Accounting for Environmental Sustainability in MCC Cost-Benefit Analysis

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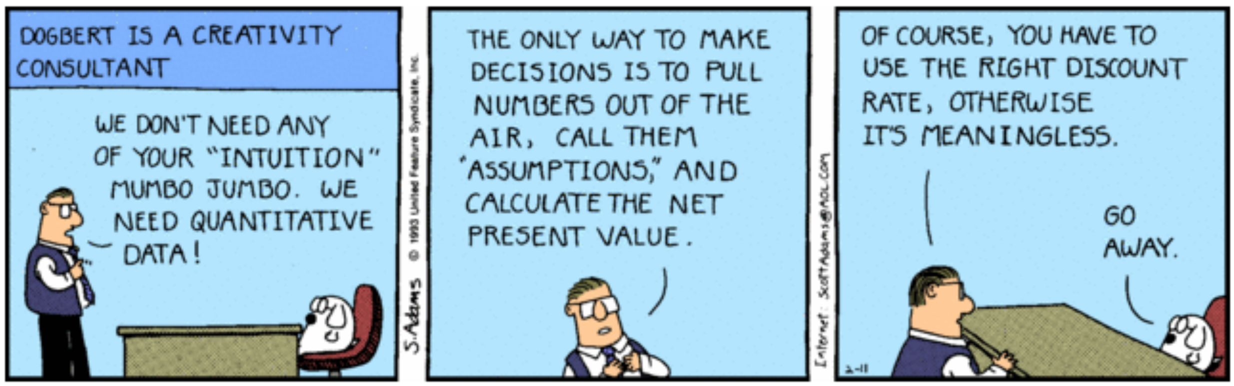

Background

This note raises questions for the MCC Economic Advisory Council (EAC) with the objective of strengthening MCC analysis of *natural capital* as a driver of sustainable growth and poverty reduction.[1] An ever-growing body of research illuminates the many ways that economic performance depends on environmental conditions (IPBES, 2019), including climate (Carleton and Hsiang, 2016). While MCC has incorporated environment- and natural resource-related costs and benefits in selected economic analyses,[2] such consideration is not yet routine and remains hampered in practice by challenges commonly associated with cost-benefit analysis (CBA) in contexts were environmental benefits, harms, or dependencies may play a significant role.

The challenges of bringing environmental factors into CBA are both conceptual and practical, and how they are handled can have direct bearing on project selection. Conceptually, many of the accounting aspects of CBA have strong implications for how environmental impacts manifest, with potential biases that may or may not be desirable (elaborated below). MCC's practice is to use a discount rate that is generally accepted as high (10%), and relatively short default time horizon (20 years, though extendable

[1] Natural Capital is the environmental stock or resources of a country (or Earth) that provides flows of goods or services that benefit people. Examples of natural capital and the services they provide include: Vegetated lands providing water purification and flow regulation, arable soils providing input to agricultural production, forests providing temperature regulation and pollinator habitat to enhance agricultural production, mangroves and reefs providing coastal storm protection, vegetation providing carbon dioxide sequestration and (in turn) climate regulation benefits, and natural lands providing recreation opportunities. Natural capital also includes non-renewable resources such as fossil fuels and minerals that serve as inputs to production of other goods. See related definitions and history at https://seea.un.org/content/frequently-asked-questions

[2] This includes some projects focused on natural capital, such as the Indonesia "Green Prosperity" project (https://www.mcc.gov/resources/story/section-ind-star-report-green-pros-project).

with adequate rationale). While not out of line with historical practice of aid organizations that utilize CBA,[3] these choices introduce a methodological bias that emphasizes near-term benefits, including the potential to favor extractive approaches (leading to resource depletion) over those that achieve long-term sustainable resource use. High discount rates also create challenges for solutions that rely on enhancing renewable natural capital (e.g., wetlands for water purification, or mangroves for coastal defense) that may yield multiple and significant benefits but take longer than engineered solutions to achieve them. Historical practice at MCC has also generally assumed that negative environmental externalities are adequately mitigated via project design and environmental safeguards, with the financial costs of such mitigation being the primary route for environmental impact to make its way into the CBA.

On the practical front, environmental outcomes are often associated with more significantly uncertain processes, either because such processes are difficult to observe even with directed effort (e.g. groundwater stocks and recharge dynamics in an understudied aquifer system), or because they are associated with the future of fundamentally complex systems.[4] The changing global climate is an example (by no means rare) where evolution of the system can be extremely difficult to predict, as can the marginal impact of policy decisions within the system. In the practical multi-stakeholder decision contexts that MCC operates within, such uncertainty can often be characterized as "deep" -- a situation wherein probabilities are poorly characterized and even appropriate system descriptions may not be agreed upon.[5] Even when all relevant analysts and stakeholders are able to work within a shared modeling and probabilistic framework, potentially varying risk tolerances must be negotiated – for example, what risk of falling below a threshold ERR is acceptable? Should it depend on characteristics of the spread and potential worst cases, or is a mean and variance estimate adequate?

Towards CBA accounting for environmental sustainability in an uncertain world

As the impacts of global climate change intensify and research continues to illuminate strong yet situationally uncertain nature-economy interactions,[6] evaluation of MCC programs will increasingly be

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[3] Most other multi-lateral development banks have used 10-12% (as reviewed in ADB (2013, p. 67)), and USAID utilized 12% as the reference rate for projects evaluated under its Feed the Future initiative.

[4] Additionally, the science and data collection procedures for systems of environmental accounts are nascent, compared to traditional national income accounting which has been relatively standardized since shortly after World War II. See the UN System of Environmental Economic Accounting (https://seea.un.org/) and the World Bank-led WAVES partnership (https://www.wavespartnership.org/) for examples.

[5] Lempert *et al* (2003) provide a more formal definition, that deep uncertainty exists when "analysts do not know or the parties to a decision cannot agree upon (1) the appropriate conceptual models that describe the relationships among the key driving forces that will shape the long-term future, (2) the probability distributions used to represent uncertainty about key variables and parameters in the mathematical representations of these conceptual models, and/or (3) how to value the desirability of alternative outcomes." Economists may also recognize this as a more general form of "Knightian uncertainty" from Knight's (1921) distinction between quantifiable (probabilistic) "risk" versus "uncertainty" which he defined as the lack of quantifiable knowledge about a system or parameter of interest.

[6] Here we use the term "interaction" to signal that the relationships and associated uncertainties manifest are bidirectional and multi-scale: Projects have environmental impacts (e.g., emissions of health-damaging pollutants from a power project, or improving habitat as part of a natural resources management project), projects are directly impacted by environmental factors (e.g., climate-exacerbated natural hazards), and both directions of impact may operate at local, regional, and global scales.

challenged by the need to consider natural capital stocks and environmental benefit streams within its CBA. This raises the risk that without adapting MCC's approach, its CBA practice may show increasing bias in favor of project designs that raise incomes in the near term but ultimately undermine growth potential by depleting natural capital stocks in ways that are not appropriately taken into account. This leads to two related but distinct high-level questions that would benefit from EAC consideration:

- What set of CBA practices (e.g. discounting, time horizons) will be best placed to allow MCC to appropriately consider long-term sustainability interests while preserving its emphasis on nearer-term growth and poverty reduction?
- How should MCC consider uncertainties (both well-characterized and deep) in its formal investment criteria, especially as relates to the ERR hurdle rate?

Both of these questions are of course broad, and answering them requires visiting a suite of sub-issues and making a host of practical choices. As examples, CBA practices relating to environmental sustainability raise questions about the appropriate discount rate (or more broadly, whether to use alternative discounting approaches, such as declining or dual discount rates), time horizons, how externalities should be valued (including distinctions between willingness to pay for improvements versus willingness to accept environmental damages), and determination of whose costs and benefits have standing – including the use or damage of global public goods like climate. The challenges of decision making under uncertainty are associated with a similarly extensive list of issues, such as processes for characterizing and propagating input probability distributions, assessment of external validity of empirical studies, construction of scenarios, reaching group decisions on risk tolerance and assessing the value of hedging and risk mitigating design changes.

Importantly, in both domains, it will be necessary to consider relationships between academic findings and concerns facing the development practitioner community,[7] as well as MCC's position within the development community. The first relationship involves considerations of how well findings from academia translate amid potentially contested project decision making processes. The latter involves recognizing MCC's unique focus on reducing poverty through economic growth (which has historically influenced decisions about what benefits count) using pure bilateral grant funding (which could, for example, have implications for which of several theoretical justifications for discounting hold the most relevance). Discussion of these issues is therefore intended to frame a longer-term working agenda that will methodically build towards answering those questions through a combination of EAC guidance and other initiatives spearheaded within MCC. For this meeting, we have selected two specific issues to bring forward.

Questions for the EAC

MCC's engagement in Tunisia provides an entry point to consider some of the more specific issues indicated above, within the broader agenda of environmental sustainability and uncertainty. As part of compact development, MCC is co-designing a project with the Government of Tunisia aimed at

[7] For example, while academic debate continues over the precise rate and form for discounting in the context of long-term environmental sustainability issues, that debate appears to occur among options that involve far more patient discounting (e.g. Goulder and Williams, 2012; Arrow et al 2014) than is currently practiced in the development community.

addressing worsening water scarcity in interior regions through investment in water saving irrigation technologies, in parallel with improved registries and information systems designed to support water management. The viability of many household livelihoods there is precarious as water tables continue to fall. Data challenges and uncertainty surrounding future climate change are daunting, and the politics around water are particularly complex and sensitive (much as they are in California!). While the government has recently passed a law intended to achieve groundwater sustainability and the project itself is intended to support sustainable management, the benefits of such an approach have proven difficult to incorporate and evaluate using MCC's default practices. In particular, the 10 percent discount rate requires the value of water to rise exponentially, and conflicting models of climate-affected irrigation demand and recharge dynamics have created wide ranges of uncertainty around economically viable aquifer lifetimes, which are not associated with agreed upon probabilities.

This situation, described more completely in the Annex, motivated the following two questions:

- Should MCC explore adjustments to its CBA accounting practices to better allow (and require) investments and policies that achieve sustainability to stand on an economic justification, or is it likely to more effectively address natural capital sustainability concerns via alternative criteria outside the CBA? In the case of Tunisia, the latter approach could involve accepting the government policy on sustainable groundwater as a "given" constraint and conditioning economic analysis on that requirement. The former approach would involve exploring adjustments to some aspects of the CBA outlined in the introductory section (e.g., discounting approach). Importantly, any such adjustments would need to be systematic – either applied across the board to MCC projects, or with clear criteria for when adjustments would be made.[8]

- Given the presence of a hard hurdle rate and the current practice of summarizing our economic rates of return with one number, how should MCC evaluate and present CBA results that depend on poorly characterized uncertainty – i.e., those with multiple competing estimates and where parties may not agree on a probabilistic treatment? Should effort be made to explain and formulate this digestibly to MCC management and other decision makers?

[8] While dual discounting for consumption of produced goods versus depletion of natural assets has some theoretical support (Almaraz and Martínez-Paz 2011), the dividing lines may be highly contentious.

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Annex: Environmental accounting challenges in the Tunisia Compact

Background

MCC is working with Tunisia to address deep concerns over water scarcity, particularly in the country's interior where one-third of the population lives and where the Jasmine Revolution started in 2010. Groundwater in central and southern Tunisia is almost uniformly over-abstracted and as much as 50% of water use is illicit and uncontrolled. Access to water has been a lingering touchpoint of social protest. Unequal ability to access resources creates social tension and hinders investment in both small and large farms. Managing water abstraction and allocation requires reliable data, trust and social cohesion among stakeholders, not to mention financing, flexible responses, and ability to monitor and evaluate the system.

The principal root causes include actual water scarcity issues that constrain economic growth, uncontrolled exploitation of the resources due to its common pool characteristics, and social tensions resulting from inequitable access. The potential project will have three components: a Policy and Institutional Reform Activity to improve groundwater management in the context of decentralization with special focus on pricing and illicit use; Rehabilitation of Public Irrigated Perimeters to reduce water losses and support otherwise high performing water user associations; Support to Cooperatives to help farmers, but especially small holders, with the adoption of new technologies and approaches to increase post-harvest revenues. The potential project's success will be measured by functioning local and regional water management bodies, reformed consistent with Tunisia's decentralization and water codes; improved irrigation efficiency in approximately 45 perimeters across four governorates; and cooperatives supporting increased private sector investment in on-farm equipment and extension services and reducing informality and social exclusion.

Problem Description

For the purpose of the cost-benefit analysis (CBA), characterizing the long-term benefits associated with achieving sustainable water management in this context has presented two challenges, both representative of the broader issues in representing environmental and sustainability considerations within a traditional CBA framework:

Justifying long-term sustainability with exponential discounting

The use of an exponential[9] and relatively high discount rate makes it difficult for a project-level economic analysis to demonstrate net societal benefits from conserving a resource. At the 10% discounting implied by MCC's hurdle rate, a benefit accruing in 30 years is only six percent of the same benefit accruing today, which biases heavily towards exploitation unless there is reason to believe that the marginal value of the resource will increase at a rate higher than the discount rate. As such, the

[9] Exponential discounting implies constant year-to-year intertemporal trade-offs, with the present value of a real-valued benefit *V* in a given year *t* taking the form $V/(1+\delta)^t$ (where δ is the discount rate). That is, it assumes that the requirements to be compensated for foregoing consumption from now until one year from now is the same relative amount as postponing consumption from, for example, year 40 to year 41.

Tunisia team has had difficulty identifying and justifying a plausible economic narrative that assigns a sufficiently high value to water consumption decades in the future such that foregoing its use in the near term (i.e., leaving water in the ground to alleviate shortages in the distant future) has a sufficiently higher value than farmers' current willingness to pay. While in principle it may indeed be the reality that it is not "worth it" to Tunisian society to conserve the resource, there is also significant risk that artificially constrained economic analysis could jeopardize the long-run livelihoods based on accounting procedures that do not accurately reflect social goals, or more technically, willingness to trade-off benefits over time.

Some options to address this could include alternate (lower) discount rates or alternate approaches, with the latter including declining discount rates, or dual discount rates that distinguish consumer goods from environmental goods. An alternate approach would be to accept the groundwater sustainability goal as a given and examine the value of different policy and irrigation infrastructure investments conditional on this constraint. This would be an example of using alternate means outside the CBA to allow or enforce a conception of sustainability. Another would be to consider end-of-life costs associated with the transition away from agricultural production if water does run out, essentially moving away from the partial equilibrium defaults that are typically associated with CBA.

Deep uncertainty in underlying condition and trajectory of the system

The useful life and magnitude of potential benefit streams associated with potential MCC programs are subject to significant and poorly characterized uncertainty stemming from multiple sources, including climate-determined recharge rates (which affect the sustainable yield). If current trends continue, some aquifers are likely to last many decades, but for others, declining water tables and increasing abstraction costs may cause irrigation to be economically unviable within as little as five to ten years. Even for a single aquifer there are multiple conflicting environmental modelling scenarios that can give dramatically different timelines, which directly affect both the with-project and without-project benefit streams entering the CBA. With such disagreement across models, MCC could assign probability weights to each scenario (with a default assumption of an equal likelihood), but there is not currently agreement or a strong evidentiary basis for what those probabilities should be. Alternatively, MCC could embrace deliberation about the ranges and plausibility of different goals, and how project design may differ, with an eye towards participatory decision making under deep uncertainty approaches (Marchau *et al* 2019). This may have benefits for decision-maker engagement and project risk mitigation, but ultimately the decision about investment-worthiness must be reached and removing the bulwark provided by a crisp hurdle rate may allow investments that are not cost-effective to make it through a more politically contested selection process.

Given this uncertainty, together with the accounting challenges, the team has had difficulty appropriately measuring the project impact in economic terms, raising the questions that were outlined in the main body of this memo. It therefore welcomes guidance on how these issues can be tackled in general, or for the specific case of Tunisia.