

# CONFERENCE REPORT

## **Deep Seabed Mining Payment Regime Workshop**

***May 17-18, 2016  
Scripps Institution of Oceanography  
La Jolla, California USA***

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## Executive Summary

I. The Deep Seabed Mining Payment Regime Workshop convened representatives from industry, academic and civil society communities, national governments, and international organizations at the Scripps Institution of Oceanography, University of California San Diego to discuss a number of foundational issues in the design of a payment regime for deep seabed mining activities in the Area (DSM). The primary focus of the workshop was to contribute towards the further development of a deep seabed mining payment regime for the International Seabed Authority (ISA). The conference was held under the Chatham House rule.<sup>1</sup>

II. The workshop sought to advance discussions in connection with a payment mechanism for exploitation activities in the Area building on the outcomes of workshops held in 2015 in Singapore and Bellagio. The workshop also provided participants an opportunity to explore in further detail the points raised by the ISA's discussion paper on the development of a payment mechanism issued in March 2015.<sup>2</sup>

III. Additionally, the workshop provided a timely opportunity, in advance of an environmental assessment workshop held in Brisbane, Australia<sup>3</sup>, to explore issues related to the environmental aspects of DSM as they relate to the consideration of both a payment mechanism and other obligations having a financial impact under future contracts for exploitation. These discussions ranged from the consideration of environmental fees to the use of bonds and funds as incentive-based mechanisms in addressing the environmental responsibilities of contractors and the application of a mitigation hierarchy framework. These environmental policy instruments were discussed in the context of possible policy approaches in the form of complementary and substitutive instruments and their interaction with the liability regime for the Area.

IV. Furthermore, participants considered the concept of inter-generational equity as it relates both to a payment mechanism and its application to future receipts and the responsibility of the ISA in connection with the discharge of its duties and principle of the Common Heritage of Mankind (CHM). This is an issue recognized by participants as requiring detailed consideration as regards current and future consumption preferences and a need to establish a social discount rate for the Area for the purposes of economic modeling.

V. The participants acknowledged that the development of a payment mechanism is one in a series of “building blocks” toward the advancement of the ISA's exploitation code and a need to consider the “total regulatory package” vital in future discussions. It was further acknowledged that the delivery of exploitation regulations to provide the necessary certainty in making investment decisions is of paramount importance at this stage.

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<sup>1</sup> When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed. See more at: <https://www.chathamhouse.org/about/chatham-house-rule#sthash.jnTbp7hE.dpuf>

<sup>2</sup> *Developing a Regulatory Framework for Mineral Exploitation in the Area: A Discussion Paper on Development and Implementation of Payment Mechanism in the Area for Consideration by Members of the Authority and All Stakeholders*, ISA 2015.

<sup>3</sup> *International Seabed Authority/Griffith Law School Exploitation Regulations Workshop on Environmental Impact Assessment for Deep Seabed Mining* Brisbane, 23-26 May 2016.

VI. Nevertheless, the workshop was able to advance a number of discussions and considerations in regard to a payment mechanism together with identifying key points for elaboration at a future workshop.

VII. The workshop continued to develop the preference endorsed at the joint ISA-CIL (Singapore) Workshop on Mineral Exploitation in the Area in June 2015 and Bellagio workshop (October 2015) for a transitional payment mechanism that *inter alia* provides for: an economic incentive to attract investment and new technology to the Area; low cost administration by both the ISA and contractors and is stable in the initial years of DSM activity to provide certainty and predictability to investment decision-making. The workshop acknowledged that potential trade-offs exist between creating incentives and the appropriate allocation of risk between the various actors. It also recognized the potential for dual innovation incentive benefits and/or financial and royalty payments applicable both at sponsoring / home State level and in the Area.

VIII. The workshop highlighted that mineral price volatility presented a fundamental challenge particularly in its impact on revenue volatility at the level of the ISA and that consideration could be given to market-related instruments to manage aspects of price volatility and its potential to impact future payment disbursements.

IX. Significant discussion focused on the payment of fixed fees to the ISA and their method of calculation, including a recovery of ISA costs, though the precise basis for the determination of their quantum remains for future deliberation. It was however thought that two fixed fees could be proposed. The first, an annual contract administration fee applied from the effective date of a contract for exploitation (akin to the annual fixed (overhead) fee applied under contracts for exploration but at a greater magnitude given likely higher administration costs under the exploitation phase – a figure of the order of +/- US\$100,000 may be appropriate but requires further analysis); the second fee, running concurrently with the first fee but applied from the date of commencement of commercial production would comprise the annual fixed fee contemplated by the 1994 Implementing Agreement. Again, the magnitude of this annual fixed fee requires detailed consideration, albeit the workshop noted that the Convention originally provided for a fixed annual fee of US\$1million from the date of the contract. It was recognized that this annual fixed fee, while contributing to the running costs of the ISA, could, in the event of a surplus, be allocated to specific funds (e.g., the economic assistance fund) or be subject to disbursement under the CHM principle.

X. Table 2 to this Report is a comparative analysis of payment mechanisms (revenue-raising charges) for exploitation activities in the Area. While the workshop did not have opportunity to consider the matrix in detail, discussions did focus on specific payment types and the relative advantages and disadvantages of each. Bearing in mind the objectives of the payment mechanism in the early years, it was generally felt that the ISA should explore the possibility of an *ad valorem* based royalty in addition to the fixed fee arrangements highlighted above. Furthermore, that under a transitional arrangement this be applied in a two-stage process with an interim (lower) *ad valorem* royalty being applied from the date of commercial production with a higher royalty rate being applied at a second, later stage. The timing of such a switch could be influenced by the break-even point for mining entity operations or be defined by a time period. The workshop considered the difficulties inherent in establishing a switchover point and agreed that the basis and exact parameters

to define this switch, from a lower to higher rate, should be taken up for further deliberation.

XI. In addition to determining the respective royalty rates, a number of other problem areas were identified and considered in connection with determining the value-base for an *ad valorem* royalty and possible variations to the royalty mechanism were considered. The addition of a royalty price floor and/or ceiling was proposed to adjust risks and incentives for timing of production. The key question of which minerals in the mined ore should be valued must be addressed when determining the value-base for an *ad valorem* royalty. Not all minerals in the mined ore may currently be utilized, but the issue of their inclusion and non-use and their value by markets and intrinsic values require resolution. Again, these matters remain for future discussion.

XII. In terms of the progressivity of a payment mechanism and the introduction of a profit-based mechanism, while the workshop did not dismiss future consideration of a profit-based mechanism, in the shorter term, participants acknowledged the difficulties inherent in operating a profit-based mechanism on a practical basis including transparency in ISA informational needs. That said, an *ad valorem* royalty regime could be adopted so as to provide progressivity in revenue terms by capturing price increases. Nonetheless, an *ad valorem* royalty in itself would not provide progressivity in the sense of a bigger share of project revenues to the ISA and the CHM upon price increases or cost decrease. The system would thus require other measures that truly track the project's rate of return. Moreover, it was noted that, as mining project profitability increases, royalties tend to collect a declining return from mineral resources.

XIII. One area that was highlighted as key for consideration is the factor(s) that determines the date of commencement of commercial production. In a land-based context this date is often ambiguous and left open to interpretation and potential dispute. Whether for DSM this can be resolved by determining a specific percentage of operational capacity or other objective criteria needs investigation to avoid misinterpretation or manipulation of a date that is fundamental to the application of an annual fixed fee and royalty payment. The criteria selected must be one that the ISA can monitor with certainty and low cost.

XIV. The workshop also addressed a number of administration and management issues connected with any payment mechanism including royalty payment periods and future review mechanisms. The outcome of these discussions is reflected accordingly in this Report.

XV. As noted in III. above, the workshop provided an opportunity to formulate initial thoughts and ideas connected with environmental considerations and their integration into the payment mechanism and the ISA's environmental policy approach. The discussions benefited from the input of expert environmental economists. It was acknowledged that while the *ad valorem* royalty compensated humankind for the extraction of the resources from the seabed, environmental policies and approaches also require formulation in connection with the incentive-based tools and instruments outlined in this Report. It was noted that further work is to be performed by the ISA and stakeholders in connection with legal responsibility and liability in the Area, jurisdictional competencies for activities in the Area and the sharing of environmental risks by the DSM sector and society. While the outcomes of these discussions will have a bearing on the various environmental instruments

discussed, a broad need for a combination of bonds, insurance, and environmental payments and funds merit further discussion.

XVI. The workshop identified a number of key questions designed to drive further debate, discussion, and possible content for a future workshop. These are listed at paragraphs 127 and 128.

XV. It is to be noted that a number of outcomes and observations made at the Bellagio workshop and in relevant ISA papers are reiterated and incorporated into this conference report to provide a fully synthesized and integrated document. It is intended that this Report can then be used as the point of departure for a future workshop related to the payment mechanism, and its associated elements, together with the integration of outcomes from related workshops and other ISA deliverables. Consequently, while some common themes and understanding became apparent during this workshop as to the future direction of the payment mechanism, this Report should not be interpreted as presenting a consensus of views or opinions of the workshop participants or explicit conclusions, but one of providing comment and guiding principles to facilitate future deliberation.

## A. Workshop Objectives and Content of Discussions

1. The workshop **objectives** were:
  - i. To share an update on and discuss development of the exploitation code and timelines; and
  - ii. To discuss the Deep Seabed Mining Payment Regime paper developed in October 2015 by a working group at the Bellagio Conference that built on the June 2015 Joint ISA-CIL Workshop in Singapore; consider the paper in the context of other efforts, and expand or refine its scope as appropriate in order to share it with the International Seabed Authority in preparation for the ISA Annual Session in July 2016. In particular, the intention of the workshop was to:
    - Discuss guiding principles and recommendations for the development of an initial payment mechanism in the Area;
    - Consider and agree upon concepts for the administration and management of a payment mechanism;
    - Identify and discuss options for integrating environmental considerations into a payment mechanism and support for technological innovation; and
    - Share ideas and experiences for the direction and development of a longer-term payment mechanism.
2. To achieve clarity on the purpose of the workshop and technical terms, the workshop noted that: (i) a fiscal regime refers to a tax regime, which is State-related – the ISA cannot levy a tax *per se* (ii) royalties are not strictly a tax and (iii) that the terms “fiscal” and/or “tax” should be avoided and substituted by the terms “financial” or “payment” regime or mechanism.<sup>4</sup>
3. The conference explicitly built upon the outcomes of the: June 2015 joint ISA-CIL Workshop on Mineral Exploitation in the Area;<sup>5</sup> October 2015 Bellagio Conference *Toward Transparency and Best Practices for Deep Seabed Mining*<sup>6</sup>; *Towards the Development of a Regulatory Framework for Polymetallic Nodule Exploitation in the Area*, ISA Technical Study No. 11, 2013; and *Developing a Regulatory Framework for Mineral Exploitation in the Area: A Discussion Paper on Development and Implementation of Payment Mechanism in the Area for Consideration by Members of the Authority and All Stakeholders*, ISA 2015.
4. The conference spanned two days. The first day focused on information sharing, and included presentations by participants on a number of framing issues in DSM. These issues included:
  - i. ISA perspective on the rationale for work on the DSM payment regime, including UNCLOS objectives and challenges as a context for discussion and an update on development of the exploitation code and timelines;
  - ii. sharing experiences with payment regimes from the perspective of developing States, including: developing State thoughts and questions

<sup>4</sup> Section 8 of the 1994 Implementation Agreement makes reference to a “system of payments”.

<sup>5</sup> ISA Briefing Paper 04/15, Report of the Joint ISA-CIL Workshop on Mineral Exploitation in the Area, 16-17 June 2015.

<sup>6</sup> *Toward Transparency and Best Practices for Deep Seabed Mining: An initial multistakeholder dialogue*, Bellagio, Italy 7-10 October 2015, World Economic Forum, January 2016.

- regarding issues, challenges, and solutions as relates to DSM exploitation; the linkages between land-based mining and DSM with a focus upon the experience of Cameroon and general payment regime principles; tax neutrality, avoidance of tax leakage, low front-end loading, built-in flexibility stability and predictability, simplicity, minimum assured level of fiscal revenue plus profit-sharing;
- iii. contractors' perspective on the payment regime, including the background on the July 2015 informal meeting between contractors and the ISA's Legal and Technical Commission (LTC), held in Kingston, Jamaica, and an overview of a possible industry development model, notably timelines of development, types of capital that still need to be invested versus expected rate of return, and need for certainty, stability, predictability;
  - iv. DSM payment regime development efforts to date, including an update on payment regime work completed for the LTC, overview of stakeholder feedback on financial terms discussion paper, key results of the June 2015 joint ISA-CIL Workshop on Mineral Exploitation in the Area, and key results of the October 2015 Bellagio conference;
  - v. the payment regime as part of a package that also includes environmental responsibilities of contractors, noting that economic incentives cannot always separate payments and environmental responsibilities (since both may simply be viewed as a payment and cost). Dual objectives of a) reducing the likelihood and magnitude of environmental damages in a cost-effective way and b) providing funds for environmental compensation. Alternative policy approaches discussed included regulation, environmental fees, liability, insurance requirements, and bonds;
  - vi. integrating environmental considerations, including the potential to integrate environmental payment or Pigouvian fees, the rationale and objectives for funds proposed to stakeholders: Environmental Liability Trust Fund and Seabed Sustainability Fund, and an introduction to performance guarantees and environmental bonds; and
  - vii. a discussion on the technical aspects of implementation with a focus upon *Developing a Regulatory Framework for Mineral Exploitation in the Area – A Discussion Paper on the Development and Implementation of a Payment Mechanism in the Area*, ISA 2015 (paragraphs 31-73). See also Table 1 to this Report.

5. The second day of the workshop continued with the technical aspects of implementation, introducing and discussing Table 1, a comparative matrix of financial payment alternatives against stakeholder criteria assessing financial mechanism alternatives with a discussion of pros and cons and tradeoffs (see Table 2 to this report). The discussion aimed to identify draft guiding principles for development of an initial payment mechanism for consideration by the LTC and other stakeholders. The results of the matrix discussion are directly integrated into this report, rather than separately summarized.

6. This discussion was followed by presentations on: (i) using payment regimes to support innovation and the environment, including discussion of incentives for industry to create better technology and environmental funds for the environment, and a discussion of

least-cost conservation and environmental mitigation and (ii) intergenerational equity, sustainable development, macroeconomic volatility, and sovereign wealth funds.

7. The workshop then resumed the structured discussion of the Discussion Paper on the Development and Implementation of a Payment Mechanism in the Area and accompanying matrix (Table 1 of the Report). After considerable discussion on the advantages and disadvantages of a profit-based mechanism (discussed in full below), this structured discussion crystallized around an initial period consisting only of a fixed fee followed by an interim “light” *ad valorem* royalty followed by a full *ad valorem* royalty as illustrated by Figure 1 of this Report. A number of related questions arose: (i) what is a “light” or initial *ad valorem* and what is a full or “normal” *ad valorem* royalty? (ii) When do the values change? When does the breakeven point for a mining company occur? (iii) What is the basket value of nodules, what are they comprised of, what formula should be used to measure them? (iv) Should there be a price ceiling and/or price floor for the *ad valorem* royalty?

8. Most of the discussion assumed or was focused on mining in the nodule provinces, and mining entity representatives were those focused on activities in the CCZ. There was little to no discussion of seafloor massive sulfides and cobalt-rich ferromanganese crusts and whether the same payment regime is appropriate for all the different types of minerals. This is highlighted for consideration at a subsequent workshop.

## B. Stylized Facts and Principles Informing the Discussion

9. The following stylized facts and principles from the joint ISA-CIL Singapore and Bellagio workshops and the two ISA papers informed the discussion.

10. Minerals prices display considerable volatility over time, generating long-term cyclical swings in revenue. Mining requires lengthy periods of exploration and development during which no revenue is generated. Deep-sea mining equipment is highly specialized, and much of the technology remains under development, further lengthening the time prior to mining and increasing risk.<sup>7</sup> The amount of capital required during the development and construction phase is relatively larger than in most other industries, but nonetheless comparable to terrestrial mining.

11. Once the mine is developed, much of the capital may not be malleable, i.e., it forms a sunk cost (a fixed cost that is not recoverable). Mines can have long lives, making them potentially subject to payment regime changes and policy instability, called time inconsistency. The long time periods involved, large upfront but sunk capital costs, technology still under development, substantial transition time to mining, uncertain reserves and environmental impacts, a still-emerging regulatory and fiscal framework, mineral price volatility, all come together to create considerable risk and uncertainty and the need for predictability, notably in any payment and regulatory framework.

### Economic and financial payment principles

12. The following economic and financial payment principles from the Bellagio workshop and ISA papers informed the payment regime discussion. Different payment regimes create stronger or weaker incentives for economic efficiency and stronger or weaker conditions of risk and uncertainty. Ideally, the payment regime creates neutrality, so that the selected charges that serve as revenue-raising instruments cause the least possible unintended disturbance to the mining entity's economic decisions. A non-neutral charge that affects actions taken by such entities is distortionary, giving rise to different incentives regarding research and development (technology), exploration, investment decisions,<sup>8</sup> rate of extraction, time of abandonment, over- or under-exploitation, method of extraction, etc. Different revenue-raising instruments allocate risks differently among mining entities, the ISA, and States.

13. A potential trade-off exists between creating incentives and the appropriate allocation of risk; where economic efficiency requires those best able to bear risk to absorb risk. In terms of delineations of boundaries, it may not be appropriate for the ISA to take on the commercial risk of downstream processing. The payment regime should minimize risk to mining entities, States, and the ISA to the maximum extent practicable, by creating a stable and predictable environment, including a stable payment regime (thereby contributing to solving what is called the time inconsistency problem). Built-in flexibility, through rules, procedures, periodic reviews, and other means, facilitates the payment regime's adaptation

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<sup>7</sup> Investors face two broad types of risk, which is sovereign (political) and project (commercial). Specific sources of risk include exploration, mineral prices, cost uncertainty, technology development, environmental damages, and policy-regulatory uncertainty.

<sup>8</sup> In considering incentives, it is important to consider the potential impact of such incentives in influencing sub-optimal investment decisions. The absence of a profit-sharing mechanism or generous royalty arrangement could contribute to this.

to changes in markets, technology, profitability, and other conditions, while complying with the CHM principle.

14. Transparency, critical for the payment regime, leads to concerns over transfer pricing (prices at which an enterprise transfers goods and services that can vary according to location or situation) and arm's length pricing (buyers and sellers of a product act independently and have no relationship to each other).<sup>9</sup> Ease and low cost of administration forms another principle. Mining entities and the ISA hold different amounts of information (i.e., asymmetric information), and obtaining sufficiently comprehensive information on costs and other sensitive financial information may or may not be feasible. Ideally, the payment regime is driven by the optimum structure and information needs, and the regime is crafted accordingly. Should such information, such as reliable and representative costs, not be obtainable, the regime must be adjusted accordingly. The potential absence of cost information and absence of an international tax and accounting code and tax treaties with the ISA potentially limit the payment regime.

15. Payments to the ISA should be levied as close as possible to the point of extraction, ideally the point of first offloading of the ore or point of first third party sale, an issue requiring further attention (as noted below). The payment regime should reflect the metal content of the ore and take account of the price and revenue volatility. When levied at the point when the ore is transferred from the mining vessel to a transport barge (i.e., mine gate), the metal content should be subject to port reconciliation. Revenue-raising charges are ideally levied at the project level, so that accounts from the project are not mixed with accounts for activities outside of the project. The UNCLOS specifies that the administrative expenses of ISA are to be a first call upon revenue raised from the Area.

16. A number of additional general issues and principles were discussed regarding the design and implementation of the DSM payment regime.

17. First, reference was made to a proposal first made in Singapore and confirmed in Bellagio for a transitional financial regime to encourage the growth of the seabed mining industry and ensure its sustainable development. The La Jolla discussion also confirmed the importance of this transitional regime. The discussion also recognized that the payment regime should facilitate stability in the initial years when contractor risks and costs are high and production and revenues are low or nonexistent. Creating economic incentives for entry into the industry, exploration, and investment is critical to achieve this economic growth and sustainable development. The view was expressed during both the Singapore and Bellagio workshops that the royalty regime should start as simply as possible, given the embryonic state of the sector. DSM, as a nascent industry with an evolving institutional structure, entails considerable risk and uncertainty as discussed above and below. The view was also expressed that there is potentially a high level of uncertainty regarding environmental impacts in the initial years of a project, and that there is an increasing level of certainty and possible needs to address findings as the industry matures.

18. Second, new technology must be developed for DSM and minimizing adverse environmental impacts. Incentives to fully develop new technology are not sufficient unless the innovator enjoys much of the benefits of the new technology. New technology is

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<sup>9</sup> The OECD Transfer Pricing Guidelines provides one international framework for applying the arm's-length principle.

typically underprovided, because the innovator pays for the technology but does not receive the full benefits while other parties can utilize the new technology without paying for it.<sup>10</sup> Third, the Common Heritage of Mankind (CHM) principle implies that developing countries receive greater economic welfare consideration (welfare weights) than developed countries. Fourth, the resource owner receives payment for mining an exhaustible resource.

## **Risk and uncertainty**

19. A number of issues arise related to risk and uncertainty.

20. First, which party bears the risks of DSM and the timing of these risks? Mining entities and investors bear the investment risks and face a long period prior to production and sunk costs as discussed above. They prefer to first receive full cost recovery before paying royalties, while recognizing that payment of certain fixed fees to the ISA is mandatory. Such an approach shifts some of the payment risk onto the resource owner. From the perspective of the resource owner (ISA), mining costs and cost recovery are the direct responsibility of the mining entity and not the resource owner; delaying payment receipts to the resource owner lowers the net present value of the payment stream unless otherwise specifically compensated for by a higher royalty rate or an appropriately sized lump-sum payment. How to determine and value mining entity breakeven (i.e., cost recovery) and when it occurs also bears upon who bears the risk. In short, different emphases shift the risk to either the resource owner or the mining entity.

21. Second, the riskier the project, the higher the hurdle rate for the DSM mining entities' internal rate of return, i.e., the greater the rate of return is required to compensate for the higher risk. Lower mining entity and investor risk can be obtained through assured payback before a payment regime or a guaranteed higher rate of return. Countries entitled to share in royalties also have opportunity costs if they must wait to receive DSM royalties, including potentially higher borrowing and capital costs if they must finance their budgets by some other means or if delayed payments lower current investment and economic growth.

22. Third, do the same risks apply to later investors as early investors? Early technology developers face higher risks from unknown technology, higher costs of technology development, an absence of proven commercial viability, and higher capital costs. As discussed above, early innovators also face disincentives to fully develop the new technology since they may not receive the full benefits of such development, and later industry entrants may not pay the full costs of employing such technology (i.e., potential free riding by later entrants). Later investors may also face lower risks and hence lower costs of capital. Later entrants, however, may face barriers to entry and mining areas with lower abundance and grade of ores. Moreover, developing States in particular may face barriers to entry along several additional dimensions as later entrants into the industry. Developing countries also face issues of differing human capital and technological capital bases in which to realize the full transferable benefits of 'free rider' effects from DSM

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<sup>10</sup> In technical economics terms, new technology is a public good with external benefits that other parties can utilize without reducing the benefits for others. These parties, who are non-innovating and non-paying yet adopt the technology, are said to be free riders. Adoption and diffusion of new technology confronts a similar public goods problem. Public policy can impact incentives for and against both the development and adoption of competing technologies. Intellectual property rights, such as patents or licenses, are often used as a solution to allow the providers of new technology to capture the full benefits and to preclude free riding.

technology development in a parallel manner to the space race and uptake of technology by developing countries and/or partnering with technology providers.

23. Fourth, a related issue is the proper allocation of environmental, social, and financial risk among the ISA, member States, and mining entities. Fifth, the progressivity of a payment regime, i.e., the extent to which revenue increases as the price of the mineral rises or production costs fall, shapes the sharing of risk between the two sides.

### **Inter-generational equity**

24. Inter-generational equity is an inherent concern with an exhaustible resource, and reflects the need to balance current with future revenues from this resource and the current and future consumption that follows. In its standard interpretation, inter-generational equity with an exhaustible resource does not consider ecosystem services. The welfare of future generations is contemporaneously considered with that of the current generation. Reducing current consumption to save and invest preserves opportunities for higher consumption by, and hence contributes to, enhancing welfare of future generations.

25. There are two components to achieving this inter-generational equity. One is the optimum rate of exhaustible resource extraction, where the social discount rate used to assess the net present value of resource royalties over time incorporates the interests of future generations. These interests of future generations include benefits enjoyed through managing and enjoying the environment, renewable ecosystem products and services as well as net revenues. (The social discount rate captures the preferences of society for current versus future consumption in this assessment.) The second component balances current consumption versus future consumption of the realized resource royalties through current saving and investment to achieve higher consumption in the future. (Ideally these two components would be simultaneously considered, but in practice they are separated.) With economic growth, it is expected that higher incomes, consumption, and welfare in the future can lead to comparatively higher current consumption. However, there is potential for depreciation including loss of ecosystem products and services directly or indirectly due to anthropogenic activities (e.g. climate change) to erode this natural capital base prerequisite for economic activity and thus future benefits and options.

### **Mineral price volatility**

26. The volatility of ISA revenues due to volatility of mineral prices and economic reserves and the implications for ISA revenue flows and their disposition to States were only briefly discussed and noted as an issue for future discussion. Some of the salient points raised in Bellagio and La Jolla include the following.

27. The prices of natural resources are inherently volatile, price swings can be large and long lasting, and rising prices can differ from declining prices. This is called the commodity price cycle. Volatility in revenue from natural resources can also stem from sudden changes in volumes of production. The procyclicality of payments to the ISA can potentially lead to procyclicality of disbursements to States, which in turn can potentially contribute to macroeconomic volatility—higher spending associated with higher revenue and may also complicate satisfying inter-generational equity under the CHM. Such procyclicality can also impact ISA budgets and spending plans to the extent they depend upon payment revenues other than fixed fees. The volatility of resource prices should make authorities cautious when choosing between investment in physical or financial assets, because physical assets

cannot be readily unwound and at low cost to address sudden drops in resource revenue. Establishing institutional mechanisms or rules to reduce the adverse effects of volatile prices can be important. One option for further discussion may be the consideration of a weighted composite basket of metals price.

28. Price volatility, because it leads to revenue volatility, may potentially complicate ISA financial planning, payment disbursements, and inter-generational equity as part of CHM. This concern may require a consideration of certain medium-term fiscal rules and precautionary savings to limit procyclicality (by delinking expenditures from resource revenues). Market-based instruments might also be used to manage price volatility. The ISA can enter into over-the-counter forward contracts to lock in prices or hedge price risk with financial instruments such as options. These contracts can be technically complex, costly, hard to communicate to stakeholders, and politically risky. Using a price-based smoothing spending rule to compute structural resource revenues or a structural fiscal indicator can help break this link. A price-based rule can mitigate the transmission of externally driven resource price volatility, which can result in a procyclical fiscal stance. A key decision is the reference price used to compute structural resource revenues.

29. Revenue volatility creates an incentive to save some of the revenue for precautionary reasons. A liquidity fund built up during periods of high prices and revenues can be tapped to smooth consumption spending when resource inflows fall short. The optimal size of such a liquidity buffer would be larger when revenue volatility is high and more persistent, and depending upon the ISA's tolerance for consumption swings. The optimal buffer would also be larger consumption out of the resource revenue when this revenue is higher. Such concerns can be applied to the ISA's own budget, to the extent it is financed by the DSM payment regime, and to payments disbursed to States.

30. A related issue pertains to ISA payments that sustain a constant flow of funds to States and addresses inter-generational equity and sustainable development under the CHM. Rather than payments out of current income, payments could be disbursed out of permanent income or total wealth. In its simplest form, permanent income equals the annuity value out of net wealth (the [discounted] present value of future *ad valorem* royalty revenue), called the permanent income hypothesis, in turn modified by consideration for investment, inter-generational equity, uncertainty over reserves, credit constraints, and other factors.<sup>11,12</sup> Once extraction is in full swing, much of the royalties are saved to build up

<sup>11</sup> The permanent income hypothesis holds that a country sustains a constant consumption flow equal to the (implicit) return on the present value of future natural resource revenue. Once extraction is in full swing, much of the revenue is saved to build up a stock of non-resource assets, which could be through a natural resource wealth fund, and investment in education (i.e., in human capital). The return on these assets sustains the spending annuity after extraction has ended. The approach takes account of the exhaustibility of the resource and the desire to maintain the value of the asset for future generations (ensuring inter-generational equity), but does not consider investment, capital and credit constraints faced by many developing countries, so that some of the resource windfall is used up front to invest, uncertainty of prices and future production volumes, and potential higher incomes of future generations. This leads to permanent income hypothesis approach.

<sup>12</sup> Payments, for example, could equal the prevailing interest rate on international capital markets times the initial natural wealth (present value of income stream). Payments out of current income run the risk of either consuming natural wealth too quickly, thereby sacrificing the interests of future generations, or consuming natural wealth too slowly, thereby sacrificing the interests of the current generation. Either rate of consumption sacrifices the concept of inter-generational equity. A boost to permanent income due to say, discovery of higher natural resource wealth (e.g., a new ore deposit) or improved technology that lowers costs and allows efficient exploitation of previously non-economic ores, raises the annuity paid to States.

the stock of non-resource assets to provide sustainable benefits in the future. The return on these assets sustains the spending annuity even after extraction has ended plus smooths out spending due to price and production changes and addresses the interests of future generations' claim to a share of the returns generated by an exhaustible resource under CHM. Sovereign wealth (natural resource) funds are one vehicle to achieve this limiting of procyclicality and the ISA's sharing of the benefits under the CHM responsibility.

31. This issue might be discussed in a future workshop and could benefit from participation by the International Monetary Fund.

### **Sustainable development**

32. The exhaustibility of minerals and transforming natural resource wealth into productive human, physical, and financial assets to yield sustainable economic growth and development was recognized as an important topic, and was noted for future consideration. A further consideration includes the role of natural resource accounting and promotion of the recovery of metals from discarded technology, which may become increasingly viable to extract in the future with technology advancement and promotion.

33. Sustainable development with exhaustible mineral resources requires transforming exhaustible natural capital into sustainable financial, human, and physical capital that underpins sustainable economic growth and revenues. This transformation is complicated by the volatility of mineral prices, which is often associated with procyclicality and exposure of the economy to boom-bust cycles. Sustainable development meets the needs of the present generation without compromising the ability of future generations to meet their own needs plus takes into account the capacity of the natural environment to sustain indefinitely the quality of ecosystem services, biological diversity, and ecological integrity. Many variations of this concept exist.

34. Exhaustibility of minerals presents a challenge to transform depleting wealth into a portfolio of other assets to support sustainable economic growth and development. Resource exhaustibility gives rise to inter-temporal decisions about how much of the resource wealth to consume now and how much to save (and invest), with implications for intergenerational equity and long-term fiscal and external sustainability. Revenue volatility calls for distinct medium-term fiscal rules and precautionary savings.

35. A key macroeconomic issue, which is part of sustainable development, when managing exhaustible natural resource wealth is how much of the resource wealth to consume now versus later. Consumption later entails lowering current period consumption to save and invest in the domestic economy (unless there is a natural resource wealth fund that invests both domestically and internationally) to generate economic growth and subsequent higher rates of future consumption. This issue affects both the ISA in the context of its CHM responsibilities and States in connection with receipts under Article 82 of the UNCLOS.

### **Different goals for different stakeholders**

36. The Bellagio workshop reported that the financial and non-financial goals and related risk mitigation of a payment regime vary for each of the key stakeholders, who may broadly be defined as States, the ISA, and mining companies (whether States, state-owned enterprises or private corporations).

37. Goals for States, both within the Area and in national jurisdiction, may include raising revenue, diversification of their economy, skills transfer, scientific knowledge, and environmental protection.

38. Goals for the ISA within the Area may include effectively managing operations, raising revenue for its member States, allocating rents “fairly” between mining entities and the CHM, and administrative ease and minimizing cost, as well as to attract investment and technology to the exploration and exploitation of the Area.<sup>13</sup> The ISA’s environmental goals include minimizing adverse impacts to the marine environment from mining activities more broadly through the development of rules, regulations and procedures, and the potential to disapprove areas for mining under prescribed circumstances.<sup>14</sup>

39. Goals for mining entities can include profits, minimizing their risk profiles, administrative ease and minimizing cost, and enhancing predictability and transparency. Goals for State mining entities can include strategic goals.<sup>15</sup>

### **Spillover effect**

40. The Bellagio workshop reported that relevant considerations with regard to the scope of the payment regime can also potentially vary by whether the mining takes place solely in the Area, on continental shelves where the activity may affect the Area, or in the Area but with potential impacts on coastal States. Notably, when mining occurs in the last two cases, there can be an environmental spillover effect from one location to another, such as a drifting plume from mining in the Area to adversely affect an adjacent coastal State’s environment. When the spillover effect creates an adverse environmental impact, the mining entity creates a cost upon citizens in the recipient area that can be unaccounted for, and the wellbeing of the adversely affected citizens can decline. The payment regime should ideally account for all costs and benefits, and include environmental spillover effects that are otherwise not considered.

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<sup>13</sup> See Articles 150, 151 and Annex III, Article 13(1) and (14), of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) as read with Sections 6 and 7 of the Annex to the 1994 Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea (1994 Agreement).

<sup>14</sup> See Article 145 and 162(2)(x) UNCLOS.

<sup>15</sup> Entities that are qualified to undertake deep seabed mining in the Area include States Parties to the 1982 UN Convention on the Law of the Sea (UNCLOS), state enterprises and natural and juridical persons when sponsored by States Parties. For ease of reference, the term ‘mining entities’ is used in this document as a collective reference to all such entities.

## C. Findings

### The fixed fees paid to the ISA

41. Annual fixed fees paid to the ISA potentially contain two fees for ISA cost recovery: (1) a regulatory fee pertaining to exploration contracts to address administrative costs that starts with the date of a contract for exploitation (an amount in the region of US\$100,000 (current rates) postulated) and (2) a second regulatory annual fixed fee<sup>16</sup> starting from the date of commercial production (US\$1,000,000 postulated).<sup>17</sup> The intent is that early industry entrants do not bear all of ISA's costs. Higher ISA costs are expected under commercial production compared to the exploration phase. Fixed fees should not create perverse incentives to produce just to produce, which creates economic inefficiency. Member States' annual budgetary contributions to ISA should be expected to decline over time as receipts from mining entity annual fees climb and the rate at which the fixed fees are set increases.

42. A number of questions arise. The size of the annual fixed fee from the date of commercial production and the basis for the size of the fee both remain unresolved. Should fixed fees that commence once production begins be specified as a fixed fee per: company; mine; area under contract; or area mined? Area-based fees are commonly applied in the petroleum and natural gas industries. The size of the fixed fee also relates to the extent that the mining sector contributes to, or takes over, some or all of the functions that the ISA might otherwise execute. For example, the mining sector could outsource to a third party some function that would otherwise be conducted by the ISA and which could be peer-reviewed.

43. Insofar as the fixed fees pertain to cost recovery for the ISA, ISA costs can, in principle, be differentiated between the ISA's function as the resource owner (or its agent) and the regulator. A large proportion of the annual fixed fees can be attributed to ISA administrative costs. That proportion of ISA costs from managing and distributing royalties can conceptually be attributed to resource ownership. These costs can in principle be deducted from gross royalty receipts prior to disbursement, but the UNCLOS also allows administrative costs to be covered by royalty receipts. Fixed fees specified on an area basis can be interpreted as an access fee.

44. A fixed fee can also be interpreted as comprising both an administrative fee and a fee to incentivize mining entities to produce rather than not mine an area and instead speculate. That is, a fixed fee can be interpreted as containing a retention fee to counter speculation. With speculation, the ISA foregoes payments due to delayed mining, and the net present value of these payments is lower due to discounting. The ISA thus bears a cost due to time discounting. The retention fee is not a royalty. The retention fee is also part of the option value that a speculating entity is willing to pay to claim but not produce from an area. The fixed fee, as an annual lump sum, incentivizes production, but because it does not vary with production levels, only incentivizes production that could be at a minimum prescribed level (i.e., it does not incentivize marginal behavior).

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<sup>16</sup> Section 8(1)(d) 1994 Implementation Agreement.

<sup>17</sup> Annex III, Article 13(3) of the UNCLOS stipulated the payment of an annual fixed fee of US\$1m from the date of entry into force of the contract. This provision was removed by the 1994 Agreement (Section 8(2)), although the reference to an annual fixed fee remains. However, the figure postulated above presents a relative starting point for discussion.

45. Production could be delayed for very sound economic reasons, such as to benefit from higher prices (either due to the commodity price cycle or if the mining volume can directly impact prices) and/or lower costs and enjoy improved technology in the future. Delayed production could simply be due to forecasts about future conditions that differ from other mining entities or the ISA. Retention payments can then be viewed as sharing the increased profit that comes from delaying, if indeed profit does increase with delaying. In short, sharing of any increased profit through retention payments from delaying would then raise payments to the ISA compared to not waiting. This is the value of an option. Potential speculation must also be distinguished from economically optimal sequential mining of multiple sites given fixed budgets for exploitation, expectations over improved technology, the current state of the commodity price cycle and future demand, production costs, or concern over impacts upon mine gate prices from large volumes of production. “Use it or lose it” stipulations might then generate perverse incentives to produce in economically inefficient volumes, times, and even techniques.

46. As an alternative to a fixed fee viewed as a retention fee, the ISA can refuse a contract extension to mining entities with an area license who are not producing. The mining entity can also approach the LTC to adjust its mining plan if a period of inactivity is anticipated. In short, a contractual provision can be used rather than a financial one to address delayed production.

47. Delayed production and payment can also potentially impact inter-generational equity if the delay is sufficiently long through inter-generational shifting. Not producing then preserves the resource for future generations. These future generations are only better off if payments from otherwise producing and saving and investing in financial, human, or physical to create a higher and sustainable payment flow are lower than the payments after delayed production, both payment streams being discounted back to the present to provide a common unit of account (i.e., numéraire of present value in inflation-free money in the same currency).

### **Types of revenue-raising charges**

48. The major types of revenue-raising charges that are available include: (1) unit-based (specific) royalties when the charge base is a physical unit (volume or weight); (2) *ad valorem* royalties based on the value (revenue) of production; (3) profit-based royalty or business income tax; (4) economic (resource) rent;<sup>18</sup> and (5), hybrid systems combining a profit or rent based system with an *ad valorem* system for example. Other approaches include production sharing, joint ventures, fixed fees, auctions, and pure service agreements.

49. Unit-based royalties are a fixed amount of money paid for each tonne of mineral that is produced. Sliding scales are sometimes used with this type of royalty, and are generally set based on production levels. (The royalty rate of sliding scale unit-based royalties, rather than being uniform for all sales, varies according to the volume of material sold.) Unit-based royalties are easy to compute, collect, monitor and provide a royalty as

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<sup>18</sup> Economic or resource rent is the net value of the resource, before charges and other payments to or from authorities, above costs necessary to make the resource available, where costs include normal profit or a “normal” rate of return to capital. This normal rate of return, which is the minimum rate of return required to hold capital in the activity, had two components: a risk-free rate of return and a risk premium that compensates risk averse private investors for the risks incurred in the activity.

long as a mine operates. They are transparent and easy to administer. They are not based on the ability to pay, prolong payback, do not respond to market conditions, and can affect decisions to mine or continue mining. They are the least economically efficient but most administratively simple of all types of payments. Unit-based royalties, when used, are most widely used for low-value bulk commodities if distorting effects are compensated by very low compliance costs. In order for a unit-based royalty to be implemented, stakeholders need to agree beforehand on a fixed cost per tonne of mineral that will be produced, consequently reducing investor uncertainty and increasing predictability and transparency that enables mining entities to further develop the DSM sector.

50. Ad valorem royalties are based on the value (revenue) of production. In its simplest form, an *ad valorem* royalty applies a uniform percentage (the rate) of the value (the base) of the mineral(s) in the products sold by the mine. *Ad valorem* royalties are conceptually simple, and even though somewhat economically inefficient (since costs and hence profits are not considered), ensure that as long as the mine operates, a royalty will be paid. The royalty rate may be uniform for all sales, or may vary according to a sliding scale based upon the volume or cumulative value of material sold, or can be progressive with a rate that increases with the mineral price, such as an international market baseline price from the London Metal Exchange. *Ad valorem* royalties require supplemental information on metal prices, generally levied on the sales price or the f.o.b. price.

51. Profit-based mechanisms received considerable discussion. A profit-based mechanism was discussed as a potential successor to an initial payment regime as well as an initial basis of payment. Such an approach was considered to contain numerous advantages and to be attractive in an ideal setting. The approach, however, received mixed support due to its difficulty in implementation. Specific implementation issues arising with profit-based payment include: (1) the absence of an international and common tax and cost accounting code (e.g., different capital recovery rules, allocation of common and fixed costs); (2) uncertain basis upon which to value costs, i.e., historical book value, current value of the costs (opportunity costs from current markets), methods to address depreciation of equipment, sunk costs, etc.; (3) compatibility of profit-based payment with corporate tax and other domestic obligations; (4) domestic country deductions for determining taxable income; (5) highly limited cost information available on a recurring timely basis with questionable reliability; (6) capability of the ISA for monitoring and auditing that can leave such payments open to dispute; (7) absence of an accepted process to mediate and enforce disputes over costs and profits; (8) costs, valuations, and behavioral objectives that may or may not be profit-maximizing with state-sponsored mining companies versus privately owned ones; and (9) ring fencing projects, costs, and profit sharing payments when companies are global and/or state-sponsored and/or have multiple areas under contract.

52. One approach to addressing the current limitations to the profit-based payments regime sets an explicit expiration date (sundown clause) to the initial payment regime. Upon reaching the expiration date, a profit-based mechanism is reevaluated. In the interim, the ISA can develop the requisite infrastructure, or the template for such an infrastructure, that addresses the current limitations to a profit-based payment program. After the reevaluation of a profit-based payment regime, such a regime can be initiated or the initial regime continued, with or without modifications. An explicit expiration date for the initial regime and an a priori established procedure for reevaluation of profit-based payment give a stable

payment regime of a known and set duration for the DSM mining entities and States receiving revenues, i.e., establishes time consistency, over this time period.

53. Economic rent-based payments are considered ideal from the broad perspective of society, because they are neutral (non-distortionary) and the resource owner receives the resource rent after the mining company has received its normal profit. However, they received little support for the same reasons as profit-based payment. Additional limitations include that they are even more notoriously difficult to measure and implement due to defining and accurately measuring the opportunity cost of a normal profit. Moreover, mining entities may not favour such economic rent-based charges because these charges potentially capture part or all of the “super normal” profits that mining entities seek to make in light of their risk profile and capital investment. As a result, due to the asymmetric information held between mining entities and the ISA, incentives are created for weakened compliance and for providing the requisite cost information required to estimate economic-rent based charges. In conclusion, economic-rent based charges remain the ideal, but their consideration is currently premature and the topic might best be revisited in the future.

54. The discussion settled upon ad valorem royalties as the preferred royalty payment, although some support remains for unit-based royalties. From the perspective of the resource owner and the CHM principle, a unit-based royalty may not fully compensate the owner and support the CHM principle. Unit-based royalties forsake the revenue gains from the commodity price cycle, since the basis is total quantity of the mined ore and not solely the revenue of production. That is, under unit-based royalties the resource owner does not benefit from higher prices. *Ad valorem* royalties are more economically efficient and less distortionary upon investment and operations than unit-based royalties. *Ad valorem* royalties are also more administratively difficult and costly than unit-based royalties. Like unit-based royalties, *ad valorem* royalties are payable regardless of whether the mine is making a profit or loss. Unlike unit-based royalties, however, *ad valorem* royalties fluctuate in unison with commodity prices. Higher prices yield more revenue than lower prices.

55. Market value of the ore can be defined in a number of ways. To satisfy concerns over transfer pricing and arm’s length pricing, the ISA can, as a minimum, incorporate a fairly standard transfer pricing provision within the regulations permitting it to adjust a value to an arm’s length value.<sup>19</sup> The Bellagio workshop discussed some options on how the *ad valorem* royalty can be assessed upon the gross value of the ore at the first point of offloading (mine gate) or point of first third-party sale using international benchmark prices, such as those from the London Metals Exchange. These prices could potentially be adjusted for differences in costs, such as transportation, handling, and insurance, to form the f.o.b. (freight on board) price at the point of first offloading. Different metals prices could be linked to the different minerals comprising the ore, i.e., its grade, weighting by the average mineral content. The average mineral content could be established from mining entities’ resource assessments<sup>20</sup> of their concession over some prescribed area, where mineral

<sup>19</sup> Transfer prices are the prices at which an enterprise transfers physical goods and intangible property or provides services to associated enterprises. Transfer prices can be applied to inputs or outputs. In effect, the company buys and sells to itself at “artificial” prices that are not arm’s length prices. An arm’s length price is a price comparable to that determined if the buyers and sellers of a product act independently. An arm’s length price for a transaction is therefore what the price of that transaction would be on the open market.

<sup>20</sup> Presented according to the Resource Classification Guidelines issued by the International Seabed Authority (ISBA/21/LTC/15).

content is assumed to be homogenous and constant over a large area.<sup>21</sup> Such an approach means that the mineral content or grade of offloaded ore does not require further assessment or verification, for example, by sampling, at the point of off-loading. Different formulae exist by which to measure the overall ore price that incorporates the different minerals contents, and further research on producer price indices will be required to inform the ideal price index formulae. A key issue becomes accurate measurement of the off-loaded ore's weight or volume; however, it was considered that this would be easily achievable and relatively inexpensive with modern technology. Another approach simply takes the realized value as shown on mining entities' invoices of at-arm's-length sales submitted with their royalty returns, although the issue is then raised of transfer pricing and appropriate assaying and payable recovery, the latter of which is particularly appropriate with polymetallic ores. Realized hedging gains or losses can be netted out of the realized value on the premise that this is the responsibility of the mining entity.

56. An *ad valorem* royalty, which captures changes in international market benchmark prices, leads to revenue and payment receipt procyclicality. Such procyclicality tracks both short-term price variability and the longer-term commodity price cycle. Such volatility creates upside risk to mining entities at the peak of minerals prices during a cycle (for example through particularly high royalty payments) and downside risk to the ISA and States that are recipients of the payment regime receipts at the troughs of minerals prices during a cycle (for example through unstable revenues to finance budgets). During price troughs, mining entities with narrow-margin operations can also become unprofitable and net cash flows may fall below the corresponding marginal cash operating costs, justifying mine closure. A price ceiling and a price floor, creating a corridor of admissible prices for the *ad valorem* royalty, can create a more stable and predictable royalty environment that recognizes price and revenue procyclicality and income floors. The impact upon risk requires further discussion. A price band might minimize risk for both mining entities and States by creating a more predictable and stable environment. A price band might also create more upside risk for mining entities by removing peak revenues and a floor might create more downside risk for mining entities by requiring higher payments than otherwise, which can particularly impact higher-cost producers. Such price bands along with royalty rates can be periodically reevaluated on a fixed schedule (a fixed and transparent schedule establishes a time-consistent payments regime). The actual magnitudes of the price ceiling and floor and the frequency of their review require further attention. Within the range set by price ceilings and floors, royalty rates can be fixed or variable with a predictable way of moving and a formula for how rates adjust. A model for such an approach is variable rate mortgages in mortgage markets.

### **Proposal for *ad valorem* royalty and fixed fee payment regime**

57. Consideration of the above principles and discussion about fixed fees and *ad valorem* royalties leads to a potential payment regime comprising of an *ad valorem* royalty and a fixed fee, which is illustrated in Figure 1. The view was expressed during both the Singapore and Bellagio workshops, and reiterated in the La Jolla workshop, that the royalty regime should start as simple as possible, given the embryonic state of the sector, high start-up costs, and considerable risk as discussed above.

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<sup>21</sup> Consideration would need to be given to which minerals to include in the calculation, as well as the fact that metal prices can differ depending on the end product.

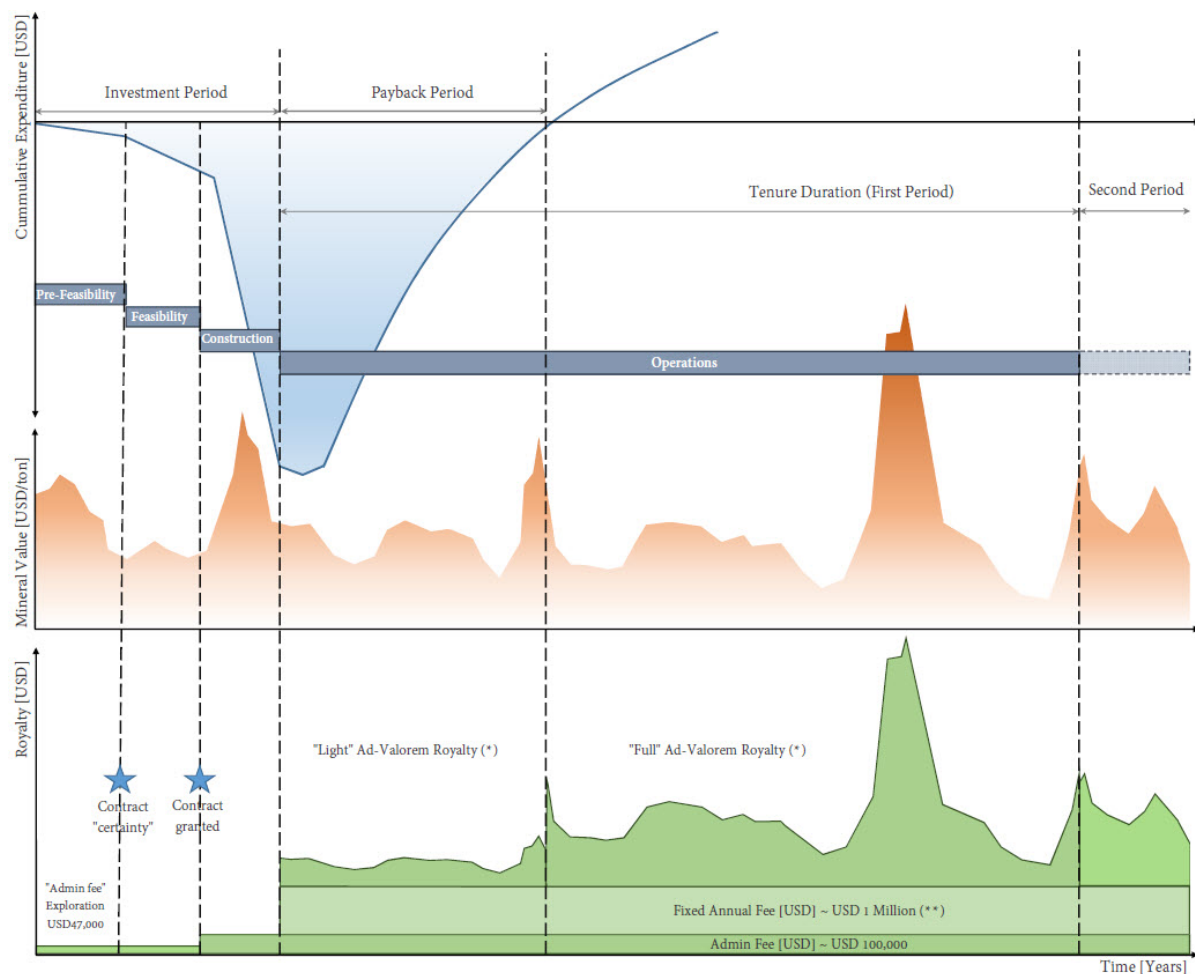
58. Under the current exploration regime, an initial fixed fee is levied based on a recovery of ISA contract administration costs.<sup>22</sup> This cost recovery fixed fee pertaining to exploration would cease at the date of termination of an exploration contract. A second, contract administration fee could start once the mining entity's exploitation contract has been awarded and the major investment phase begins (the ISA's administrative costs would also likely be higher during this phase than under the exploration phase). This approach allows for the industry to develop and either fully reach or start to approach profitability before an *ad valorem* royalty begins. At the same time and from the ISA's perspective, such a fee contributes toward the running costs of the ISA thus reducing the financial burden on Member States.

59. Once commercial production begins and commercial mining revenues start, an additional annual fixed fee is payable (in accordance with the 1994 Agreement) that remains constant over some time period, such as 20 years. Also with the commencement of commercial production, an initial or interim *ad valorem* royalty is paid that recognizes a minimum payment to the resource owner and the CHM and that mining entities have yet to break even (i.e., cash costs are not fully recovered and profits are negative). Some attendees proposed that once break-even is reached, the *ad valorem* royalty rate increases to a "full" *ad valorem* royalty rate to allow the by-now positive profits to be shared between the mining entity and the resource owner and further discharge the responsibility toward the CHM. Other attendees noted that ISA monitoring and supervision of a break-even approach and an agreed-upon definition of commercial production (see paragraphs 77-79 below) would both be difficult and make such an approach problematic to practically adopt and implement.

60. As discussed at Bellagio, the royalty rate can be capped between a price ceiling and a price floor to limit revenue procyclicality, establish a floor to ISA and State revenues, and to bound associated risks. The royalty rate can either be fixed or can be variable, tracking some agreed-upon financial benchmark. The tracked benchmark could include cumulative or daily production (at the risk of no profit with production), spot prices, an average over some defined period, or even a moving average international benchmark price (discussed below). Variable interest rate mortgages provide the model for such a variable *ad valorem* royalty rate payment regime.

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<sup>22</sup> Presently, the ISA exploration regime requires exploration contractors to pay an annual overhead charge (fixed fee) intended to recover ISA's administration costs. The fee may be adjusted, but is payable at the same rate for all contractors and is currently fixed at \$47,000.



Note: This diagram is not to scale and therefore does not show proper proportions.

(\*) Ad-Valorem Royalty is directly linked to the metal value of the polymetallic nodules.

(\*\*) LOSC, Annex III, Article 13 (3)

## Additional issues arising with an *ad valorem* payment regime

61. As discussed in Bellagio, another valuation issue arises due to choice of currency to value the revenues and fluctuations in these exchange rates that creates another source of risk to all parties. To minimize this potential currency risk, International Monetary Fund (IMF) Special Drawing Rights (SDRs), which is a basket of reserve currencies, could be used as a unit of account to value the revenues upon which the *ad valorem* royalty is levied.<sup>23</sup> If an actual global currency is desired, SDRs could be converted to U.S. dollars using an SDR to dollar conversion factor that is calculated using the Atlas conversion factor (used by the World Bank). The use of major reserve currencies or Special Drawing Rights limits any impact of large royalty inflows upon exchange rates (the so-called “Dutch Disease”).

62. The setting of the actual *ad valorem* royalty rate requires additional attention. Section 8 (Financial Terms of Contracts) of the 1994 Implementing Agreement stipulates that rates of payments to the Authority shall be within the range of those prevailing in land-

<sup>23</sup> Special Drawing Rights, or SDRs, an international reserve asset, are created by the International Monetary Fund, and valued and based on a basket of four key international currencies, the euro, Japanese yen, U.S. dollar, Chinese renminbi, and the UK pound sterling. SDRs can be freely exchanged for usable currencies. In addition to its role as a supplementary reserve asset, the SDR serves as the unit of account of the International Monetary Fund and some other international organizations.

based mining of the same or similar minerals to avoid conferring on deep seabed mining entities an artificial complete advantage or imposing on them a competitive disadvantage.<sup>24</sup>

63. The size of the *ad valorem* royalty rate requires further discussion and has a number of implications. A lower royalty rate starting from the beginning of commercial production (discussed below) – a lower or “light” royalty rate – can incentivize entry into the industry, because as discussed below, it provides an implicit subsidy under certain conditions. This implicit subsidy can be either “good” or “bad” from the overall perspective of the resource owner in ways discussed below. Moreover, maximum production is typically realized only after lower production in earlier years, which give limited profits, if any, during this time period.

64. The size of the royalty rate also bears upon risk bearing and risk tolerance for producers and the resource owner, and as discussed above, upon which parties bear the risk. A “light” royalty rate during early periods of production lowers risk to mining entities and shifts risk onto the ISA and CHM. A “light” initial royalty rate can incentivize faster production rates in the early years, because the royalty as a cost to producers falls. Higher earlier production may or may not impact the optimal rate of exploitation over the entire time period of the resource that maximizes expected net present value, depending upon size of rates, size and quality of the resource, risk tolerances, impacts upon industry entry, option value of waiting to produce, exploration, development of new technology, metal prices, input prices, and other factors. Certainly, a relatively higher initial rate of production for a limited exhaustible resource stock, all other factors held constant, leads to faster exhaustion of the resource and closure of the mine.

65. A question remains unanswered of when and how to measure the movement from the interim or “light” *ad valorem* royalty rate to the “full” *ad valorem* royalty rate. The point at which the payment regime switches from “light” to “full”, depending upon the length of the interim time period and how quickly the regime transitions, can create differential incentives for the develop and diffusion of new technology. Similarly, the royalty rates in both the “light” and “full” payment regimes and any policy instruments that may be imposed have different impacts upon the development and diffusion of new technology. Defendable justification as to how deep-sea minerals are special and differentiated compared to terrestrial minerals may also be a consideration with regards to incentives during a “light” period.

66. In effect, the “light” regime can potentially create a “good” subsidy for the first years to incentivize entry and innovation.<sup>25</sup> This subsidy is only “good”, i.e., enhancing of economic welfare, under certain conditions, and if these conditions do not hold, then the subsidy lowers overall economic welfare and is a “bad” subsidy. A “good” subsidy recognizes that early entrants bear higher costs and risk and that the innovator does not receive the full benefit of innovation even while bearing the full costs of innovation. That is, there are external benefits to the provision of new knowledge from provision of new technology and

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<sup>24</sup> However, this is not straightforward given that land-based rates vary substantially and ISA will need to set a royalty that is appropriate to the resource and business model, taking into account the various factors set out above.

<sup>25</sup> As discussed in the Workshop, an alternative to a “good” subsidy is to grant patents and licenses to the providers of new technology and exclusive rights to exploitation for providers of new knowledge about new information on resource abundance and quality.

conditions over financial feasibility, size and quality of the resource, and other factors that benefit all parties but that are paid for by only the provider of the new knowledge while others “free ride” on the innovator’s investment. When the knowledge provider pays for but does not receive the full benefits (including the external benefits) then there is economically sub-optimal provision of new knowledge. Moreover, even a “good” subsidy can be larger than the economically optimal and then become a “bad” subsidy past that point.<sup>26</sup> There may also be potential for dual subsidies to be realized both from the Area and from home countries e.g. tax credits to incentivize innovation.

67. As discussed previously, early entrants into the industry (first movers) face higher risks and costs than later entrants, but may also face greater opportunities. One intention of the payment regime is to create economic incentives for mining entities to enter into the industry and to start production (rather than simply “sitting” on their site and not producing at all or not producing at the full rate). The question arises with the “light” versus “normal” royalty period is whether this equally or differentially extends to all mining entities regardless of when they enter the industry. The UNCLOS confers no special advantage once a mining entity enters the industry, i.e., treatment is equal, and the principle is nondiscrimination. Hence, the same incentives and regulations apply to all mining entities, whether early or late entrants.

68. Limits to defining the “light” regime by years, as opposed to another criterion, were noted. Defining the “light” regime by years could potentially incentivize a “race to extract”, since mining entities will pay a lower rate on a higher volume of production and also benefit from a higher net present value by receiving revenues earlier rather than later. Such an extraction rate differs from the socially optimal rate of extraction and creates economic inefficiency. Again, the difference in discount rates (time value of money) to mining entities and the resource owner also comes into play in defining the socially optimal rate of extraction. The race to extract could also cause socially-ecologically excessive environmental damage for a number of reasons, which further lowers economic efficiency (broadly defined from the perspective of all of humanity and the CHM principle). An alternative to a fixed

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<sup>26</sup> Up to some level of subsidy, such a subsidy is a “good” or economic welfare-improving subsidy, also called a Pigouvian subsidy. Such a subsidy improves economic welfare if there are external benefits so that a public good, such as knowledge or technology (for mining and/or environmental mitigation), is under-produced. The subsidy then compensates the producing party that does not receive the full benefits of the technology it produces but that bears the full costs of development. The subsidy thus incentivizes the socially optimal level of production. Knowledge and information are public goods, and additional external benefits related to learning as experience is gained using the new technology (learning-by-doing) exist related to adoption and diffusion of the technology. Network externalities exist if a product becomes technologically more valuable to an individual user as other users adopt a compatible product. Network externalities mean that production costs can fall as with more users and higher production levels (i.e., dynamic increasing returns to scale). A welfare-enhancing subsidy could also be warranted to the extent that early entrants create knowledge, which is at least in part available to other producers, on resource abundance, quality, and availability (besides learning by doing about how to use the new technology). In this case, such knowledge can entail in part an external benefit from which other firms can gain but for which the early entrants do not receive full compensation. An increase in a firm’s physical capital stock leads to a parallel increase in its stock of knowledge, which is a public good with an external benefit that any other firm can access at zero or low cost and which creates “dynamic increasing returns”. Dynamic increasing returns over time lower the per unit costs of production. Knowledge external benefits also create a wedge between private and social returns to research and development. The discussion also noted that early entrants may mine the most economically profitable stocks of minerals that could increase the production costs of later entrants, and especially by developing countries.

time period for the “light” royalty regime while maintaining the implicit subsidy for early industry entrants is to define the switching point from “light” to “normal” as production levels or cumulative production levels that allow reaching economies of scale in production.<sup>27</sup>

69. Measuring mining entity break-even costs, at which full cost recovery occurs, is subject to the issues of obtaining and measuring costs, auditing, dispute settlement and enforcement, and other factors discussed above. Measuring mining entity break-even points is also subject to the problem of moral hazard and adverse selection under differing quantities and quality of information (asymmetric information) between the mining entity and ISA.<sup>28</sup> That is, with moral hazard some mining entities may, after the contract has been written, face the incentive to inflate or otherwise alter their costs to prolong the perceived time of break-even. With adverse selection, some mining entities may, prior to the contract has been written, inflate costs on some grounds, such as pointing towards an especially economically inefficient mining project. One approach (to mitigate the problem of defining and measuring breakeven) suggested was to define the break-even point, at which the *ad valorem* royalty regime switched from “light” to “normal”, as a fixed and a priori agreed-upon number of years. This approach however balances the trade-off between the resource owner receiving royalties earlier with a higher net present value (due to discounting and receiving revenues earlier) and the mining entities lowering risks and increasing profits by delaying the time of normal royalty (also benefitting from a higher net present value to money saved due to discounting and delaying payments). Ring fencing costs to a mining site or concession area becomes important when determining what is an allowable cost when allowing for break-even costs or a profit-sharing payment regime. The issues of a break-even cost and/or determining the date of first commercial production are critical to the establishment of an initial “light” royalty regime; this could, without resolution, lead to a single regime.

70. The resource owner and mining entities may also vary in their discount rates (due to different rates of pure time preference and generations in future likely to be wealthier than the current population), which in turn impacts the date of switching from light to full royalty payment. As a general rule, private parties (both firms and consumers) have a higher discount rate than society, which can also be compounded by different levels of risk.

71. Not fully discussed and requiring further attention is the basis of the size of the annual fixed fee and how it relates to the *ad valorem* royalty and any potential user charge for cost recovery within the fiscal regime. The relationship between the payment regime and the mining entities’ home State tax codes, tax credits, and other such issues may also require further attention.

<sup>27</sup> It was noted that under Article 82 of UNCLOS, royalty rates are defined by a time factor, commencing in the 6<sup>th</sup> year of production at a rate of 1%, rising by 1% each year until the 12<sup>th</sup> year and remaining at 7% for subsequent years of production.

<sup>28</sup> Asymmetric information arises because the risk-taking party to the transaction, here the mining entity (sometimes called the agent), knows more about its intentions and its costs better than the party bearing the consequences of the risk, here the ISA representing the resource owners (sometimes called the principle). Moral hazard (hidden action) may occur when the actions of one party with more information about its actions or intentions may change to the detriment of another party with less information after a financial transaction has taken place and/or after a contract has been written and implemented. Adverse selection (hidden information) may occur when the actions of one party with more information about its actions or intentions occur before a transaction.

73. Another area requiring further attention is the information needs corresponding to the optimum payment regime structure (subject to the needs of a simple and cost-effective regime). Such information includes cost information, auditing, and international tax and accounting codes that include agreed definitions and measurement of costs. Yet another area requiring further attention is the point at which the *ad valorem* royalty is levied, such as the point of first offloading or first third-party sale.

73. Additional topics not covered and remaining for discussion include: (1) whether or not prices underpinning the *ad valorem* royalty should directly and immediately track changes in the international benchmark prices; (2) whether prices used to calculate *ad valorem* royalty revenues should only partially track the international benchmark prices; (3) and whether these prices should track with a time lag and/or be smoothed over time, such as through a moving average calculated over an as yet undetermined time period.

74. Which metals in mined ore should be valued? One approach values mine gate ore by only the most commercially important minerals. An alternative approach values mine gate ore by the entire market basket of commercially important minerals. Different metals prices could be linked to the corresponding metals comprising the ore, i.e., its grade, weighted by the average metal content. In price indices, these contents are typically valued by their total economic value, comprised of both market and intrinsic values. This creates a producer price index with individual metals weighted by their proportion (share) in total metal content allowed (probably valued by market and intrinsic values). Different formulae exist, and most formulae allow for substitution of metals within the index over time as mine gate prices change. The index can be updated on a periodic basis, much like a consumer price index or GDP implicit price deflator. Metals within the mined ore that are not currently utilized but may be utilized in the future can also comprise the index. Following the CHM principle, these currently non-utilized metals contain an intrinsic value, but how to provide such a value requires further discussion. Their weight (share) in such an index, and the weight of all currently utilized metals, depends upon this valuation, since each metal's weight is its proportion of the total economic value (both the market value and intrinsic value).

75. Different formulae exist by which to measure the overall ore price index that incorporates the different metals contents, and further research on producer price indices will be required to inform the ideal price index formulae. Such an approach may not apply to all mining entities, which may not process all metals in the ores they mine, but it also creates incentives for full utilization of most metals mined (discussed below). Additional questions include who will set the formula, will it be set through an impartial process, by stakeholders or only the Legal and Technical Commission, a potential role for an Economic Planning Commission (stipulated in UNCLOS but not yet established), frequency of rate setting and review of the index, how to set the weights (e.g., time period of sampled ores to measure the relative proportions), and other issues. Appropriate penalties and fees for late payments of *ad valorem* royalties and a process to mediate and address appeals for such payments require further discussion.

76. The issue of how to define progressivity also arose. Progressivity could be defined in terms of revenue, thereby in accordance with an *ad valorem* royalty regime, rather than profit. A profit-based mechanism may lend itself better to progressivity than an *ad valorem* royalty, but as noted the profit-based mechanism was deemed inoperable on a practical basis, at least in the foreseeable future. The gains in technology -- that lower cost and boost

profits and may or may not impact revenues -- derive from the mining entities but are potentially shared between the mining entity and the resource owner. (The impact upon revenues and profits in part depends upon the responsiveness of mineral prices to changes in volumes and any impact upon volumes of production.)

77. How should the date of first commercial production be defined? The definition of this date can have several implications. The definition impacts the date at which the “light” *ad valorem* royalty and the higher rate of fixed fee commences. The definition can also create incentives for alternative mining entity actions and for smoothing out and lowering risks. For example, pilot projects generate ore that can be sold. Should this pilot production and/or lower initial production building experience and learning by doing prior to full production count toward commercial production, or can it be considered as part of the development phase that lowers producer risk and costs? Counting pilot production as commercial production could then delay the pilot phase of development, potentially raising producer risk and costs, delaying larger-scale production, and lower the net present value of the *ad valorem* payments (due to time discounting in which payments received at a later date are valued lower due to the time value of money).

78. Conversely, such an approach incentivizes moral hazard behavior through deliberately maintaining ostensible pilot production. Should the resource owner as part of the CHM share in all of the revenues, even those not explicitly intended for “commercial” production, since any input use should yield benefits for the resource owner? (The general opinion at the workshop was yes, although it may not have been unanimous.) Non-payment on pilot production under some circumstances could be interpreted as an implicit subsidy to incentivize industry entry and earlier production by lowering production risks.

79. A need for clear definition of the date of first commercial production, with little or no potential for manipulation or misinterpretation, was emphasized. Several options were raised. A simple definition is the first time the barge is filled up and the ore sold. Another and widely used definition is some agreed-upon percentage of production capacity.<sup>29</sup> Yet another definition raised was some level of revenue, which could be the amount sufficient to cover marginal costs or some other threshold amount. However, it must be emphasized the difficulty of the ISA to supervise such an approach.

80. How should commercial inactivity be defined and what are its implications? Commercial inactivity has a number of implications. The annual fixed fee is paid regardless. Commercial inactivity can also entail speculation, which was discussed with fixed fees above.

81. The right-to-audit impacts compliance and enforcement of royalties and the use of cost recovery. Auditing ore is for metal volume and content, the parameters upon which valuation is made. Practical issues are important. Points of ore transfer along the supply chain at which metals are valued are easier and cheaper to audit than auditing in member States. Auditing during the initial stages of the supply chain, notably transfer of ore from mining vessel to transport barge or port of (first) landing, represent natural points of valuation and auditing. Auditing higher in the supply chain must account for changes in

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<sup>29</sup> Capacity itself has a number of definitions and methods of measurement. A definition of capacity and its measurement is required. A potential resource for developing an approach based upon capacity is International Bar Association, Model Mine Development Agreement. <http://www.mmdaproject.org> (accessed May 27, 2016).

content and value due to processing, waste, transport costs, and other factors that affect value added and metal content.

82. Financial reporting can raise several issues. Financial reporting can be conducted according to International Financial Report Standards (IFRS), or the IFRS used as a standard by which develop ISA-specific standards. State-owned contracts could be reported in a different way from privately owned contracts.

83. Frequency of royalty payment and accompanying reporting to the ISA can occur at different rates. Every six months was considered reasonable for royalty returns. Annual reporting of statements and other related information to the ISA was considered reasonable.

84. Penalties remain an unresolved issue with multiple facets. For example, what type of penalty and interest payments apply to delayed payment? The IMF's Special Drawing Rate interest rate could be applied to late payments. Another example is an escalation procedure that ultimately could lead to termination when payments are not made.

85. Transparency of fixed and royalty payments to the ISA enhances overall economic efficiency and CHM payments. It also normalizes the conditions upon which State and non-State actors operate and could contribute to time consistency.

86. Benchmarks for future rates of payments and CHM's fair share were discussed. No clear principles upon which to set benchmarks emerged. The differences between DSM and land-based payment regimes and difficulty of comparisons were stressed. Also stressed was the nascent state of DSM industry, with technology still under development, high risks for early entrants into the industry without an industry that is proven to be technologically and economically feasible, nascent and uncertain payment regime and regulatory structure, required incentives to attract new mining entities and to development technology, little experience with multiple commodity price cycles, need to consider home country taxes and charges (such as for serving as a sponsoring State), and to allow for progression to full-scale commercial production. The need for more detailed discussion establishing some form of a future benchmark, a phased-in approach, and plan for a future target rather than an arbitrary target, were discussed.

87. Review of payment mechanism was discussed. The UNCLOS and 1994 Implementing Agreement both provide for the possibility of review of mechanisms as conditions change and experience is gained with the phased approach in the payment regime and the need to create an incentive for early entrants and investors, other elements of the payment regime and DSM. After a review, for example, the royalty rate might be adjusted as experience is gained, or an *ad valorem* royalty regime transitioned to a profit-based regime, or the type and length of any incentives for early entrants. The review can be on a periodic and regular basis. The discussion also included whether or not mining entities should also be reviewed on a periodic and regular basis, and whether or not early entering and later entering firms should be subject to different conditions and standards as discussed elsewhere. The discussion also considered whether guiding principles and thresholds should be set, and if reached whether other specifications of the payment regime begin.

88. While review is considered important, the need for a stable payment regime (time consistency) was also stressed to give mining entities a predictable business environment. DSM entails several production decisions over time. Each decision can be very difficult,

sometimes more so than previous ones, and each time period's previous costs are sunk costs. Predictability is what will drive the next investment decision. New technology must also be developed with accompanying high risk, and time consistency is required to contain the high risks. The importance of gaining experience over at least one and perhaps two mineral price cycles was raised innumerable times.

89. The difficulty in changing the payment regime in response to reviews was also raised in that all changes are the process of multilateral negotiations among member States. From this perspective, a stable and time-consistent payment regime is necessary.

90. What social discount rate should be used to calculate net present values? Measuring impacts, cost-benefit analyses, settling disputes, establishing royalty rates can all conceivably require time discounting of cash flows to obtain a net present value. A social discount rate for the Area is required. National discount rates and discount rates for development banks are not necessarily applicable since all of humanity is involved and the Area is beyond national jurisdictions.

91. What price deflator should be used to measure inflation? Analyses and payments are often conducted in inflation-free or "real" rather than nominal values. For example, fixed fees stated and paid in nominal values (current time period values that include changes in value due to inflation) have a purchasing power (i.e., real value) that declines over time. The ISA and CHM then progressively receive payment that declines over time in its purchasing power.

92. The calculated deflator pertaining to Special Drawing Rights is based on inflation measures of the economies represented in the basket of currencies that are used in SDRs. The SDR deflator is calculated as a weighted average of the GDP deflators of the countries comprising the SDR. Weights are the amount of each country's currency in one SDR unit. Both the composition of the SDR and the relative exchange rates for each currency change over time. The SDR deflator is first calculated in SDR terms, and if desired, can then be converted to U.S. dollars using an SDR to dollar conversion factor that is calculated using the Atlas conversion factor (national currency to U.S. dollar).<sup>30</sup> The weights vary over time with the composition of the SDR and relative exchange rates.

93. The SDR deflator is a broad measure of inflation for the economies comprising the SDR. This contrasts with a producer price index for metals and specifically for DSM metals but allowing for currency risk. An alternative to be explored entails calculation of an ISA DSM metals price deflator for a basket of currencies used in SDRs and corresponding metals prices or producer price indices from the countries comprising the SDR and weighted by the amount of each country's currency in one SDR unit. Producer price indices might need to be calculated in some instances. An alternative would use metals prices from global benchmarks and SDR countries to the extent that global benchmarks for metals are not in SDR countries, where weights would correspond to the national composition. In short, GDP deflators of the countries comprising the SDR would be replaced by metals producer price deflators in the SDR deflator.

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<sup>30</sup> The Atlas conversion factor for any year is the average of a country's exchange rate (or alternative conversion factor) for that year and its exchange rates for the two preceding years, adjusted for the difference between the rate of inflation in the country and Japan, the United Kingdom, the United States, and the Euro Zone. Presumably with the addition of the renminbi to the SDR, the rate of inflation for China is now included. A country's inflation is measured by its GDP deflator (an implicit price deflator).

## Conservation, prevention of waste, and high-grading

94. The workshop briefly discussed conservation of the mined resource, prevention of waste, “high-grading”, and how the payment regime takes these topics into consideration. Because of their inherently difficult location on the seafloor, it is expected that: (1) it will be very difficult to achieve optimum levels of mineral recovery (from a total resource perspective) within a given deposit area and (2) dilution of the ore will be a problem in marginal areas of any deposit. Nonetheless, lower grade or more inaccessible resources can be left for future generations that may have better technology to exploit the lower grade or more inaccessible resources. Moreover, DSM differs from land-based mining on the ability to sterilize ore. DSM does not have veins or chutes and the overburden question on land when sterilized, and hence the issue may be absent for DSM.

95. Based on available deep-sea information and experience gained from relevant land-based mineral developments, DSM can be expected to proceed sequentially from: (1) relatively small but high-grade areas with a rapid payback to (2) a limited, but significant number of large and high-grade occurrences to (3) similar-sized deposits but of relatively low grade.

96. “High-grading” is mining the highest concentration or higher valued metal content to maximize profits and minimize costs over a short time period, while not mining or leaving as waste lower grades of ore. High-grading depends upon the resource. High-grading for polymetallic nodules pertains to abundance and as such may not even exist as whilst mining high abundance areas, the contractor is not “destroying” low abundance areas. High-grading for polymetallic sulfides pertains to the quality or grade of metals of the ore and as polymetallic sulfide deposits are heterogeneous, high-grading may happen when the contractor mines high quality ore and in the process “destroys” low quality ore. However, high-grading is fundamentally an economic decision.

97. There can be sound economic reasons for high-grading the deposit. If the operational costs of mining are very high, for example, mining only the highest-grade portions of the deposit may be the only economically feasible alternative. Economically, this can be viewed as mining a deposit with a high cut-off grade. The position in the commodity price cycle, current and expected future state of technology, depth of the ore for some resources, and other factors also impact the economic decision on the cut-off grade. What appears to be high-grading and waste over a longer time period may simply be the sequential mining of different areas that yields the highest net present value. Full removal of a resource is also not necessarily ecologically beneficial. With polymetallic nodules, for example, leaving some nodules in an area facilitates recovery, since flora and fauna remain to seed the area, and many of these may require the hard substrate provided by the nodules. Moreover, the protection of the marine environment is also part of the CHM, not just the minerals removed and their payment stream.

98. High-grading has a number of implications. Starting with high-grade areas can also impart a smaller impact upon ecology, and lowers the costs and can potentially increase the rate of learning by doing with new technology by starting sooner than otherwise. Starting with high-grade areas also increases the revenues in the early period (provided the valuation of the ore reflects this), and when coupled with discounting, increase the net present value of the cash flow and thereby CHM payments. If the ISA controls enough area to impact price, then conservation becomes, in part, an economic question of controlling

supply and thereby price. There are also costs to the ISA by pricing quality. Eventually, an Economic Planning Commission can monitor supply and demand and can constrict supply to influence price and thereby CHM payments.

99. Divergent views were expressed on high-grading, but the general trend was that production decisions should be left to the mining entity. Any environmental issues related to waste and high-grading should be left to environmental policy instruments rather than through the payment mechanism. The resource issue of optimal timing and ore grade to extract relates to the payment regime.<sup>31</sup>

100. Specification of the payment regime, along with current status of minerals markets and state of technology, also creates differing incentives to high-grade and prevent waste. For example, the payment regime specification may impact the timing of the mine shut-off and choice of areas to mine that contain more marginal deposits. Alternatively, the payment regime might set differential royalty rates according to ore grade and even area mined, where a lower royalty rate corresponds to a lower grade ore. The payment regime could set a threshold for minimum extraction from areas with high ore abundance and quality. In contrast to land-based mining, revisiting a reserve for recovery at a later date may not be economically feasible. Some expressed that extraction should be of average balance grade. Incentives should also satisfy additionality. That is, incentives should only apply to activities mining entities would not otherwise do. For example, might be willing to revisit a site in the future under conditions of improved technology, lower costs, or higher market prices, and any additional favorable conditions provided through an incentive, such as a “good” subsidy, would not change mining entity behavior.

101. Relinquishment clauses to mining contracts can also comprise part of the payment regime to incentivize ‘whole-of-deposit’ mining. Mining entities would relinquish areas which they think contains insufficient ore grade, and the ISA might retender to other mining entities or set aside for conservation. The ISA requires progressive relinquishment with exploration contracts for all three resources. Unresolved in relation to the exploitation regime is the initial size of the exploitation contract area and whether or not mining entities are permitted to immediately mine all of the area or progressively mine the area subject to satisfying environmental and operational standards.

### **Land-based producer compensation**

102. The nature by which land-based producers of the same minerals that are affected by DSM receive compensation if they receive a lower price or these land-based producers are displaced from the market was discussed. The impacts of changes in relative prices, called a pecuniary externality, do not alter the level of economic welfare but merely redistribute it among the different parties involved when all parties receive equal importance. Impacts upon land-based mining firms from changes in relative mining prices due to changes in supply from DSM are therefore pecuniary externalities and do not affect the level of economic welfare, only its distribution, when all parties receive equal importance. The

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<sup>31</sup> The associated cost is called the user cost. If an exhaustible resource is extracted now, the opportunity to extract it in the future is foregone. The economic value of this lost opportunity for future profits is the user cost, i.e., the user cost is the opportunity cost of producing now instead of in the future. The marginal user cost is the opportunity cost of producing one more unit of ore. Under static technology, each additional unit of production has a higher marginal user cost than the previous unit, so that the marginal user cost is increasing with total production.

exception to a changing level of welfare occurs if the adversely impacted parties are deemed more important (i.e., have higher welfare weights) than the benefiting parties, in which case there is a net loss in economic welfare. The conventional approach attaches equal weight to all parties, but developing countries with adversely impacted land-based mining receive a higher welfare weighting under the 1994 Agreement, in which case a decline in overall economic welfare is expected. Developing country owned DSM would similarly receive a higher welfare weight when evaluating the net benefit impacts of relative price changes. Compensation for this net loss in economic welfare of developing States is provided for as “Economic Assistance” in the 1994 Agreement together with principles for its application. The ISA is required to establish such an economic assistance fund.

103. Whether or not increased DSM mining displaces land-based production depends upon whether or not the incremental DSM production is an addition to existing production (an increment to supply), in which case there is no displacement of existing land-based or DSM production. DSM production may displace existing land-based production due to greater economic efficiency (lower costs). DSM production may also both increase overall supply and displace existing land-based production. Even with displacement, overall net benefits increase, although there are both gainers and losers. The increase in economic benefits may also exceed the increase in accounting profit. The picture is complicated if the higher costs incurred by a displaced producer could be due to environmental mitigation. The question of compensation arises when DSM mining displaces land-based mining for developing States.

### Environmental charges and issues

104. The payment regime is part of a total package that also includes the environmental responsibilities of mining entities and the ISA. Creation of incentives cannot separate payments and environmental responsibilities.

105. Environmental damages from seabed mining, which create an external cost, are unlikely to receive substantive remediation, if at all, due to the deep-sea nature of the resource and the nature of deep-sea ecosystems. (External costs are costs borne by society but not borne by producers or consumers of the final product.) Without remediation, mining entities do not bear corresponding remediation costs, as they are normally supposed to do on land, at least in the foreseeable future; it may become economically and technically feasible in the future.

106. Environmental damage can also create liabilities that are both known and unknown. Known environmental damage can be addressed by an environmental charge that differs from the *ad valorem* royalty and should be kept distinct. The environmental charge receipts can be placed into an environmental fund (or sustainability fund) that is distinct and ring-fenced from the royalty receipts.<sup>32</sup> The unit-based or *ad valorem* royalty is due to payment for exploitation of the “publically owned” (i.e., by humanity, in the Area) exhaustible resource, whereas the environmental charge and fund represent payment for the environmental damage (“internalizing the external cost”). These two purposes are completely distinct and should not be conflated.

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<sup>32</sup> Such an environmental charge is called a Pigouvian charge. A Pigouvian charge is priced at the marginal external cost and increases economic welfare.

107. The environmental charge receipts may be used to fund, for example, activities that benefit the Area and improve management of its marine environment and which ultimately protect and preserve the marine environment, including vulnerable marine ecosystems and ecologically or biologically sensitive areas. Accepted international principles and best-practices for such offsetting actions favour conservation that is as close as possible in ecological equivalence to the environmental damage (i.e., ‘like-for-like’ rather than ‘out-of-kind’) and that address residual impacts following the avoidance, minimization, and remediation steps of the conservation mitigation hierarchy. Open questions include the type of offset, offset unit of account (currency or the definition and measurement of the damage and appropriate valuation approaches e.g. for intrinsic value), uncertainty through offset multipliers, offset duration, how to discount future effects, the basis upon which to set the environmental charge, and the administration of the environmental fund and offsets. Monitoring and compliance are additional concerns including who is responsible for undertaking and if they are required to meet both ISA and compliance requirements for adjacent EEZs in particular for issues of a transboundary or mobile nature. Other issues include whether the offsets should be realized ahead of time for predictable impacts, should only achieve ‘no net loss’ or instead aim for a ‘net gain’ and also whether the offsets pertain to only the residual impacts after all other steps in the mitigation hierarchy have been followed to the maximum extent practicable and accounting for risk or whether the offsets offer lower-cost and/or higher risk-adjusted ecological returns and not only for minimizing residual impacts. There may be potential for tradable pollutant rights and or biologically linked performance limits within a mining area and subject to scientific information on environmental tolerances in a similar manner to terrestrial water quality management for catchments – and thus also incentivizing the improved environmental performance of operators e.g. suspended solids. If there is potential for irreversible damage, or potential endemic species extinctions recognized that there may be a requirement as part of an environmental management and monitoring plan to maintain minimum areas; however this would need to be protected in terms of property rights i.e. sterilized area not for future exploitation.

108. The potential impact on existing commercial fisheries and the potential for future deep-sea fisheries was also highlighted as a consideration for ecosystem products and services potentially impacted by DSM activities e.g. habitat. Further work may need to be done to clarify property rights and/or compensation mechanisms in the Area.

109. Liability for environmental damage was also discussed, including unknown liabilities and strict liability rules and negligence rules. Both assurance bonds and insurance, whether private or administered through the ISA, as discussed in greater detail below, provide a means of ensuring that funds are available to meet possible remediation measures needed due to unanticipated, unintended or extreme environmental impacts. A liability fund, as suggested by the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea (ITLOS) in the Seabed Mining Advisory Opinion, is also further discussed below.

110. A related issue arises with environmental impact. If DSM production is an addition in supply, then there is no environmental gain from reduced adverse land-based environmental impact. If DSM displaces land-based production, then any environmental gain from reduced adverse land-based environmental impact is weighed against the increased adverse DSM-induced environmental impact. Defining ‘like-for-like’ or how to

compare environmental impacts, including even deep-sea to terrestrial, pose considerable difficulty.

## **Environmental bonds**

111. Environmental bonds are economic instruments commonly used in environmental management. Environmental bonds are also known as assurance bonds. Environmental bonds typically require the resource user to place a sum of money up front prior to mining that is equivalent to the potential damage that the activity can have on the environment or more commonly the cost of its remediation. In contrast, money is refunded if there is not an incident. The bond can be refundable, provided the damage is not incurred, or is repaired or mitigated by the resource user through, for example, offsets. Because environmental bonds require the resource user to place a sum of money equivalent to the potential damage of an activity or to the cost of its remediation, they place a price on the environmental damage (external cost). Their rationale is to secure compliance with environmental regulations, best environmental practice, and adequately discharge responsibilities. The implied property right is the “polluter pays”. Environmental bonds are similar to strict liability.

112. The bond can take a variety of forms: cash deposit, parent company guarantee, State guarantee, financial institution letter of credit and associated investment grade of any issuer. Cash bonds are preferable. The terms of its release and what can be deducted against the deposit must be established. Commercial operators generally prefer commercial insurance against bonds.

113. Performance bonds are sometimes distinguished from environmental bonds. Environmental bonds generally focus on closure costs. Performance bonds can provide a general performance guarantee or security for other obligations in the Plan of Work. The requirement may depend upon the applicant’s financial viability and capability.

114. Environmental bonds have several advantages. They can provide strong incentives to reduce impacts, have potentially low administrative costs, and generate funds for compensation even if mining entities are subsequently declared bankrupt or insolvent. Environmental bonds also have several disadvantages, including high risk and high up-front costs for mining entities, uncertainties in determining the value of the environmental damage and hence difficulty in setting the magnitude of the bond, and an uncertain impact upon the mining entity.

115. A number of issues need to be resolved before they are implemented. One corresponds to clearly defining the purpose for which the performance guarantee bond will be used, such as abandonment prior to closure and post-closure activities. However, with DSM and assuming there is no rehabilitation, other applications include post-monitoring obligations, emergency response guarantee, and liability for economic damages. Another question pertains to how to determine the form of guarantee. Should the guarantee be cash or financial (security), where cash is generally preferred? Is cash paid as a lump sum or by installment? Criteria for return must be established. It is necessary to consider liability and other mechanisms under other regimes and establish a viable model. The interaction of bonds with insurance, such as for accidents, must be considered. As part of the application process, the bond could be site and risk specific.

116. As a contract, environmental bonds are subject to the problems of different quantities and quality of information between the mining entity and the ISA (i.e.,

asymmetric information), where the mining entity holds more information. This asymmetric information can lead to a problem of adverse selection prior to writing the bond. For example, the mining entity might only place sites with lower levels of expected environmental damage if the bond is required but not well enforced, or the bond might not be written to include the worst forms of environmental damage. Moral hazard, which arises after the bond is written, could arise if the mining entity fails to reveal the full cost of the environmental damage and monitoring is not well enforced.

## Funds

117. In addition to environmental bonds, the broad objectives and rationale for two possible funds were also discussed, namely an Environmental Liability Trust Fund and Seabed Sustainability Funds. The proposal for two funds arose from the draft legal framework issued by the LTC. Though the concept behind the funds received general support, there has not been any further work performed in connection with these to date.

118. The Environmental Liability Trust Fund, identified by the ITLOS, is intended to cover the environmental liability gaps identified by the ITLOS. Funding, use of funds, interaction with performance guarantees are all issues requiring resolution together with a review of existing models. It was also highlighted at the workshop that the Convention does not provide for a strict liability regime. Two issues arise here: (1) jurisdictional competences, so that it is clear who is responsible for what and (2) responsibility and liability in an international setting.<sup>33</sup>

119. The idea for the Seabed Sustainability Fund sprang from the United Kingdom Marine Aggregates Sustainability Fund, entailing research on the effects of dredging activities plus the promotion of the best environmental practice. The fund was funded by a levy on extraction and is not a liability fund *per se*. Funding is an area of contention. It aims to facilitate research into marine ecosystems, increasing understanding of effects, including cumulative impacts of activities, and efficient and safe resource extraction. These aims are highly relevant to deep-seabed mining, where additional research is badly needed to understand impacts and develop more sustainable extraction technologies. Two issues arise: (1) one of jurisdictional competencies, so that it is clear who is responsible for what and (2) further discussion over responsibility and liability generally in the Area, it being noted that the UNCLOS does not provide for a strict liability regime.

## Incentive-based environmental policy

120. Incentive-based environmental policy and policy instruments were discussed. Alternative policy objectives include: (1) reducing the likelihood and magnitude of environmental damages in a cost-effective (least-cost) way and (2) providing funds for restoration and compensation. Different policy instruments provide differential impacts. The alternative policy approaches reviewed were: (1) regulation, including up-front requirements; (2) environmental fees; (3) liability; (4) required insurance; and (5)

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<sup>33</sup> It has been suggested that a workshop be held later in the year to consider issues arising from jurisdictional competencies. Responsibility and liability is also a Priority Deliverable for the ISA Council / LTC. Additionally, the ISA has issued a discussion paper in respect of dispute resolution: *Dispute Resolution Considerations Arising Under the Proposed New Exploitation Regulations* as the first paper in a series of discussion papers to support the development of the Mining Code (available at <https://www.isa.org.jm/legal-instruments/ongoing-development-regulations-exploitation-mineral-resources-area>).

environmental bonds (which were discussed in detail above). The approaches differ in terms of: (1) types of incentives they create (for care per unit of output and scale of activity or extent of operation); (2) cost to the mining entity and implied property rights (implementation of the “polluter pays principle”); (3) allocation of risk (financial and environmental); (4) generation of funds for restoration and compensation; and (5) administrative costs (including monitoring). Which of the policy approaches is best and whether or not approaches should be combined remains to be addressed. We review each of the policy approaches in turn.

121. With regulation, the implied property right and costs is “shared” in that it implies a partial polluter pays principle. That the mining activity does not bear its full social costs implies that the activity level is higher than socially-ecologically optimal. The advantages of regulation include the known impact on mining entity behavior if it is compliant, low levels of risk for mining entities, and relatively low administration costs. The disadvantages of regulation are the absence of funds for compensation, thereby entailing a large risk for society, and no incentive for the mining entity to exceed its regulatory-compliant behavior.

122. With environmental fees, the implied property rights and costs are the polluter pays principle. Mining bears its full, expected social-ecological costs. Furthermore, if the environmental fee is targeted directly at the damage, the mining entity also has an incentive to develop and use more advanced technologies that minimize the environmental damage (and so minimize the fees paid). The disadvantages of environmental fees enter if the fee cannot target the damage directly (for example due to uncertainty or inadequate ability to measure damages). In this case the fee would target only the overall scale of mining, and so may not adequately incentivize less damaging technologies. Generally, environmental fees should be set at a level that corresponds to the size of environmental damage. Distinguishing the environmental (Pigouvian) fee from the royalty charge may pose a challenge in this setting. Environmental fees generate revenue, and the most effective impact from its distribution poses a question to be resolved. The revenue generated from the environmental fee could be used to reduce some of the environmental damage that occurs or could be applied to another environmental project as an offset. (Fees of this type can create what is called a “double-dividend,” where the first dividend is the environmental gain in the sector paying the fee and the second dividend is the benefit from applying the revenue to another beneficial activity.) Finally, some or all of the revenue from the environmental fee could be distributed alongside revenue from the royalty, representative of the idea that losses in environmental quality also draw from the CHM.

123. With strict liability, the implied property rights and costs are the polluter pays principle. Mining activity bears its full actual social costs, which implies that mining is at its socially-ecologically desirable level. The advantages of strict liability include strong incentives for care and innovation, administrative costs that are mainly ex post facto, and full generation of funds for restoration and/or compensation provided the courts are able to identify damages and compel the mining entity to pay. The disadvantages include high level of risk for mining entities and reduced incentives for environmental care if the firm is “judgment-proof” such that it can avoid liability (e.g., because of limited assets or bankruptcy).

124. With negligence rule liability, the implied property rights and costs are shared, implying a partial polluter pays principle, and no responsibility for residual damages. Mining is not subject to its full social-ecological costs, which implies mining at a level higher than

socially-ecologically desirable, similar to regulation. The advantages include an incentive to comply with due standard of care, with a known impact on mining entity behavior if non-negligent, and low risk.

125. An insurance requirement has implied property rights and costs of the polluter pays principle. These costs include both the direct costs of mining plus the external costs related to environmental damage, i.e., costs that the mining entity does not bear but humanity does. When mining bears the full expected environmental cost, then the scale of mining is at its socially desirable level. The incentives of insurance to alter mining entity behavior to account for the external environmental cost depend upon how the premiums are set. An insurance payment that is set “too low” incentivizes a scale of mining production beyond the social optimum, whereas an insurance payment set “too high” incentivizes a scale of mining lower than the social optimum. Insurance always has a potential moral hazard problem, meaning that after the insurance is issued, the mining entity has incentives to be less careful because insurance covers the environmental damage. For this reason, insurance may contain a deductible clause, so that mining entities must first pay an agreed-upon amount prior to receiving insurance payments. This moral hazard can thus incentivize mining entities to be less careful unless the insurance contract contains provisions to counter this inherent incentive. Insurance lowers the level of risk for mining entities, potentially lowers administrative costs, and potentially generates funds for compensation, even if mining entities are judgment-proof (e.g., bankrupt), and covers problems even if the mining entity has exited the industry.

126. When using multiple policy approaches, whether they are substitutes or complements impacts the outcome. Examples of possible policy substitutes include regulation and the negligence rule, fees and strict liability, strict liability and required insurance, double charging mining entities for environmental substitutes, and redundancy and double penalties. Complements can become more effective when combined as the policy strengths reinforce one another. Examples of possible complements include regulation and environmental fees, regulation and strict liability, regulation and required insurance, and environmental fees and a negligence rule (inducing non-negligent behaviour).

127. Key questions that can drive further discussion and debate in connection with environmental considerations in connection with the DSM regime development could include:

- i. How will environmental damage be valued for purposes of damage compensation, fee, bond or fund assessment? Will environmental valuation focus on ecosystem services? biodiversity? Or some other metric?
- ii. What policy approaches provide strong incentives for reductions in environmental damages from DSM, i.e., which create strong incentives to reduce the likelihood that there will be no “serious environmental impacts” (however that is defined)?
- iii. How should funds that might be needed for redress or compensation be financed? Should this be based on the “polluter pays principle” or some sharing of costs between contractors, sponsoring States, the ISA and society?
- iv. Should environmental risks be borne entirely by contractors or shared between contractors and society? (Note: the allocation of costs and the allocation of risks are potentially two different things. For example, an

environmental fee could impose full (expected) costs on contractors but little risk, because the amount of the fee that would have to be paid would be very predictable. Conversely, strict liability imposes full (actual) costs, but also significant risk, since the amount for which the firm would ultimately be held responsible is unknown *ex ante*).

- v. What approaches (e.g., regulation, environmental fees, liability (strict or negligence-based), insurance, bonds), used either individually or in combination will best achieve the desired incentives, allocation of costs, and allocation of risks?
- vi. If fee-based, what should the fee be based on, i.e., a fee per unit of what?
- vii. If liability/insurance/bond-based, what threshold or “event” should trigger contractor responsibility? (Note: the trigger needs to be something that can be monitored/observed/measured.)
- viii. To what extent are different approaches substitutes or complements?
- ix. Environmental bonds / performance guarantees: rationale / purpose; criteria; form of bond / guarantee; interaction with insurance / funds.
- x. Potential differences for addressing environmental issues between polymetallic nodules, massive sulphides, and cobalt crusts.
- xi. Allocation of the responsibility, cost and liability for monitoring and enforcement activities and including for potential transboundary pollutant impacts.

128. The following questions and issues also arise for discussion at a future workshop:

- i. Parameters to defining the date of commencement of commercial production.
- ii. Progressivity of profits, royalties, etc. What does this mean, what criteria, how to measure?
- iii. Different formulae exist by which to measure the overall ore price index that incorporates the different minerals contents, and further research on producer price indices will be required to inform the ideal price index formulae.
- iv. Information needs corresponding to the optimum payment regime structure (subject to the needs of a simple and cost-effective regime). Such information includes cost information, auditing, and international tax and accounting codes that include agreed definitions and measurement of costs and cost recovery/break-even costs.
- v. Point at which the *ad valorem* royalty is levied, such as the point of first offloading or first third-party sale.
- vi. Whether or not prices underpinning the *ad valorem* royalty should directly and immediately track changes in the international benchmark prices and the administrative mechanism(s) to achieve this in practice.
- vii. Whether prices used to calculate *ad valorem* royalty revenues should only partially track the international benchmark prices.
- viii. Whether these prices should track with a time lag and/or be smoothed over time, such as through a moving average calculated over an as yet undetermined time period.
- ix. Which metals in mined ore should be valued?

- x. How should these metals be valued? What is the role of both market and intrinsic values and how should they be measured and these measures used?
- xi. Currency-exchange rate risk: how should it be measured and addressed?
- xii. Social rates of discount: what social discount rate should the ISA use and the context of their application.
- xiii. Price deflators (for inflation): what price deflator to obtain inflation-free measures of revenue and costs be used?
- xiv. The size of the fixed fee from the date of commercial production and the basis for the size of the fee.
- xv. The size / range of the *ad valorem* royalty rates, including an initial “light” rate and a later “normal” or “full” rate
- xvi. When and how to measure or determine the movement from the interim or “light” *ad valorem* royalty rate to the “full” *ad valorem* royalty rate
- xvii. *Ad valorem* royalty rates that are constant over time and the commodity price cycle versus *ad valorem* royalty rates that vary directly with the commodity price cycle.
- xviii. Variable royalty rates require agreed-upon financial benchmark. What is this financial benchmark?
- xix. Price ceilings and price floors for royalty: should they both be used, should only one be used and if so which one, and price ceilings and or floors are used at what level should they be set? Strengths and weakness, impacts upon risk for mining entities.
- xx. Types of payment regimes that might vary between polymetallic nodules, seafloor massive sulphides, and cobalt-rich crusts.
- xxi. The workshop proposed to construct a financial model to further test the concept developed in the diagram. (The workshop noted the need for current financial and other data and information (resource estimates, capital expenditure, operating costs etc.) in order to model scenarios reliably and to make appropriate recommendations).
- xxii. Inter-generational equity, sustainable development and the Common Heritage of Mankind.
- xxiii. Considerations arising from a discussion of a payment mechanism as they relate to a future disbursal mechanism.
- xxiv. Transfer of contracts: consideration as to whether the ISA should capture (by way of a transfer royalty or share) the value realized on the sale or disposition of a contract for exploitation (and perhaps exploration) to third parties.
- xxv. The application and practical use of SDRs.
- xxvi. Consideration of categories of monetary penalties for contract violations.
- xxvii. A separate, multidisciplinary (economists, ecologists, lawyers) discussion is needed on environmental damage compensation mechanisms.

## Annex: List of Participants

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## Table 1. Technical Aspects of Payment Regime Implementation

This Table 1 was presented to workshop participants as a summary of the points raised by the ISA Discussion Paper 2015 on developing a payment mechanism in the Area. It formed the basis for a number of discussions reflected in this Report. The Table also includes highlights from submissions made by various stakeholders to the ISA discussion paper.

	Para. /(Page) ISA 2015	Heading	Issue (extracts) from ISA 2015	Stakeholder responses - highlights	Comments/ Recommendations
<b>A. Regulations – General Approach / Principles / Administration</b>					
1.	32 (20)	Standard financial terms	Applied <b>consistently and uniformly</b> across the Authority's contractor base? <b>Standard term(s)</b> as opposed to their individual negotiation?	<ul style="list-style-type: none"> <li>Fairest, but differentiate between early and later entrants: risk, uncertainty etc. – general theme (C)</li> </ul>	<ul style="list-style-type: none"> <li>Is this statement valid?</li> <li>Is there any rationale for departure?</li> </ul>
2.	54 (25)	Predict-ability	Establish an appropriate, <b>target benchmark</b> for the CHM's fair share (e.g. a percentage of accounting profits, as defined).	<ul style="list-style-type: none"> <li>Establish benchmark, say 10 years from commercial scale production (C)</li> <li>Yes, but base on CHM principles not land-based (G)</li> </ul>	<ul style="list-style-type: none"> <li>Set a target benchmark in principle?</li> <li>Further work required if recommended in principle</li> </ul>
3.	55 (25)	Review of mechanism	Modification / review of the payment mechanism every 5-years. Certainty in contract terms versus transitional mechanism may result in "early" contracts for exploitation benefiting from a lower payment burden to the CHM. It may shift profits from the CHM to a taxing State.	<ul style="list-style-type: none"> <li>Review contracts after 10 years or 5 years after first production (G)</li> <li>No changes in first 10 years following CP (C)</li> <li>Grand-fathering clauses in early contracts (C)</li> <li>Regulatory stability for first 20 years (C)</li> </ul>	<ul style="list-style-type: none"> <li>Options / recommendations for incorporating a review mechanism need to be discussed.</li> </ul>
4.	33 (20)	Phased approach	Adopt transitional approach. Defining absolute parameters now puts risk on both ISA and contractors. But establish guiding principles toward development?	<ul style="list-style-type: none"> <li>Yes, but clear royalty structure during a defined period e.g. 20 years to attract early capital. Review after first few years of commercial production but apply to new contracts (C)</li> <li>Yes, lighter royalty regime for contracts concluded within 10 years of regulations coming into force (C)</li> </ul>	<ul style="list-style-type: none"> <li>Links with Review of Mechanism and Predictability above.</li> <li>Discuss principles / rationale for phased approach.</li> </ul>

	Para. /(Page) ISA 2015	Heading	Issue (extracts) from ISA 2015	Stakeholder responses - highlights	Comments/ Recommendations
			from processing waste. How can / should this be monitored and payment accounted for to the Authority?	of whether they are extracted at a later stage (NGO)	
7.	61 (26)	Trigger points	What will trigger a royalty payment e.g. “all Minerals produced, saved and sold or otherwise disposed of from the Mining Area”.	<ul style="list-style-type: none"> <li>Achieve consensus on a common value per tonne (C)</li> </ul>	<ul style="list-style-type: none"> <li>Should apply to ore recovered from Area i.e. sold or removed for whatever purpose.</li> </ul>
8.	63 (26)	Thresholds	A <i>de minimis</i> threshold?	<ul style="list-style-type: none"> <li>Should consider royalty / profit-free thresholds (C)</li> </ul>	<ul style="list-style-type: none"> <li>Consider at a later stage.</li> </ul>
9.	64 (26)	Transfer pricing	Regulatory provision for transfer pricing and general anti-avoidance?	<ul style="list-style-type: none"> <li>Reference / norm price will be evident in the medium / longer term (C)</li> <li>Assess at point of first offloading / establish range of values with respect to average grade of ore.</li> </ul>	<ul style="list-style-type: none"> <li>A standard transfer pricing regulation can be drafted including the ability of the ISA to adjust to an arms'-length value. Transfer pricing issues also a consideration for the determination of the payment mechanism.</li> </ul>
10.	65 (27)	Reporting	Return / payment: 6 monthly	<ul style="list-style-type: none"> <li>Consider 12-monthly reporting (C)</li> </ul>	<ul style="list-style-type: none"> <li>Half-yearly reporting periods with 90 day return / payment period would seem appropriate.</li> <li>Information to be submitted / format of return can be determined at a later date.</li> </ul>
11.	66 (27)	Penalty	Overdue payments / escalation procedures toward suspension / termination	<ul style="list-style-type: none"> <li>Consider land-based examples + grievance mechanism (C)</li> </ul>	<ul style="list-style-type: none"> <li>Interest should be charged: use Special Drawing Rights interest rate + increment?</li> <li>Penalties for: under declaration or underpayment / failure to deliver or furnish a royalty return / false royalty returns and information. Can be best on existing best practice + administrative appeals mechanism.</li> </ul>
12.	67 (27)	Transparency	EITI-style adoption in respect of payments made / received		<ul style="list-style-type: none"> <li>Concur in principle?</li> </ul>
13.	68 (27)	Right to audit	General right. But practicalities need to be considered. States assistance / exchange of information.		<ul style="list-style-type: none"> <li>Right to audit and audit inspection provision by the Authority's duly authorized representative can be drafted.</li> </ul>
14.	69 (27)	Financial reporting	IFRS recommended. But specific policies required for DSM	<ul style="list-style-type: none"> <li>IFRS adoption (C)</li> </ul>	<ul style="list-style-type: none"> <li>Specific books and records in conformity with IFRS will need to be detailed.</li> </ul>
15.	70 (27)	Ring fencing	Applicability in a DSM context.	<ul style="list-style-type: none"> <li>Yes but look at operations where different mining areas seeking to attract an average balanced grade (C)</li> </ul>	
16.	71 (28)	Commercial inactivity	Surface rent during periods of inactivity?	<ul style="list-style-type: none"> <li>No payment to Authority. Consider a surface rent during periods of high metal prices where evident contractor choosing to sit on a tenement (C)</li> </ul>	<ul style="list-style-type: none"> <li>Need to consider nature of “inactivity”. Annual fixed fee to continue during “inactivity”? Prolonged activity may lead to suspension / termination.</li> </ul>
<b>B. Timing of Payment Mechanisms</b>					
17.	46 (23)	Commencement	Royalties from date of CP?	<ul style="list-style-type: none"> <li>At start of CP is fair (C)</li> </ul>	<ul style="list-style-type: none"> <li>General principle that royalty liabilities</li> </ul>

	Para. / (Page) ISA 2015	Heading	Issue (extracts) from ISA 2015	Stakeholder responses - highlights	Comments/ Recommendations
		of payment		<ul style="list-style-type: none"> <li>From CP but royalty free / low royalty for 10 years from CP; adjustment thereafter based on pre-determined criteria</li> <li>Grace period (5-7 years) desirable (C)</li> </ul>	commence from date of CP.
18.	47 (23)	Commencement of production	Establish clearer criteria for date of commencement of CP?	<ul style="list-style-type: none"> <li>Operating at large-scale / equipment fully commissioned (C)</li> <li>Potentially grey area: consider production timeframe over defined period</li> <li>Unit-based: capacity reaches design-scale; ad valorem on sales revenue</li> </ul>	<ul style="list-style-type: none"> <li>Criteria for commencement of CP?</li> </ul>
19.	52, 53 (24)	Recoupment of investment	Methodology of recoupment of investment and applicability to payment mechanism requires further consideration.	<ul style="list-style-type: none"> <li>Needs early consideration (C)</li> <li>To consider additional incentive mechanisms e.g. accelerated depreciation</li> <li>Potential for manipulation / additional costs to administrator</li> </ul>	<ul style="list-style-type: none"> <li>Methodology and applicability requires discussion.</li> </ul>
<b>C. Valuation and Valuation Points</b>					
20.	31 (20)	Intrinsic value	Target value at intrinsic value?	<ul style="list-style-type: none"> <li>Clear transparent market pricing valuation desirable (C)</li> <li>Should not include value add such as processing (C)</li> </ul>	<ul style="list-style-type: none"> <li>How to determine intrinsic value?</li> </ul>
21.	39, 42, & 43 (21-22)	Valuation	Valuation point: preference for point of third party sale + auditable. Valuation ( <i>consider under royalty options</i> )	<ul style="list-style-type: none"> <li>At point of offload from production vessel to bulk carrier for royalty (C)</li> <li>Requires further research (C)</li> </ul>	<ul style="list-style-type: none"> <li>In terms of a royalty mechanism, general consensus that the valuation point should be at the point of transfer from the mining support vessel to the transport barge</li> </ul>
22.	49 (23)	Profit	Is the boundary point for activities in the Area unclear?	<ul style="list-style-type: none"> <li>On activities in Area only (C)</li> </ul>	<ul style="list-style-type: none"> <li>This question is of greater significance for profit-share mechanisms.</li> </ul>
<b>D. Payment Mechanism</b>					
23.	34 (21)	Annual fee	Provided for by 1994 Agreement (annual fixed fee) from date of commencement of CP and creditable. Criteria for determining annual fixed fee.	<ul style="list-style-type: none"> <li>Clear indication of what fees will be used for. Focus to fund ISA structure (C)</li> <li>ISA to consider how credit mechanism will work (G)</li> <li>No fee where on “care and maintenance” (C)</li> <li>Early contractors should not bear disproportionately higher ISA costs than later entrants (C)</li> <li>Not considered feasible: consider other options (G)</li> </ul>	<ul style="list-style-type: none"> <li>How will the <i>annual fixed fee</i> be determined? Principles for determination?</li> <li>What costs will it cover?</li> <li>Should it be linked to size of contract area?</li> <li>Possible <i>annual contract administration fee</i> from date of contract?</li> </ul>
24.	35 (21)	System of payments	Alternative models for consideration? Or focus on royalty / profit-share model?	<ul style="list-style-type: none"> <li>Profit share model only on activities in the Area (C)</li> <li>Profit-based royalty for early payment system (C)</li> </ul>	<ul style="list-style-type: none"> <li>Perhaps one shortcoming in the Discussion Paper is that possible incentive mechanisms acknowledged by the Convention to further objectives were not discussed. The concept</li> </ul>

	Para. / (Page) ISA 2015	Heading	Issue (extracts) from ISA 2015	Stakeholder responses - highlights	Comments/ Recommendations
					of incentives could range from a transitional mechanism, payment holidays to future credits for environmental technology etc.
25.	36 & 50 (21 & 24)	Comparable rates	Royalty and profit-related taxes only of relevance here? What other “taxes” (payments) could be relevant?	<ul style="list-style-type: none"> <li>• Comparability a challenge. Economics of land-based environment has predictable economics. Future benchmarking may be appropriate (C)</li> <li>• Avoid automatic comparison with land-based models: land-based provision of infrastructure by State; tax holidays and incentives (possible lack of latter under a domestic regime) (C)</li> <li>• Not comparable: delink + 15 year royalty holiday (G)</li> </ul>	<ul style="list-style-type: none"> <li>• This is an area of challenge. The wording in the 1994 Agreement seems sufficiently broad to provide “flexibility”, not least reference to “rates of payments”, as opposed to headline / statutory rates.</li> <li>• However, any principles of departure from this at least for an initial payment mechanism should be discussed.</li> </ul>
26.	37, 38, 40, & 41 (21-22)	Ad valorem v. unit-based	Shorter-term: royalty-based mechanism. Unit-based versus ad valorem.	<ul style="list-style-type: none"> <li>• Lack of current market, price volatility, processing capability: promotes for a unit-based mechanism for early movers (C)</li> <li>• If unit-based, assess on dry tonnage (C)</li> <li>• If ad valorem, not to be applied to all metals: consider economic recoverability</li> <li>• Ad valorem preferable: tracks value / unit-based promotes “high-grading” and possible loss to CHM (G)</li> <li>• Different grades a challenge in developing a common unit-based royalty mechanism (C)</li> <li>• Care to be taken in conversion rates from natural capital to financial capital, how that financial capital is invested and the level of natural capital extracted (NGO)</li> <li>• “Keep it Simple – so a 10 year old can understand it” (C)</li> <li>• Use ad-valorem based royalty (link to international metal exchange) (G)</li> <li>• “Sustainability dependent royalty” which would vary depending on the grade / abundance of mineral resources. Higher royalties for fields with a higher economic value on the basis that it is not considered “sustainable” to ignore less valuable fields. (O)</li> </ul>	<ul style="list-style-type: none"> <li>• See table 2 of Comparative matrix for further discussion on the 2 royalty payment types.</li> </ul>
27.	44 (22)	“One size fits all”?	Should same royalty rate(s) be applied to a valuation base across all categories of mineral resources recovered from the Area? Within each category of resource is the application of a single royalty rate “fair”? That is, should there	<ul style="list-style-type: none"> <li>• Not appropriate to adopt same royalty rate for different resource categories (C)</li> <li>• Different rates within each resource category owing to constituent metals, extraction etc. (C)</li> </ul>	<ul style="list-style-type: none"> <li>• Need to discuss principles applying here.</li> </ul>

	Para. /(Page) ISA 2015	Heading	Issue (extracts) from ISA 2015	Stakeholder responses - highlights	Comments/ Recommendations
			be different royalty rates for the constituent metals and minerals?		
28.	45 (23)	Single royalty	Different royalty rates for constituent metals / minerals?	<ul style="list-style-type: none"> <li>• Preference for single royalty rate – less distortion (C)</li> </ul>	<ul style="list-style-type: none"> <li>• Links with above.</li> </ul>
29.	51 (24)	Economic rent	Watch trends as industry develops. May be a longer-term objective.	<ul style="list-style-type: none"> <li>• Currently relevant for high-margin industries e.g. oil and gas / review in longer term when economics of industry have been proven (C)</li> <li>• Contribution by State during excessive loss-making periods often omitted from rent-resource tax models (C)</li> </ul>	<ul style="list-style-type: none"> <li>• Consider as part of longer-term mechanism.</li> </ul>
<b>E. Other considerations (for noting)</b>					
30.	56 (25)	State taxing	Interaction with State regimes: who takes what?	<ul style="list-style-type: none"> <li>• A matter for sovereign States</li> </ul>	<ul style="list-style-type: none"> <li>• This requires discussion at a wider stakeholder level at a later stage.</li> </ul>
31.	57 (26)	Double taxation	Deductibility of payments to ISA under State regimes.	<ul style="list-style-type: none"> <li>• A matter for sovereign States</li> </ul>	<ul style="list-style-type: none"> <li>• An issue States need to explore.</li> </ul>
32.	62 (26)	No withholding	Payments to Authority to be made gross.	<ul style="list-style-type: none"> <li>• Needs to be assessed by sovereign States in the light of the nature of the payments finally agreed upon (G)</li> </ul>	<ul style="list-style-type: none"> <li>• This is a matter for sovereign States to address and should be highlighted to the ISA Council at an appropriate time.</li> </ul>
<b>F. Other comments</b>					
33.	25, 26, 27, & 28 (19)	A fair return	Definition and discussion of what constitutes a fair return	<ul style="list-style-type: none"> <li>• The commentary on page 19 has come under scrutiny for not addressing environmental integrity and intergenerational equity. Equally for the payment mechanism to compensate for loss of biodiversity and ecosystem services values and future options. Too narrow a focus in respect of economic and financial interests only.</li> <li>• Too much uncertainty and risk to determine a “fair return” at this stage</li> </ul>	<ul style="list-style-type: none"> <li>• This is fair comment and does require thought and discussion perhaps as part of inter-generational equity and sustainability.</li> </ul>

Stakeholder responses to ISA 2015: Contractors (8); Government (5); NGO (1); Other (3).

Suggested Working structure for Financial Terms Regulations	
	<div> <div> <b>Financial Terms of a Contract</b> </div> <div> <b>Section 1 General</b> <ul style="list-style-type: none"> <li>Equality of treatment</li> <li>Guidelines</li> </ul> </div> <div> <b>Section 2 Annual fees</b> <ul style="list-style-type: none"> <li>Annual contract administration fee</li> <li>Annual fixed fee</li> </ul> </div> <div> <b>Section 3 Liability to a Royalty</b> <ul style="list-style-type: none"> <li>Contractor shall pay royalties</li> <li>Rate of Royalty</li> <li>Opinion on liability to Royalty</li> </ul> </div> <div> <b>Section 4 Returns, payments and refunds</b> <ul style="list-style-type: none"> <li>Reporting Period</li> <li>Royalty Returns</li> <li>Information to be submitted</li> <li>Payment of Royalty</li> <li>Overpayment of Royalty</li> </ul> </div> <div> <b>Section 5 Records, inspection and audit</b> <ul style="list-style-type: none"> <li>Proper Records to be kept</li> <li>Audit and inspection by the Authority</li> <li>Appointment of auditor</li> <li>Assessment by the Authority</li> <li>Confidential information</li> </ul> </div> <div> <b>Section 6 Anti-avoidance measures</b> <ul style="list-style-type: none"> <li>General anti-avoidance rule</li> <li>Arms-length transactions</li> </ul> </div> </div> <div> <b>Section 7 Interest and penalties</b> <ul style="list-style-type: none"> <li>Interest on unpaid Royalty</li> <li>Penalty in respect of any under declaration or underpayment</li> <li>Penalty in respect of any failure to deliver or furnish a royalty return</li> <li>Penalty in respect of false royalty returns and information</li> <li>Recovery from performance guarantee</li> </ul> </div> <div> <b>Section 8 Suspension or termination of Contract in respect of unpaid royalty</b> <ul style="list-style-type: none"> <li>Suspension or termination of Contract in respect of unpaid royalty</li> </ul> </div> <div> <b>Section 9 Disputes regarding Royalty calculations and payments</b> <ul style="list-style-type: none"> <li>Disputes regarding Royalty calculations and payments</li> </ul> </div> <div> <b>Section 10 Review of payment mechanism</b> <ul style="list-style-type: none"> <li>Review of payment mechanism</li> </ul> </div>

Table 2: Comparative analysis of payment mechanisms for exploitation activities in the Area<sup>i</sup>

Objectives / Criteria <sup>ii</sup>		Simplicity & transparency (in administration & enforceability) <sup>iii</sup>	Effectiveness & economic efficiency (to achieve ISA <sup>iv</sup> revenue and economic objectives) <sup>v</sup>		Equity (1) (equality in treatment of contractors, fair allocation) <sup>vi</sup>	Stability in revenue flows	Equity (2): Ability to pay / Flexibility (to change in market conditions)	Neutral (to investments decisions) <sup>vii</sup>	Investment recoupment / Impact on profitability (economic efficiency)	
			Optimum revenues	Attract technology & investments <sup>viii</sup>						
Stakeholders <sup>34</sup>		The Authority						Investors		
General comments		The greater the complexity of a regime, the potentially less attractive. Administration related costs of compliance to be minimized.	Authority objective of optimum revenues from proceeds to commercial production.	Regime must encourage capital investment. As a frontier industry, key consideration in early years. Capital is mobile.	A challenge where a number of different entities at State and private levels and different strategic / commercial objectives.	There should be an element of stable income flows throughout the life-cycle of an exploitation project.	That is, potential flexibility to respond to profitability / cash flow / offsets and deductions.	Premise that activities will occur based on reserves, grade etc. irrespective of payment mechanism.	Investors will seek an early payback of investment spend. Ongoing mechanism impacts profitability and cash flows.	
Payment type <sup>ix</sup>										
Production-based	Unit –based royalty (specific) <sup>x</sup> – see also Table 2	The simplest. Linked to volume or weight. Transparent and easily measured / auditable.	Assures <i>a</i> revenue flow. Economically inefficient (most) as the payment is <b>not</b> linked to mineral prices.	Predictable, stable & easy to forecast / monitor. Generally considered regressive.	Perhaps most transparent. But variability in grades and cut-off?	Most stable and a minimum flow In early periods of production.	Least flexible but can provide stability and predictability.	Will impact extraction costs in forecasts but is stable and predictable.	Delays recoupment. Raises marginal extraction costs. Influences economic behaviour.	<b>For royalty-based mechanisms:</b> Administrative complexity reduced Revenue (ISA) stability improves Economic efficiency decreases Opportunity (optimal base) to share in upside reduced Transparency
	Value-based royalty ( <i>ad valorem</i> ) – see also Table 2	Administratively simpler than profit-based but “one size fits all”? Potential for valuation risk.	Assures <i>a</i> revenue flow. Economically inefficient (least) as the payment is linked to mineral prices.	Less regressive than unit-based given link to mineral prices.	Depends on base / methodology adopted.	Price dependent but secures a minimum flow.	Revenue reflects underlying commodity price.	Will impact extraction costs in forecasts.	As for unit based but some correlation to revenue / price.	

<sup>34</sup> Note: some stakeholder objectives are, potentially, mutually compatible: e.g., economic efficiency (neutrality, promotes optimal economic extraction of resource) and administration.

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			Optimum revenues	Attract technology & investments <sup>viii</sup>						
Stakeholders <sup>34</sup>		The Authority					Investors			
Profit based	Profit sharing / Profit-based royalty	Requires accounting code / system. Higher compliance costs. Less visibility.	Potential for upside (longer term). More economically efficient as the payment is linked to mineral prices.	Difficult to monitor, compliance, transparency issues, but more progressive in nature.	Demands consistent / uniform rules / assessment base.	Relatively, less stable.	Reflects individual cost base.	More progressive.	More progressive depending on calculation of base i.e., allowable deductions for capital expenditure, operating costs and financing costs.	
	Economic rent	Requires accounting code / system. Higher compliance costs. Less visibility.	Opportunity for upside (depends). Considered most economically efficient (but no consensus).	Difficult to monitor, compliance, transparency issues.	Challenge in setting return rates uniformly across entities.	Least stable. Prescribed return levels may not be achieved.	Reflects individual cost base + hurdle rate.	Theoretically neutral. Practical implementation questionable.	As for neutrality, but complexity in design.	
Hybrid mechanisms <sup>xi</sup>		Partial - Mix of the above.	Partial - Mix of the above.	Partial – Mix of the above.	Mix of above.	Minimum flow.	Mix.	Mix.	Mix.	

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		Optimum revenues	Attract technology & investments <sup>viii</sup>						
Stakeholders <sup>34</sup>	The Authority					Investors			
Other comments	Transparency in reporting and publication of payments also an important factor. This objective also aligns with investor requirement to reduce administrative burden.	Optimum is considered “best” revenues. Temporal aspects. At this stage financial models not known; therefore, potential upside over minimum royalty unknown. Optimum revenues also a factor of Equity and allocation across the contractor base. A debate will unfold as to what is considered a “fair return”.	Objective to attract technology and investments closely aligns with investor criteria and objectives. “Unattractive” regressive model will impact investment decisions if set too high. It may become “attractive” due to its forecast-ability. Also a question of attracting the “right” investment / operator to ensure delivery of broader objectives.	Not all projects will be comparable: size of area, abundance, grading, downstream activities. But a challenge to differentiate between projects. Uniform application is preferable.	The optimum level of stability needs to be ascertained. The regressive nature of a flat, non-progressive royalty mechanism will impact project economics / investment decisions if set too high	Royalties, in a land-based context, can induce particular economic behaviour e.g., the high-grading effect. To promote optimal exploitation? Different royalty rates by mineral to facilitate flexibility?	Royalties can be considered regressive. They will not allow for recoupment of spend (save to the extent a payback period is factored in). This factor partially aligns with ISA objective of attracting investments and technology.	Certainty and predictability will be key factors here for on-going operations.	

## Note on Royalty Payment Types

Royalty type	Base / point of assessment	Comment	Issues to consider / other points
<b>Unit-based royalties</b>	Assessed typically at mine mouth (or other specified point) either on volume or on weight.	Typically applied to low value bulk commodities at say set USD amount. More “efficient” where scales of operations vary?	<ul style="list-style-type: none"> <li>• Rationale for potential use over value-based royalty in short term?</li> <li>• Principles / factors to determine rate? Relationship to value? Impact on cut-off grades?</li> <li>• Based on dry tonnage / wet tonnage? Point of assessment?</li> <li>• Sliding-scale?<sup>xii</sup></li> <li>• Annual adjustment to royalty – index: US GDP deflator? Other price indices?</li> <li>• Perception: low value return to ISA?</li> </ul>
<b>Value-based royalties</b>	<ol style="list-style-type: none"> <li>1. The mineral content or the ore at the <i>mine mouth</i> (for the Area, point of first offloading);</li> <li>2. The mineral contained in the first product sold;</li> <li>3. Mineral recovered;</li> <li>4. Gross sales revenue;</li> <li>5. Gross sales revenues derived less allowable costs (e.g., transportation, insurance, and handling); or</li> <li>6. The net smelter return.</li> </ol>	<p>Value-based royalties are levied on a variety of bases as identified in the column on the left. In connection with determining a sales value (in order of priority) include:</p> <ul style="list-style-type: none"> <li>• international reference prices</li> <li>• actual sales values / revenues where sale is to a third party;</li> <li>• the arm’s length price, where the ore is transferred to a related party.</li> </ul>	<ul style="list-style-type: none"> <li>• Principles / factors / assumptions for determining base methodology and rate, including exchange considerations? Constituent minerals, grade, weight etc.</li> <li>• Preference for valuation / assessment at first point of offloading from mining vessel? Transparency / auditability decreases in the down stream process. Valuation further downstream can give rise to complex netbacks.</li> <li>• Preference for international reference pricing? Ideally. Avoids transfer pricing issues / disparity in pricing. Average prices could be set according to royalty accounting period. India an example of LME metal price base; rate varies by commodity. Concept of price floor / price ceiling discussed at Bellagio.</li> <li>• “One size” does not fit all minerals?</li> </ul> <p>Other mechanisms:</p> <ul style="list-style-type: none"> <li>• <b>Sliding-scale royalty mechanism (rate: price):</b> rate determined by international price e.g., Queensland (base = gross sales value).</li> <li>• <b>Sliding-scale royalty mechanism (rate: profit / margin):</b> some royalty mechanisms apply a sliding scale royalty rate according to “profit”. South Africa applies a minimum / maximum royalty rate in accordance with an EBIT formula. Potential for <i>longer-term</i> consideration but complexity in determining EBIT / net margin levels etc. Remains mildly regressive but more progressive than simple ad valorem royalty.</li> </ul>

## Notes to Table 2

<sup>i</sup> Adapted from a variety of sources including: Baunsgaard T *A Primer on Mineral Taxation* IMF Working Paper, WP/01/139, September 2001; Brown C *Developing Financial Terms for Deep Sea Mining Exploitation* (Report prepared for the LTC), 2 July 2014; Commonwealth Secretariat / ICMC *Mineral Taxation Regimes: A review of issues and challenges in their design and application*, February 2009; Guj P *Mining Royalties and other mining-specific taxes* International Mining for Development Centre (2012); Otto J et al *Mining royalties : a global study of their impact on investors, government, and civil society* The World Bank (2006).

<sup>ii</sup> In designing any fiscal mechanism, the following key principles are generally considered relevant: effectiveness; equity; efficiency; simplicity, transparency and certainty; coherence and consistency; flexibility and enforceability. These principles are inherent in the financial objectives and principles set-out in the Law of the Sea Convention (LOSC) and the 1994 Implementation Agreement.

<sup>iii</sup> As per 1994 Implementation Agreement: the system should “not be complicated” and “no major administration costs”. Equally, an effective audit mechanism is also consideration.

<sup>iv</sup> ISA is considered for the purposes of objectives / criteria to be Member States.

<sup>v</sup> LOSC Annex III, articles 13(1)(a) & (b).

<sup>vi</sup> LOSC Annex III, article 13(1)(c): “to ensure equality of financial treatment and comparable financial obligations for contractors”.

<sup>vii</sup> Predictability is also a key factor. Predictability for business / investment planning, though periodic & collaborative re-assessment of any payment mechanism is considered necessary. Later requires a clear process, timing and any relevant trigger points or thresholds for review.

<sup>viii</sup> This matrix does not consider financial incentive mechanisms e.g., credit-style mechanism. Where considered, these need to be targeted and focused to support the wider objectives of the Authority and the industry.

<sup>ix</sup> Does not reflect an Annual contract administration fee / Annual fixed fee. Note: Annual Fixed Fee is creditable against payment mechanism under 1994 Implementation Agreement. Also, matrix does not consider possible future auction / bidding arrangements (see ISA Technical Study No. 11).

<sup>x</sup> The Bellagio report noted at p. 6 that sliding scales were common for this royalty type. Is that true?

<sup>xi</sup> Examples of a hybrid mechanism include New Zealand’s mining system (higher of ad valorem royalty of 2% net sales and an accounting profits royalty of 10% accounting profits (+ corporate income tax)) and Quebec (greater of 1%/4% output value and 16%-28% on profit).

<sup>xii</sup> Under Tonga Offshore Mining Limited’s sponsorship agreement with the Tongan Government, a royalty of US\$1.25 per dry ton for the first 3 million dry tons of nodules mined per year, and US\$0.75 per dry ton for all subsequent tons mined thereafter in the same year (to be verified).