Integrating non-fiscal impacts into cost-benefit analyses of extractive industry projects

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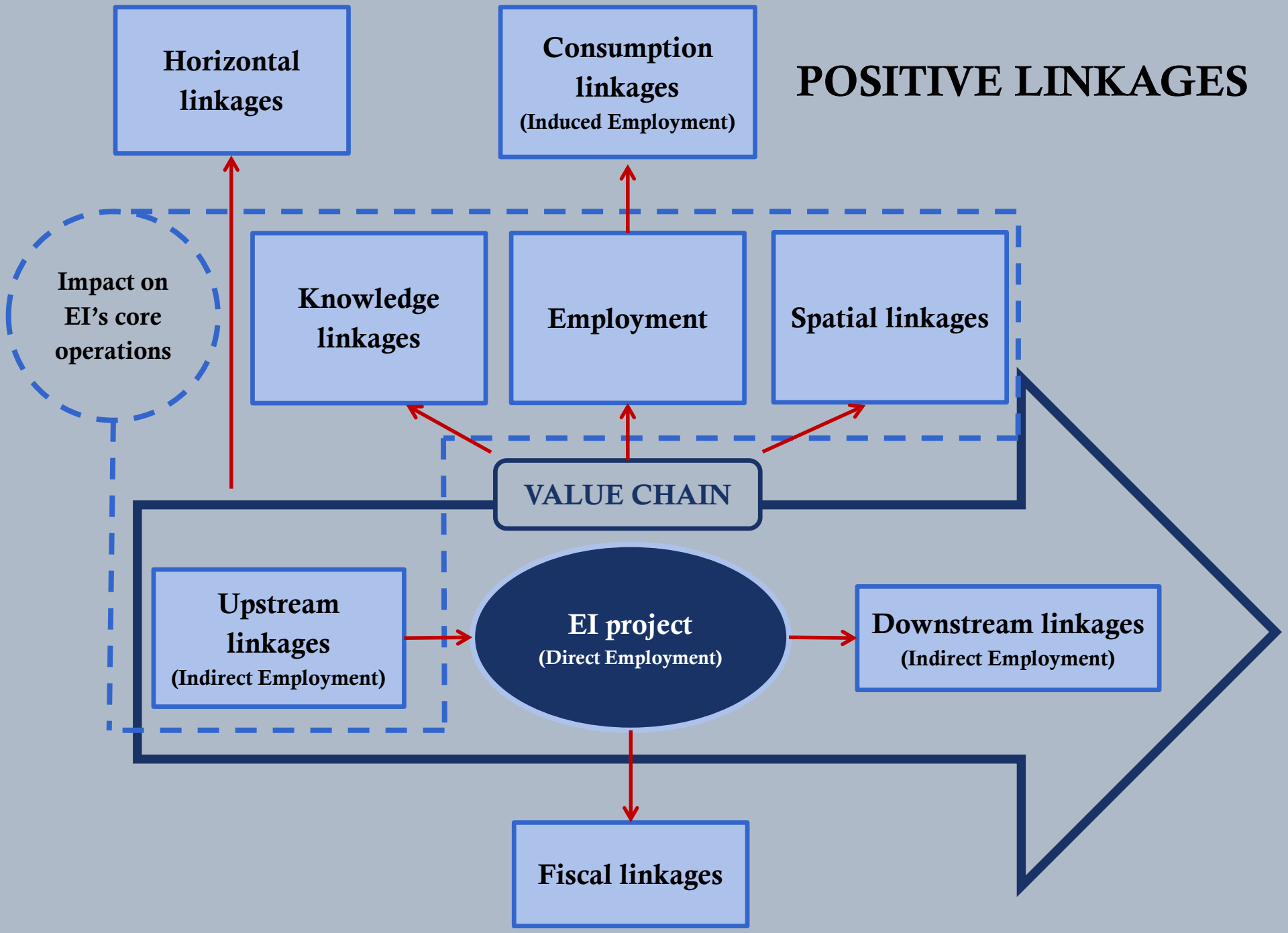
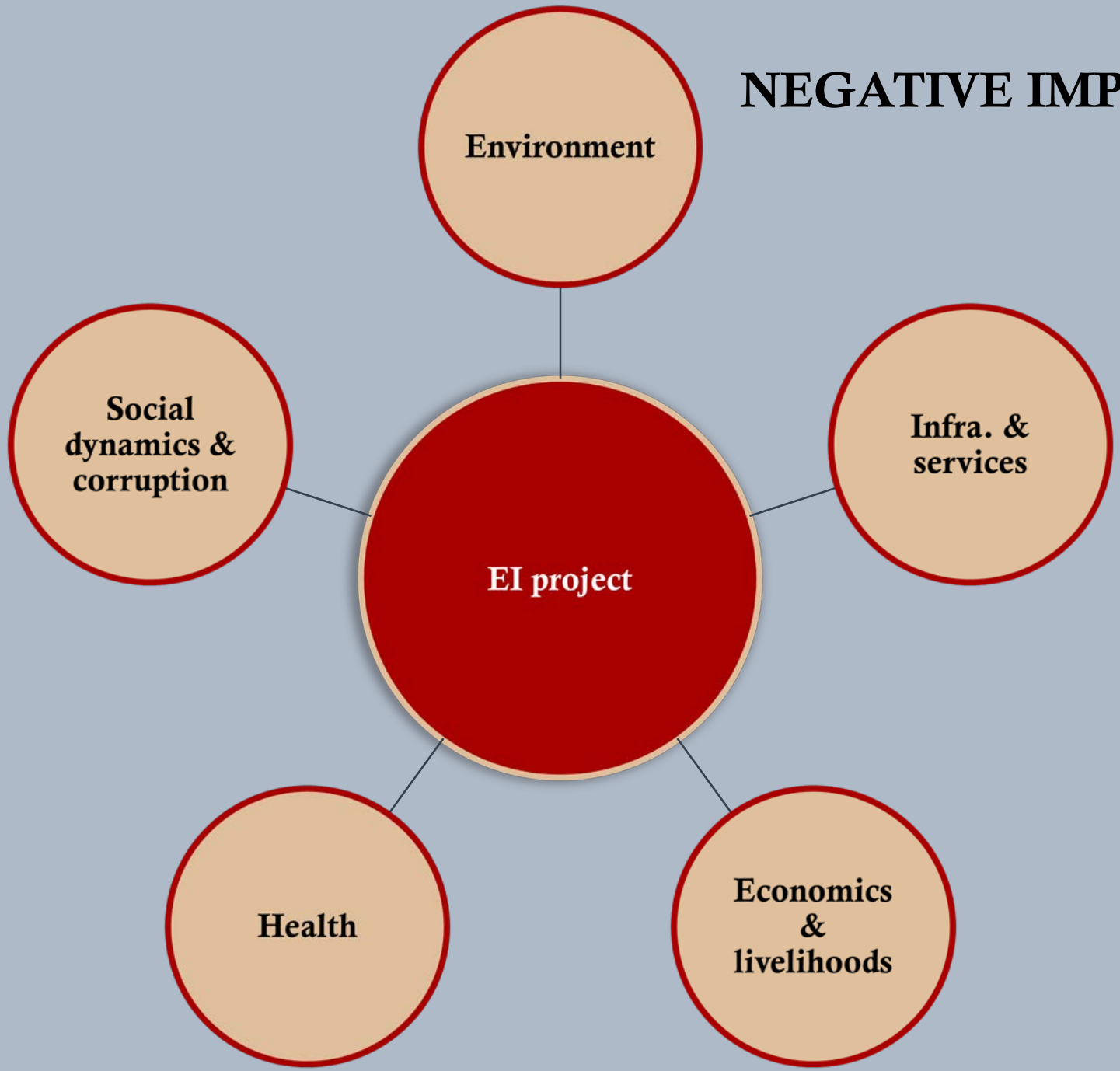
Columbia Center
on Sustainable Investment

A JOINT CENTER OF COLUMBIA LAW SCHOOL
AND THE EARTH INSTITUTE, COLUMBIA UNIVERSITY

POSITIVE LINKAGES



NEGATIVE IMPACTS



Can we integrate it all aspect in 1 holistic cost benefit analysis (aka: model) of the project:

- To have a more informed view to support the decision to extract
- To ensure that all relevant ministries and agencies participate in the evaluation of this decision
- To ensure the non fiscal benefits are worth the tax incentives that are often negotiated in exchange of these

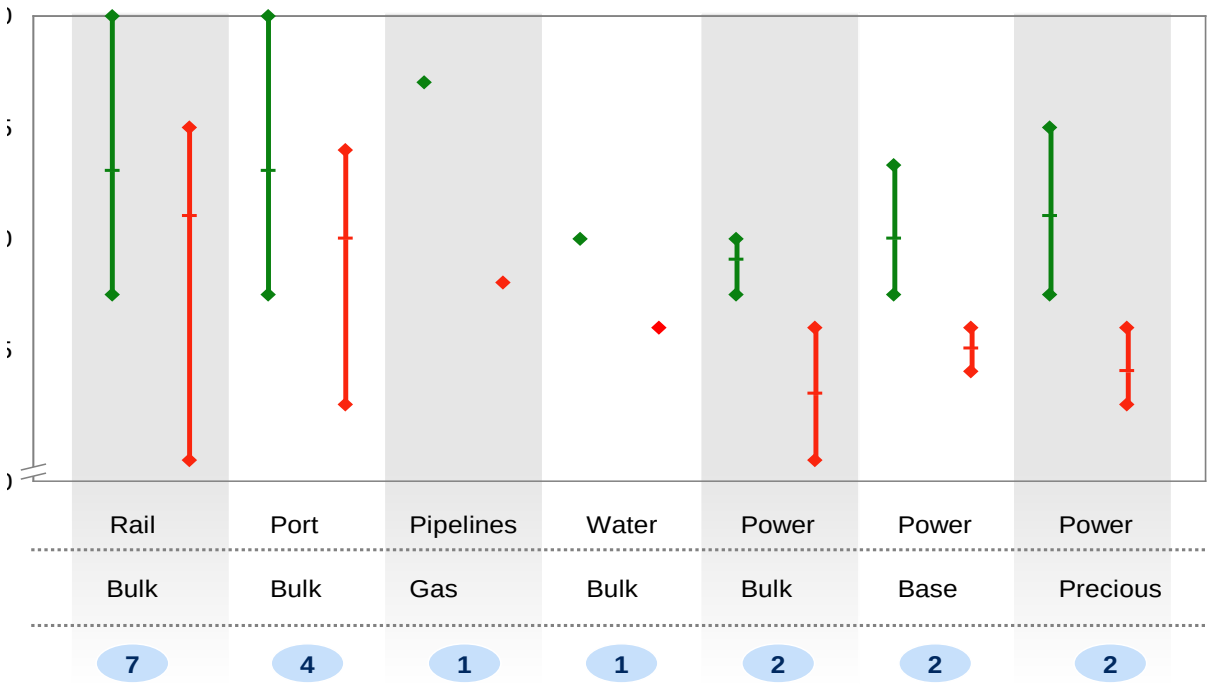
As other groups, CCSI only understands some discrete pieces of the puzzle..

Infrastructure: Can we associate a net benefit cost to shared- use?

While sharing is generally beneficial, the associated costs vary substantially between projects

Costs/benefits of a range of shared infrastructure projects

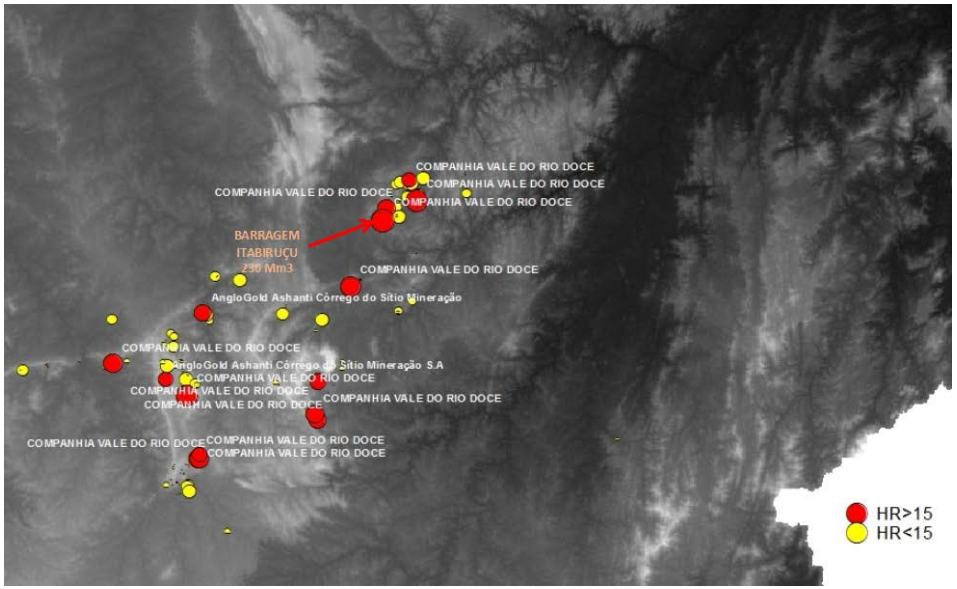
1= low, 2= medium, 3= high



SOURCE: Vale Columbia Center; McKinsey Global Institute analysis

CCSI will soon start a pilot case in Brazil

Environment: Can we integrate provision for risks and adequate mitigation costs in the equation?



Source: Columbia Water Center, CCSI, 2017

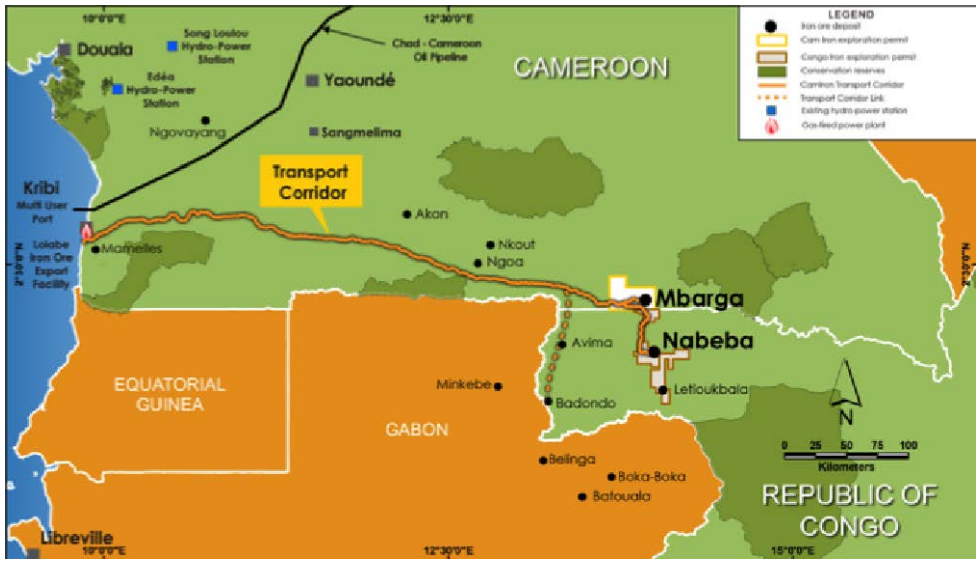
Around 300 tailing dam failures have been reported between 1915-2016 but many go unreported

Overtopping (eg: flooding) is failure mechanism in 30-40% of cases – Monitoring is costly

- Often tailing failure risk is 1 single risk scenario (looking at the most probable mode of failure based on physical process and original design) + rarely considering cost of failure.
- Whereas what we need is considering:
  - all possible scenarios of mode of failure,
  - their probabilities,
  - the size of impact on communities
  - corresponding costs (penalty, reparation, compensation, closure….)
- Avoid disregarding situations when probability could be low but impact and costs huge
- Would justify cost of proper oversight
- Can be a no-go!

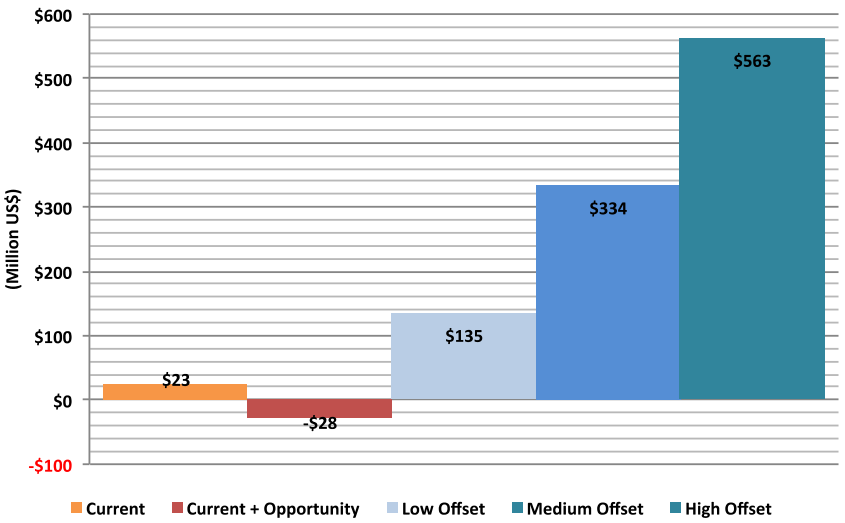
Climate: Integrating carbon pricing is easy but what about actual reduction on Co2

CamIron Project



- 1,740 sqkm concession
- 580km railway line & port
- 35mtpa of iron ore
- 18 million tons of CO2 over project life

Carbon offset of CamIron CO2 footprint



- Proposal to protect Forest Management Unit 10034 - 164,000 ha of intact forest from logging by leasing area for $6/Ha per year
- If the concession remains unlogged, only offset 25% of CO2 + compensation payment doesn't cover opportunity cost
- If carbon is fully offset and credit paid to the government, impact is marginal on IRR.

Economic benefits of a Benefit Sharing Agreement

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Can we model the benefits in a BSA as compared to non BSA?

- **Idea**: Like in MDAs, the benefits in BSAs can be modeled, and should be modeled, to guide negotiations.

$$TOTAL_B = \sum_{t=0}^{T} \frac{B_t}{(1+d)^t}$$

- **Challenges**: non-fiscal benefits must be converted into dollars so that trade-offs can be understood. An appropriate counterfactual (business as usual) must be identified.

$$E[Benefits, w/BSA] - E[Benefits, BAU]$$

- **Approach**: Model project, choose major quantifiable benefit streams (cash, jobs, contracts), estimate economic impact from each for each year of the project, and discount future benefits at a social discount rate.

Economic value of job creation and contracting opportunities above BAU

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- **Expected benefit from jobs** = the mine output *

job intensity of the mining project * the additional share of jobs going to the community (as compared to BAU) * times the wage premium.

- **Expected benefit to the community from contracts** = mine expense * by the contracting (procurement) share of expense* the share of contract value that is economic value added (profit+ wages) * times the share of local participation in the companies getting the contracts – opportunity cost of contacting outside of the project.

Ahafo gold, Ghana

- **Employment targets**: 35% to local community members, rising to 50%
  - BAU: 25%, GDP per capita opportunity cost
- **Royalty and profit sharing**: $1/oz gold + 1% net profits to development fund

Mary River iron ore, Canada

- **Employment targets**: 25% to Inuit
  - BAU: 8.3%, median income opportunity cost
- **Preferential contracting:** to Inuit-owned firms
  - BAU: limited contracting, some opportunity cost
- **Payments and royalty**: Various fixed payments, land rental, fund contributions + 1.19% net revenue to QIA

Automation: Impact of 4th industrial revolution on mining: is that only negative?

	Direct Impact	Direct + Indirect	Direct, Indirect + Induced	Total impact as % of total multiplier effects of mine	Total impact as % of national GDP
High-Income OECD Country Scenarios					
30%	55,931,204	75,507,125	92,006,831	8.5%	<0.01%
50%	92,736,431	125,194,182	152,551,429	14.0%	<0.01%
70%	129,541,658	174,881,238	213,096,028	19.6%	>0.01%
Low Middle-Income Country Scenarios					
30%	39,843,100	103,592,059	124,310,471	6.2%	<2%
50%	65,474,572	170,233,887	204,280,664	10.2%	<3%
70%	91,106,044	236,875,715	284,250,858	14.1%	<4%

Note: Multipliers used are from the national accounts of the respective host countries.

IISD, CCSI, EWB, 2016

What if we measure the positive impacts on : workers' health, reduction on community-company conflicts through better communications and monitoring, better environmental monitoring (satellite imagery)?

IISD, CCSI, EWB, 2019: Bringing the qualitative answers but quantitatively would adjust expectations regarding impact of tech progress.

Models are out there to integrate it all but is that what we need in policy making?

- "Mining will create thousands of jobs!"
- How to monitor claims made by the sector on employment creation and multiplier effect?
- Created a simple handbook on how to assess employment multipliers using OECD's Input / Output model
  - Good but rigid – eg: assumes that an industrial structure remains unchanged by an economic event
- Then realizing that there are more flexible and sophisticated techniques such as the computable general equilibrium (CGE) model but it necessitates a lot of high quality data at all levels of the economy in addition to software equipment

http://ccsi.columbia.edu/work/projects/handbook-on-measuring-employment-from-extractive-industry-investments/

What tech can realistically be adopted for quantification-based policy making?