and environmental sustainability as well as economic progress. At the same time, we can seek to pro-actively seek out opportunities for unconventional investments that might drive new engines of economic growth.

Specifically, the practical application of economic analysis in designing and selecting projects that contribute to the welfare of a country could help us to[4]:

(a) decide whether the private or the public sector (or both) should undertake the project;
(b) estimate the project's fiscal impact;
(c) determine whether the arrangements for cost recovery are efficient and equitable;
(d) assess the project's potential environmental and social impact (hidden and external costs) and contribution to poverty reduction.

There are many economic appraisal techniques that can be used in performing economic analysis. One of the standard economic appraisal techniques is Cost Benefit Analysis (CBA), which is a standard appraisal tool for governments in developed economies. *Cost Benefit Analysis (CBA) quantifies in monetary terms the costs and benefits of a proposal, including items for which the market does not provide a satisfactory measure of economic value*[5]. CBA offers the possibility of capturing impacts of a project beyond financial returns. This appraisal technique is particularly revealing when assessing the socio-economic desirability of a project, especially in cases where public goods and services need to be provided free of charge to users as part of government efforts at social welfare improvement. In addition to valuing socio-economic aspects of a project, CBA is also popular in monetizing the total economic value of environmental projects or environmental and social changes caused by a project.

The benefits of CBA are well-recognized, and the following institutions use it as a key tool:

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[1] "Externalities are costs or benefits arising from an economic activity that affect somebody other than the people engaged in the economic activity and are not reflected fully in prices". (The Economist A-Z)

[2] "Things that can be consumed by everybody in a society, or nobody at all… Examples include clean air, a national defence system and the judiciary." (The Economist A-Z)

[3] "When a market left to itself does not allocate resources efficiently." (The Economist A-Z)

[4] *As quoted from Handbook on Economic Analysis of Investment Operations. Belli,Perdo et. al. 1998.p.3*

[5] *This definition is taken from The Green Book: Appraisal and Evaluation in Central Government. 2003. P. 6*

- National governments including US, UK, Ireland, Canada, etc.
- International Finance Institutions (IFIs) including World Bank, European Investment Bank, International Monetary Fund, Asian Development Bank.
- Intergovernmental Organizations (IGO) including various commissions of United Nations (UN) such as United Nation Economic Commission for Africa (UNECA) and United Nation Framework Convention on Climate Change (UNFCCC).
- International Economic Organizations including Organisation for Economic Co-operation and Development (OECD).
- Private sector investors looking to demonstrate the wider benefits of their projects, or the improvements they have made to project designs to benefit local communities.

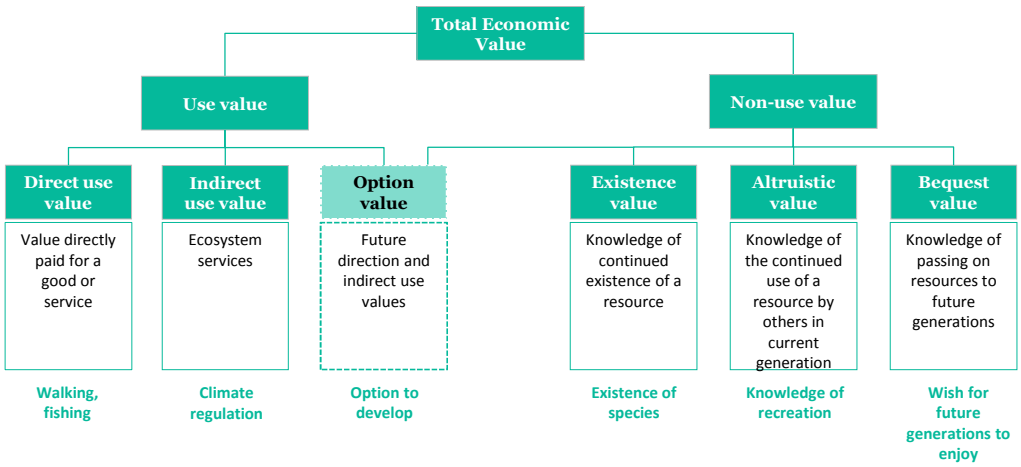
CBA is often used as justification for the use of public funds. Economic metrics such as benefit-cost ratio (B/C), Economic Rate of Return (ERR) and Economic Net Present Value (ENPV) calculations enable CBA to provide comparable scenarios of cost and benefit under several circumstances; between applying and not applying one project; and, between several policy scenarios. Thus, it can suggest not only the ideal policy for decision makers but also suggest whether or not a project is the best option available and worth pursuing from a societal perspective.

In addition, the CBA approach can also help answer the following questions:

(1) What are the aims of the project?
(2) What will happen if the project is undertaken, and what will happen if it is not (in terms of economic, social and environmental impacts)?
(3) Are the project components the most efficient ones?
(4) Who are the potential winners and losers from the project?
(5) What are the quantified overall impacts on government's fiscal position?
(6) Is the project financially sustainable?
(7) What are the risks of undertaking the project?

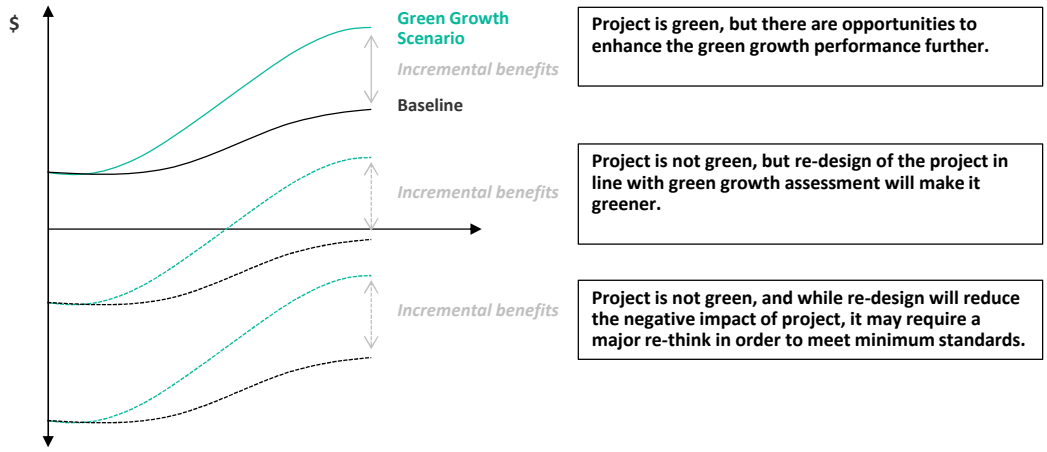
An Extended Cost Benefit Analysis (eCBA) is a particular manifestation of CBA looking especially carefully at the social and environmental impacts; the hidden and external costs not normally accounted for in decision making. Frameworks such as Total Economic Value, which rigorously categorizes and quantifies the value of natural capital, are often applied in eCBA. Given eCBA can be used for a specific investment proposal as well as broader analyses; we use the phrase "project-level eCBA" in this document where relevant.

Figure 1: Total Economic Value framework used in eCBA



In this context, eCBA is particularly useful for not only assessing the full costs and benefits of the Business As Usual Scenario (including hidden and external costs) but also suggestive of other options such as Green Growth scenarios, where these costs are minimized and the benefits maximized. In terms of Figure 2, eCBA provides the means to provide the information and measure the difference between BAU and Green Growth.

Figure 2: Measuring Business As Usual and Green Growth



Having provided a wider view of costs and benefits, a CBA or eCBA will often provide a public policy rationale to provide regulatory and policy frameworks to induce investment flows in green activities, or the greening of existing activities. This may take the form of incentives for private sector investment or direct financing or a combination of the both (PPP, fiscal subsidy etc.). See Chapter 4 for more discussion on policy applications. In this way, it can drive a reduction in the wedge between BAU and Green Growth in the figure above.

Example 1: High Speed Rail in China

The Chinese government has invested, and continues to invest, heavily in High Speed Rail (HSR). It was argued by a number of public commentators that HSR was expensive for government to build and maintain. A Cost Benefit Analysis on one of the proposed HSR lines (from Hong Kong to mainland China) was conducted to assess wider benefits such as economic development, and social benefits including travel time savings and safety improvements. The government was therefore able to justify the investment on broader grounds than a purely financial appraisal would rely on. Indeed, the study showed that when these wider benefits were quantified, the total Net Present Value was $2.1 billion (net of the original investment of $8.6 billion).

It is worth noting that as whole, the HSR investment portfolio in China is controversial and has been criticized on safety and environmental grounds, which serves to underline the importance of conducting CBA across as many areas as possible, and basing the analysis on reliable and objective data.

Source: Tao et al (2011), Cost Benefit Analysis of High-Speed Rail Link between Hong Kong and Mainland China, Journal of Engineering, Project and Production Management.

History of Cost Benefit Analysis

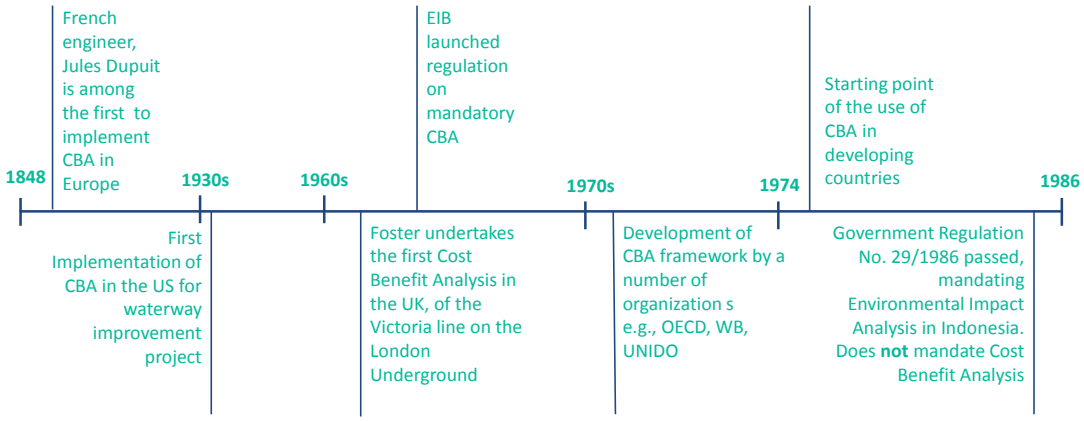
The research questions, and practical applications, of CBA has evolved over time. The first known example of a CBA dates back to 1848, when the French Engineer Jules Dupuit conducted CBA of public works. Then in 1936, the US Corps of Engineers conducted Social CBA as part of a waterway improvement project[6]. It was adopted as a government tool at scale during the recovery from the Great Depression and during WWII as American government spending escalated and it was increasingly important to allocate funds to the "right" projects, from society's point of view. From here, Social CBA became popular with other developed country governments and international institutions. In the 1970s, with more consensus on the methodological principles, Social CBA was increasingly applied in an emerging market context, as a tool to optimize international development spending[7].

"Cost Benefit Analysis is an indispensable part of the Singaporean policymaker's tool kit … Should we build a new MRT line? Should government finance the development of a high-speed fiber optic network enhance the country's competitiveness? Will allowing integrated resorts bring greater benefits to Singapore than the social costs that might be created?"
Yen and Low (2011) Public Policy and Behavioral Economics in Singapore

Despite a period where Social CBA became less popular – as it was believed that policy reform efforts that align shadow prices with market prices would be more productive than accounting directly for shadow prices in project evaluations – it remains in widespread use especially among multilateral institutions, partly in recognition that for phenomena such as externalities, it is not practical for policy to eliminate all market failures[8]. And it is still a standard tool for advanced economy governments[9].

Most developing and emerging markets have not yet incorporated CBA into their policymaking process[10], but by doing so, could leapfrog past some of the planning mistakes developed economies historically locked-in to their economic model. Figure 3 below summarizes this evolution of the technique.

Figure 3: Key milestones in the development and adoption of Cost Benefit Analysis



6 Watkins, *Introduction to Cost Benefit Analysis*, Available at (http://facweb.cs.depaul.edu/nsutcliffe/483readings/10-INTRODUCTION%20TO%20COST%20BENEFIT%20ANALYSIS.htm)
7 Kirkpatrick and Weiss (1996) Cost Benefit Analysis and Project Appraisal in Developing Countries
8 Kirkpatrick and Weiss (1996) Cost Benefit Analysis and Project Appraisal in Developing Countries
9 Livermore and Rivesz (2013) The Globalization of Cost-Benefit Analysis in Environmental Policy
10 Livermore and Rivesz (2013) *op cit.*

2. The Scope of a project-level eCBA

From the previous discussion, a project-level eCBA can be viewed as an analytical tool that governments can use to identify the monetary values of public goods, environmental externalities and social returns associated with many projects. In this sense, results of a project-level eCBA can be used as a base of evidence to determine the size of public and private investment flows needed to maximize these values over time.

A project-level eCBA is flexible in scope and can encompass different geographies and timeframes depending on project size. It can also be applied across different sectors by different users. Here, a range of common applications is discussed, before referencing the methodological principles that distinguish Extended and Social Cost Benefit Analysis (eCBA) from Financial Cost Benefit Analysis.

Geography

Generally the inputs of an eCBA (investment, running costs etc.) are defined at the project level (i.e., the construction zone of the project); hence "project-level eCBA". The economic, social and environmental outcomes of the project can be defined up to national level, although biophysical impacts are restricted by the size of the relevant communities, ecosystems and/or landscapes.

Project Size

Social Cost Benefit Analysis of many projects in advanced economies and for projects funded by multilateral institutions is often mandatory. However, generally *de minimis* thresholds are imposed as CBA entails costs of its own and it is important to ensure appraisals undertaken are commensurate with the size of the project.

A couple of international examples provide some perspective:

- European Regional Policy (2008) considers a project worth more than €10-50m (depending on project type) in need of CBA analysis
- In the Republic of Ireland, the Public Spending Code obliges a project with estimated cost of €20m or more to undertake CBA analysis (and a lighter form of CBA for projects over €50,000).

One way to cover the scope of more projects cost-effectively (to include smaller projects too) is to reduce the scope or depth of analysis; a "pre-CBA" or other high-level analysis that at least takes account of the key market failures. This approach may be more appropriate for district and sub-district level decision making in Indonesia, as well as projects at the conceptual stage.

Timeframe

The typical eCBA evaluation life time depends on how long *material* costs and benefits are expected to accrue for. These mainly depend on the sector or technology under consideration. For example, a typical power plant is considered to have an average economic life of 25 years, and an energy efficiency scheme 15-20 years. A range of 15-40 years is fairly typical for industrial applications.

For impacts relating to natural capital, however, a period of 50-100 years is often used, or even longer, to account for the fact that material benefits can be expected from ecosystem services

over a much longer timeframe (natural capital deprecation is generally nil, and often negative, so only the impacts of discounting[11] will render the benefits immaterial over time).

Conditions for application

As some intangible benefits are less easily quantified - especially in government projects with overlapping objectives and in projects where reliable data are not available - CBA comes with some practical limitations.

In the case where output has multiple dimensions and is not easily measured, Multi Criteria Analysis (MCA) is more applicable as an evaluation tool. When evaluating a project with more homogenous outputs, Cost Effective Analysis (CEA) might be more suitable. The European Investment Bank (EIB) provides an overview of the different circumstances under which applications each of 3 project appraisal methodologies is appropriate (see Table 1 below).

Figure 4: Scope of eCBA as compared to other tools

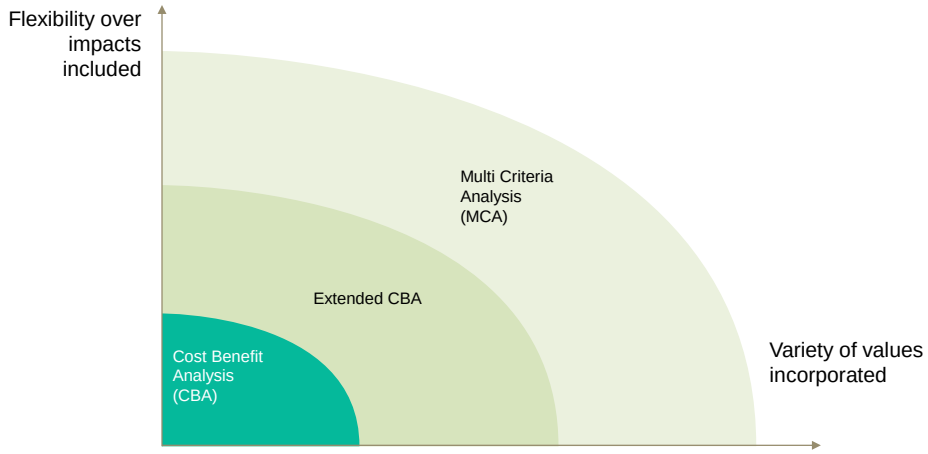


Table 1: Appropriate conditions under which to apply CBA

		Number of output variables	
		High	Low
Measurability of outputs variable and monetization possibility	High	**CBA** CEA	**CBA** CEA
	Low	MCA	CEA

[11] The practice of multiplying costs or benefits in one time period by an interest rate (discount rate) to make them comparable to costs and benefits in another time period. See "Social Discounting" below.

Economic Sectors

Often these conditions are closely aligned with technology and economic sector, especially the ability to monetize outputs, the breadth of impacts, and the availability of reliable data. For this reason, eCBA is more commonly applied in some sectors than others; the Table below provides a summary.

Table 2: Common sectors to which CBA is applied

CBA	CEA	MCA
• Agro-industry • Energy • Manufacturing • Telecommunications • Tourism • Transport • Water and wastewater	• Energy • Solid waste management • Water and wastewater	• Education • Health • Urban and Regional Development

Source: European Investment Bank, The Economic Appraisal of Investment Projects

Methodology

An eCBA explicitly accounts for market imperfections, including:

- Impatience and uncertainty about the future (e.g. under-investing in climate change adaptation)
- Externalities (e.g. unregulated water pollution affecting downstream users)
- Public goods or bads (e.g. clean air, green house gas emissions)
- Taxes and subsidies (e.g. fossil fuel subsidies, labor taxes, taxes on capital)
- Knowledge spillovers (e.g. under-investment in human capital and training)
- Asymmetric information and principal-agent problems (e.g. investor is not a beneficiary of investment)

A core principle of the eCBA methodology is therefore to consider a much wider range of prices that goes beyond pure market prices to arrive at the social costs and benefits of a project (the "social opportunity cost"[12]). There are a number of principles to be followed when calculating social opportunity cost (SOC). These principles are crucial in differentiating eCBA (similar to "social cost benefit analysis") from "financial appraisal" or "financial cost-benefit analysis", which only considers market costs and benefits from the perspective of a private investor. More detail on each of these principles is contained within Appendix 1.

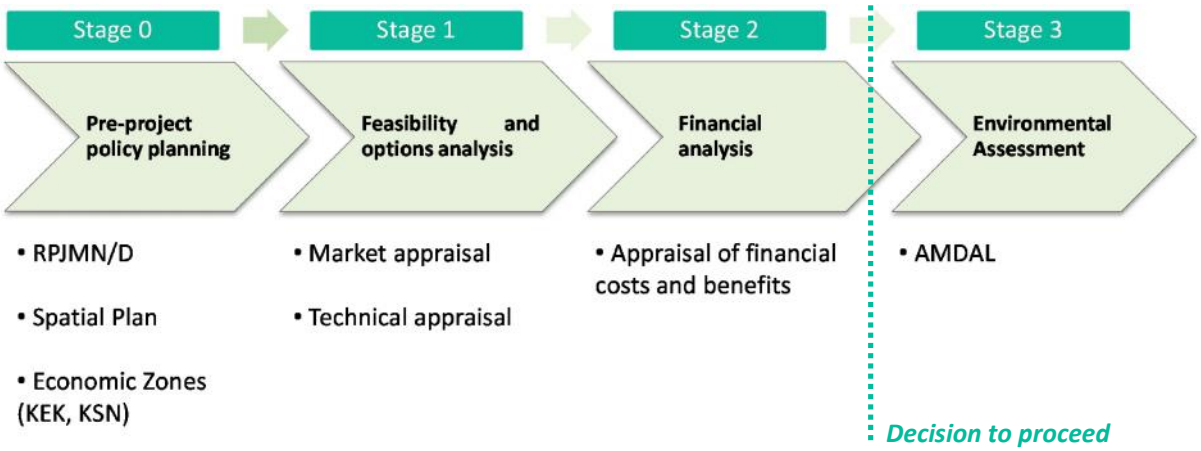
[12] This is as opposed to "private cost", and still encompasses economic, social and environmental costs in the classic Sustainable Development framework.

3. Potential Applications: The Project Appraisal Process

The existing project appraisal process

Major investment projects in Indonesia and many other countries will typically undergo an appraisal process in 3-4 stages before construction starts.

Figure 5: Stylized overview of the project appraisal process in Indonesia



Firstly, before the project is conceived, there will be a high-level planning framework set by government. This includes planning priorities set in the RPJP(D)N/RPJM(D)N, the national spatial plan (RTRWN), and localized spatial plans for economic zones (KEK, KSN)[13]. These collectively provide guidance on the type of activities that should take place in each geography.

Secondly, private or government-led feasibility assessments take place to confirm that there is a market for produced goods and services (is there a sufficient level of demand and clear route to market?), and whether the project is technically feasible from an engineering and practical point of view (is the site suitable, and are local resources such as raw materials and employees present?)[14].

Thirdly, following the detailed engineering design (not shown as a step below), a detailed financial appraisal is undertaken to understand if the project is profitable (or fiscally neutral), and how it can be financed. After this stage, the broad decision to proceed with the project is commonly taken and planning applications finalized.

Fourthly and lastly, before construction begins, an Environmental Impact Assessment[15] takes place. In general, the AMDAL involves identifying impacts from the work plan, detailing the

[13] Details on the planning process are available in Technical Annex 3.2

[14] This is commonly followed by a high-level financial assessment and then a detailed engineering plan. These are omitted for the sake of brevity

[15] AMDAL was mandated by Government Regulation 29/1986, and regulated again by Regulation 27/2012. It is supported by Law No 32/2009 as an instrument for prevention of environmental contamination and/or damage.

environmental aspects of impact, predicting and prioritizing impacts, and evaluating important impacts in order to compose the Working Plan and Monitoring Plan.

These four steps are illustrated in Figure 5 above. It is important to note that the decision to proceed is taken between stages 2 and 3. The AMDAL is primarily a risk mitigation measure for a pre-determined project, but not a tool to fundamentally re-design the project and achieve the project objectives in a more sustainable manner.

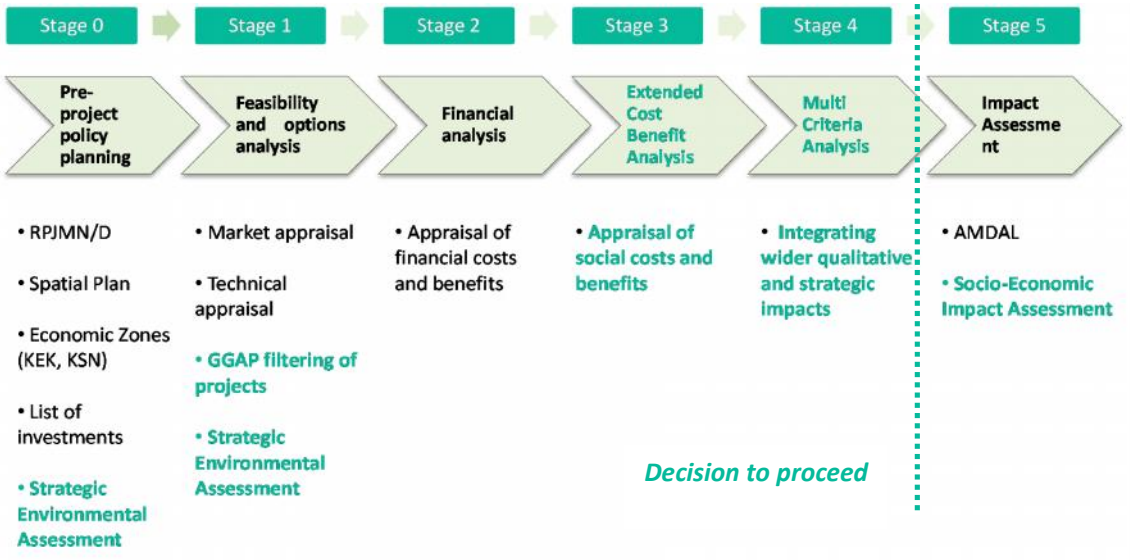
Greening the project appraisal process with eCBA

Extended Cost Benefit Analysis can fit into this existing process. By conducting an eCBA before the decision to proceed with the project (alongside other assessments such as Strategic Environmental Assessment, and Multi-Criteria Analysis), it is possible to assess whether and by how much, a project is contributing to social, economic and environmental outcomes. This allows for key decisions to be made *before* implementation:

- Does it offer net positive benefits and should it proceed?
- Are there opportunities to re-design this project to enhance green growth performance?
- Are there policies that might drive better outcomes for this and other projects (see next chapter)?

These additional stages in the appraisal process are illustrated below.

Figure 6: Stylized overview of a "greened" planning and project appraisal process in Indonesia



Note: The GGAP (Green Growth Assessment Process) tool is a tool designed by the Global Green Growth Institute to priorities major capital projects for further analysis such as eCBA. The prioritization is based on high-level economic, social and environmental data expected to be available at the project inception phase.

Mainstreaming eCBA in practice

The "green" stages in project appraisal included in Figure 6, additional to the typical current process as outlined in Figure 5 are not always conducted. This is partly due the high cost of performing these analyses. But, it is also due to the lack of regulations mandating them (with the exception of Strategic Environmental Assessment mandated by Environmental Law No. 32/2009).

However, some of these stages are conducted for projects classified as Public-Private Partnerships (PPP). For example, Social Cost Benefit Analysis at the pre-feasibility or feasibility stage, as well as high-level project screening through Multi Criteria Analysis, are already steps in the project appraisal process[16]. This is encouraging, since while PPP projects are currently limited in number, it is a government priority to increase their share in infrastructure delivery.

If the Indonesian government in future decides to implement eCBA as part of the mainstreaming of green growth across *all planning and investment processes*, then it would probably be necessary for an appropriate Ministry to coordinate and supervise the performance of eCBA including: the arrangement of the required costs; setting the criteria for projects that require eCBA; and, ensuring the independence of the results.

In terms of the cost of implementation, there are a number of alternative arrangements that could be considered by government as to who should bear the burden of eCBA. One possible route follows the example of the private sector PROPER environmental rating in Indonesia where the government:

- Provides an option for certain activities to undergo eCBA
- Defines certain criteria explaining the circumstances under which eCBA and MCA are obligatory stages
- Has the liberty to refer the project appraisal to be conducted by an independent and certified institution to avoid conflict of interest and for quality assurance purposes.

The government could also motivate the investors or private companies to perform project-level eCBAs and MCAs by providing a fiscal benefit such as tax holiday or green subsidy for projects that have demonstrated their green growth performance through conducting an eCBA.

In addition, the government can **emphasize the private benefits of conducting a project-level eCBA** and implementing project re-designs such as the positive perceptions and acceptance from the community towards the project, more favorable access to international finance, better relations with local government etc.

The tools might also help in persuading the Government of Indonesia and international donor agencies to invest *incremental finance* towards green improvements on project baselines.

[16] Government of Indonesia, Coordinating Ministry of Economic Affairs (2010) *Public Private Partnership Investor's Guide*

4. Potential Applications: Regional and National Planning

The eCBA process has value beyond the approval and design of green projects, or the greening of brown projects (i.e., it doesn't always have to be a project-level eCBA). It can also be used at a micro and macro level to draw policy implications, and drive progress across the 5 outcomes of Green Growth. In particular, eCBA can be used in four broad ways to drive Green Growth policy and planning:

1. As a **justification** for public policy
2. As a tool for **quantification** of policy incentives.
3. As a tool for **prioritization** of policies
4. As a **validation** mechanism before implementation

It is worth noting that eCBA serve a purpose cutting across all these specific policy goals, which is to cast light on a process that is often not fully transparent. By forcing the quantification and open disclosure of strategic and technical parameters, eCBA facilitates constructive criticism on policy and project design and can make policy making a more participatory process.

eCBA for justification

Firstly, the results of an eCBA during the project appraisal process (whether for one, or across a number of projects) provide a strong evidence base for justifying public policy intervention. Green projects or the greening of existing projects frequently generate significant social, economic and environmental benefits (positive externalities). However, conventional CBA and other conventional project appraisal tools usually do not measure these positive social returns and the private sector does not have any incentive to fund green policy interventions as long as the benefits of doing so are unclear i.e. are not monetized. Identifying these external costs and benefits provides a clear rationale for government action and strong evidence base for crafting policy interventions. These include making the case for enabling policy support (e.g. streamlined regulation, land provision), supporting incentives (e.g. taxes and subsidies) as well as the direct provision of public goods (e.g. education or vaccination).

Often, neither government nor business alone holds the means for successful investment, and so collaborative solutions such as public-private partnerships (PPP) are required. This is particularly true for green markets where the private sector is required to design a sustainable and scalable business model but government must de-risk investments and make them financially viable in the early years, in order to attract sufficient private investment.

An example of an eCBA providing justification for government intervention in the Sanitation sector in Indonesia is included in the Box overleaf.

Example 2: Costs and Benefits of Investment in Sanitation

A 2011 study funded by the World Bank quantified the costs and benefits of investment in proper sanitation with the aim of increasing the volume and efficiency of Indonesian government spending for sanitation programs in both rural and urban areas.

The study estimated the cost of poor sanitation conditions in Indonesia to be US$ 6.3 billion (IDR 56 trillion) per year; the equivalent of 2.3% of Indonesia's GDP in 2005 (the base year of assessment). This mainly consisted of health problems caused by open defecation in rural areas and in urban areas as the result of rapid urbanization and slums in Indonesia's biggest cities.

Based on key metrics including IRR, NPV, payback period, impact on health, drinking water, and sanitation, the study showed, for example, that the economic benefits of having pit latrines in rural areas exceed the costs by at least seven times. Based on this evidence, it was possible to make policy recommendations including:

1. Intensify efforts to improve access for the entire Indonesian population to improve basic sanitation population. There was enough evidence to show that establishing a viable sanitation market - where demand by all income levels meets affordable and good quality supply - is feasible.
2. Provision of advanced sanitation where the population demands it and funding is available. This requires more information on the costs and benefits of conveyance and treatment options.

The study also promoted decision making based on (wider) evidence. Decisions should take into account not only the more easily measurable economic costs and benefits but, also, other key factors including intangible impacts and socio-cultural issues that influence demand and behaviour change, availability of suppliers and private financing, and actual household willingness and ability to pay for services. In effect, this is a call for wider deployment of eCBA and MCA.

Source: The Economic Returns of Sanitation Investment in Indonesia, World Bank, 2011

eCBA for quantification

Secondly, eCBA can help the specific quantification of policy incentives to help determine what the precise level of incentives should be? By valuing non-market externalities, this means that they can be levied as per-unit financial taxes or subsidies. This can be then used as a compensation fund for losers of negative externalities as well as an incentive to drive correct behaviors.

Similarly, if there is a desired investment target for a new or existing industry, then a financial Cost Benefit Analysis can be used to decide at what level the financial incentive should be set to attract sufficient volumes of private capital.

Note these two incentives are slightly different. For example, the first says, given the adverse health impacts of sulfur dioxides and nitrous oxides from the coal combustion, that coal should be taxed at a particular level (or subsidize its substitutes) to account for this damage. The second says, given a desire for 1,000 MW of renewable capacity by some future date, a price needs to be received by investors in order attract enough capital investment.

eCBA for prioritization

Thirdly, by providing a comparable methodology across projects, technologies and sectors, eCBA can help assess and compare the 'size of the prize' of different options; i.e., the total possible

economic, social and benefits. Therefore, eCBA not only makes the case for a particular intervention, and quantifies the policy resources required, but also helps prioritize which policies should be implemented given limited fiscal and economic resources.

eCBA for validation

Fourthly, eCBA or the methodologies sitting behind eCBA can also be applied in a broader sense as a technique to validate macro-level policies. This type of eCBA often takes place in the context of a 'Regulatory Impact Assessment' – the analysis of a proposed policy package before it is implemented. As in a micro, project-level, CBA, the costs and benefits of an intervention are calculated. But, since the analysis is taking place at a much higher level, across a broad range of groups (perhaps even at national level), such analyses tend to be more financial and/or macroeconomic in nature. This is because of the availability of tools to robustly and cost-effectively measure macroeconomic impacts versus localized social and environmental issues. Often, additional tools such as macroeconomic or energy system models are used in these CBAs. An example of a macro-level CBA in Indonesia is provided in the Box below.

Some of the tools that feed into the eCBA toolkit such as non-market valuation can also be applied to policy and planning decisions at the macro level. For example, natural capital valuation for different land-use types can be used to designate spatial zones on account of their social, economic and environmental value rather than their biophysical status (however, in practice, the lack of locally-specific data with national coverage means that the valuation tools are simply layered on top of existing land-use classifications, which does not necessarily assist decision making).

Example 3: Cost Benefit Analysis of the mineral export ban

In 2012, the Indonesian Ministry of Industry did a Cost Benefit Analysis study on the mineral raw material export ban and its impacts to the industrial sectors. The study aimed to analyze the costs and benefits of the mineral exports ban and its impact on industrial sectors and the economy in general. This analysis in turn relied on supply and demand estimation for copper and nickel as well as an economic impact assessment.

The conclusion of the study is that the greatest economic benefit would be achieved under a scenario where 100% of the raw material could be processed domestically. In contrast, the greatest economic cost would occur under the scenario where producers lower their production to 26% to meet domestic demand only. In short, the raw mineral export ban law could only generate the desired monetary benefit when Indonesia's industry could absorb the raw material of these commodities.

The recommendations of the study therefore aimed to support smelting and manufacturing industry to absorb these raw materials. These recommendations included:

- Investment in domestic capacity
- Natural resource mapping
- Guarantees on the continuity of supply

5. Conclusion

Conventional economic and political models often fail to capture the full impacts of policies and investments. Cost Benefit Analysis was developed as a key tool to overcome these limitations, and remains popular with advanced economy governments and multilateral institutions for this reason.

Extended Cost Benefit Analysis (eCBA) focuses heavily on the social, economic and environmental implications of decision making, as well as proposes modification to project design in order to maximize benefits. In the policy context, it provides a justification for public policy intervention, quantifies the right level of fiscal incentives, prioritizes policy measures and helps validate policy designs before implementation.

It is likely that the application of Extended Cost Benefit Analysis would significantly enhance social, economic and environmental outcomes of policies and investments in Indonesia, thereby facilitating the shift towards a Green Growth path.

The methodological principles are well-established and the main pre-requisite for this to become a reality are:

- The establishment of a clear framework by government as to how, where and why eCBA can be applied to investments and policies. This should be supported by appropriate law enforcement and economic incentives.
- Support for the underlying Monitoring, Reporting and Verification protocols (i.e., data collection)
- Support to build human and technical capacity needed to implement eCBA

There is a 'natural home' for eCBA in Indonesia, to take place after the financial appraisal of a project and before the AMDAL. The Public-Private Partnership project appraisal process is a good model on which to more widely mainstream project-level eCBA. For maximum impact, the eCBA should be combined alongside other Green Growth tools such as Green Project Prioritization tools, Strategic Environmental Assessment and impact assessment techniques.

Appendix 1: Technical notes

Technical process for carrying out an eCBA

Below are some standard (technical) steps undertaken while performing a CBA:

(1) Set the framework and objective of a project for the analysis (needs assessment)
(2) Define the alternative to achieve the goal
(3) Formulate appropriate assumptions
(4) Identify whose costs and benefits should be recognized
(5) Categorize the costs (inputs) and benefits (outputs) of the project
(6) Monetize costs and benefits
(7) Obtain present value by discounting costs and benefits
(8) Calculate the Net Present Value (NPV)
(9) Test the sensitivity analysis
(10) Provide recommendations, if applicable

Basic methodological principles for carrying out an eCBA

Social discounting: Discounting is used to compare costs and benefits that occur in different time periods. Society generally prefers one dollar now to one dollar next year. This is partly due to intrinsic impatience in human nature and partly due to the expectation that society will be wealthier in future. It can also alternatively represent the fact that dollars invested now create new assets and income tomorrow, and therefore capital has an opportunity cost across time.

The rate at which costs and benefits are compared across time ('discounted') is called the Social Discount Rate (SDR[17]). In general, the SDR will be significantly lower than a private sector discount rate used in financial appraisal since society can afford to take a longer term view of assets, risks are spread across entire populations not just one project, and there are no taxes to consider. Since the costs and benefits of green growth interventions can stretch across decades and even centuries, discounted net benefits are often extremely sensitive to the choice of discount rate[18]. One key point to make is that long-term environmental impacts are often discounted using a lower discount rate than might be used for 20-50 year infrastructure projects; this is due to factors such as inter-generational equity, the mathematical nature of exponential discounting in the long-term, and inherent uncertainty over such a long time-frame (this captures the idea of 'irreversible impacts' as well).

Taxes and subsidies: If there are significant taxes or subsidies present, then market prices will not represent the SOC of a resource (since taxes/subsidies are simply a transfer payment to/from government). For example, in assessing an intervention that conserves gasoline, it is important to value the savings at the full cost on the international market, not the domestic retail price that also includes a government subsidy. This is because saving one unit of gasoline saves the consumer the retail price and saves Ministry of Finance the subsidy; in total these savings are equal to the international price.

Shadow wages: Labor is also a highly taxed item, and also one where market distortions such as unemployment (or in the Indonesian case, under-employment) mean that the opportunity cost is less than the market wage. If a project uses workers who would otherwise be idle, then the true economic cost of their employment is lower than their wages.

[17] Or: Social Rate of Time Preference. In the Ramsey (1928) model, SDR is defined as the sum of: the Pure Rate of Time Preference; and the Marginal Elasticity of Utility with respect to Income, multiplied by expected Income Growth.

[18] For a full discussion on the importance of the social discount rate, see Stern (2006) The Economics of Climate Change

Trade-related taxes and import costs are covered under "tradable goods" below.

Externalities: Where the social cost of the extraction or consumption of a resource differs from the private cost (or equivalently, the benefits), there is said to be an "externality". Again the market price, determined solely by private costs and benefits, will not reflect the true SOC of the resource or activity. The presence of externalities is a major feature of the Indonesian Economy, with natural capital extraction generally considered unsustainable, and without sufficient regard for the knock-on loss of flow-benefits for other communities. Externalities could include the under valuation of the many non-market provisioning and regulatory services attributable to land and marine ecosystems, or the health externalities associated with localized air pollution.

Market power: Similarly, if a market is distorted due to oligopolistic or monopolistic market structures, then the market prices will fail to reflect the true opportunity cost of a resource. This is because market dominance allows the raising of product sales prices above their economic cost of production (or vice versa on the demand-side).

Tradable goods and Exchange Rates: Tradable goods should be valued as if there are no impediments to trade (i.e., no quantitative restrictions, no import/export tariffs or subsidies). For exported products, the use of free-on-board (f.o.b.) prices will generally exclude tariffs and subsidies. For non-traded goods, the appropriate price is the long-run marginal cost of production.

Costs relating to finance: The payment of interest and repayment of principal is often a key part of a financial appraisal. This is excluded from eCBA since the project is being assessed on its social costs and benefits, and its impact on resource use. Debt service represents a transfer from payer to payee, and does not affect use of resources or output. Also, the eCBA discounting process takes account of the opportunity cost of the project's capital and operational expenditure incurred (so to count financial costs would be double-counting). The same argument applies to interest capitalized during construction.

For a full set of guidelines for carrying out an eCBA including sector guidance and technical notes the reader is referred to the following publicly available publications:

- The World Bank "Handbook on Economic Analysis of Investment Operations"
- The European Investment Bank "The Economic Appraisal of Investment Projects"
- United Kingdom HM Treasury "The Green Book: Appraisal and Evaluation in Central Government"