



Pacific
Community
Communauté
du Pacifique

Cost Benefit Analysis for Deep Sea Minerals Mining in the Pacific

Jeffrey Wakefield ^a, Kelley Meyers ^a, Akuila Tawake ^b

^a Cardno, 121 Continental Drive, Suite 308, Newark, DE 19713, USA

^b Geoscience Division, Pacific Community (SPC), Suva, Fiji

Presentation Outline

- CBA Process Used
- Objectives of the CBA
- CBA Methodology
- Analyses of DSM Mining
- PNG Cost-Benefits Comparison
- Cook Islands Cost-Benefits Comparison
- RMI Cost-Benefits Comparison
- Summary of Total Net Benefit

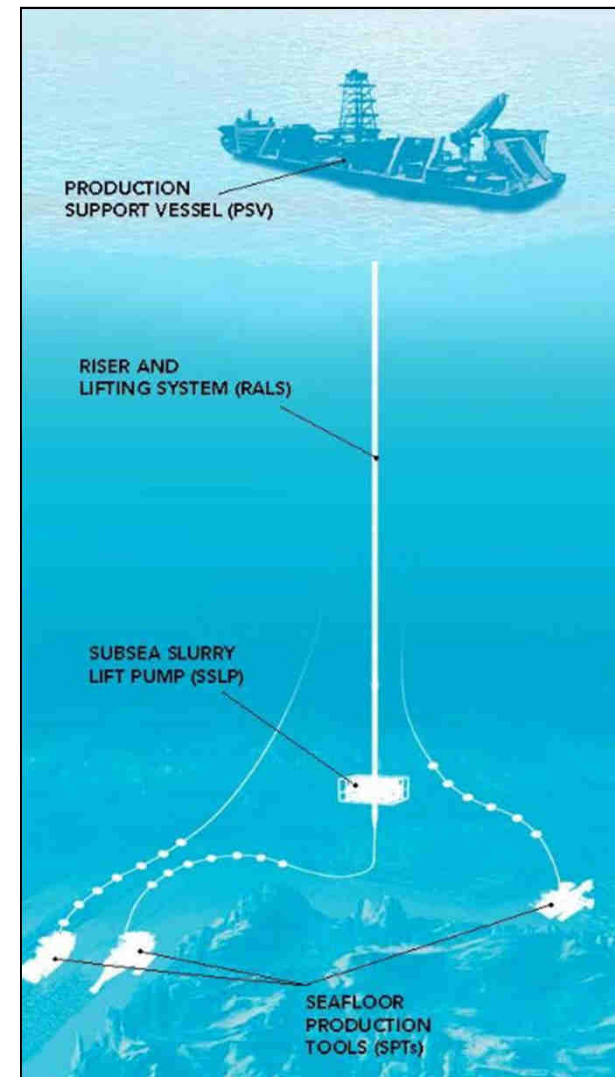
CBA Process

- **Feb 2015:** After the tender evaluation process contract was awarded to Cardno;
- **Mar-Apr 2015:** data and information gathering, country visits, stakeholder consultations;
- **Apr-Jul 2015:** data analysis, report writing, draft report delivered and reviewed;
- **Aug-Oct 2015:** Report revised and final report submitted to SPC;
- **Nov 2015-Jan 2016:** Vetting and review by SPC Publication;
- **Feb 2016:** Final report released to PICs and other stakeholders.



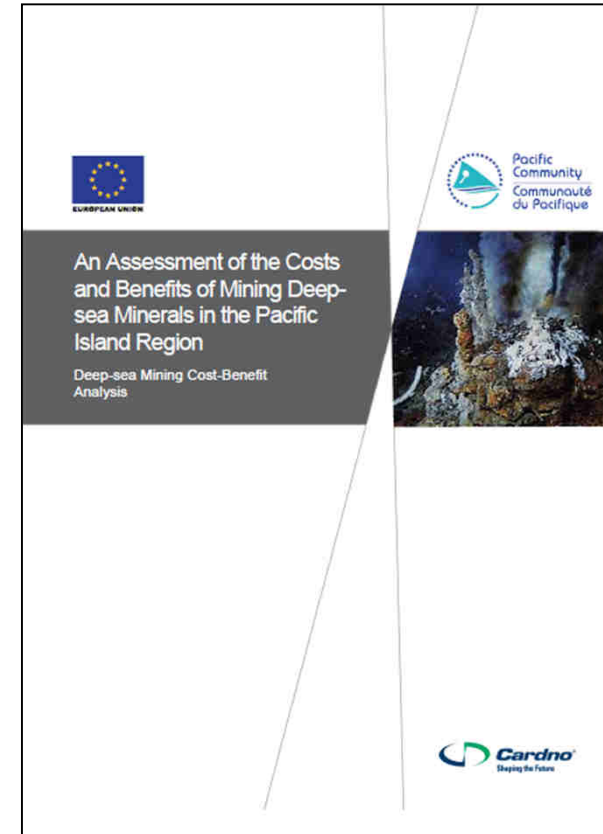
Objectives of the CBA

- To conduct a preliminary economic (cost-benefit) analysis of DSM mining based on a realistic yet hypothetical mining scenario developed for each of the three countries (PNG, CI, and RMI).
- For each country, the CBA focuses on the operation of a single mining site.
- Results of the CBA provide decision makers with a better understanding of the costs and benefits likely to be associated with DSM mining.
- CBA report provides lessons learned for government consideration at broader regional and international levels.



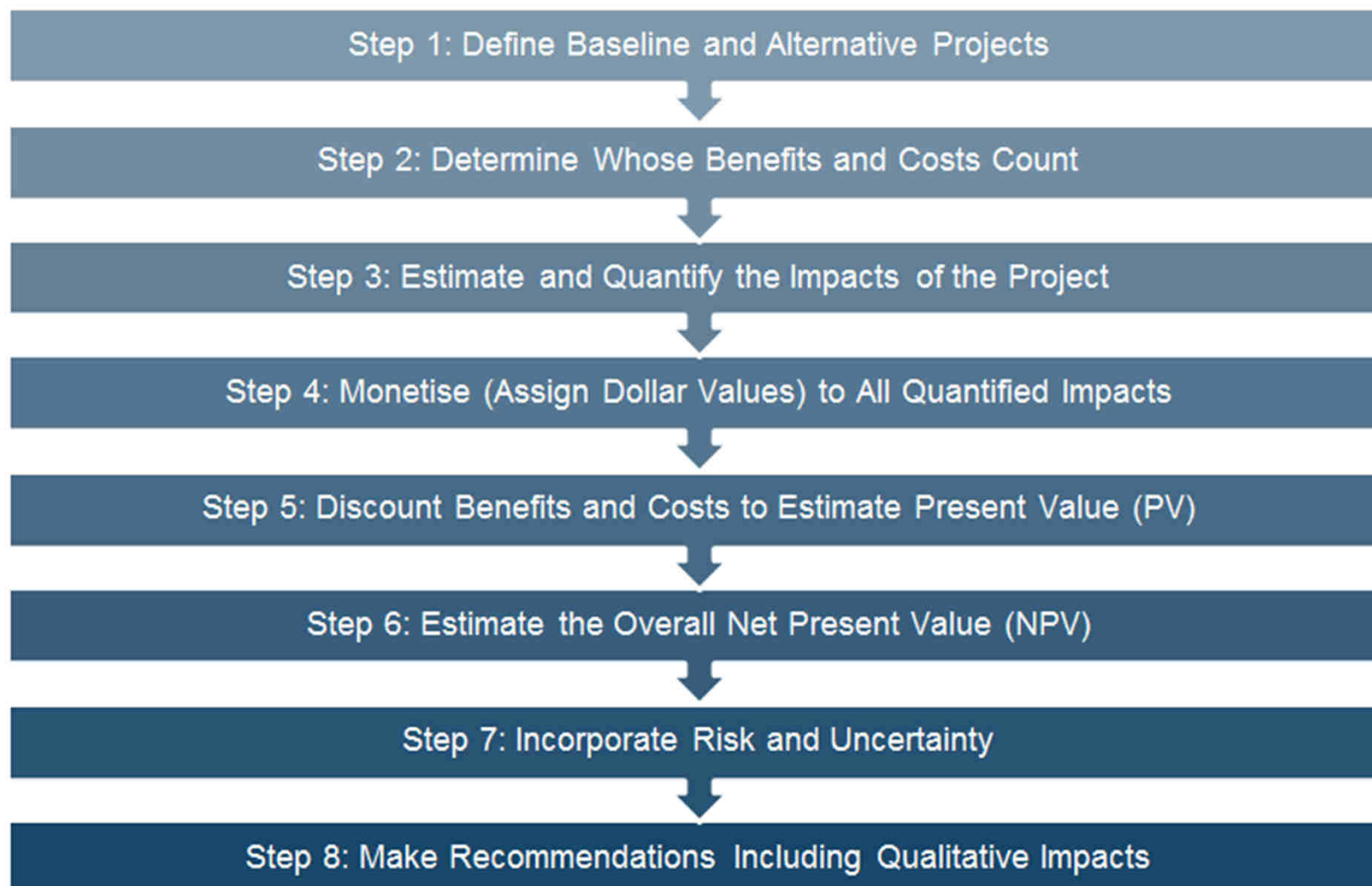
CBA Methodology

- Analysis built upon a combination of (i) secondary data, (ii) primary research including conversations with stakeholders in each of the case study countries and consultations with SPC staff, and (iii) economic relationships embedded in IMPLAN.
- Secondary data derived from articles in journals, technical reports, proceedings and presentations from conferences, government reports and statistics obtained through stakeholder contacts.
- IMPLAN is used to quantify the effects of DSM mining to local communities and to each country by estimating employment effects, and value added (total labour and other income) supported by expenditures associated with mining operations.

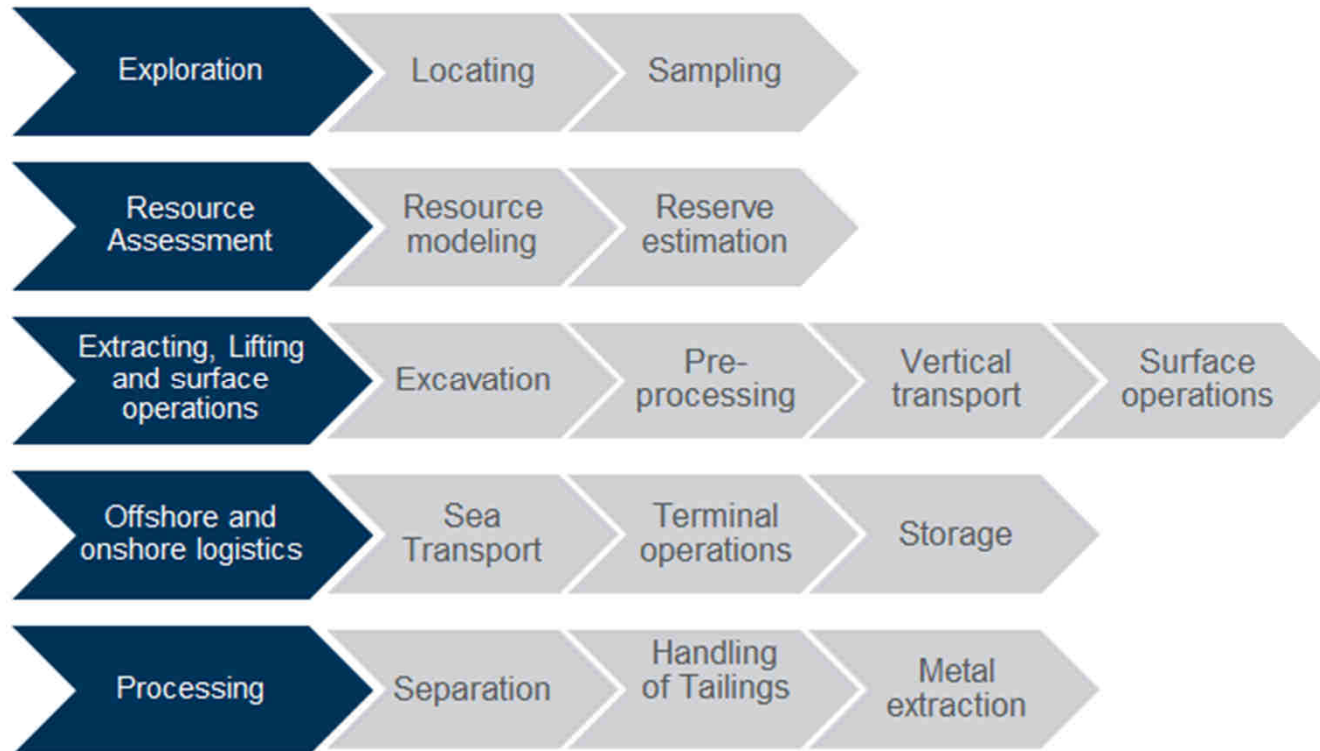


IMPLAN is a well-recognised economic input-output (I-O) modelling software package used to conduct the regional economic impact analyses.

Steps in Conducting a CBA



Typical DSM Mining Value Chain

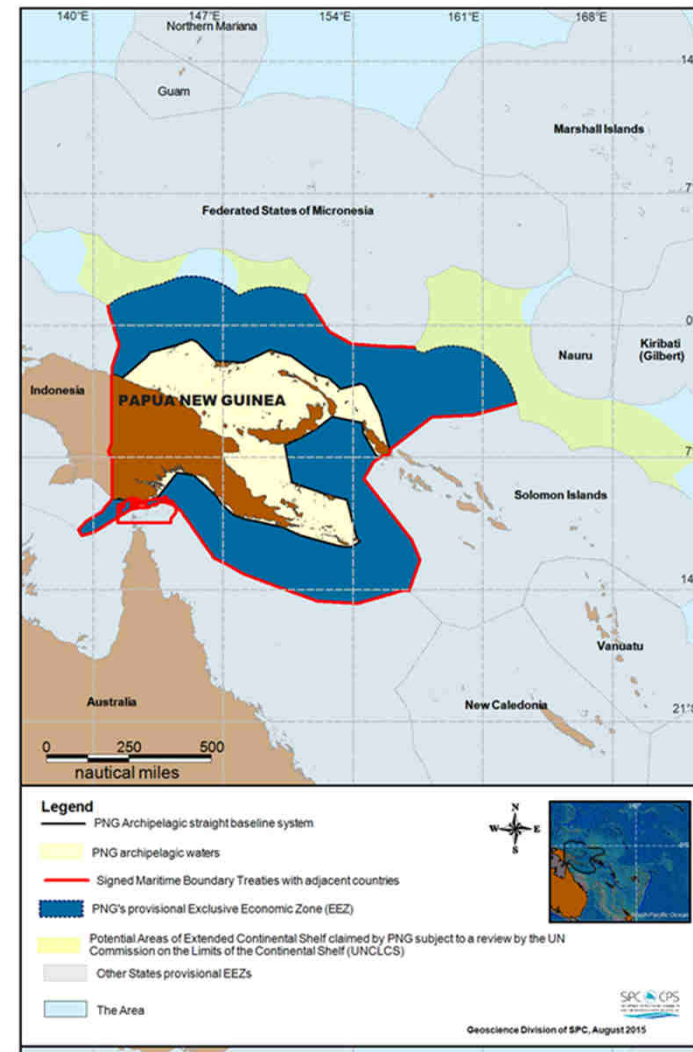


- The report quantifies and monetises as many of the potential social costs of DSM mining as possible.
- External environmental costs of DSM mining activity that result in a reduction in the quantity or quality of ecosystem services provided by the environment to the country's citizens.

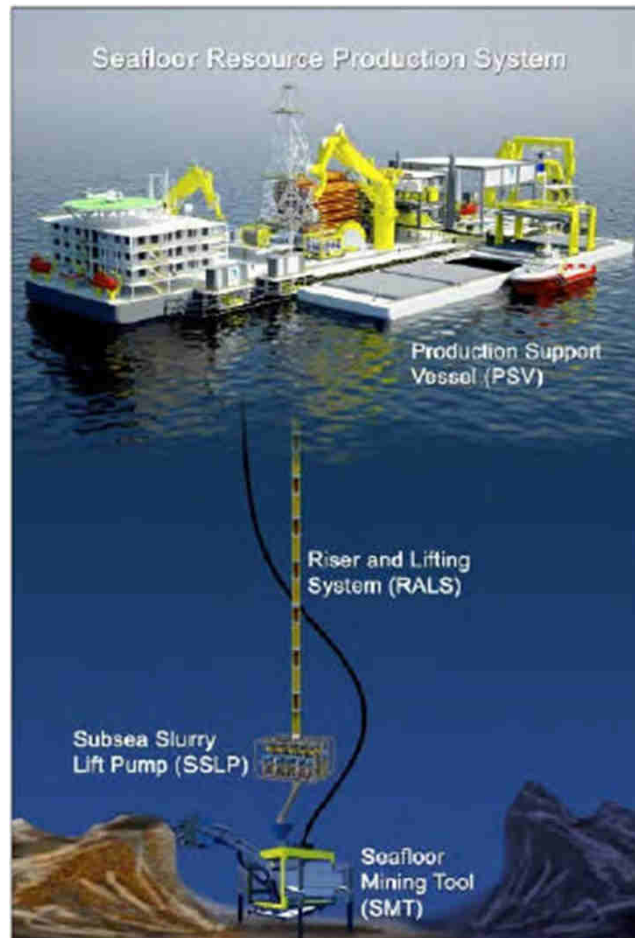
Analyses of DSM Mining in PNG, Cook Islands and RMI

The CBA considers the following:

- DSM resources – SMS, MN, CRC;
- Current status of DSM policy and legislation;
- Description of Baseline Scenario – state of the country in the absence of DSM mining;
- Each country's mining scenario - size, duration, location of mining operation, total estimated resource, and metal content;
- Cost Methodology – DSM mining operation in each country;
- Benefits Methodology – Revenue received by government;
- Cost-Benefit Comparison.



PNG Cost-Benefit Comparison



Net Social Benefit (NSB) = PV of BENEFITS (government *revenue*) – PV of COSTS (private government *costs* + external *costs*)

- Expected NSB in PNG Mining Scenario (in millions USD)

Category	Present Value
Government revenue	83.3
Unplanned spills and grounding	-0.03
Replacing lost environmental services	-0.61
Mean Net Social Benefits	82.7
Benefit-Cost Ratio	124

Cook Islands Cost-Benefit Comparison

- Expected NSB by Cook Islands Mining Scenario (in millions USD)

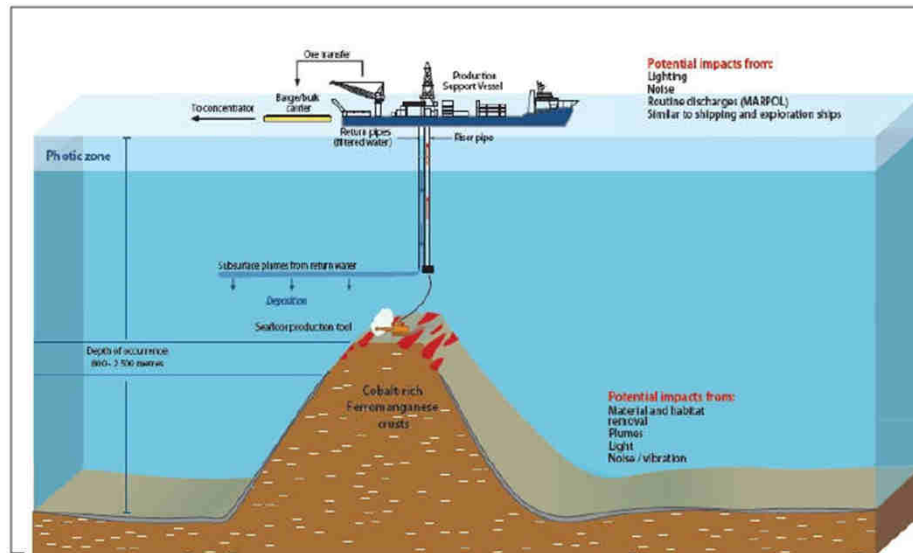
Processing Route	Scenario #1		Scenario #2		Scenario #3	
	Net Social Benefit to Cook Is	Benefit-Cost Ratio	Net Social Benefit to Cook Is	Benefit-Cost Ratio	Net Social Benefit to Cook Is	Benefit-Cost Ratio
3-Metal (Co-Ni-Cu)	0	-	0	-	0	-
4-Metal (Mn-Co-Ni-Cu)	0	-	467	18	Not considered	Not considered
3-Metal + REY	0	-	0	-	Not considered	Not considered

- Scenario #1** is where the miner owns only the mining operation and has to sell raw ore to processor overseas.
- Scenario #2** is where the miner owns both the mining and the processing facility located overseas.
- Scenario #3** is where the miner owns both the mining and the processing facility located in the Cook Islands.

RMI Cost-Benefit Comparison

- **Scenario #1** - Miner owns the mining operation and exits the value chain by selling the raw ore to a processor overseas.
- **Scenario #2** - Miner owns both the mining operation and a processing operation located overseas.

- Expected NSB in RMI Mining Scenario (in millions USD)



Category	Present Value
Total Costs	29.3
Total Benefits	39
Mean Net Social Benefits	0
Benefit-Cost Ratio	0

Summary of Total Net Benefit

- The table summarises the preliminary estimates of the total social costs, total social benefits and net social benefits (total social benefits minus total social costs) in each of the case study countries.
- Summary of Total Net Benefits by Case Study Country (in millions USD)

Country	Resource	Total Costs	Total Benefits	Net Benefits	Benefit-Cost Ratio
PNG	SMS	0.64	83.3	82.7	124
Cook Islands	MN	27.4	494	467	18
RMI	CRC	29.3	39	0	0

- This table suggests that DSM mining activity in both PNG and the Cook Islands has the potential to make the citizens of the host country better off.
- Given current technology and market conditions, the benefits associated with DSM mining activity in RMI are unlikely to exceed the costs.