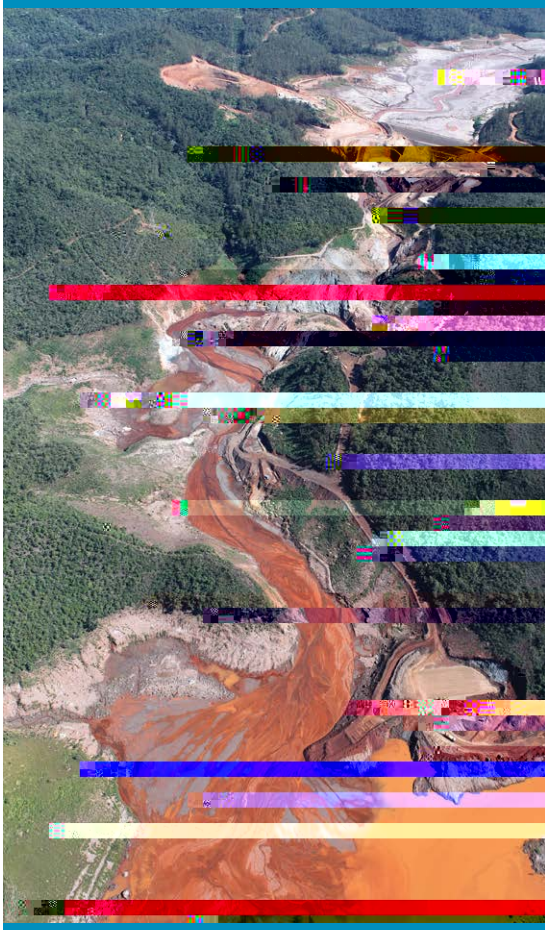
Issue Paper No. 4

A framework for assessing



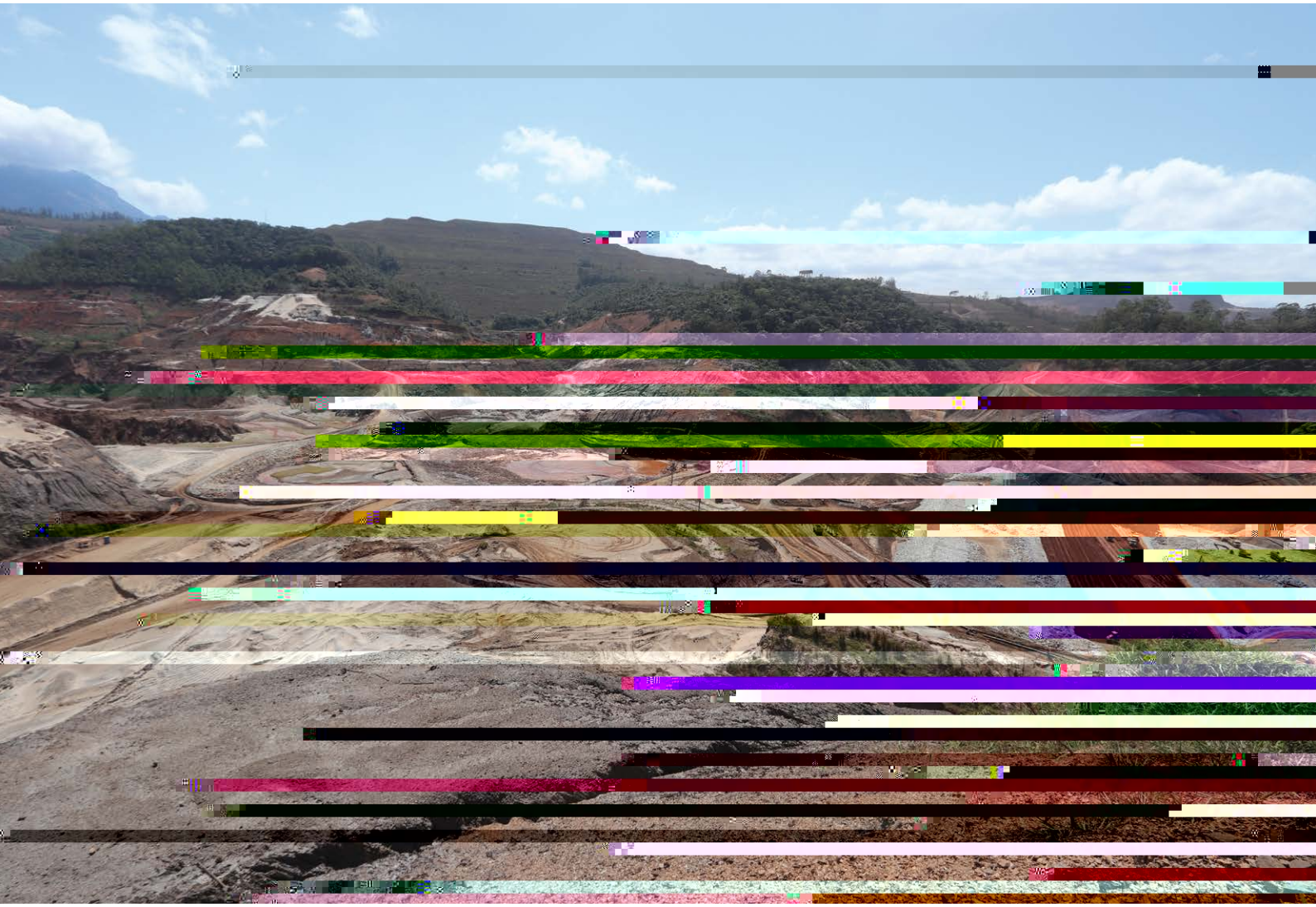


Figure 1. View of Fundão Dam site. On the right, a permanent dam referred to as S1, is being constructed to contain the tailings remaining on site. This dam is part of the actions determined by government agencies to address tailings management (October 2018).

Source: © Luis E. Sánchez

What is the issue?

Disasters disrupt communities and often result in severe environmental harm. Following the collapse of the Fundão Dam, short- and long-term impact mitigation programmes were designed over a four-month period as part of an out-of-court settlement.[1] Although a rapid assessment of damages was conducted prior to the settlement, a comprehensive and in-depth assessment of the environmental and social impacts of the dam's failure has not been completed so far, although a number of initiatives started early and are underway.

The first recommendation of Rio Doce Panel's Thematic Report No. 1 urges Renova Foundation[2] to undertake such an assessment (Sánchez et al., 2018). The current Issue Paper thus aims to present a systematic approach, which would facilitate the collection and analysis of key data and information required to carry out an impact assessment and to evaluate the effectiveness of mitigation programmes.

Why is it important?

A complete assessment of the actual consequences of the dam collapse is necessary to identify cumulative effects from past and present human actions in the watershed and in the coastal zone. As such, it will contribute to addressing the potential threats to the effective delivery of mitigation programmes, which is also one of the recommendations of Rio Doce Panel's first thematic report.[3]

A comprehensive ex-post[4] assessment also provides an opportunity to communicate information and interact with the local population, community and political leaders, and other stakeholders interested in the outcomes of the actions that are being undertaken to restore, remediate and compensate for the harmful impacts of the dam failure.[5]

Current approaches to ex-ante[6] environmental and social impact assessment (ESIA) can be adapted to perform an ex-post assessment of the cumulative effects of the dam failure.[7] In this regard, guidance is deemed necessary to help Renova Foundation implement the Panel's recommendation.

It is expected that the framework presented here will also be useful for practitioners, decision-makers and scientists involved in identifying, assessing and mitigating impacts of other disasters with severe environmental consequences.

What can be done?

One possible approach when preparing a comprehensive assessment is to start by mapping all impacts and their key characteristics into a synoptic table or chart that can be used as a tool to guide the assessment. While other approaches are possible, provided that key information is clearly shown, a synoptic table can foster a shared understanding among stakeholders about the scope of the impacts of the Fundão Dam's failure. However, it cannot substitute for a detailed and focused assessment of each impact that is fundamental to setting a solid foundation for decision-making about mitigation, and to identifying information and knowledge gaps.

Mapping 'all' impacts means identifying all relevant impacts related to the dam failure at appropriate spatial and temporal scales. Expert judgement, public participation, and tailor-made approaches suited to the context of each impact are indispensable for that purpose.

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[1] For further information, please visit: www.samarco.com/en/plano-de-recuperacao-macro/

[2] Renova Foundation is an entity created by Samarco and its parent companies to restore the affected environment and compensate for damages, following guidance jointly issued by several government agencies.

[3] For further information, please visit: https://portals.iucn.org/library/node/47833

[4] Evaluation *after* an event or an intervention has been completed.

[5] For an overview of such actions, please visit: www.fundacaorenova.org/en/

[6] Evaluation *before* the implementation of an intervention, usually conducted in support of decision-making.

[7] In this paper and in line with the Panel's publications, the term 'impact assessment' refers to the process of identifying any change, positive or adverse, in the environment or any of its biophysical or social components, resulting from a past, present or intended future human action. Impact assessment is used for supporting decision-making about human actions that can affect the environment, including the mitigation of the consequences of disasters. Terms, such as 'damage assessment', are sometimes used specifically to assess harmful effects of past events; however, such terminology is not used in this paper.

In order to facilitate the application of the proposed approach, this paper provides a template in the form of a synoptic table (see Table 1) using examples and applying key concepts of cumulative impact assessment (CIA), with a view to organizing information and analysis.[8]

A CIA usually starts by scoping the key issues through the selection of valued environmental and social components (IFC, 2013) or simply valued components (VCs) (IAIA, 2017). VCs are defined as "environmental and social attributes that are considered to be important in assessing [impacts and] risks" (IFC, 2013, p. 21).[9] In comparison with an ESIA, where a new project usually starts by identifying the major actions that can cause the impacts, CIA starts by choosing VCs that can be affected by an action and takes into consideration several stressors that could affect them.

Public participation is considered essential in the selection of VCs (IAIA, 2017). Even though a CIA is usually conducted for a limited set of VCs (Canter, 2015; Canter and Ross, 2010), for the purpose of the assessment recommended by the Rio Doce Panel, it is advisable to draw up a list of components that is as complete as possible. The scoping phase is critically important in a CIA and should be conducted with the purpose of ensuring a comprehensive assessment of all significant impacts. In addition to selecting VCs for analysis, defining the scope requires setting geographic and time boundaries to the assessment.

The proposed framework illustrated in Table 1, which describes the impacts on VCs spread over 19 columns, features categories of information and interpretation. Since mitigation is a long-term endeavour that should transcend staff turnover, political transition and be adaptable to changing priorities, it is important to remember that interpretation must be grounded on appropriate analyses and traceable to relevant sources of information. Traceability also helps minimise a possible bias that could result from exercising professional judgement when assessing certain impacts.

Cumulative impacts to be considered are those to which the dam failure contributed. The VCs, which should be included in the assessment, are those that are recognised to have been affected and for which pathways can be established on reasonable grounds.

Rather than a one-off exercise, the table is meant to be a living tool which can and must be continuously improved. The process is similar to the implementation of ISO 14001[10] standard environmental management systems, where the identification and analyses of environmental aspects and impacts are first conducted, then periodically updated. In this regard, critical analyses and recommendations from regular internal audits and external reviews could be fed back into the table along with supporting documents and information systems. This would benefit from the fact that Renova Foundation's programmes and actions are regularly audited both internally and externally.

The examples of impacts provided in Table 1 are intended to illustrate how the approach can be applied immediately, offering a variety of situations which are likely to be observed when applying the framework. The list represents a fraction of the impacts of the Fundão Dam failure; the final table will likely feature several more impacts. For this reason, Renova Foundation may have an interest in developing information technology-based versions of the table that can be linked to existing internal management systems.

The following are general guidelines on how to implement the tool:

1. Establish a core team of assessors and programme managers who will take the responsibility of preparing the first version and subsequent updates;

2. Consult and involve specialists in each VC – their inputs will be valuable in determining the appropriate terms to describe the components and impacts;

[8] The expanding literature on CIA provides valuable information and additional guidance. For further readings, please see: Broderick et al. (2018); Dibo et al. (2018); Hegmann et al. (1999); IFC (2013). Cumulative impact assessment, or CIA, is also referred to as cumulative effects assessment.

[9] Valued components are also known as 'valued ecosystem components', or VECs, in practice and in the literature about cumulative impact (or effects) assessment, due to the origins of the concept, that results from critical reviews of the approach used to assess ecological impacts in early environmental impact assessments.

[10] For further information, please visit: https://www.iso.org/iso-14001-environmental-management.html

Table 1. A synoptic table for cumulative impact assessment and management, including examples of impacts on valued environmental and social components [1] [2]

*NA Not applicable **TBD To be determined

(1) See explanatory notes next page.
(2) Examples in this table are provided only to facilitate its possible application. They do not necessarily represent advice from the Rio Doce Panel or IUCN about a speci□c course of action or an evaluation of current performance.

Table 1. (continued)

*NA Not applicable **TBD To be determined

(1) See explanatory notes next page.
(2) Examples in this table are provided only to facilitate its possible application. They do not necessarily represent advice from the Rio Doce Panel or IUCN about a speci□c course of action or an evaluation of current performance.

Notes and keys to Table 1:[11]

(1) **Component –** Different approaches can be used to organize the information in this column.[12]

(2) **Types –** If necessary, a component can be divided into two or more types. Components are broad categories, while types are parts of a valued component. Such a division should only be used to the extent that it can be useful to describe an impact with appropriate detail, which means that some components will not be disaggregated.

(3) **Description of impact –** All direct and indirect impacts resulting from the dam failure should be listed. As the final list will be considerably large, it is advisable that impacts of a similar nature be aggregated, as appropriate. Impacts on a number of valued components may be unknown, either because the baseline is insufficient to support a conclusion or because an impact may be delayed or for any other reason. In those cases, the corresponding cell in the table can be marked as 'unknown'. It is possible that some impacts will only be detected after monitoring.

(4) **Category of impact –** Refers to a further description of an impact.

(5) **Impact pathway or affected process –** A summarized information about the linkages between the event and the described impacts should be provided.

(6) **Affected area –** Should preferably be located in a GIS-based map. A column or a code could be added to link each cell in the synoptic table to one or more maps. It is advisable to note that the area of impact may change over time and the impact magnitude can vary over that area (i.e. being more intense in certain places than in others across the affected area). However, the table is intended to provide a synoptic view of the impacts before any mitigation.

(7) **Temporal scale –** Different descriptors can be used for this column, such as short- or long-term, temporary or permanent, seasonal, chronic or others. It is important to define clearly the meaning of the descriptors.

(8) **Indicator of impact magnitude –** An indicator should have reliable metrics. Both quantitative and qualitative indicators can be used or a combination of both, such as, for example, '128 hectares of degraded forest land'. The source should be entered in column 19 (key references). Indicators should inform about the impact before mitigation. It is possible to add columns to show relevant indicators after or during mitigation, but the Panel recommends that other tools, including other tables, would be preferable to follow-up on the outcomes of the mitigation measures.

(9) **Uncertainty in the determination of magnitude –** The magnitude of an impact is a description of its intensity. Such description, where appropriate, should as much as possible be quantitative or semi-quantitative. However, the uncertainty in determining impact magnitude is inherent to both ex-ante and ex-post assessments. One important source of uncertainty is an inadequate baseline. The following qualitative scale can be used to describe the level of uncertainty:

Low	Baseline is considered well-known and the impacts have been estimated on the basis of field measurements or observations, remote sensing, statistical analysis or other established technique.
Medium	Baseline is not well-known and the estimation of magnitude is based on professional judgement or any other qualitative approach, including local knowledge.
High	Baseline is not well-known and there exists contradictory information about the magnitude of impacts.

If there is negligible uncertainty about the magnitude of an impact, write 'not applicable' (i.e. this category is not applicable to that particular impact). If the impact is known to its full extent, write 'certain'.

(10) **Persistent effects of past or present actions affecting the valued component –** The responses to this column require careful consideration; the documented sources are expected to substantiate judgement.

(11) **Other past or present actions affecting the valued component –** Listing the actions requires context-specific expert evaluation. Current remediation actions should not be considered in this column.

(12) **Mitigation implemented, being implemented or required to be implemented –** Should be summarized in this column and referred to in an existing or scheduled programme.

(13) **Types of mitigation –** The following types can be used:

Remediation – Actions aiming at reducing impacts and risks derived from the post-disaster situation, such as stabilizing an affected component or removal of risk factors.

Restoration – Actions aiming at restoring the component to a pre-disaster situation. A specific concept can be developed for particular valued components, e.g. to restore the attributes or functions of agroecosystems.

Compensation – Actions aiming at substituting the affected component or the benefits provided by that component.

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[11] The numbering corresponds to the column number. For further help and guidance, please see the references on cumulative impact assessment.

[12] IFC (2013) defines valued environmental and social component as "environmental and social attributes that are considered to be important in assessing risks" (p. 21), while Hegmann et al. (1999), for the purpose of assessing cumulative effects, conceptualized those components as "any part of the environment that is considered important (...) on the basis of cultural values or scientific concern" (p. A4). The careful selection and description of valued components are of paramount importance to the effective application of this tool.

Recommendations

The Rio Doce Panel suggests that Renova Foundation undertake the following actions:

1 **Adopt a structured and systematic approach for a comprehensive assessment of the environmental and social impacts of the Fundão Dam failure, taking into account the following advice:**

- Impacts should be identified, described and characterized in detail, including information on affected area, estimated temporal scale and an appropriate indicator of impact magnitude, acknowledging uncertainties.
- The assessment should consider the cumulative effects of other past and present actions that could affect each valued component.
- The selection of valued components for analysis should be conducted by engaging with relevant stakeholders.
- For each impact, the following steps should be undertaken: describe ongoing or planned mitigation actions; identify threats to effectiveness; and explain any adverse environmental or social impact of mitigation.
- This assessment is not meant to be a one-off exercise, but a living tool to be continuously updated and improved.

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The Rio Doce Panel is an IUCN-led Independent, Scientific and Technical Advisory Panel, which has the critical objective of advising on recovery efforts following the breakdown of the Fundão Dam in November 2015 and leveraging long-term landscape-scale positive impact. Comprised of national and international experts, the Rio Doce Panel is convened and managed by IUCN, which acts in impartial coordination, and technical and administrative support, in respect of the principles of independence, transparency, responsibility and commitment.

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