INTERNATIONAL UNION FOR CONSERVATION OF NATURE

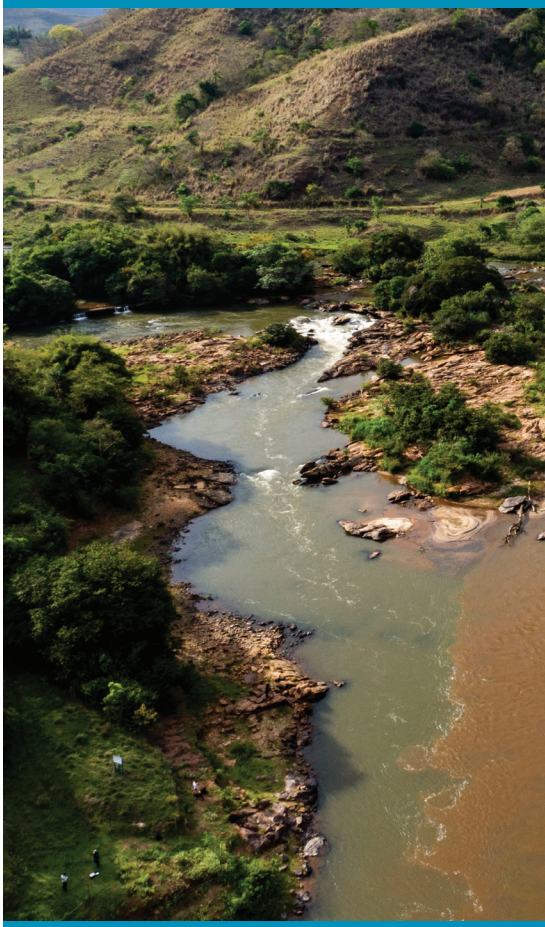
BUSINESS AND BIODIVERSITY PROGRAMME

Rio Doce Panel

Issue Paper No. 1

Alternative livelihoods in the rural landscapes of the Rio Doce Basin after the Fundão Dam failure

Creating opportunities for the future



In November 2015, the failure of the Fundão tailings dam at the Samarco´s iron ore mining site in the State of Minas Gerais, Brazil, resulted in 19 deaths and severe environmental, economic and social damage. The tailings spill ran approximately 650 km through the Rio Doce to the Atlantic Ocean. It is referred to as one of the worst environmental disasters in Brazil's history.

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What is the issue?

The historical trajectory of the Rio Doce watershed has been nearly exclusively focused on economic activities related to the extraction of natural resources, resulting in widespread environmental degradation (Espindola, 2015). The failure of Samarco's Fundão Dam, while being unprecedented in scale and disaster for people and nature, provides an opportunity to rethink this trajectory and seek different pathways that will allow the communities in the watershed to interact with nature and prevail in a more resilient and sustainable manner. However, the potential transformation of the regional economy to serve diverse purposes is limited by path dependency,[1] as well as the lack of technical knowledge and experience in interacting with different value chains – all of which hinder a constructive transformation.

In this context, spurred by the upheaval brought about by the dam failure, this Issue Paper proposes a "learning economy"[2] (Lundval, 2016) approach, where a crisis can lead to an opportunity to discover alternative local and regional economic activities that can underpin a more sustainable future for all the inhabitants of the watershed. This opportunity must be informed by the knowledge of what exacerbated the impacts of the Fundão Dam failure.

The current land use and employment structure is influenced both by historically dominant economic activities and, more recently, by the disruption brought about by the Fundão Dam failure as well as by fluctuations in global demand for iron ore.[3] In the late 18th century, activities in the upper Rio Doce Basin were centred on the mining of gold and precious stones, followed by iron mining from the early 20th century onwards (de Paula, 1997). Even the name Minas Gerais indicates the territory's vocation for mineral extraction and processing. Iron and steel production based on iron ore concentrated in the *Vale do Aço* remain significant; their direct and indirect production and employment still constitute a major source of income for the basin's population. In 2015, for example, mineral extraction and manufacturing (of which a significant share is in metallurgy) were responsible for, respectively, 12% and 27.7% of the gross regional product of the 102 municipalities that make up the Vale do Rio Doce meso-region of Minas Gerais, centred on Governador Valadares and Ipatinga (Nogueira, 2017).[4]

Conversion of native forests, firstly as a source of noble woods and later to fabricate charcoal for smelting, initially decimated the original forests (Espindola et al., 2011). Plantations of eucalyptus for pulp, paper and charcoal supplanted part of the native forests, although most iron smelting has become integrated over time with steel manufacturing facilities, which have substituted charcoal with coke as a reducer.[5]

In comparison to mining and related deforestation, livestock ranching became a more common livelihood in the Rio Doce watershed. After forests were initially harvested for timber and charcoal, their clearing gave way to pasture expansion for cattle husbandry and milk production. This was accompanied by the introduction of exotic *colonião* (*Panicum maximum*) and *brachiaria* (e.g. *Brachiaria brizantha*) grasses, the poor management of which culminated in intense soil degradation, erosion and stream sedimentation (MAPA/INAES, 2015). Springs dried up and the cattle came to rely on streams for watering, which aggravated stream bank erosion.

Other important livelihoods based on natural resources in the region include fishing, either in freshwater (including both the river itself and coastal lagoons) or in the marine area adjacent to the Rio Doce mouth (Pinheiro and Joyeux, 2007). Fishing for native species has also been undermined by overfishing and water quality degradation, leading to substitution with non-endemic species.[6]

Livelihoods in the Rio Doce Basin have thus primarily evolved around the extraction and degradation of natural resources throughout its history (Espindola, 2015).

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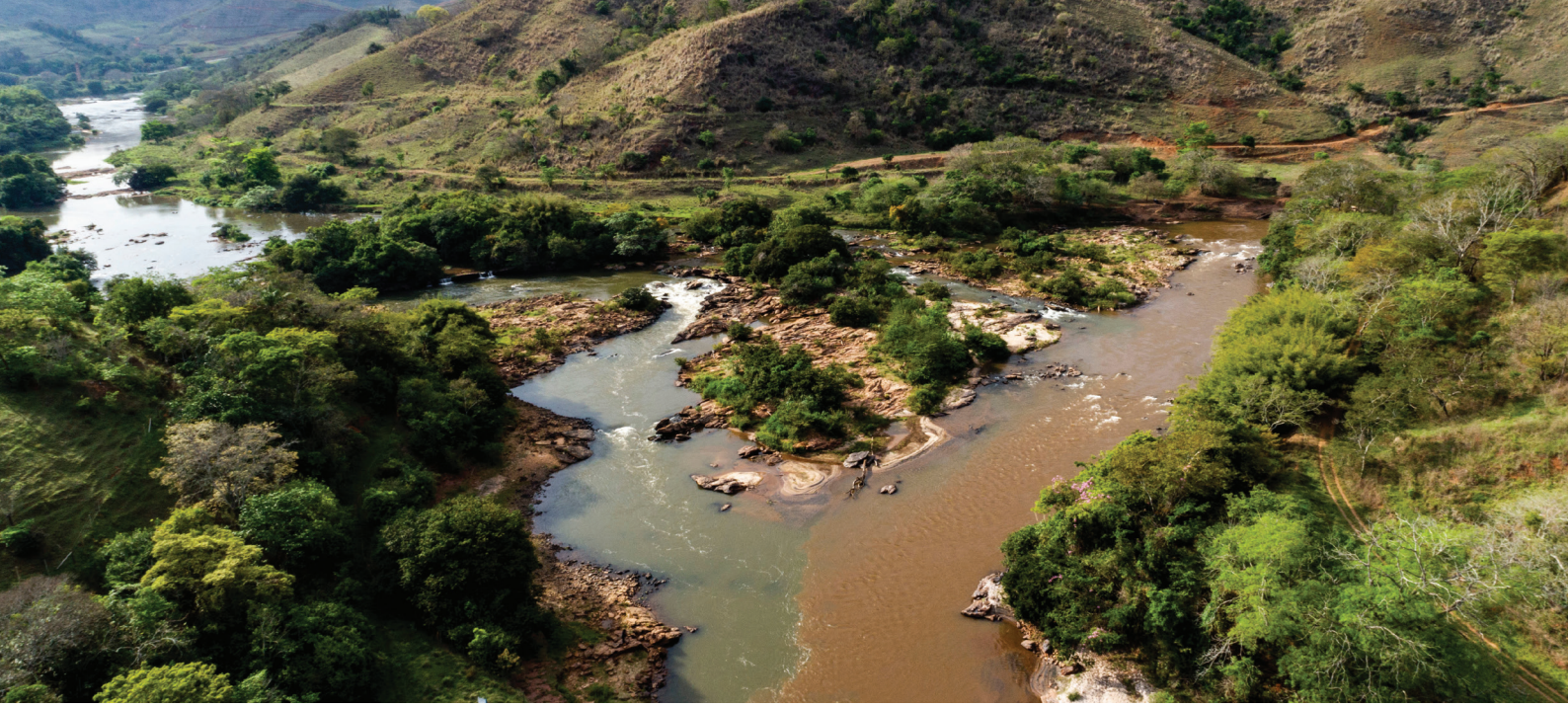
[1] Path dependency arises when "… the future development of an economic system is affected by the path it has traced out in the past" (Hodgson, 1996, p. 203), which restricts its capacity to evolve along different lines.
[2] Innovation and capacity to seize opportunity through knowledge are part of what Lundval (2016) termed a "learning economy", an approach that brings hope even in the midst of adversity.
[3] See next section for further discussion on sectors affected by the disaster.
[4] The area directly affected by the dam failure is composed of 39 municipalities which extend into the neighbouring state of Espirito Santo. The affected area comprises the principal mining and metallurgical industries in the basin, having functioned as a regional industrial pole since the mid-20th century (Espindola et al., 2011).
[5] It is worth noting that today's integrated steel mills rely on gas or coke as reducing agents, which portend much more serious impacts on the global climate than the original charcoal-based blast furnaces. Some steel industries in the region, such as Belgo-Mineira (now ArcelorMittal BioFlorestas) and Mannesmann (now Vallourec Tubes), have invested in eucalyptus expansion specifically as a "green alternative" in the steel industry.
[6] Please see the forthcoming Issue Paper in this series which addresses in greater detail fisheries management in the basin.



Rural landscape showing the merging of the Piranga and Carmo Rivers that form the Doce River. Photo taken in October 2018. (By NITRO – Courtesy of Renova Foundation)

Why is it important?

A better understanding of the conditions which affect short- and long-term employment and economic prospects in the region is needed to ensure measures are taken to promote diversification and avoid continuing the degradation of important natural resources.

Existing employment data (MTE, 2018) suggest that primary occupations in agriculture and mining were heavily affected by a combination of the suspension of Samarco operations,[7] as well as by broader economic and environmental conditions, which reduced the rate of growth in iron ore and steel demand both in Brazil and among primary importers.[8] Current levels of unemployment in the region are thus due only in part to the dam failure; an economic strategy for the region should therefore address both **immediate** and **long-term** trends.

In the **short term**, the sector that has been most impacted – vulnerable to layoffs and the loss of markets – following the Fundão Dam failure, is the mining sector itself (MTE, 2018). At the same time, fisheries, tourism and dairy have also suffered repercussions due to restrictions on activities related to the dam's failure. For example, fishing and dairy may have initially lost market share due to consumer fears of contamination and continued fishing bans, while tourists were less attracted to coastal villages that had been tainted by the deposition of tailings.

As the reduced cash flows rippled through the local economy, these impacts were multiplied due to backward and forward linkages between suppliers and commercial outlets. Although some of the shortfall is being replenished by compensatory payments to affected persons and municipalities, as well as by financial assistance cards provided by Renova Foundation in accordance with the TTAC,[9] the overall impact of compensation on regional incomes and employment (albeit crucial to those directly affected) is insufficient to promote long-term economic recovery. In the long term, rather than rely upon reparations from the disaster, a distinct configuration of employment and resource use should be contemplated in an effort to achieve socioeconomic and environmental resilience.

[7] According to an interview with a Samarco environmental director, studies by Tendências Consultoria Integrada under contract to BHP, estimate that 20,000 direct and indirect jobs were "at risk" due to Samarco's having had its operations suspended (Silva, 2018).
[8] Although industry statistics suggest that global demand rebounded somewhat in the last few years, the commodity boom driven by China from 2000 is unlikely to repeat itself as its environmental and social repercussions are being played out along with looming global financial and trade risks. The circular economy and global climate change are among the drivers that are likely to restrain future demand (Worldsteel, 2017).
[9] TTAC – Termo de Transação e de Ajustamento de Conduta (Terms of Transaction and Conduct Adjustment). For further information, please visit: www.samarco.com/en/plano-de-recuperacao-macro/

What can be done?

Seek opportunities for economic alternatives consistent with Rio Doce restoration

While land use alternatives have been adopted among producers in parts of the Rio Doce Basin (e.g. coffee, cacao and forest plantations), the capability of degraded soils and their viability for restoration needs to be better understood at a landscape scale. Legal restrictions imposed on stream bank use, once they are better enforced and integrated throughout the region, can help reduce some sediment loads. However, the national native vegetation protection legislation[10] revising the Forest Code allows smallholders to use stream banks for "consolidated uses" (i.e. land use prior to 22 July 2008), such as grazing and cattle watering. Furthermore, this legal provision, and the law's removal of hillside and most hilltop protections, are inconsistent with a broader landscape perspective associated with Rio Doce's restoration (SBPC/ABC, 2012). Alternative economic activities that are sources of provisioning and ecosystem services, such as commercial reforestation, agroforestry and natural regeneration, will require concerted efforts to engage small, medium and large landowners to achieve both on- and off-site benefits (Pires et al., 2017). The role of Renova Foundation in restoring 40,000 ha of degraded land through such practices, as called for in the TTAC, will be an important stimulus for reinforcing restoration throughout the Rio Doce watershed.

What land use alternatives are both potentially lucrative and protective of ecosystem values and services, and how can they be fostered?

The new native vegetation law, rather than being either overly restrictive or providing loopholes, can act as a stimulus to restore degraded land, if carefully implemented. Restoration activity may not only generate restoration of stream flows, reduce sediment loads and improve water quality downstream, but also provide on-site benefits, including employment, inputs sales and tax revenues associated with seedling production, monitoring, management, learning and exchange of knowledge. The cost of restoration thus can become a benefit for the local economy (Vital and Ingouville, 2016),

Native tree seedlings planted at the Liberdade land reform settlement in Periquito, Minas Gerais. Photo taken in September 2018. (Courtesy of Carolina Del Lama Marques)

rather than a burden. Once it is perceived as a benefit, such costs and risks could be more evenly spread throughout society. These benefits are clearly discernible, for example, in the Liberdade land reform settlement in Periquito, Minas Gerais, where community members led by women and rural youth under a purchase agreement with Renova Foundation successfully produced over 100,000 tree seedlings of more than 50 native species, generating new knowledge on biological pest control in the process.[11]

At the same time, estimates of the on-site economic benefits of forest restoration are yet to be clearly communicated, since they are still perceived by many landowners as implying unnecessary costs. Stimuli for participation by landowners should take heed of the experiences, both positive and negative, obtained from state payment for environmental services (PES) in Espirito Santo (Reflorestar) (IUCN, 2017) and Minas Gerais (Bolsa Verde) (Silva, 2013) that are already serving as models for Renova Foundation's restoration effort and its own PES program. In constructing this synergy, partnership with local and state governments is key for orchestrating technical, financial and mobilisation support along the lines developed by the *Produtor de Água* (Water Producer Programme)[12] coordinated by the National Water Agency (ANA, 2018).

[10] For further information, please visit: www2.camara.leg.br/legin/fed/lei/2012/lei-12651-25-maio-2012-613076-normaatualizada-pl.pdf
[11] Based on interview with local leaders in Periquito. See reporting at www.mst.org.br/2017/10/25/mst-produz-150-mil-mudas-para-reflorestar-bacia-do-rio-doce-contaminada-pela-samarco.html
[12] The *Programa Produtor de Água* (Water Producer Programme) has been operational for over a decade in the National Water Agency (Agência Nacional de Águas-ANA), having provided complementary technical and financial support to water resource related PES schemes throughout Brazil, in partnership with municipal governments, NGOs, river basin commissions and other regional actors. Water producers receive payments under these schemes based on reduction in sediment loads associated with best agricultural practices.

A learning economy for Rio Doce value chains

As mentioned earlier, innovation and niche building capacity to seize opportunity in adversity through knowledge are part of what Lundval (2016) has termed a "learning economy". Based on this approach, opportunities may be identified, such as the revival of tourism through agro or ecotourism, with emphasis on the Rio Doce mouth and coastal communities. Short food supply chains can reduce dependence on staple foods brought from outside the region, assuring greater food security and stimulating local economic recovery. Based on appropriate business plans and demand assessment, investments can be channelled to natural resource-based supply chains in the region (e.g. ceramics, crafts, processed agro-food and agroforestry products, seedling production, sustainable fishing, etc.). Similarly, locally-provided assets and knowledge, technical capacities, as well as the potential and risks associated with vertical integration along value chains, need to be better assessed and mobilised.[13] These actions should be complemented with public investments in collective goods, such as road improvements, local tourism and recreational activities and communications infrastructure, including telematics. The latter is especially important for young people, who otherwise are increasingly drawn to migrate to larger cities, attracted by the goods and services available there.

Finally, there is a compelling case for a re-qualification of those displaced by either the Fundão Dam failure or the broader economic changes in the region, as well as a need for apprenticeship opportunities targeting youth to harness their energy, entrepreneurship and yearning for a better chance in life. For example, the potentially beneficial role of *Desenvolve Rio Doce,* the working capital fund under the responsibility of Renova Foundation, could spread out by forging a partnership with state microcredit sources.[14] The fund could have even greater results were it to be used to leverage resources, such as local banks and credit unions, as well as non-conventional funding partnerships directed at green and circular economy investment, to a focus on employing regional youth.

Needless to say, technical assistance and rural extension programmes are needed to support innovation and help formalise and strengthen productive supply chains. This work can be led by specialized regional institutions, such as the rural technical assistance agency EMATER (*Empresa de Assistência Técnica e Extensão Rural)*[15] and non-governmental organisations (NGOs) that have a long history of providing such services to rural communities. With the support of these organizations, family farmers may become eligible to channel their produce through institutional purchases at guaranteed prices under strategic policy instruments, such as the National School Food Programme (PNAE)[16] and the National Food Acquisition Programme (PAA)[17]. This, in turn, would make it feasible to strengthen supply chains associated with ecosystem restoration for the watershed.

One major hurdle that has stymied such a learning economy in Brazil in the past is the need for compliance with overly rigid regulatory frameworks, e.g. for processing and marketing of final products. These can be overcome initially by relying on local direct marketing initiatives, such as those associated with PNAE and PAA, as well as farm-based tourism within each municipality. However, in the long run, expanding value chains will require building capacity for labelling and responding to sanitary and building requirements, as well as the establishment of accounting capacity and legal status. Thus, the key question for local and regional stakeholders is: What are the possible concrete actions that can be taken to ensure a transition in the Rio Doce Basin, from day-to-day survival to socio-environmental sustainability through alternative livelihoods in rural landscapes?

[13] Smallholders have been exposed to financial risk in, for example, assuming credit repayment in dairy cooperatives and in committing to sell to a sole buyer of eucalyptus production carried out under contract.
[14] From their inception in October 2017 to August 2018, over BRL 18 million have been disbursed for working capital loans for micro and small enterprises in Minas Gerais and Espirito Santo. However, the impact of these loans has yet to be evaluated.
[15] For further information, please visit: www.emater.mg.gov.br and www.incaper.es.gov.br
[16] For further information, please visit: www.fnde.gov.br/index.php/programas/pnae
[17] For further information, please visit: www.mda.gov.br/sitemda/secretaria/saf-paa/sobre-o-programa

Recommendations

The Rio Doce Panel suggests that Renova Foundation incorporate measures to promote regional economic alternatives, through the following actions:

1. Identify opportunities and constraints on rural value chains and production practices, offering the potential for alternative local products and services to gain in scale and generate backward and forward linkages between local economies and employment, with an emphasis on forest restoration, good agriculture and cattle-raising practices, rural tourism, ecotourism and environmental improvement. The analysis should examine factors that will enhance the combined effectiveness of policy instruments, investment strategies and risk-sharing mechanisms, such as price guarantees and institutional purchasing.

2. Coordinate capacity assessment/training, business planning, credit worthiness and financial instruments among existing institutions through partnerships, including those with whom Renova Foundation is already engaged, such as the microenterprise and small business support agency *Serviço Brasileiro de Apoio às Micro e Pequenas Empresas* (SEBRAE).[18] In addition, such partnerships could be extended to include local chambers of commerce, rural technical assistance by EMATER, NGOs and the "S" system of vocational training,[19] with an emphasis on initiatives that can train and employ youth.

3. Assess the need for additional policy or financial instruments, such as the creation of a fiduciary fund to stimulate investment in economic alternatives. A forward-looking assessment of synergies between existing and innovative measures, together with approaches to override path dependency and the orchestration of institutional partnerships is required. Among the complementary policy instruments to be prioritized are those which target sustainable rural development, food security, integrated climate mitigation and adaptation, and rural technical assistance to promote associative enterprises and short supply chains for agro-ecological produce and farm-based or ecotourism.

[18] For further information, please visit: www.sebrae.com.br/sites/PortalSebrae

[19] The "S" system, created by productive sectors (in industry, commerce, agriculture, transport and cooperatives), offers free courses in key areas of industry and commerce, in addition to having developed a network of schools, laboratories and technology centres throughout the country (for further information, please visit: thebrazilbusiness.com/article/introduction-to-sistema-s).

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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.

Published by: IUCN, Gland, Switzerland

Citation: May, P., Alonso, L., Barbosa, F.A.R., Brito, M.C.W., Laureano, F.V., Sánchez, L.E., Kakabadse, Y. (2019). *Alternative livelihoods in the rural landscapes of the Rio Doce Basin after the Fundão Dam failure. Creating opportunities for the future.* Rio Doce Panel Issue Paper No. 1. Gland, Switzerland: IUCN.

Available from: www.iucn.org/riodocepanel/issue-paper-1-EN

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