ROOTS OF RESILIENCE

a participatory approach to mapping, measuring and mobilising cultural heritage in Brazil's Iron Quadrangle

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People's Palace Projects (PPP) is an arts research centre and a subsidiary of Queen Mary University of London. For the last 24 years, PPP has been asking what role the arts and creativity plays in approaching and responding to issues of social justice and development challenges around the world, including in the UK and in favelas and Indigenous territories in Brazil. PPP is an Arts Council England National Portfolio Organisation.

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INTRODUCTION

Resilience is the ability to overcome difficulties when exposed to threats. Resilient systems, societies and communities resist or adapt to a threat's impact, as well as change and recover from a threat's effects. This resilience comes from acquiring knowledge that enables the restoration and maintenance of social systems and groups, as well as their basic structures[1]. Building resilience becomes essential in the face of ongoing climate change[2], and culture plays a central role in this process. That is, more than something merely to be protected, culture and existing tangible and intangible cultural heritage[3] should be understood as resources, whose mobilisation is essential in building strategies to adapt and mitigate disasters and climate change impacts, whilst positioning local communities as leaders in learning and decision-making processes.

The Roots of Resilience project seeks to understand and strengthen the mechanisms through which cultural heritage organisations can foster resilience in communities of the *Quadrilátero Ferrífero* (Iron Quadrangle) region in the state of Minas Gerais, Brazil.

Coordinated by People's Palace Projects (PPP) and conceived in partnership with Inhotim Institute, the project has been funded by the UK's Arts and Humanities Research Council (AHRC) and the Department for Digital, Culture, Media and Sport (DCMS) via the Global Challenges Research Fund (GCRF).

The project's premise is to propose a participatory and co-creative research approach by working with cultural organisations and empowering them to conduct research independently and with their communities. The methodology used to achieve this is one developed by PPP called Relative Values, which evaluates the socio-economic impacts of activities promoted by cultural organisations in a participatory and co-created way. In addition to the Inhotim Institute, the Roots of Resilience project used five other local cultural heritage organisations from the Iron Quadrangle as research partners: Associação Cultural Clube Osquindô, Casa Quilombê, Banda São Sebastião Musical Corporation, the Carlos Drummond de Andrade Cultural Foundation and Atrás do Pano Theatre Group.

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[1] 'Resilience', United Nations, <https://www.undrr.org/terminology/resilience>.

[2] According to the latest report of the Intergovernmental Panel on Climate Change (IPCC), the effects of human action on climate change are already being felt. 'Climate Change 2021: the Physical Science Basis. Summary for Policymakers', Intergovernmental Panel on Climate Change - IPCC, October 2021, <https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf>.

[3] Cultural heritages are tangible or intangible assets, which are significant for identity, the action and the different communities, nations and/or humanity. While the former are objects such as artifacts, documents, monuments, buildings, and significant places; the latter refers to traditions and forms of expression passed down from generation to generation, such as oral traditions, social practices, traditional knowledge, and festivities, as defined by international organisations, such as the United Nations Educational, Scientific and Cultural Organisation (UNESCO), and the Brazilian legislation. 'What is Intangible Cultural Heritage?', United Nations Educational, Scientific and Cultural Organisation, <https://ich.unesco.org/en/what-is-intangible-heritage-00003>. 'Legislation', Brazilian National Institute of Historical and Artistic Heritage, < http://portal.iphan.gov.br/ac/legislacao>.

Throughout 2021, Roots of Resilience hosted a series of online workshops with its partner cultural heritage organisations to promote knowledge exchange about the project and outline the methodology approaches. At the same time, the project team mapped and evaluated the organisations' contributions to building the resilience of the local population in the face of extreme events and disasters. The details of this process are described in the Methodology section of this report.

The initial results of the research were discussed at a Roots of Resilience seminar, held in December 2021[4] at Inhotim Institute, and condensed into a short report[5]. There was also a presentation of the initial analysis of the data collected by each of the partner organisations. This report includes an account of the research results and an in-depth analysis of the data, offering an overview of risk and disaster management in the region, as well as approaches that can support the preservation of the Iron Quadrangle's cultural heritage.

> "The precautionary principle is important to prevent such disasters.

In summary, we would like to highlight the Roots of Resilience hypothesis, which has been backed up by our research: (1) cultural heritage is a tool to build capacity and resilience in local communities that are threatened by environmental disasters and climate change; (2) adopting **the precautionary principle is important to prevent such disasters;** and (3) climate change increases existing risks that mineral exploitation places on communities and threatens cultural and natural heritage in the Iron Quadrangle. We argue that these three issues are crucial in the preservation and maintenance of communities and cultural and natural heritage, and thus are the central tenets that propel this research report. We will revisit them in the concluding section, which addresses the question of how to move forward, and offers recommendations for further research, and future policy and practices.

The report is structured as follows: this introduction is followed by an overview of the partner organisations and the Iron Quadrangle region[6]; the second section details the methodology and research process; the third presents the main results according to four axes: context, organisation, impacts and diagnosis of risk perception; and, finally, the fourth section features the main conclusions and outlines brief recommendations for future research, policies and practices, which will be discussed in four local seminars in Minas Gerais, in addition to the Rio+30 conference.

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[4] The recording of the first part of the seminar, streamed online, is available at: <https://youtu.be/4IJh-PBgfY8>.

[5] Available at: <https://peoplespalaceprojects.org.uk/en/projects/roots-of-resilience/>.

[6] Considering the relevance of public policies to defend heritage and how they are the basis for many of our recommendations, a collection of these policies – covering federal, state and municipal levels – and their shortcomings, has been added to the appendices section of this report.

1.1 | PARTNER ORGANISATIONS

CULTURAL HERITAGE PARTNER ORGANISATIONS

01 Brumadinho
Instituto Inhotim

A museum of contemporany art and botanical garden, Instituto Inhotim has one of the largest and most important artistic collections in Latin America, exhibiting works by renowned Brazilian and international artists. By integrating art, botany, landscaping, architecture and education, it provides a unique expetience for visitors, and runs a programme of socio-educational projects with local communities.

02 Brumadinho

Corporação Musical Banda São Sebastião

Founded in 1929, this symphonic band is one of the most traditional music institutions in Brumadinho.

03 Brumadinho

Casa Quilombê

A cultural centre for descendants of the Afro-Brazilian enslaved population who work with arts, music and literature.

04 Nova Lima

Grupo atrás do Pano

Education is the main pillar of this theatre company that works with local communities.

05 Mariana

Associação Cultural Clube Osquindô

Through books and games, this local cultural organisation works with children and young people, enabling them to access and produce culture.

06 Itabira

Fundação Cultural Carlos Drummond de Andrade (FCCDA)

The foundation keeps alive the work and memories of Carlos Drummond de Andrade, the Brazilian poet and writer who born in itabira.

1.2 | A BRIEF HISTORY OF THE IRON QUADRANGLE IN MINAS GERAIS, BRAZIL

Located in the central region of Brazil, in the state of Minas Gerais, the Iron Quadrangle is one of the country's main mineral provinces. With an area covering 7,000 km , the region comprises 34 municipalities and the state capital, Belo Horizonte[7], and has an estimated population of 4.7 million[8].

The region is predominately famous for its centuries-old mining history, but there are also other significant features of note. For example, Serra do Espinhaço, one of the region's geographical landmarks, is home to three Brazilian biomes[9] – Caatinga, Cerrado and Atlantic Forest – that perform an essential role in biodiversity and preserving national water resources[10]. In fact, Serra do Espinhaço was granted UNESCO Biosphere Reserve status in 2005 and, in 2018, the Brazilian federal government made the area an official 'conservation unit' as part of a wider conservation zone in the region[11,12].

The Iron Quadrangle area is also renowned for major archaeological discoveries. For one, it is home to one of the oldest fossils discovered in the Americas, a human female estimated to be 11,500 years old – baptised Luzia – who was uncovered during an excavation in nearby Santana do Riacho. Also, the area boasts culturally and historically important archaeological sites[13] such as Pedra Pintada in Barão dos Cocais, which features rock paintings estimated to be 4,000 years old[14]. As for preserving today's Brazilian heritage in the region, the cultural roots of Indigenous populations are strongly maintained by the Krenak and Pataxó ethnic groups[15].

“
The region is predominately famous for its centuries-old mining history, but there are also other significant features of note.

[7] 'Municípios do Quadrilátero Ferrífero', Universidade Federal de Ouro Preto, [n.d.], <https://qfe2050.ufop.br/municiipios-do-qfe>.

[8] Data obtained from the Brazilian Institute of Geography and Statistics – IBGE (2022), <https://cidades.ibge.gov.br/>, [accessed on 12 January 2022].

[9] Biome is a biological unit or geographic space whose specific characteristics are defined by macroclimate, soil and altitude, among other criteria.

[10] The region partially covers three large Brazilian river basins: the Doce, Jequitinhonha and São Francisco river basins. Thus, the water supplies, besides being essential for that region, are strategic for the semi-arid region of Minas Gerais and Brazilian Northeast region. Eric Pereira, Bernardo Gontijo, Luiza Abreu, 'As ecorregiões da reserva da biosfera da serra do espinhaço: elementos para o fortalecimento da conservação da biodiversidade', Caderno de Geografia, 25:43 (2015).

[11] Ordinance No. 473, of December 28, 2018, recognises the Mosaic of the Federal Conservation Units of Serra do Espinhaço – 'Quadrilátero Ferrífero', Official Gazette of the Union, 31 December 2018, <https://antigo.mma.gov.br/images/arquivo/80238/Portaria_473_DOU1_31_12_p158_QFerr%C3%ADfero.pdf>.

[12] 'Região do Quadrilátero Ferrífero é reconhecida como mosaico de áreas protegidas', LEIA, 11 January 2019, <https://leia.org.br/regiao-do-quadrilatero-ferrifero-e-reconhecida-como-mosaico-de-areas-protegidas/>. It is also worth mentioning that, since 2011, the region is part of the Quadrilátero Ferrífero Geopark project, which recognises the geological importance of the region and seeks to integrate the UNESCO Global Geoparks Network, <https://www.geoparkquadrilatero.org/>.

[13] 'Patrimônio Arqueológico - MG', National Institute of Historical and Artistic Heritage - IPHAN, [n.d.], <http://portal.iphan.gov.br/mg/pagina/detalhes/639/>, [accessed on 12 January 2022].

[14] Úrsula Azevedo et al., 'Geoparque Quadrilátero Ferrífero (MG): proposta', 2012, <https://rigeo.cprm.gov.br/handle/doc/17149>.

[15] 'Terra Indígena Fazenda Guarani', Socio-Environmental Institute - ISA, [n.d.], <https://terrasindigenas.org.br/pt-br/terras-indigenas/3665>, [accessed on 05 January 2022].

The population in the Iron Quadrangle surged following the discovery of gold in the 17th century by the Portuguese, who consequently occupied the region as part of their enslaved colonial empire. The gold also attracted thousands of migrants to the area, creating a gold rush and leading to the formation of the first settlements: Vila de Sabará, Vila do Carmo (present-day Mariana) and Vila Rica (Ouro Preto), which in the 18th century became the most populous urban centre of Portuguese America with around 25,000[16] inhabitants. Most of these (now considered) cultural heritage sites emerged during the height of gold extraction in colonial Brazil.

The economic boom in the colonised region was only made possible by the work of enslaved Africans brought over by the Portuguese, and subsequently the black population increased in both the region and in the state of Minas Gerais as a whole. Out of this population grew an uprising of dissenting slaves of African descent who escaped and set up quilombola communities, and Minas Gerais harboured the largest number of these settlements [18,19].

As the region's gold reserves depleted at the end of the 18th century[20], the area fell into economic stagnation and local populations were forced to pursue other sources of income, such as agricultural work. Bustamante and Gonzales[21] declare that the desertion of gold mines following the population exodus allowed historical cities to remain intact. Following their rediscovery in the early twentieth century, the cities' preservation enabled the now called National Institute of Historical and Artistic Heritage (IPHAN) to list them as national heritage sites. This is in addition to two colonial sites located in the Iron Quadrangle that have now been recognised as UNESCO World Heritage Sites: Ouro Preto and the Basilica of Senhor do Bom Jesus de Matosinhos in Congonhas. Currently, Minas Gerais boasts almost 6,000 official cultural heritage sites[22,23].

[16] Mariana Barcelos, Vila Rica', BiblioAtlas - *Library of References of the Digital Atlas of America Lusa* (2015), <http://lhs.unb.br/atlas/Vila_Rica>.

[17] The period is best represented by the Baroque movement, which has as one of its masterpieces the Sanctuary of The Lord Good Jesus of Matosinhos, in Congonhas, formed by a set of six chapels and a church. It has a basilica with altars clad in gold and works carved in soapstone by Aleijadinho and coloured by Manuel da Costa Athaíde. See 'A cidade de ouro preto', Minas Gerais, [n.d.], <https://www.mg.gov.br/conteudo/conheca-minas/turismo/cidade-de-ouro-preto, [accessed on 05 January 2022].

[18] '*Comunidades quilombolas em Minas Gerais*', Eloy Ferreira da Silva Documentation Centre, <https://www.cedefes.org.br/quilombolas-destaque/>.

[19] '*Você conhece a Rota dos Quilombos do Vale do Jequitinhonha?*', State Institute of Historical and Artistic Heritage of Minas Gerais, 9 March 2021, <http://www.iepha.mg.gov.br/index.php/noticias-menu/606-voce-conhece-a-rota-dos-quilombos-no-vale-do-jequitinhonha>.

[20] In the first decades of the 18th century, there was a new rise in gold mining after the entry of foreign capital, mainly English, and the introduction of more advanced mining techniques, according to Azevedo et al. (2012).

[21] Ana Maria Bustamante and Sidney Gonzalez, 'Patrimônio cultural e geologia do Quadrilátero Ferrífero', *Revista Brasileira de Geografia*, 62:2 (2017).

[22] 'Conheça 4 bens tombados como Patrimônio Cultural da Humanidade em Minas', Minas Gerais, 4 June 2021, <https://www.minasgerais.com.br/pt/blog/artigo/conheca-4-bens-tombados-como-patrimonio-cultural-da-humanidade-em-minas>. Among the recognised cultural assets, 149 assets were listed by the IEPHA and another 204 were listed by IPHAN, making Minas Gerais the Brazilian state with the second-highest number of listed national assets.

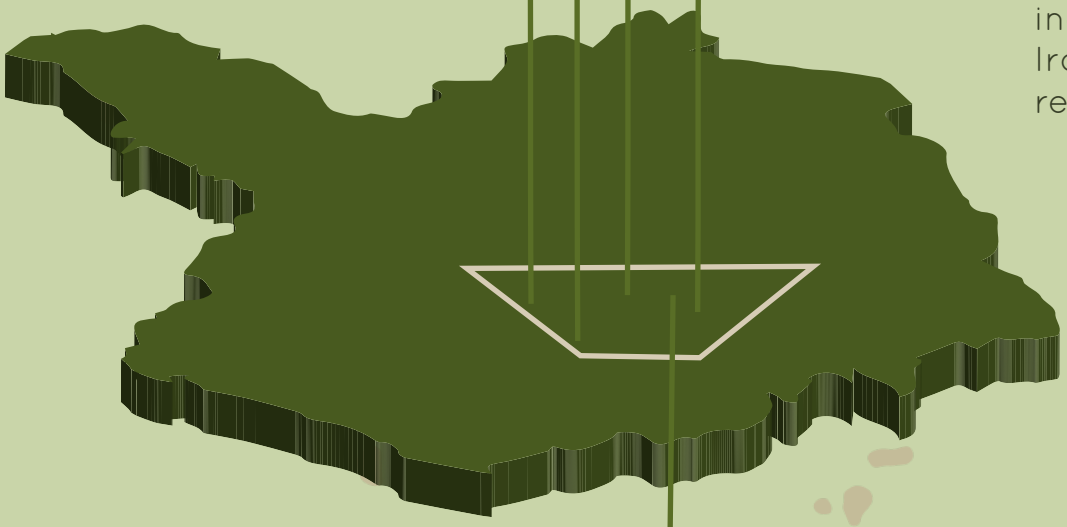
[23] The state also houses four cultural heritage sites recognised by UNESCO, which are: the historic city of Ouro Preto; the Sanctuary of The Lord Good Jesus of Matosinhos, in Congonhas; the historic centre of Diamantina; and the Pampulha Modern Complex in Belo Horizonte. See 'World Heritage Sites in Brazil', United Nations Educational, Science and Culture Organisation - UNESCO, [n.d.], <https://pt.unesco.org/fieldoffice/brasilia/expertise/world-heritage-brazil>.

INHABITANTS
4.7 million
(IBGE, 2022)

APPROXIMATE AREA
7.000km²

SITES LISTED BY IPHAN; [24]
121

MUNICIPALITIES
34, totally or partially included in the Iron Quadrangle region



THREE WORLD HERITAGE SITES (UNESCO, 2021)
Ouro Preto; Sanctuary of the Senhor de Bom Jesus do Matosinhos (Congonhas); and Pampulha Modern Complex (Belo Horizonte).

[24] According to data available in the '*Index of Listed Goods and Processes in Progress*', IPHAN, 22 Nov. 2021, <http://portal.iphan.gov.br/pagina/detalhes/126>.

1.3 | THE IMPACT OF MINING ON THE IRON QUADRANGLE

Despite the decline in mining for gold, mineral extraction continued because the region had plentiful other natural resources to exploit. In the 19th century, this led to an influx of foreign capital investment in the region's mining activity, especially by British companies. The British-founded Itabira Iron Ore Company, supported by the Brazilian Hematite Syndicate, was the first company authorised to operate in the region, thereby starting a new wave of mineral exploitation that continues to this day. The company was gradually taken over by the Brazilian federal government, which acquired all its assets in 1942 in a move to limit foreign control over national resources. Renamed Vale do Rio Doce, the company remains one of the largest producers and exporters of iron ore in the world.

The Iron Quadrangle, as its name suggests, plays a central role in the supply of iron ore, reaching peak production in 2008 with 70% of all Brazilian iron ore extracted from the region.

Over time, however, the region has been affected by different cycles of production, owing to a combination of mineral resource depletion and the dynamics of international markets. These various industrial mining phases have shaped the region in different aspects – they have degraded the environment but they have also created areas of social memory and local identity.

[25] The entry of the English capital into mineral exploration in the region is based on the foundation in England of the Imperial Brazilian Mining Association, in 1824. John D. Carvalho, 'Os ingleses e o tráfico interno de escravos no Brasil: o caso da Imperial Brazilian Mining Association (1809-1833)', *Borders – Revista Catarinense de História*, 38 (2021), 284-298, <https://periodicos.uffs.edu.br/index.php/FRCH/index>.

[26] The creation *of* Companhia Vale do Rio Doce (CVRD), during World War II, was part of a series of federal policies for national industrialisation. In 1997, CVRD was privatised and, in 2007, changed its name to Vale, excluding the reference to the Rio Doce "as if the company were now about to cross the river itself from the map", José Miguel Wisnik, '*Maquinação do mundo. Drummond e a Mineração*', (2018), 37. Regina da Luz Moreira, '*CSN: uma decisão política*', ([n.d.]), https://cpdoc.fgv.br/producao/dossies/FatosImagens/CSN. 'Vale - Our History', Vale, (2012), <http://www.vale.com/brasil/pt/aboutvale/book-our-history/paginas/default.aspx>.

[27] Azevedo et al. (2012).

[28] Jeanne Crespo, 'Paisagens Culturais, Território e Patrimônio Cultural Mineiro no Quadrilátero Ferrífero de Minas Gerais, Brasil', *Urban*, 17:30 (2014), <http://revistas.ubiobio.cl/index.php/RU/article/view/211>. The cycles are also related to a higher incidence of disasters: while periods of high prices lead to an expansion of resource exploration, subsequent periods of low sums appear to be related to a greater amount of mining waste dam disruptions, according to data from 1970 to 2010 analysed at: Michael Davies and Todd Martin, '*Mining Market Cycles and Tailings Dam Incidents*', 2009, <https://docplayer.net/14797608-Mining-market-cycles-and-tailings-dam-incidents.html%20michael>.

Climate change has played a key role in highlighting the destructive elements of mining, and the Iron Quadrangle in particular presents a high environmental risk due to the fragility of its ecosystem and the intensity of human activities, with both these factors expected to worsen.[29] The observable effects of climate change have already been manifested in the alarming rise in extreme meteorological phenomena such as heatwaves.[30] With the Iron Quadrangle's mountainous terrain frequently prone to heavy rain, an increase in the intensity and occurrence of rainfall is predicted to cause extreme hazardous events such as floods and landslides.[31] There is also the additional risk of more disasters arising from mining activity and the likely impact of climate change on mining infrastructure, including damage to tailings dams (used to contain mining by-products), dykes and other structures used in mining processes.[32]

The region suffered its first major mining disaster on 5 November 2015 when the Fundão tailings dam at the Germano iron ore mine of the Samarco Mariana Mining Complex burst, killing 19 people and affecting hundreds of thousands of others.

The collapsed dam released around 44 million cubic metres of toxic mining waste and mud into the Rio Doce basin, destroying the Bento Rodrigues district and Paracatu de Baixo, and devastating downstream rural areas around the city of Mariana, rendering thousands of residents homeless overnight. When the mud reached the Doce River it flowed for 16 days and 680km (400 miles) before pouring out into the Atlantic Ocean, causing severe water pollution that decimated residents' water supply, destroyed livelihoods that were reliant on the river, and killing 11 tons of fish.

The collapse of the Fundão dam is considered the greatest environmental disaster in Brazilian history.[33] Although most of the tailings were contained close to the disaster with the use of pre-existing dams and other structures,[34] the damage caused to the environment and communities officially affected 45 municipalities (35 in Minas Gerais and 10 in Espírito Santo) and four Indigenous territories – an area equivalent to the whole of Portugal. [35] [36]

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[29] State Foundation for the Environment (AMOR), a study of regional vulnerability to climate change in Minas Gerais, 2014. The environmental risk is calculated according to the natural vulnerability of the territory, indicative of the fragility of the ecosystem in relation to human actions, and the intensity of human activities (industrial, agricultural and mining) on the site. In 2012, the Southeast region constituted 92% of the cases of landslides and 47% of the floods observed in the country. In addition to the forecast of increased rainfall in the region, it is possible that the increase of droughts in northern Minas Gerais generated a migratory flow to the region of Belo Horizonte and the Iron Quadrangle as a whole, expanding the impacts of human presence on the environment.

[30] '*Climate Change 2021: the Physical Science Basis*', Intergovernmental Panel on Climate Change - IPCC, <https://www.ipcc.ch/report/ar6/wg1/#TS>.

[31] Sílvia Zanirato and Wagner Ribeiro, 'Mudanças climáticas e risco ao patrimônio cultural em Ouro Preto – MG - Brasil', *Franco-Brazilian Journal of Geography*, 21 (2014).

[32] FEAM (2014).

[33] '*Há 3 anos, rompimento de barragem de* Mariana *causou maior desastre ambiental do país e matou 19 pessoas*', G1, 25 January 2019, <https://g1.globo.com/mg/minas-gerais/noticia/2019/01/25/ha-3-anos-rompimento-de-barragem-de-mariana-causou-maior-desastre-ambiental-do-pais-e-matou-19-pessoas.ghtml>

[34] The Nova Santarém dam and the S4 dyke were built to contain new spills, but this flooded part of Bento Rodrigues district. Aline Diniz, Bárbara Ferreira, Bernardo Miranda and Luciene Câmara, 'Lama sem fim', O Tempo, 3 November 2016, <https://www.otempo.com.br/polopoly_fs/1.1395510.1487612199!/novo.html>

[35] 'Audit Rio Doce', Ramboll, [n.d.], <https://auditoria-riodoce.ramboll.com/>, [accessed on 5 January 2021].

[36] Mariana Tokarnia, '*Tragédia de Mariana faz 5 anos e população ainda aguarda reparações*', Agência Brasil, 29 October 2020, <https://agenciabrasil.ebc.com.br/geral/noticia/2020-10/tragedia-de-mariana-faz-5-anos-e-populacao-ainda-aguarda-reparacoes>.

Residents' reports highlighted the lack of transparency about the risks associated with the mine, the deadly absence of evacuation plans, and the failure to train mining personnel to act during disasters, breaching the national legislation on dam safety.[37] [38]

In 2016, the companies involved in the disaster – Samarco Mineração and its two shareholders, Vale SA (formerly the aforementioned Vale do Rio Doce) and BHP Billiton – and federal and state government bodies signed the Terms of Transaction and Conduct Adjustment, detailing a set of rules governing the recovery actions in the areas and communities affected by the collapse of the Fundão dam.[39] As a result of this signing, a foundation called Renova was founded to be the entity responsible for mobilising the creation, management and execution of these actions to repair but also to compensate these areas and communities. However, seven years on and the Fundão disaster continues to impact the communities and the environment, and repair and compensation actions have been heavily criticised for its slow pace. The resettlement of residents, for example, has not yet occurred, with the delivery of houses not planned until the end of 2022.[40]

Social participation in decision-making processes has also been limited, especially during the Covid-19 pandemic. More than 200,000 victims of the disaster have taken action and filed a £5 billion ($6.6 billion) lawsuit against BHP Billiton Ltd and Vale SA in 2018, but it is still ongoing.

Additionally, although the Renova Foundation employed thousands of experts – including environmental specialists and scientific technicians – to work on the reparation process, others raised concerns over protecting local heritage. [41] In a recent study, the Lactec Institute evaluated the extent of the damage caused by the disaster and the effect of reparations on archaeological materials and the tangible and intangible heritage of the region. According to the study, 15 out of the 16 types of damage identified worsened as a result of the continuous use of heavy machinery in the affected areas, potentially harming existing sites, cultural practices and landscapes, as well as community relations.[42]

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[37] Justiça Global, *'Vale de Lama'*, 2016, <http://www.global.org.br/wp-content/uploads/2016/03/Vale-de-Lama-Justi--a-Global.pdf>.

[38] *A questão mineral no Brasil (2). Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco/ Vale / BHP Billiton*, ed. by Marcio Zonta and Charles Trocate, (Marabá: Editorial Iguana, 2016).

[39] Available at: <https://www.fundacaorenova.org/sobre-o-termo/>.

[40] Cristina de Castro and Raquel Freitas, 'Mariana: *com prazo vencido há 7 meses, Renova agora prevê entregar casas só no fim de 2022*', G1, 1 Oct. 2021, <https://g1.globo.com/mg/minas-gerais/noticia/2021/10/01/mariana-com-prazo-vencido-ha-7-meses-renova-agora-preve-entregar-casas-so-no-fim-de-2022.ghtml>.

[41] A particularly noteworthy local heritage protection project is the Historical, Cultural and Artistic Memory Programme. Its objective is the recovery of the material heritage of affected communities. See: <https://www.fundacaorenova.org/programa/memoria-historica-cultural-e-artistica/>.

[42] Lactec Institute, '*Opinion 35. Opinion Scenarios of Damage to Cultural Heritage*', 27 April 2021, <http://www.mpf.mp.br/grandes-casos/caso-samarco/atuacao-do-mpf/pareceres-e-relatorios/instituto-lactec>. According to this opinion, the only damage process that had been halted was the triggering of physical-chemical processes that accelerate the degradation of material goods. This damage affected 15 movable properties of the Church of Our Lady of Mercy, which were properly stored in the Technical Reserve of the Renova Foundation.

Just three years after the Mariana dam disaster, another deadly dam collapse occurred in Minas Gerais in January 2019, killing more than 270 people. The B-I iron ore tailings dam of Vale S.A.'s Córrego do Feijão mine burst, releasing 11.7 million cubic metres of toxic sludge towards the city of Brumadinho, collapsing two further dams, destroying farmland and homes, devastating the landscape (including 133 acres of native Atlantic Forest and 197 acres of permanent preservation areas) and contaminating water supplies. [43] The disaster directly impacted at least 20 municipalities, seven quilombola communities, Pataxó Hã-Hã-Hãe and Kaxixó Indigenous groups and terreiro communities. [44] [45] Most of the victims worked for Vale SA, making the disaster one of the largest work accidents on record in Brazil.

At the time of publishing this report (June 2022), both the investigations into what happened and the impacts of the 2019 disaster are ongoing. In early 2021, an agreement was signed between Vale S.A. and the state of Minas Gerais but this has been heavily criticised and challenged in court.[46]

The relationship between mining and its socio-environmental impacts permeates what some scholars characterise as an ideology of mineral dependence. Large-scale mining is often carried out in low and middle-income areas, creating a positive double-header of jobs and local revenue, [47] thereby making local residents more tolerant to the negative effects of mining. he perceived necessity of mining also extends beyond the local communities as the export of iron ore is seen as essential to Brazilian trade and economy.[48]

Despite lessons learned from the two catastrophic dam disasters in 2015 and 2019, the Iron Quadrangle continues to live in fear of new mining disasters, especially those caused by burst tailings dams. According to Minas Gerais local authority data, 39 dams are on emergency alert, and three of these – all in the Iron Quadrangle – are reported to be at imminent risk of collapse.[49]

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[43] Mariano da Silva, Carlos de Freitas, Diego Xavier and Anselmo Romão, 'Sobreposição de riscos e impactos no desastre da Vale em Brumadinho', Science and Culture, 72:2 (2020) 21-28.

[44] '*Relatório da Insustentabilidade da Vale*', Articulação internacional do afetados pela Vale, 2021, <https://atingidosvale.com/relatorios/relatorio-insustentabilidade-2021/>.

[45] 'Brumadinho: *histórico do rompimento*', Minas Gerais, [n.d.], <https://www.mg.gov.br/conteudo/pro-brumadinho/historico-do-rompimento>.

[46] Andréa Zhouri, '*A efetivação do "Big Business Brumadinho*', Folha de São Paulo, 9 February 2021, <https://w+ww1.folha.uol.com.br/opiniao/2021/02/a-efetivacao-do-big-business-brumadinho.shtml>.

[47] Tádzio Coelho, 'Dilemas e obstáculos na economia de Brumadinho frente à minério-dependência', *Science and Culture*, 72:2 (2020) 29-33.

[48] Mauricio Angelo, '*Pressionado, governo federal considera mineração atividade essencial e se torna cúmplice de mineradoras*', Mining Observatory, 3 April 2020, <https://observatoriodamineracao.com.br/pressionado-governo-federal-considera-mineracao-atividade-essencial-e-se-torna-cumplice-de-mineradoras/>.

[49] The three dams with level 3 alert are in Ouro Preto, Barão de Cocais and Nova Lima, according to the Civil Defence of Minas Gerais, '*Níveis de Segurança das Barragens em Minas Gerais*', [n.d.], <http://www.defesacivil.mg.gov.br/index.php/boletim-diario/52-boletim/26-nivel-seguranca-barragem>, [accessed on 12 January 2022].

2 | METHODOLOGY

People's Palace Projects has developed a multidisciplinary methodology called Relative Values that measures the socio-economic impacts of cultural activities. Our goal is to develop indicators that offer diverse narratives about the potential impacts of arts organisations and artistic initiatives, addressing topics such as socio-economic development (individual and collective), the relationship between individuals and their community/ territory, feelings of effectiveness, the relationship with culture – local or otherwise – in its various aspects, social and political engagement, and skills development. [50]

The Roots of Resilience project is built on the Relative Values methodology, which also looks to encompass the socio-economic relations between partner organisations, their public, their associates and their community/ territory on the one hand, and the mining activity on the other. In this sense, the perception of potential hazards to the regions' cultural heritage has been part of the research process and thus has been turned into its own axis of analysis (see below). To do so, the project combined qualitative (which allows further analysis of phenomena) and quantitative (which enables more comprehensive but less detailed analyses) methods.

Aside from the analysis strategy, the six aforementioned cultural heritage partner organisations were directly involved in the entire research process, from understanding the different focuses of analysis through to defining the target audience, the strategies to reach that audience and the indicators to be measured in the collected data analysis. In addition, two or three representatives from each organisation took part in in-depth interviews.

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[50] The Relative Values methodology was used in three different projects: the first, Relative Values I, developed and applied the pilot model with four Brazilian and British cultural organisations (Youth Network Agency, Battersea Arts Centre, Maré Arts Centre and Contact Theatre). The second, Beyond Exchange, involved 40 young people working in cultural and artistic projects from the peripheries and favelas of the Metropolitan Region of Rio de Janeiro; it was conducted in partnership with the agency Redes para Juventude and the Central Artes da Maré. Finally, the project O Valor da Cultura, carried out in partnership with Itaú Cultural's Rumos Project, applied the methodology in partnership with five Brazilian projects: Editora e Gráfica Heliópolis, Grupo Ninho, Hip Hop Caboclo, Verdevez and Retratistas do Morro. More details of the methodology and the projects are available at: <https://culturalvalue.org>, [accessed on 12 January 2022].

Day-to-day life is full of events, facts and interrelations that can be better understood if we transform them into indicators/variables/data – that is, if we can measure these phenomena and, consequently, their impacts. In this sense, when we think about measuring some aspect of social life, we want to attribute value to it. This process of transforming social phenomena into variables involves different steps as follows:

- Identify a social phenomenon of interest (an abstract concept).
- Recognise different dimensions related to the phenomenon of interest: point out possible ways to interpret/ operationalise the abstract concept.
- Detect where you can find data related to the phenomenon of interest. In other words, where does the information we need come from?
- Build indicators that sum up the phenomenon of interest and translate it into quantifiable variables. That is: transform our abstract concept into measurable indicators.

In summary, indicators systematise obtained information and, in this process, codes (usually numerical) are used to organise such information. From this data, we are able to explore patterns of occurrence and (co)relate our variables.

The research was structured in four interconnected axes of indicators, grouped according to the data source. The first axis focuses on the **context** of the territories of the participating organisations. We used secondary socio-economic data to describe the different territories. The second axis focuses on the **actions** of organisations: it focuses on the relationship between organisations´ participants and their territories, as well as the communities surrounding them. A qualitative research approach through a series of semi-structured interviews with members/employees of each organisation was used. The third axis evaluates the socio-economic **impacts** of the organisations on their audience and/ or the network through a survey. Finally, the fourth axis called **hazard perception diagnosis** brings together a mapping of potential threats to local cultural heritage. This fourth axis was developed by the research team through data collected in the other three axes, emphasising perceived environmental risks. Figure 1 summarises the four axes of the research:

Figure 1: Research analysis axes

Axis 1: Context	**Axis 2:** Actions	**Axis 3:** Impacts	**Axis 4:** Hazard Perception Diagnosis
Focus: Territory • Demonstration of territories' realities. **Instrument:** Available statistics	**Focus:** Organisation • Relationship between the organisation and the heritage **Instrument:** Semi-structured interviews	**Focus:** Individuals and communities • Effects: individuals, territory, and the re-lationships between them. **Instrument:** close--ended questions	**Focus:** Heritage and environment **Instrument:** Close-ended questions and semi-structured interviews

Source: Authors.

Axis 1 presents the **context** in which organisations are based. It is mostly focused on descriptive socio-economic data of the four cities in which the partner organisations are located (Brumadinho, Itabira, Mariana and Nova Lima). The indicators are:

Table 1: List of socio-economic indicators

Dimension	Description	Indicators
Demographic	Demographic characteristics of the communities	Number of inhabitants
		Population density
		Race/Ethnicity
		Gender
		Age
Social development	Level of social development of each municipality	Human Development Index - Municipal (HDIM)
		Gini Index
Economic development	Economic characteristics of each municipality	Composition of municipal GDP (by sectors)
		Formal jobs (by activity)
		GDP per capita
		Average income (formal workers)

Source: Authors.

Through these indicators, we can better understand the territories and explore how social and economic relations emerge in relation to mining activity. These indicators are presented alongside data from Minas Gerais and Brazil, with the ambition of positioning data about each municipality in relation to national and state information.

Axis 2 focuses on the activities developed by organisations: their projects, their history, and their identity. This axis seeks to give voice to the members/employees of the organisations and understand issues such as the relationships, behaviours and attitudes related to the (co)experience of these organisations. A qualitative methodology is used to allow further analyses and to fully understand relationships, processes, structures and contexts.

At this stage, 15 semi-structured interviews were conducted with two or three members or employees from each partner organisation. The interview script included questions about:[51]

- The involvement of the interviewees with the communities impacted by the actions of the organisations in which the interviewees work.
- The interviewees' perceptions of local cultural heritage and the challenges to maintain and preserve them
- The relationship between the region where the interviewees live and/or work and the mining activity, as well as the environmental hazards involved in this relationship.
- The habits of acquiring information about environmental risks and local cultural heritage.
- The social and political engagement of the interviewees.

Axis 3 aims to understand a wide range of socio-economic impacts of the partner organisations. To this end, more than 500 survey questionnaires were administered online (through the SurveyMonkey platform and/or done face to face) with the target audience, beneficiaries and local networks of these organisations. The quantitative research allowed the analysis of a large volume of data, the observation of occurrence patterns and interrelations between the variables, as well as the comparison between the results of each partner organisation.

In addition to socio-economic questions (age, gender, place of residence, race/ethnicity, income and education level), the questionnaires were divided into six sections, five of which refer to axis three,[52] as presented below:

- **Times of crisis and mental health:** these questions relate to the impact of organisations' actions on the mental health of respondents, especially in times of crisis, such as the Covid-19 pandemic and the periods following the ruptures of the tailings dams.
- **Access to cultural activities and skills acquisition:** these questions address the effect of the organisations' actions on respondents' access to various cultural activities, the development of skills and the discovery of professional areas related to culture.
- **Social capital and networks:** these questions focus on the impact of the organisations on the expansion of respondents' contacts and networks.
- **Self-confidence and feeling of effectiveness:** these questions address the impact of organisations on respondents' self-confidence and their sense of effectiveness (i.e., the subjective perception of being able to influence the future and the preservation of local cultural heritage, as well as the perception of recognition by those responsible for local cultural heritage preservation and maintenance).
- **Involvement and belonging:** these questions regard the impact of cultural organisations on the involvement of respondents in community activities, and the feeling of belonging and identification with the territory.

[51] The full version of the interview guide is available in the appendices of this report.

[52] The sections of the survey used by all six partner organisations can be seen in the appendices of this report.

Foto: Matheus Castro (Pass Mariana)

Finally, **Axis 4** constructs a **hazard perception diagnosis** (environmental or general) of the local cultural heritage. Combining qualitative and quantitative methods, and collecting data from Axis 2 (in-depth interviews) and Axis 3 (survey), this axis investigates how people living in the Iron Quadrangle perceive potential threats, environmental or otherwise, to themselves and to local cultural heritage. In this sense, the way mining is perceived is also addressed, aiming to evaluate whether the effects of this activity are considered a source of hazard.

In the next section, we will move on to the analysis of the four thematic axes, analysing the main results of the research. Finally, we will present our considerations and recommendations focused on public policies, cultural practices and future research.

3 | RESULTS

As stated in the previous section, the research has been structured using four axes: Axis 1 uses available official statistics to present the context in which the cultural organisations are placed; Axis 2 focuses on the actions of organisations and thus utilises information collected through semi-structured interviews, which were conducted by the PPP team with members/employees of the partner organisations; Axis 3 analyses the impact of the partner organisations on individuals and territories where they operate, using results of questionnaires administered by these organisations and answered by their audiences, beneficiaries and (former) employees; and Axis 4 examines the population's hazard perception in relation to new disasters and possible threats to the environment and local heritage.

The following sections present the main results of each axis:

3.1 | AXIS 1: CONTEXT

The partner organisations are situated across four municipalities of the Iron Quadrangle: Brumadinho, Itabira, Mariana and Nova Lima. Brumadinho and Nova Lima are part of the Metropolitan Region of Belo Horizonte,[53] while Itabira and Mariana are both about 110 km (68 miles) away from the capital of Minas Gerais. The four municipalities are regarded as medium in size in terms of population.[54] In 2021, the population of the towns were estimated to be between 41,000 (Brumadinho) and 121,000 (Itabira). All four have a population density higher than both Minas Gerais and Brazil: Nova Lima has the highest population density with 226.9 inhabitants/km and Mariana has the lowest with 51.7 inhabitants/km (see Table 2).[55]

Table 2: Demographic indicators

	Brumadinho	Itabira	Mariana	Nova Lima	Minas Gerais	Brazil
Foundation	1938	1833	1711	1891	____	____
Population	41,208	121,717	61,830	97,378	21.4 million	213.3 million
Area (km²)	639.4	1,253.7	1,194.2	429.1	586.500	8.5 million
Population density inhabitant/ km²)	64.4	97	51.7	226.9	36.5	25

Source: Data estimated for 2021 (IBGE, 2022).

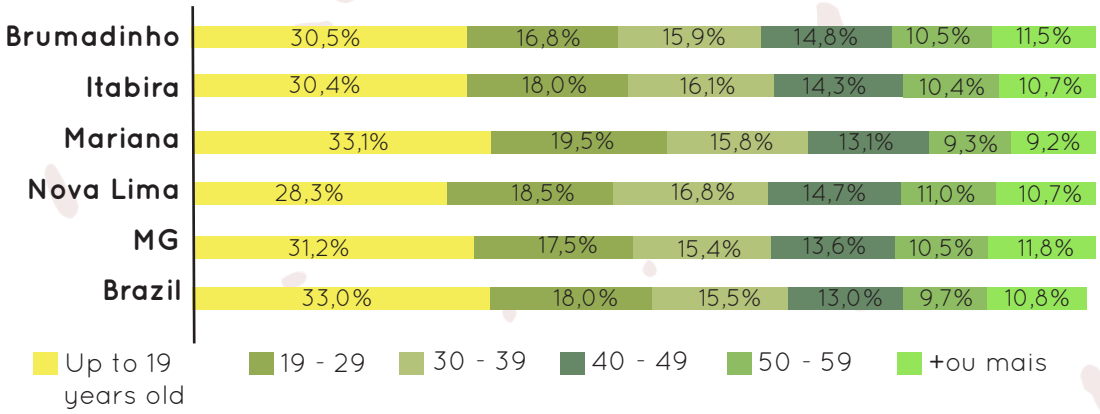
[53] '*Região Metropolitana de Belo Horizonte*', Metropolitan Plan rmbh, <http://www.rmbh.org.br/rmbh.php>.

[54] According to the IBGE classification, '*Perfil dos municípios brasileiros: 2019*', (Rio de Janeiro: IBGE, 2020).

[55] It is important to highlight that one of the partner organisations is *quilombola* and, despite being located within the boundaries of Brumadinho, in Marinhos, its territory is far from the urban centre. There is no disaggregated data for the specific territory, so we will use Brumadinho data as references

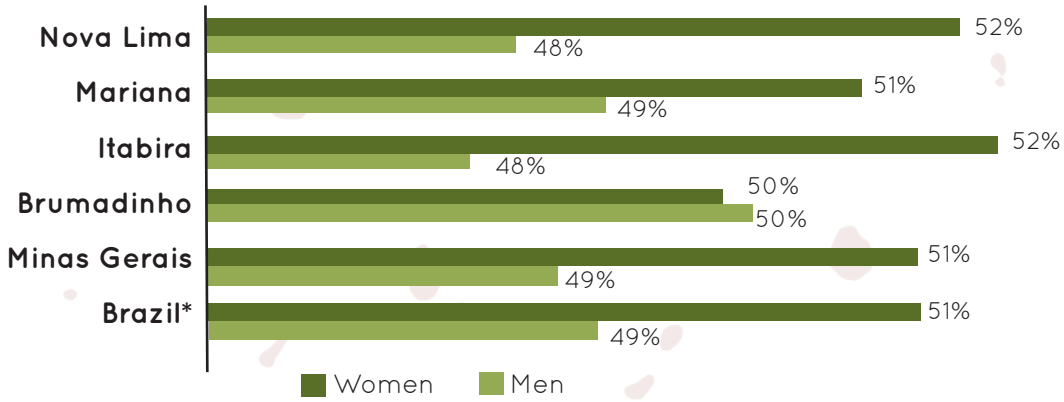
In general, the age distribution is similar in the four municipalities, Minas Gerais and Brazil; although Nova Lima has a slightly older population with a lower concentration of people below 29 years and a higher number of people over 40 (Figure 2). The male-to-female ratio in the municipalities is also similar to those of state and national levels, with more women than men overall. The exception is Brumadinho, with estimated ratio of 50.1% men to 49.9% women in 2017 (Figure 3).

Figure 2: Distribution of the population by age group (2010)



Source: IBGE, 2010.

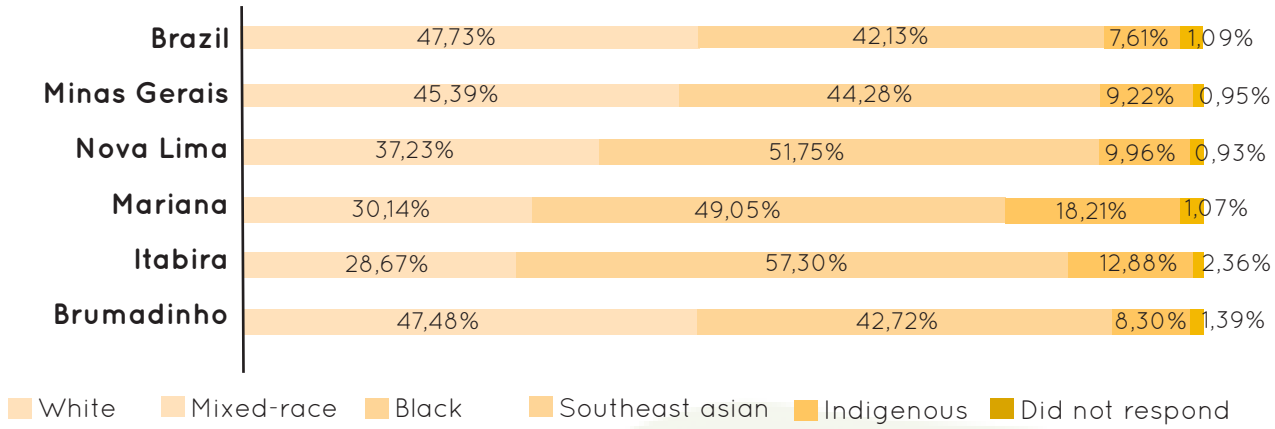
Figure 3: Distribution of the population by sex (2017)



Sources: IBGE (2010) and PNAD-Contínua (2017). *Data from 2010.

Additionally, analysis of the impact of disasters in Minas Gerais indicates that, both in Brumadinho and Mariana, Black communities were the most affected. In 2015, when the dam burst in Mariana, it was estimated that 84.3% of residents in the Bento Rodrigues district – the most affected area – were Black.[56] Moreover, in 2019, when the dam collapsed in Brumadinho, it was estimated that about 63.8% of those most affected within a 10 km (6 mile) radius of the disaster were Black, and in the areas immediately affected the percentages were 70.5% (Parque Cachoeira) and 58.8% (Córrego do Feijão).[57]

Figure 4; Distribution of the population by race/ethnicity (2010)



Source: IBGE 2010.

[56] Global Justice (2016).

[57] Articulação Internacional dos afetados pela Vale (2021).

Another index used was the Human Development Index - Municipal (HDIM). The HDIM considers three dimensions of human development: longevity, education and income, ranging from 0 to 1 – the closer to 1 the greater the local human development. In 2010, Brumadinho, Itabira and Mariana had high HDIMs (respectively, 0.747, 0.756 and 0.742), and Nova Lima, a very high HDIM (0.813). All had higher HDIMs than the state-level average index (0.731) and the overall Brazilian index (0.724) (see Table 3).

The Gini Index is used as an indicator of social inequality. It measures the degree of income concentration: the closer to zero, the greater the equality in the distribution of income; and the closer to 1, the greater the inequality. Nova Lima and Brumadinho had the higher indicators of 0.68 and 0.57, indicating a higher concentration of income, while Itabira and Mariana both had an index of 0.51, indicating a lower concentration of income. Both sets of figures are, respectively, higher and lower compared with the state figure – Minas Gerais (0.56), and the national figure – Brazil (0.54) (see Table 3).

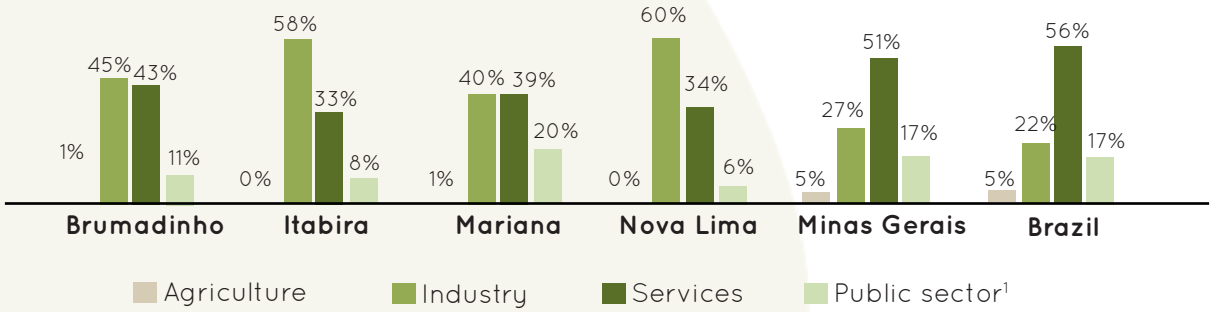
Table 3: Socio-economic indicators

	Brazil	Minas Gerais	Brumadinho	Itabira	Mariana	Nova Lima
HDI AND HDIM (2010)[58]	0.724	0.731	0.747	0.756	0.742	0.813
GINI[62] (2017)	0.54	0.56	0.57	0.51	0.51	0.68

[58] Human Development Index - Municipal considers three dimensions of human development: longevity, education and income. It ranges from 0 to 1, and the closer to 1, the greater the local human development.

A breakdown of the Gross Domestic Product (GDP) in the municipalities reveals the dominance of the mining industry in local economies. While in Minas Gerais the industrial sector, which includes mining, made up 27% and in Brazil, 21.8% in proportion to the GDP in 2019, in Nova Lima the figure was 59.7%; in Itabira, 58.1%; in Brumadinho, 45.5%; and in Mariana, 40.8%. On the other hand, there was lower participation in the services and agriculture sectors in the municipalities analysed. The share of the public services varied widely, ranging from 5.8% in Nova Lima to 19.8% in Mariana[59] (see Figure 5).

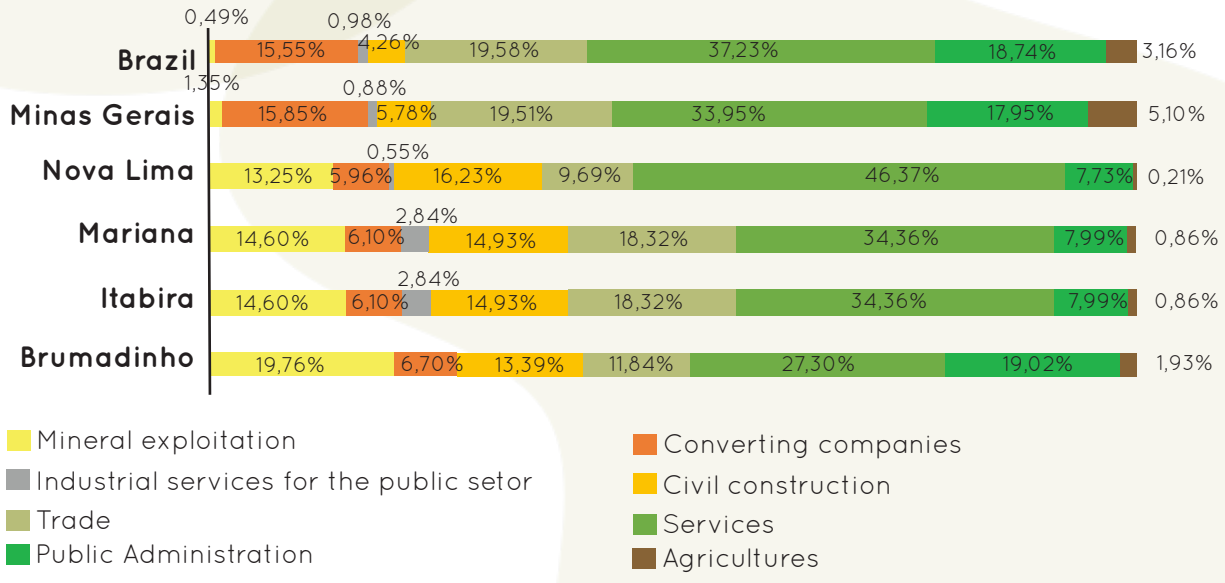
Figure 5: Gross Value Added (GVA) by sector in proportion to the GDP (2019, current prices)



[1] Public sector: administration, defence, social security, education, and public health.
Source: SIDRA - IBGE (2022).

The importance of mining is also evident when analysing formal employment. While the mineral extraction sector accounted for about 1.3% of formal employment in Minas Gerais and for less than 0.5% nationally, it was the third largest sector for formal employment in Brumadinho and Nova Lima, and the fourth largest in Itabira and Mariana, according to 2020 data (see Figure 6).[60]

Figure 6: Percentage distribution of formal employment by economic activity sector and by federative unit (2020)



Source: RAIS (2020).

[59] Data available at: <https://sidra.ibge.gov.br/tabela/5938#resultado>.

[60] Data available at: <https://bi.mte.gov.br/bgcaged/caged_isper/index.php #>.

Finally, all four municipalities have a shared history related to the beginning of mineral exploitation in Minas Gerais, even though they have different foundation and/or emancipation dates – Mariana was founded in 1711, for example, whilst Brumadinho was only emancipated in 1938. All have tangible/intangible heritage registered and/or listed by IPHAN, the Minas Gerais' State Institute of Historical and Artistic Heritage (IEPHA)[61] and all four areas have their own city-level policies and institutions for the recognition and preservation of cultural heritage. In Brumadinho, there is the Municipal Council of Cultural Heritage; [62] in Itabira, the Municipal Advisory Council of Historical and Artistic Heritage of Itabira; [63] in Mariana, the Municipal Council of Cultural Heritage; [64] and in Nova Lima, the Municipal Council of Historical and Artistic Heritage. Risk and disaster management is carried out by local civil defences.[65]

"All four municipalities have a shared history related **to the beginning of mineral exploitation in Minas Gerais."**

[61] In the List of Goods Listed by IPHAN, there are no listed assets in Brumadinho. IPHAN, (2021).

[62] *'Law No. 2,539, of July 1, 2020'*, Brumadinho City Hall, 2020, <https://www.cmbrumadinho.mg.gov.br/docs/legislacao/LEI_2539.pdf>.

[63] *'Conselho Municipal de Patrimônio Histórico e Artístico de Itabira completa 35 anos de criação'*, Itabira Prefecture, 2 September 2021, <'https://www.itabira.mg.gov.br/detalhe-da-materia/info/conselho-municipal-de-patrimonio-historico-e-artistico-de-itabira-completa-35-anos-de-criacao/195001>.

[64] Available at <https://www.compat.info/>.

[65] *'Centro Cultural de Nova Lima'*, Nova Lima, [n.d.], <https://novalima.mg.gov.br/cultura/trades/centro-cultural-de-nova-lima>.

3.2 | AXIS 2: ACTIONS

The second axis seeks to elucidate the relationship between the cultural heritage organisations and their territories, in order to better understand the perceptions of the communities on issues relevant to our research. This process is carried out through semi-structured in-depth interviews, which were conducted between July and August 2021 with 15 members/ workers from the six cultural heritage partner organisations. These people live and/or work in the municipalities of Belo Horizonte, Brumadinho (including the *quilombola* community of Marinhos in the district of São José do Paraopeba), Itabira and Mariana (including the district of Passagem Mariana), and Nova Lima.

The interviews were analysed using a 'thematic analysis' method, which seeks to interpret qualitative data through the identification of common themes. This analysis technique allowed us, through immersion in the data, to recognise recurrent themes that form patterns of meaning, thus establishing codes that organise our data. From this, the interviews were described and interpreted according to the themes identified. Within this methodological perspective, the analysis followed an exploratory method guided by the data, which means that the themes were identified according to the content of the interviews, and not according to pre-established hypotheses (Braun and Clark, 2006).

The themes identified from the interviews centred around the dynamics of cultural heritage, their role and importance, as well as the role of communities' relationships to their cultural heritage. In addition, the importance of cultural organisations and the duality of mining in the region were also focal points

The following sections explain and analyse the identified themes.

The role of civil society in maintaining tangible and intangible cultural heritage.

In general terms, the interviews strongly indicate that, for the people interviewed, the role of civil society is central to preserving cultural heritage. Although the government is often mentioned as the main entity responsible for the preservation of cultural heritage in the region, the involvement of the communities is highlighted as essential. In addition, the lack of interest of the community is repeatedly pointed out as one of the main threats to these assets:

> "I believe that the community itself is responsible for preserving because it is responsible for fostering as well. There is no point in existing if the community itself has no interest there, wanting to perpetuate that heritage. So, it turns out that, for example, [organisation X], if the community had no interest, there would be no enterprises that facilitate visitor visitation, such as hotels, restaurants, and [organisation X]. So, if you didn't have that interest, no heritage would have survived to this day. So, the community itself, it is the main responsibility even for the perpetuation of the heritage. (Respondent 10)

Also, when considering the main threats to the region's cultural heritage, lack of funding, issues of political and religious intolerance and social inequality are also frequently mentioned.

Education as an agent of preservation. Education is consistently highlighted as the main mechanism to promote the involvement of communities with their cultural heritage, in a way that is characterised as a strategy to ensure the preservation of tangible and intangible heritage. Two mechanisms are evidenced by the respondents: i) once the population is familiar with their cultural heritage, they learn to value it and, thus, the demand for investments (public and private) in the cultural area increases; ii) with the greater involvement of younger generations, practices, habits and traditions will continue and will not be lost.

> "If schools try to rescue this, inside the school is a great place to leave these local stories ... the school visits [heritage sites] with the children, with teenagers, to [let them] know the places they have in the community. I think that activities within the school also help a lot to preserve the history of the places, the stories are passed down from generation to generation, teachers work on these stories, work on these places, come here to know the local culture, I think this makes it [be] preserved for longer, [so it] is not lost. (Respondent 3)

> "The issue of education, especially municipal education, which is that of young children, the first grades of the school, it is the responsibility of the municipality. The municipality itself, it has it, it can [make it] be valued, showed. So, I think it can come from education from a young age at school, I think it's the most important because it's when [children] create character, create interests.... So, I believe that it is a mistake of the municipality, to [not] value what is theirs, it creates a snowball effect, the less people are interested, the less they visit the palaces. So, I think it might be a problem back there [when they] stopped valuing it ... which continues today and people are the least interested, not even know what that [heritage] is. Because if there is a commitment from the community, if the government sees that it is valued by the community and there is pressure about it, I believe that the tendency, the right thing, would be that it was also valued by the community. I think it must be done like this, to see that the community values, what the community is interested in, so there is a clear path for the public power to intervene [preserve]. (Respondent 12)

Cultural organisations as advocates of education and transformation. Cultural organisations are institutions capable of providing enhancement to personal and professional skills, and of exposing people to realities and themes that impact their worldviews. From the new skills acquired from organisations, both members and the target audiences of the activities can expand their range of interests and professional performance. In this sense, the cultural sector can be seen as an economic alternative to the mining sector.

The younger interviewees reported a similar trajectory regarding their relationship with the local cultural heritage organisations to which they are linked: they began their activities in these organisations as children or teenagers – as members, scholarship holders or interns – and developed skills related to culture and art, working professionally in these areas when they entered adulthood. In addition, they reported that the involvement with these organisations impacted their worldview, their interpersonal relationships and their identities.

> "Every cultural heritage has a story, it is considered heritage by the history it carries, it may be a more recent history, it may be older, but it always tells stories and it helps perpetuate everything it represents ... as [organisation X], for example, it is a history that is under construction, it is a new heritage ... but that has been transforming the story of several people, the lives of several people. Mine, for example, I don't know if I hadn't had this contact with [organisation X] many years ago, I don't know how I'd be today, which way I'd go, if I would have the same worldview I have today. So, this is important, personally speaking, it was important to me and I believe it will be important to other people as well. (Respondent 10)

> "I think 100% of what I'm doing here is because of it. Because before, besides the courage that we gain, because before I could not speak in public, I could not articulate things, so today, I no longer have this shame anymore. I'm going to turn around and say 'no, why are you saying that?' .... So, I am 100% sure I wouldn't be doing what I do today, the opinion I have today if I wasn't there. Also, because people are different, we tend to talk about... we understand why such a place is like this ... I think 100% of what I am, so 80% of what I am today is because of been raised in [organisation X], because I am there since I was nine years old. (Respondent 12)

The economic power of mining.
The economic power of mining companies in the Iron Quadrangle is considered a constraining factor to the professional performance of people in the region and their relationship with the environment. There is a dualism between the importance of mining companies to the local economy and the environmental impacts caused by both regular mining activity and recent environmental disasters. Thus, contradictory social and macroeconomic relations are established in the region and are evident in the statements of different respondents.

I think that [feeling threatened by new disasters] is the feeling of everyone who is part of the Iron Quadrangle. Because, although we recognise the importance of mining for us, we also recognise that any [new] environmental disaster and the city will no longer exist. So, like, there are two sides of the coin" (Respondent 2).

"... from the one that already happened, for example, Bento Rodrigues [respondent is referring to the burst of the Fundão Dam], the people affected were kind of forced to go, after everything they lost. But, for example, here [in city X] there was no mobilisation because of what happened there ... Here the concern, here [in city Y], the municipality was like 'will companies close?' Or 'how's it going to be now? What economic path will we have?'. Because a lot of people who work, who live here [in city X] worked there at the company and were afraid of it closing, the [city Y] as well. So that was the concern when it happened, not with the rights." (Respondent 3).

"I think the economic power will always talk much bigger than lives, than anything, like that. It is a perspective, it is not a good perspective, although I am a very hopeful person that [I believe] this will still improve, that laws will be created that will be fulfilled, that will be fulfilled, but today I still do not believe that we will not have another accident, another disaster of the level that occurred here" (Respondent 6).

The harmful effects of mining on the environment (in addition to disasters). Finally, it is evident that the environmental impact of mining in the region goes beyond the direct effects of dam disruptions. The more general consequences are indirect, with more extensive areas impacted than those directly affected by mud and tailings.

From an economic point of view, many cultural organisations were affected by being forced to interrupt their activities either because the roads were blocked, local commerce was paralysed, or because there was a collective mourning at the time and/or they suffered a significant reduction in the demand for cultural and tourist activities. In addition, impacts prior to the most recent disasters caused by dam failures had already affected the environment in the region and residents' quality of life.

We've always been affected, we've always been affected, because then it is, what is getting affected? I'm getting affected, so if I talk about mud, anyway, the mud didn't get here, but we're totally affected, even though the mud hasn't arrived in the community, we're directly affected, because when it crossed the street, for example, there [in city X], so we didn't have a road. You've been off without any road access for an entire day. The guys had to buy food, it got complicated to cross the city, everything went crazy, you cannot imagine how the city got, markets, people, everything closed, imagine a movie, a horror movie happening in real live, and I saw a lot. Then, [I am] always affected, [I am] always affected. (Respondent 13).

I think the biggest risk that we may actually have of some crime or some tragedy is like it was here, then we are really more affected, but the very issue of taking, ending a mountain, ending a forest, it indirectly harms all of us regardless of whether we are involved with a cultural organisation or not, because more than the culture that we have, for example, the Serra dos Três Irmãos, a landmark here, a symbol, let's assume that the mining company destroyed it, it would end up with a cultural symbol, natural of the city, but more than that there is the general health issue, by destroying the environment to build something that aims for profit. (Respondent 14)

3.3 | AXIS 3: IMPACT

The idea of impact varies in different fields and over time. At the same time, there are very diverse understandings of the impacts of culture. The focus on the economic aspects is often due to the fact that economic indicators are widely recognised and considered in the development of public policies, as well as used to legitimise the allocation of public resources. Nevertheless, while the economic sciences have questioned (and criticised) the use of strictly monetary indicators in impact analyses, the social sciences have been proposing new ways to evaluate the impacts of actions and policies.

In this sense, impact conception has expanded and, consequently, impact indicators of the cultural sector are constantly being reformulated and tested. As mentioned, the Relative Values project and its development into projects such as Roots of Resilience is part of this debate that aims to propose new understandings of the impact of cultural organisations and generate data illustrating these impacts, with a focus on organisations that are driven by marginalised themes and positioned in peripheral contexts.

> “**Roots of Resilience** sought to evaluate the positive effects of having contact with and/or engaging with actions organised by the cultural heritage organisations inside the **Iron Quadrangle.**.”

In addition to theoretical-conceptual aspects, there are other variations in impact evaluation, that is, a programme, action or policy can have both positive and negative impacts, predicted or unexpected, direct or mediated by other individual or collective factors. Although the idea of ‘positivity’ and ‘negativity’ varies according to the people being questioned as well as the theoretical approach, there are some widely valued aspects of society: health, education and economics. These three pillars are commonly related to the idea of well-being and quality of life, both entailing more varied indicators.

Roots of Resilience sought to evaluate the positive effects of having contact with and/or engaging with actions organised by the cultural heritage organisations inside the Iron Quadrangle. The research focused on evaluating individual impacts and identifying possible indicators of these effects. It should be noted that the project has a descriptive bias and includes collecting data from the six partner organisations. To indicate whether the effects analysed are direct or mediated, more specific methods of casual effects and correlation would be required. Nevertheless, the indicators resulting from this research serve as the basis for future analyses and explorations within the theme. Moreover, the qualitative analysis employed here is important to elucidate connections, relationships, and paths through which the impacts of these organisations occur, thus expanding the understanding of the phenomenon.

Foto: *People's Palace* - Brendon Campos

3.3.1 | Profile of the respondents

The quantitative data analysed was obtained through survey questionnaires, which were administered by partner organisations with their audiences and (ex-) members and or employees. The questionnaires were co-created by the PPP team and partner organisations, and consisted of 27 questions common for all organisations and up to three specific questions per organisation. In all, 489 responses were collected between June and August 2021. Data collection was mostly done online using the SurveyMonkey platform. However, there were also face-to-face interactions since some of the respondents live in a *quilombola* community. The analysis of the data obtained is in the subsections below, [66] starting with the profiles of the respondents.

Through the distribution of 489 questionnaires, we were able to engage people involved with the six partner organisations. The amount of respondents per organisation is shown in Figure 7; a factor in the percentage variation is each organisation's differing target audience sizes, as well as differing strategies deployed for gathering respondents.[67]

Figure 7: Percentage of respondents per organisation

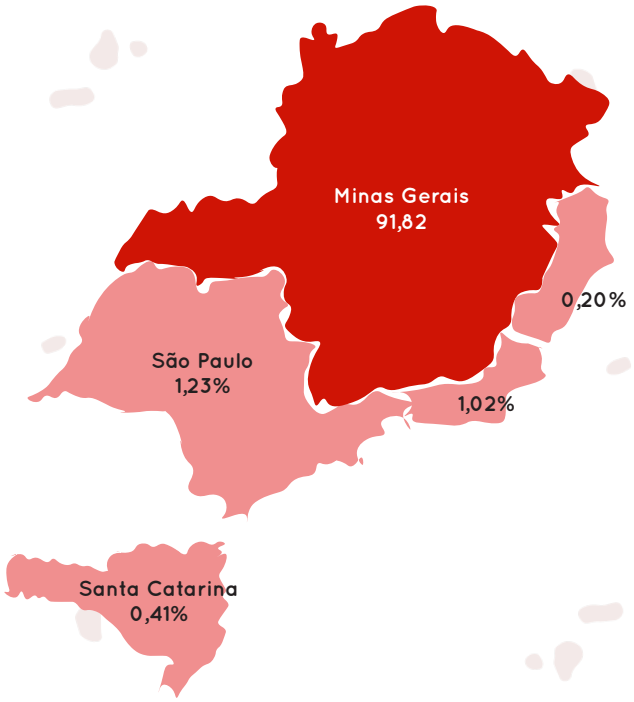
Source: Roots of Resilience survey data, 2021

[66] Unless stated otherwise, all analyses refer to the 489 responses.

[67] When delimiting their target audience, some organisations selected specific programmes. This was the case for FCCDA, which administered the questionnaire only to (ex-)participants of the Drummonzinhos Programme.

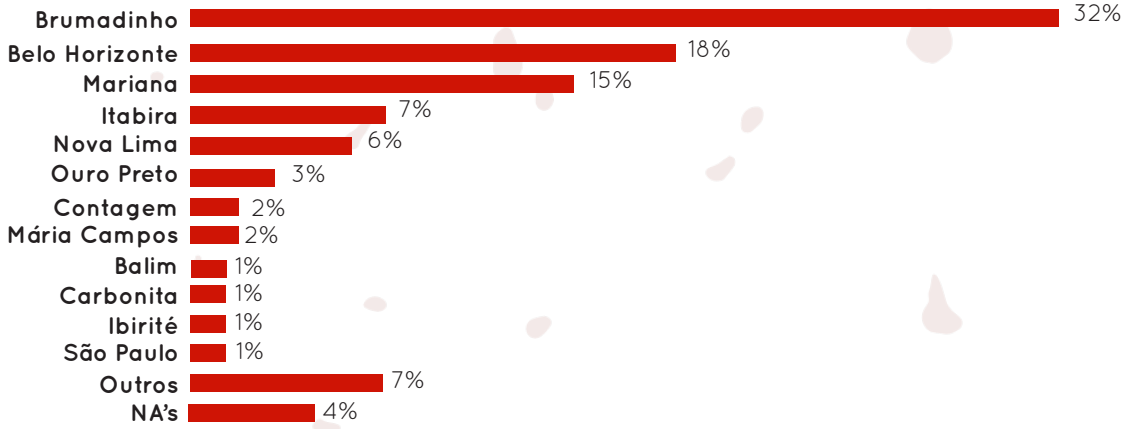
Most respondents (92%) live in Minas Gerais, with the most respondents based in Brumadinho, Belo Horizonte, Mariana, Itabira and Nova Lima (Figure 8). Among the respondents who live in Brumadinho, at least 20% are residents of the *quilombola* community of Marinhos. Among the respondents living in Mariana, at least 51% live in the Passagem de Mariana district (Figure 9). Overall, the sample shows the respondents are highly educated, young and mostly female.

Figure 8: Distribution of survey respondents by state



Source: Roots of Resilience survey data, 2021.

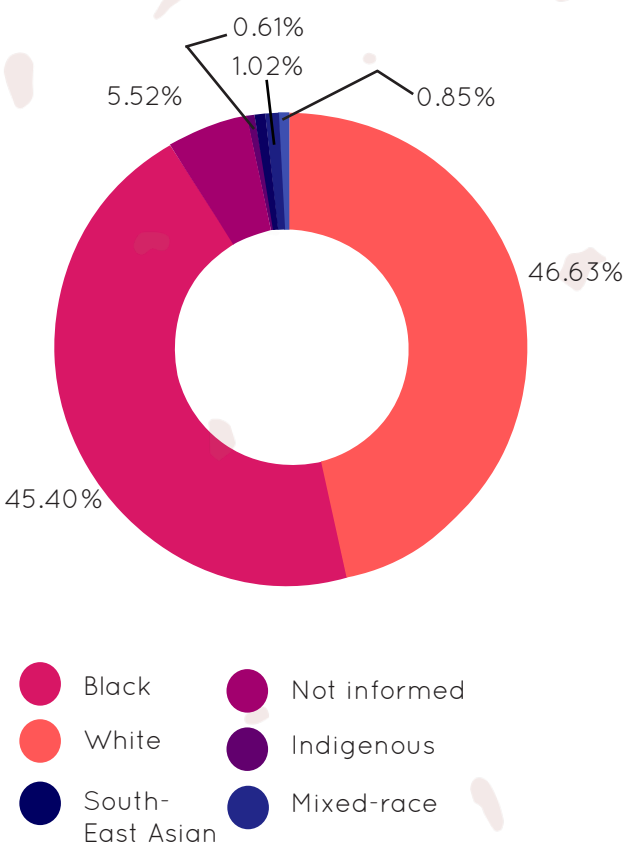
Figure 9 – Distribution of survey respondents by municipality



Source: Roots of Resilience survey data, 2021.

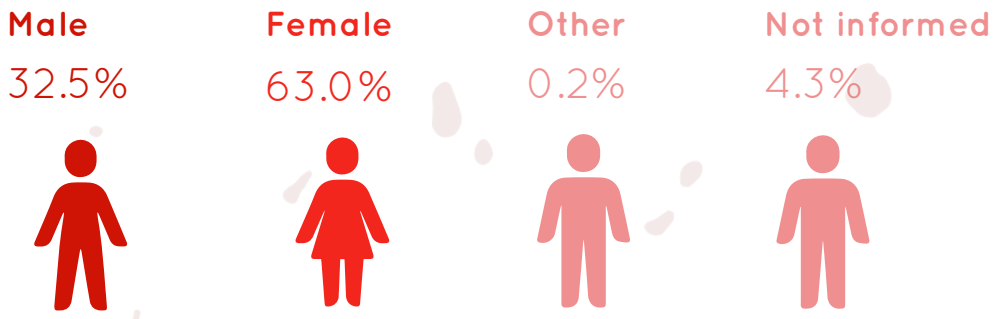
Most of the survey respondents identify as white, in contrast to the total population of most of the cities analysed, as clarified by the data presented in the previous section. The number of survey respondents who identify as Black or Mixed race is virtually the same as the ones who identify as White (see Figure 10). In addition, most of the survey respondents were: women (63% of respondents) (Figure 11), young people between 18 and 34 years (42.5%) (Figure 12), people with higher education qualifications (47.6%) (Figure 13) and with a family income between two and five times the minimum wage (38.4%) (Figure 14).

Figure 10 – Race/Ethnicity of survey respondents



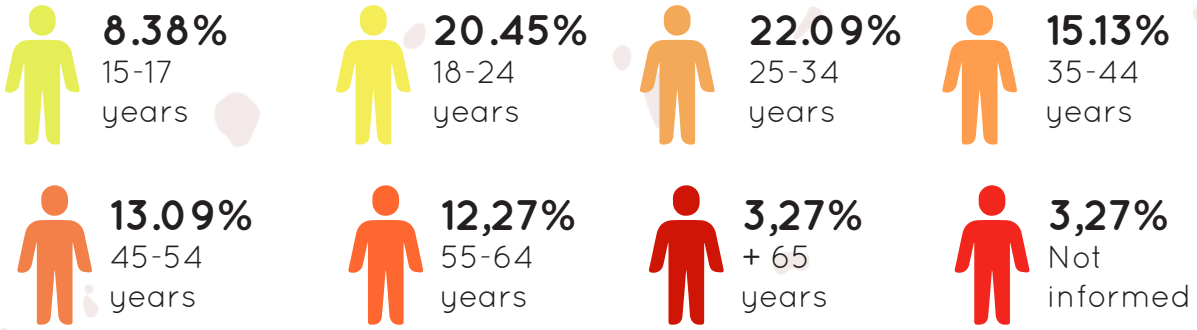
Source: Roots of Resilience survey data, 2021.

Figure 11: Gender of survey respondents



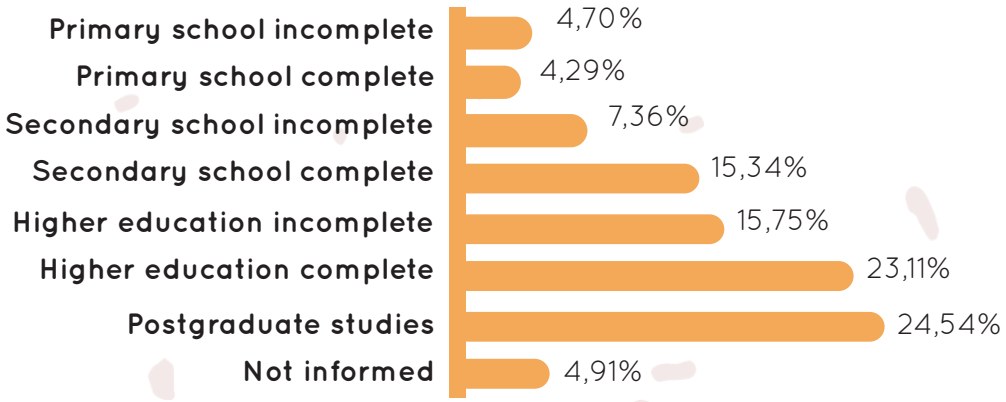
Source: Roots of Resilience survey data, 2021.

Figure 12: Age of survey respondents



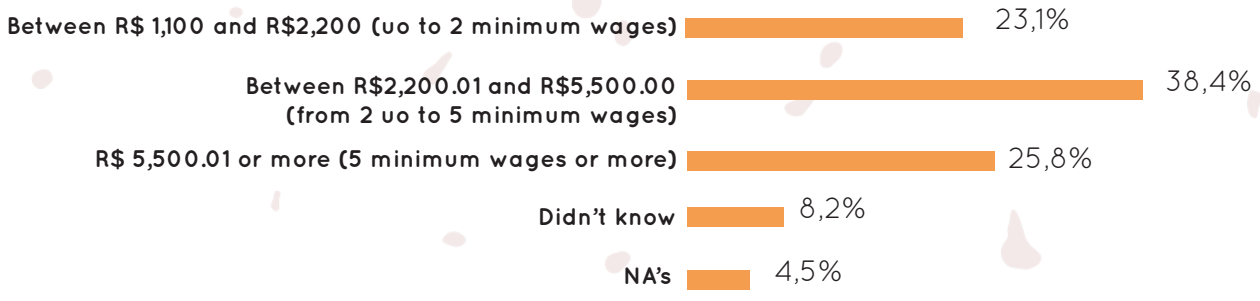
Source: Roots of Resilience survey data, 2021.

Figure 13: Education stages of survey respondents



Source: Roots of Resilience survey data, 2021

Figura 14: Faixa de renda familiar dos respondentes



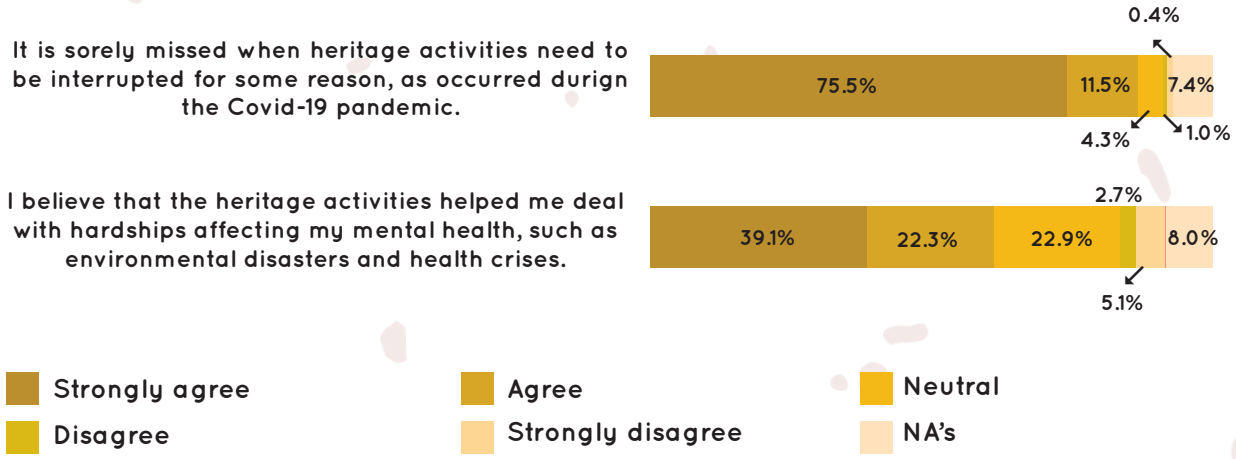
Source: Roots of Resilience survey data, 2021.

3.3.2 | TIMES OF CRISIS AND MENTAL HEALTH

The first dimension of analysis in this axis is mental health and how the organisations' actions impacted its members and beneficiaries. This element is important, especially in a crisis, such as the recent environmental disasters in the region and the Covid-19 pandemic.

In the survey results, 61.4% of the respondents acknowledged that cultural heritage organisations' activities helped them handle problems affecting their mental health, such as environmental disasters and health crises. The impact was also felt when organisations' activities were interrupted: 94% of survey respondents indicated that they sorely miss their organisation's activities when they are interrupted for any reason, such as the Covid-19 pandemic (see Figure 15).

Figure 15: Survey respondents' relationship with the rganisations and perceived impacts on their mental health



Source: Roots of Resilience survey data, 2021.

3.3.3. | ACCESS TO CULTURAL ACTIVITIES AND SKILLS ACQUISITION

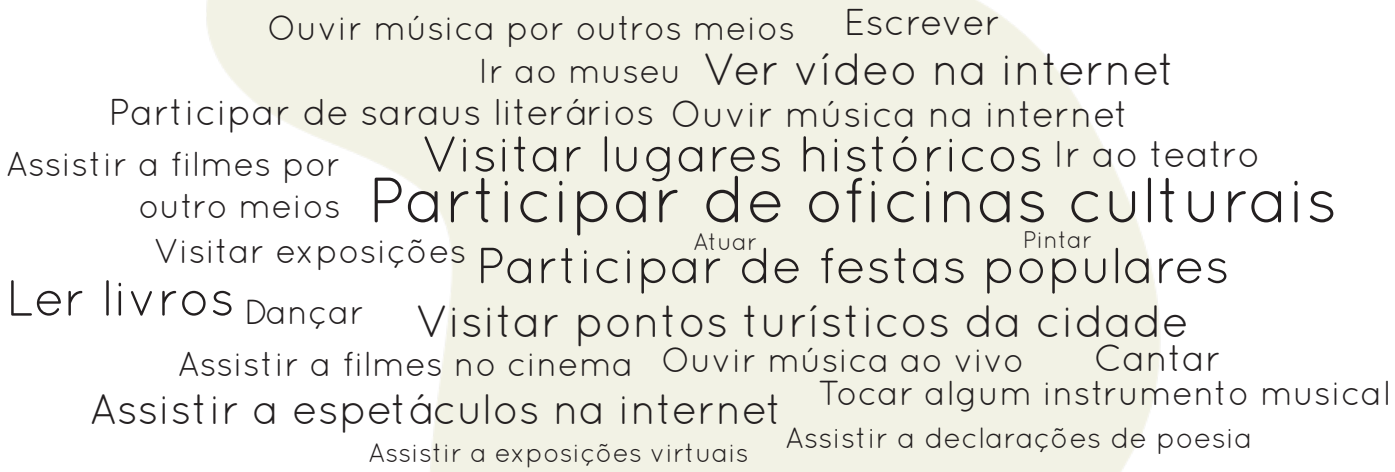
Another dimension that shows impact is the promotion of cultural activities, the expansion of access to culture and the development of skills and knowledge acquisition related to culture through the organisations. More than half of the 489 survey respondents pointed out that they had acquired knowledge related to local culture (60.5%), arts (56.5%) and cultural traditions (52.7%) through the participating organisations' activities (Figure 16). This answer is corroborated by the confidence survey respondents reported they had acquired through their engagement with cultural activities and cultural heritage organisations.

Figure 16: Word cloud – Knowledge acquired through engagement with the organisations

Source: Roots of Resilience survey data, 2021.

In addition, knowing or engaging with our partner organisations led survey respondents to engage more frequently activities such as participating in cultural workshops (48.5%), in popular festivals (44.8%) and reading books (36%) (Figure 17). It is noted that each organisation, according to its focus of activity, stimulated knowledge acquisition and the performance of specific activities.

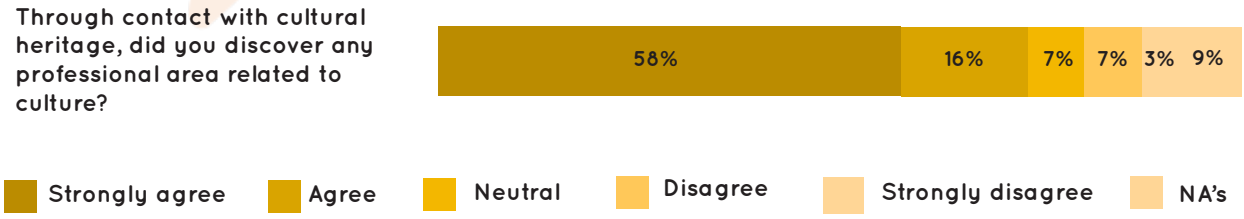
Figure 17: Word cloud – Activities most frequently performed by respondents after their involvement with the organisations



Source: Roots of Resilience survey data, 2021

Moreover, 73.4% of survey respondents pointed out that they had discovered new areas of professional activity related to culture based on their contact with the cultural heritage organisations (see Figure 18).

Figure 18: Relationship with the organisation and discovery of areas of professional activity

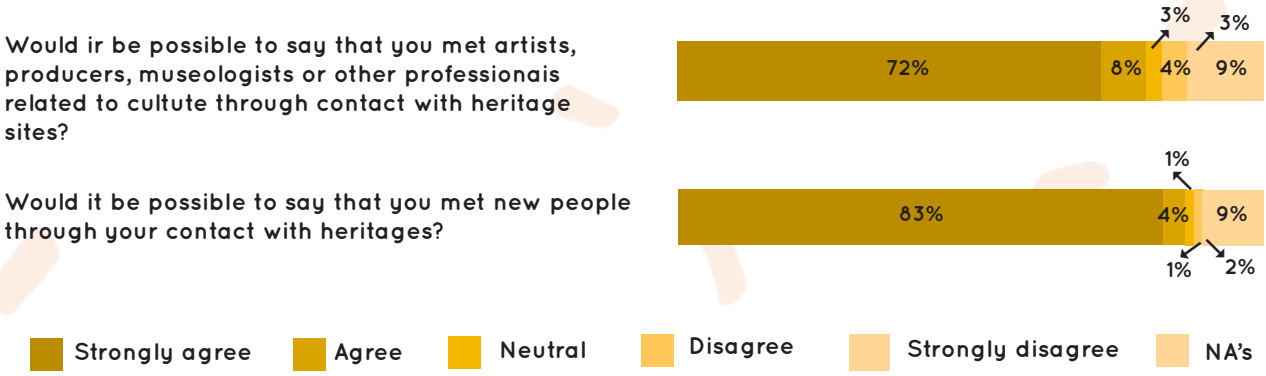


Source: Roots of Resilience survey data, 2021.

3.3.4. | SOCIAL CAPITAL AND NETWORKS

A third area of reported impact relates to the establishment of contact and conviviality networks, which enables survey respondents' social capital expansion. 86.9% of survey respondents stated that they had met new people through their contact with the organisations. In addition, 80% of the respondents reported having had contact with various cultural professionals, such as artists, producers and musicians, through their involvement with the organisations (Figure 19).

Figure 19: Network development

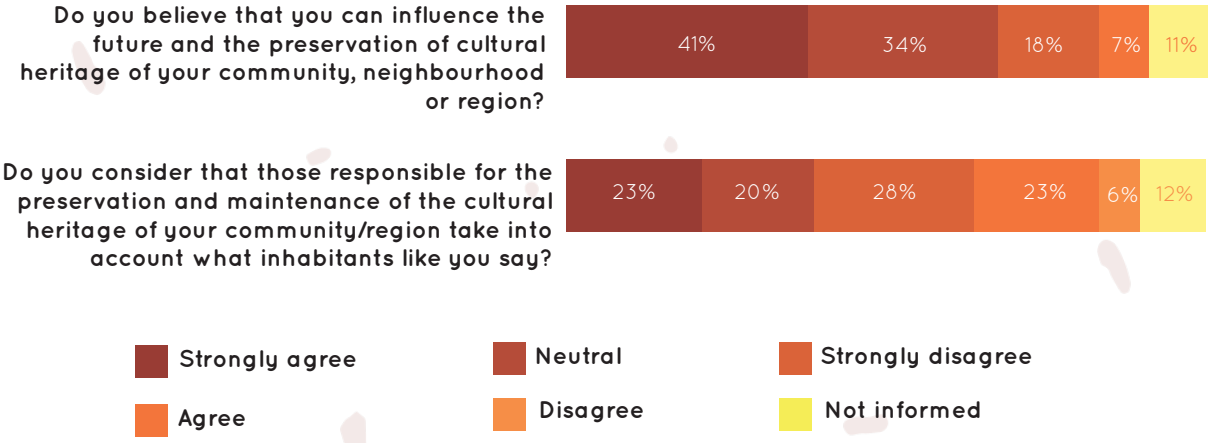


Source: Roots of Resilience survey data, 2021.

3.3.5. | SELF-CONFIDENCE AND FEELING OF EFFECTIVENESS

The fourth area of impact relates to feelings of effectiveness[68] , which is demonstrated in survey respondents' understanding of local cultural heritage and their levels of confidence in engaging in cultural activities. **In general, survey respondents were confident to perform various activities, especially organising or participating in cultural events, or working in** activities related to the cultural sector, such as photography, acting, producing and others. In addition, 75% believe they could influence the future and the preservation of local cultural heritage, but a smaller portion (43%) felt that those responsible for preserving and maintaining local cultural heritage take into consideration what they think (Figure 20).

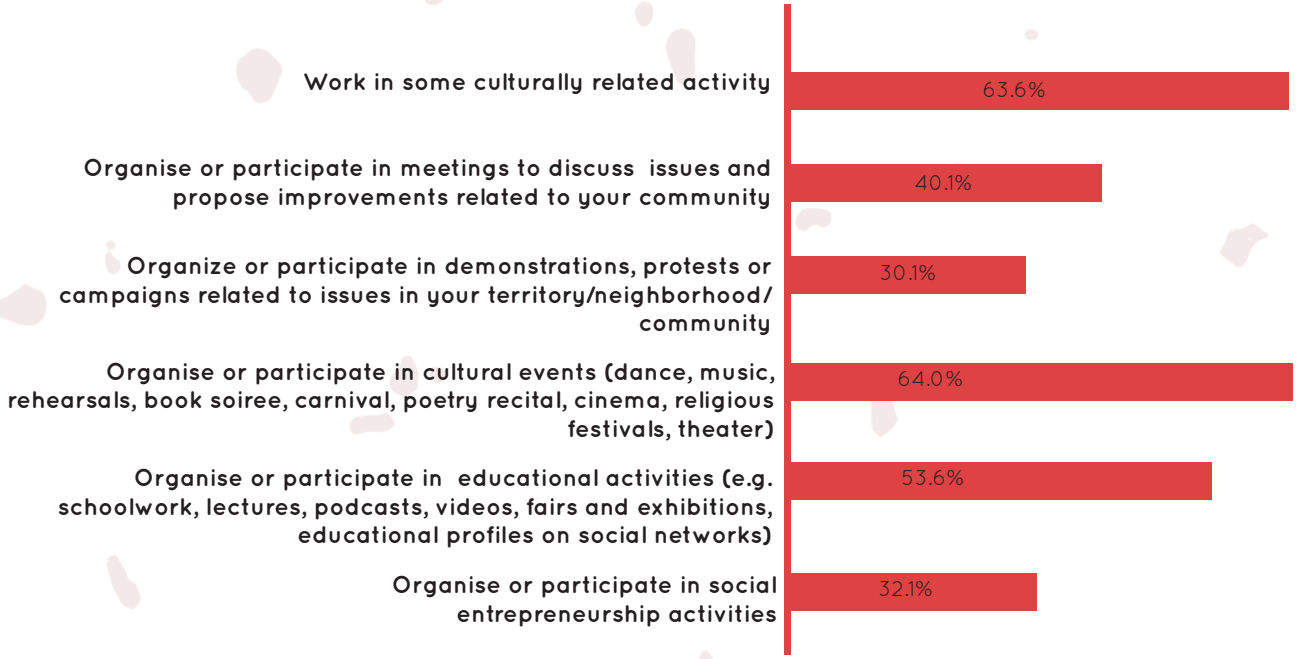
Figure 20: Ability to contribute to change and capacity to influence stakeholders



Source: Roots of Resilience survey data, 2021.

[68] The feeling of effectiveness concerns the respondents' perceived ability to influence the directions of their community and feel that their opinion is taken into account by the decision-makers.

Figure 21: After the contact with the heritage, do you feel confident to perform any of the following activities?

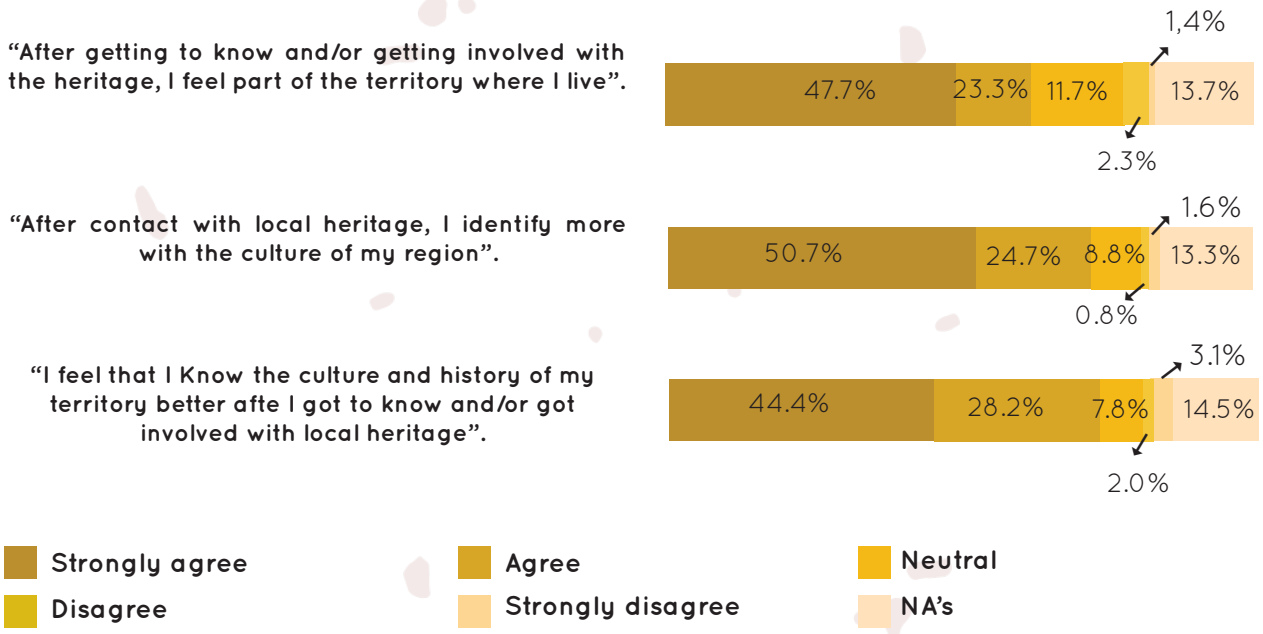


Source: Roots of Resilience survey data, 2021.

3.3.6. | INVOLVEMENT AND BELONGING

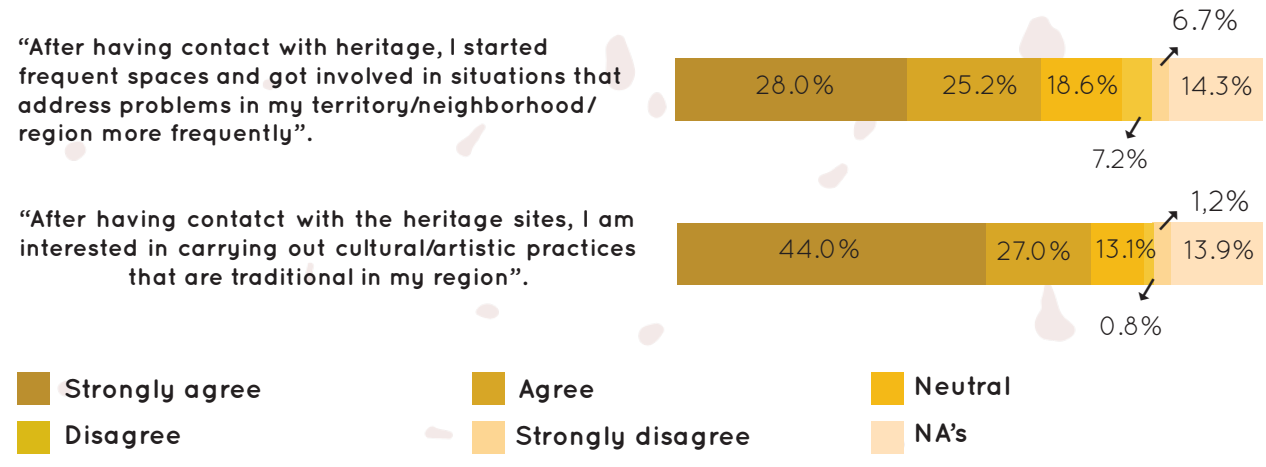
In the fifth and final dimension of impact, we evaluate whether contact or involvement with partner cultural organisations impacts people's sense of belonging and social engagement. For most survey respondents, the contact with cultural heritage organisations increased their sense of belonging to the territory and their connections with local culture (Figure 22). In addition, contact with the organisations fostered knowledge about local culture and history, propagating the interest by taking part in traditional cultural practices in the region and increased involvement with issues and problems specific of the territory, neighbourhood, or region (Figure 23).

Figure 22: Level of agreement with the affirmations about personal involvement



Source: Roots of Resilience survey data, 2021.

Figure 23: Level of agreement with the affirmations about the feeling of belonging



Source: Roots of Resilience survey data, 2021.

3.4. | AXIS 4: HAZARD PERCEPTION DIAGNOSIS

To understand the roles communities play in protecting the region's cultural heritage, Roots of Resilience explored the survey respondents and interviewees' perceptions of risk and environmental threats. When asked about the risks of further disasters in the region, two elements were highlighted. First, there is the idea that the region's communities live under a continuous risk of new disasters: the region, for these respondents, is like a "ticking time bomb" (Respondent 1). Second, there is a feeling that affected areas are now at a lower risk of new disasters, as stated by one of the interviewees:

> I'm a very hopeful person, you know, so I believe that here *[people]* are not [under threat of *being hit by new environmental crimes*] because it has already happened. ... Here it became the city, for me, it became a reference of tragedy, of dam failure, of lost lives. I believe there must be someone either in the town, the state, the country or in the world who is worried that it doesn't happen again. But I believe that somewhere else it can happen again, because if it happened in Mariana ... it's because something is wrong and it should have been looked at and it wasn't. I don't know by whom, what the necessary authorities or the companies themselves should do, but I believe it could happen again in a wide range of places as it has [happened] here, but I believe not here, because here, it is not possible that after everything that has happened it will happen again... *It would be like lightning striking the same place twice*, it's very difficult to happen. (Respondent 14, italics by the authors)

The perception of hazards has also changed over time, with better dissemination of information and clearer understanding of the risks facing the region reported by the respondents after recent disasters. Still, some interviewees indicated a lack of information about the risks the region is facing, which was sometimes accompanied by the desire to know more. They also indicate a general sense of distrust regarding the information received:

> By my knowledge, which is very superficial about the existence of these dams, how many there are, if there is still any that brings risk to the people who are there. So [the possibility of new disasters] is not a fear, it's not a phobia I have. But I think it might be because of lack of knowledge. (Respondent 10)

> I think I need to be more informed; you know? Mainly, I understand the institutions that work for this preservation. Like I talked about this issue of public authorities and public bodies. I understand, I know what they are, but I wanted to dig a little deeper into it. (Respondent 4)

> Unfortunately, because it is a mining area, I do not know ... to what extent they will want to inform us in this sense of being able to leave us, to be able to make us avoid new disasters. So, I don't have this total confidence, no matter how much we see the information coming, but it doesn't come, maybe it doesn't come so complete, in a way that we can contribute to these disasters not happening. (Respondent 4)

In the interviews, the risk of new disasters is directly associated with the possible destruction and erasure of local tangible and intangible cultural heritage. Here, the greatest concern lies with people, who give meaning to heritage. As illustrated by one of the respondents, a cultural heritage site, such as a church, "is often a certain group of people, a certain family that cares for that church ... so if these people are threatened, if something happens to those people, then the heritage is threatened, even more because of what happens with people" (Respondent 12).

Disasters also bring indirect risks to heritage, especially because of the resulting economic impact in the region. In addition to the interruption of economic activities, addressed in Axis 2 of this report, the interviewees emphasised a general economic recession, including less public investment in areas such as education and culture. A more frequently expressed fear by the interviewees is that people, afraid of new disasters, stop visiting and engaging with the cultural heritage, as can be seen in the following responses: "one of the risks is that the place is kind of abandoned, because of people's fear." (Respondent 10); "people start not going, they are afraid to visit, and then, the spaces that are abandoned, fall into oblivion." (Respondent 11).

In addition to disasters, the interviewees also emphasised the risks arising from communities' lack of knowledge and appreciation of local cultural heritage. The lack of interest and involvement of the communities is considered one of the main risks for heritage preservation:

I think the greatest risk is the non-involvement of the community, in the sense that the community does not recognise, does not feel belonging, does not recognise this heritage as their own. (Respondent 5)

And the story is made up of people, if the people end, if this culture is not passed on, then it is threatened. I think it's a question of people, both in the intangible as much as in the tangible [heritage], because the tangible needs that person to maintain that. So, I believe that the greatest risk is personal, the issue of valuing people. (Respondent 12)

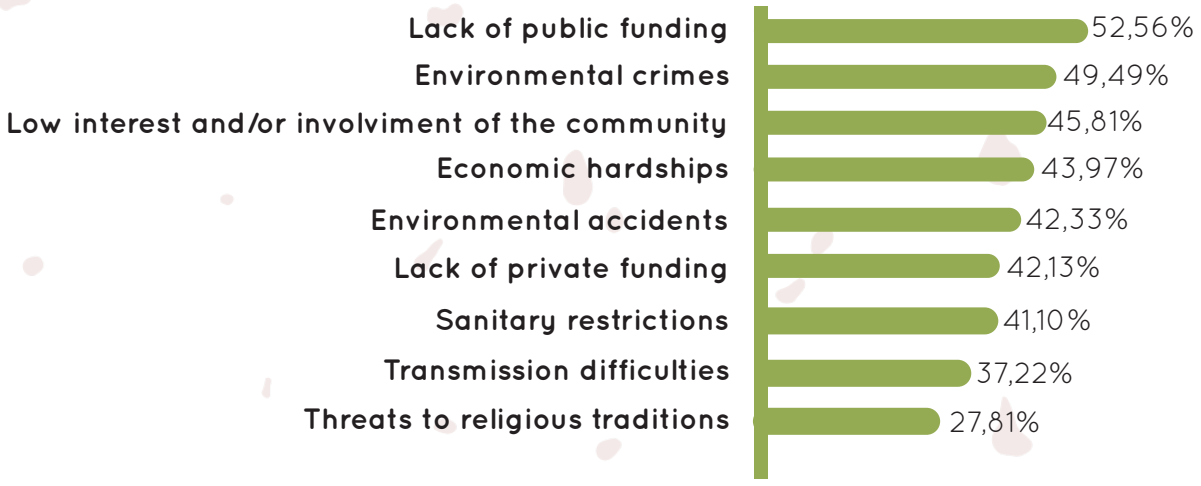
When addressing this issue, the interviewees often discussed the role of education in building knowledge and the value of cultural heritage. However, they also refer to the need for policymakers' recognition of the problem:

I believe cultural heritage is very vulnerable not only due to these environmental issues that you talked about, but in the sense, really, of institutions being strong and having continuity, being careful, getting the respect they need to have. ... [Here] there's also [the problem of] not treating these places the way they need to be treated, which is dynamic, giving life to these places, they generate culture. So that's a big risk. (Respondent 8)

Preservation is not only to speak like this: 'that place is beautiful', but it is to be able to enjoy it, it is to be able to be present within it. Because then, you will speak with more property that you will preserve and take care of that heritage. So, it's also being able to participate. And also, to have that openness, to have that sensitivity in order that everyone is to be able to participate. (Respondent 4)

These risks were also pointed out as central by survey respondents. For them, the main risks to local cultural heritage are the lack of public funding (52.6%); environmental crimes (49.5%), which were defined in the questionnaire as "any and all avoidable damage or damage caused to the elements that make up the environment: flora, fauna, natural resources and cultural heritage"; low interest and/or involvement by the communities (45.8%); and the economic hardships affecting the population (44%) (Figure 24).

Figure 24: In your opinion, is the cultural heritage of your territory/region under threat from any of the following issues?



Source: Roots of Resilience survey data, 2021.

It is worth noting that hazard perception varies according to age group. While younger respondents (aged 15 to 34) expressed greater concern about the low interest and/or involvement of the population with cultural heritage, the other interviewees (35 years and older) placed greater emphasis on issues related to the economic difficulties of the cultural sector and the population in general. The concern with environmental crimes proved to be central for all age groups.

There is also variation when responses are organised according to the race of the survey respondents. For white respondents, the main risks are lack of public funding (60.5%), environmental crimes (59.5%) and environmental accidents (53.9%). For Black respondents the top three risks are low interest/involvement by the communities (51.4%), lack of public funding (46.1%) and environmental crimes (43.9%). Finally, separating respondents by gender, the lack of public funding is the main risk highlighted by everyone. However, women placed greater emphasis on environmental crimes (52.3%) and economic difficulties affecting the communities (45.4%), while men placed more emphasis in the low interest/involvement of the communities (52.8%) and the lack of private funding (50.9%).

The research also mapped environmental problems that pose hazards to cultural heritage in the Iron Quadrangle according to survey respondents. Both survey respondents and interviewees demonstrated a strong concern about the exploitation of the region's natural resources, mainly related to mining and water resources. However, the concerns were not exclusively linked to these:

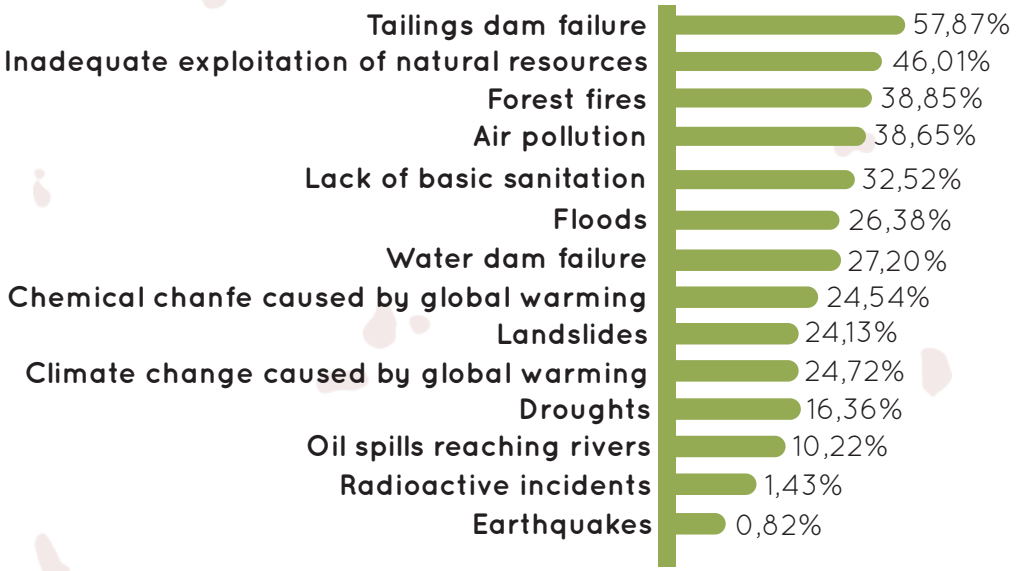
In the view of environmental and archaeological heritage, it affects these soil issues, direct air pollution, the tremors that happen here when you have this... the explosions in the mines around here, the contamination of the environment as a whole in that sense. (Respondent 5)

From an environmental point of view, the degradation is evident, now there is always a risk of dam failure, there is a risk [of] implantation of a new pit. I think that implementing a new mine by itself is already a huge environmental disaster as well. And when we are talking about the implementation of a new mine, we are talking about degradation against the environment, and Brumadinho has many springs, many waterfalls .... And all this is at stake, isn't it? And besides, here at the centre there is the risk of the river flooding, of fire; in this dry season, it is very common. (Respondent 9)

For survey respondents, the biggest current environmental threats are the risk of further ruptures of tailings dams (57.9%) and inadequate exploitation of natural resources (46%). Other environmental threats to cultural heritage that were highlighted include fires (38.8%), air pollution (38.6%) and chemical contamination of soil and groundwater, either by mining waste or by the indiscriminate use of pesticides (24.5%).

It is also worth mentioning the recognition of the impact of environmental issues related to urban infrastructure, such as lack of basic sanitation (32.5%), landslides (24.1%) and floods (27.2%). These problems were also highlighted during the interviews – often in relation to the need for increased awareness about environmental issues (Figure 25).

Figure 25: Do you consider that the cultural heritage of your territory/region is threatened by any of the following environmental problems?

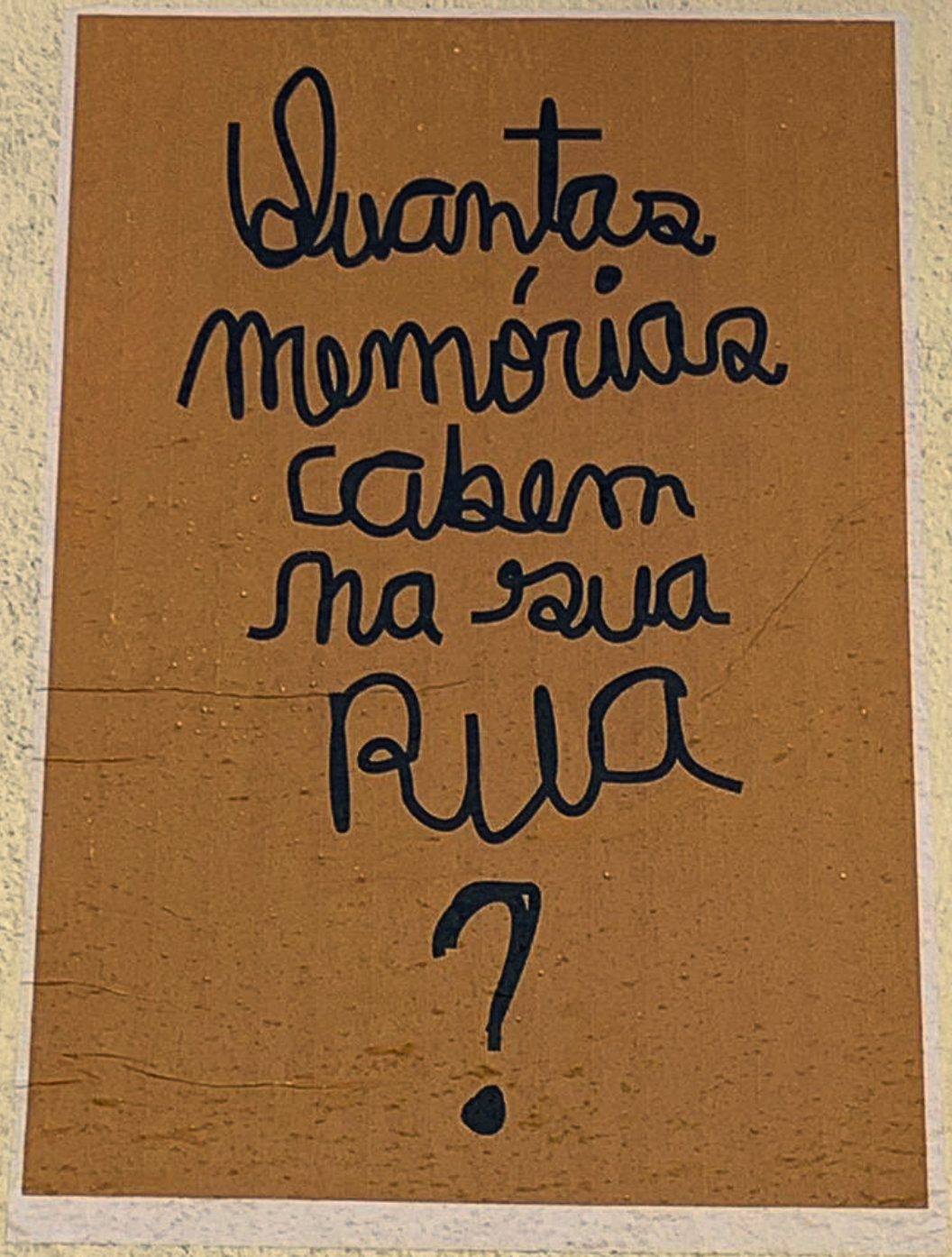


Source: Roots of Resilience survey data, 2021.

4 | FINAL REMARKS

The research process has allowed us to bridge and promote knowledge exchange between our partner organisations. On the one hand, organisations received training in research techniques, the ambition being that they become empowered to harness appropriate methodologies in the search for information. In addition, organisations were able to better understand the relationship between the region's cultural heritage and their impact as promoters and mediators of transformation and resistance in the Iron Quadrangle. On the other hand, the collaborative research team gained access to the privileged knowledge of these organisations – not just about the organisations themselves but also their actions, their audiences, and the reach of their voices. Additionally, the project was able to hear and give voice to Iron Quadrangle inhabitants and their perceptions about their history, traumas, collective and personal mourning, fears and courage.

From the ties established and information gathered, the research has outlined an overview of the Iron Quadrangle and the impact of the actions of partner organisations, as well as the perception of environmental and general hazards to the cultural heritage and communities in the region. From the data gathered, it is possible to establish actions that reinforce the resilience channels mediated by artistic organisations and to outline strategies for disseminating research findings among stakeholders and policymakers.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4.1. | WHAT DID WE FIND OUT?

This research project has enabled the partner organisations to understand the profile of their audience, helping them develop strategies for responding to communities and reaching other target audiences. In addition, the data collected has demonstrated the role cultural organisations play in promoting well-being for their communities as well as their members and/or employees, especially in times of crisis. It is clear from the research that these organisations:

- Enable – with differing intensity – contact between those attending cultural and artistic activities, new communities as well as professionals from different cultural areas.
- Promote the development of interpersonal and professional skills, and position the cultural (and educational) sectors as a means of employment and income generation, offering an alternative to the mining-dependent production chain that dominates opportunities for the inhabitants of the Iron Quadrangle.
- Produce important connections between communities and the territory, history, culture and local cultural heritage, all of which are considered fundamental to heritage preservation – in the transmission of practices and traditions as well as generating investment.

The research findings has highlighted the complex relationships between a lack of public investment and the marginalisation of people from cultural and artistic events and activities. The research has demonstrated that investment in dissemination and educational actions is considered essential to the development of a culture of prevention and to the valorisation of the region's cultural and environmental assets.

Amongst the environmental threats respondents noted, new tailings dam disruptions are the most feared, results show. However, the exploitation of natural resources and other threats whose control, although partial, lies predominantly with public authorities, was also a source of concern among the survey respondents. Dialogue between communities and public authorities was highlighted as critical in ensuring that policies to preserve cultural and environmental heritage and to contain climate change can be realised, as well as the implementation of better regulations to minimise the harmful impacts of mining activity. The research has highlighted that mining, despite its economic importance, should be managed according to the precautionary principle to reduce its negative impact on human lives and the environment.

The research has brought us some key findings – which we have already cited in the introductory section of this report. These issues chart a path by which we intend to develop future research, and propose public policies and practices. Firstly, **cultural heritage is a tool to build capacity and resilience in local communities facing environmental disasters and climate change. Heritage protection implies community protection.** Whether in the form of traditional knowledge or as practices and living spaces, the tangible and intangible heritage of communities are also tools to strengthen the resilience of those communities, fostering the construction of partnerships, support networks, active participation and social inclusion. Cultural heritage organisations are the main facilitators building these capacities in the region.

Secondly, it is necessary to remember that **disasters are not natural, highlighting the importance of adopting the precautionary principle**. The outcomes of adverse events, whether natural or manmade, are dependent on the vulnerabilities to which local communities are exposed and their capacity to adapt to threats and respond to those events. It is essential to develop and strengthen a culture of risk reduction and disaster prevention, which includes cultural heritage, educating future generations and raising awareness amongst policymakers and economic stakeholders.

Finally, **climate change increases the existing risks mineral exploitation places on communities and on cultural and natural heritage in the Iron Quadrangle**.

Ongoing impacts of climate change, such as the forecast of an increase in extreme events and rainfall in the Iron Quadrangle, demonstrate the escalation of existing risks, which are predominantly a consequence of mining activities. economic alternative to mining.Ongoing impacts of climate change, such as the forecast of an increase in extreme events and rainfall in the Iron Quadrangle, demonstrate the escalation of existing risks, which are predominantly a consequence of mining activities. economic alternative to mining.

Foto: *People's Palace* - Brendon Campos

4.2. | HOW TO MOVE FORWARD? RESEARCH RECOMMENDATIONS, POLICY, AND PRACTICES

From the research presented in this report and our findings, we have summarised a series of recommendations for how we might move forward, both in terms of research and of possible policies and desired practices. The following recommendations should be interpreted as a starting point rather than a destination. They are a rhetorical exercise that has emerged from the collaborative knowledge generated during this journey, and we hope that they can continue to be discussed, developed and put into practice.

1 | CULTURAL HERITAGE IS A TOOL TO BUILD CAPACITY AND RESILIENCE IN LOCAL COMMUNITIES FACING ENVIRONMENTAL DISASTERS AND CLIMATE CHANGE.

- **Encourage research and the dissemination of information about local cultural heritage,** promoting its value and protection.
- **Recognise the importance of heritage and local cultural heritage organisations** in the construction and dissemination of information, as well as in mobilising communities and expanding their capacity for positive action.
- **Establish a reference centre for research** that can enhance the capacity of cultural heritage organisations to build and disseminate information.
- **Mobilise local and regional stakeholders, organisations and the creative sector** to define priorities and seek collaborative solutions to the current natural and manmade challenges.
- **Strengthen local cultural heritage organisations** through specific private and public funding initiatives, which will enable them to focus on institutional consolidation and development.
- **Ensure funding initiatives that consider environmental** issues and make the connection between heritage preservation and environmental protection an explicit requirement, expanding the role of cultural heritage as a tool for preservation in the region.

2 | DISASTERS ARE NOT NATURAL: THE IMPORTANCE OF THE PRECAUTIONARY PRINCIPLE.

- **Foster a culture of risk management to reduce the vulnerabilities within communities and their local and regional cultural heritage**, promoting collaboration between the public and private sectors and civil society.
- Strengthen local participatory bodies**, engaging local communities to support cultural management and governance in risk management.**
- **Value the knowledge and cultural practices of local communities, especially traditional,** *quilombolas* **and Indigenous peoples, to preserve cultural and natural heritage locally and globally.**
- **Recognise culture as a human right, integrating a cultural dimension in risk prevention and impact mitigation planning.**
- **Encourage the formation of collaborative networks and strengthen existing ones**, establishing important partnerships for risk management and joint action in case of disaster.
- **Continue the mapping of cultural heritage and** cultural heritage organisations to enable cooperation and networking between stakeholders with different experiences.
- **Establish an educational programme for young people** that can help to raise awareness about the importance of cultural heritage in the region and the impact of climate and environmental disasters there.

3 | CLIMATE CHANGE INCREASES THE EXISTING RISKS MINERAL EXPLOITATION PLACES ON THE COMMUNITIES AND THE CULTURAL AND NATURAL HERITAGE IN THE IRON QUADRANGLE.

- **Support and expand research around the impact of disasters and climate change on local and regional cultural heritage.** Specifically, it is important to actively include Indigenous populations in heritage research. Indigenous peoples are greatly affected by climate change and, with their extensive traditional knowledge, have a huge role to play in developing solutions.
- **Create connections between existing research projects** to foster a better understanding of the impact of climate change on cultural heritage in the region and around the world.
- **Recognise the socio-economic importance of local cultural heritage in the Iron Quadrangle, including its potential to diversify the local economy.**
- **Create local cultural hubs** to enable young people to explore different opportunities in the fields of arts and culture and related professions.
- **Foster the region's creative economy through municipal and/or regional policies** capable of identifying, supporting and nurturing the local and regional creative sectors. The link between tourism and the economic viability of cultural heritage organisations should be a focus on those plans.

APPENDICES

APPENDIX I - SURVEY QUESTIONNAIRE

➜ RELATIONSHIP TO THE HERITAGE INSTITUTIO

1. What is your relationship with [HERITAGE NAME]? _____
(Eliminate if the respondent does not know the heritage institution in question.)

➜ SOCIO-DEMOGRAPHIC PROFILE

Age (number)
2. How old are you?_____

Gender
3. What gender do you identify as?

Male ( )
Female ( )
Non-binary ( )
Other ( )
Specify: _____

(98) I prefer not to answer.
(99) I don't know.

Place of residence (municipality)
4. What municipality do you live in? _____

Place of residence (neighbourhood)
5. What is the name of your neighbourhood and/or community?
_____

Education
6. What is your education level?? _____

I've never studied. ( )
Elementary school incomplete. ( )
Elementary school complete (up to eighth grade/ninth grade). ( )
High school incomplete. ( )
High school complete. ( )
Higher education incomplete. ( )
Higher education complete.
Postgraduate. ( )

(98) I prefer not to answer.
(99) I don't know.

➜ INCOME RANGE

What is approximately the monthly income of your household? In other words, what is the monthly sum of the income of all the people who live in your house?

From R$ 1,100.00 to R$ 2,200.00 (up to twice the minimum wage).
From R$ 2,200.01 to R$ 5,500.00 (between 2 and 5 times the minimum wage).
R$ 5,500.01 or more (5 times the minimum wage or higher).

(98) I prefer not to answer. ( )
(99) I do not know. ( )

Family constitution - to calculate per capita income (number)

8. Including you, how many people live in your house? _____

Race

9. Do you identify yourself as being of what race/ethnic origin? Você se se identifica como sendo de qual raça ou origem étnica? _____

Black ( ) White ( ) Southeast Asian ( )

Specify family origin (Chinese, Korean, Japanese, etc.):_____

Indigenous: _____
Specify ethnicity:_____
Other: _____
Specify: _____

(98) I prefer not to answer. ( )
(99) I don't know. ( )

➜ COVID-19 AND MENTAL HEALTH

Between 1 and 5, in which 1 means that you COMPLETELY DISAGREE and 5 that you COMPLETELY AGREE, what do you think of the following statements?

10. 'I believe that the activities promoted by [HERITAGE NAME] helped me deal with the difficulties that affected my mental health, such as environmental disasters and health crisis.'

I completely disagree.
I disagree partially.
I neither agree nor disagree
I partially agree.
I completely agree.

(98) I prefer not to answer. ( )
(99) I don't know. ( )

11. It is very much missed when the activities of [HERITAGE NAME] need to be stopped for some reason, as occurred during the Covid-19 pandemic'.

I completely disagree.
I disagree partially.
I don't agree, I don't disagree.
I partially agree.
I completely agree.

(98) I prefer not to answer. ( )
(99) I don't know. ( )

➜ ACESSO À CULTURA E HABILIDADES

12. Do you consider that you have acquired any of the following knowledge from your involvement with [HERITAGE NAME]? (Check as many alternatives as you think you need).

Manual activities. ( ) Literature. ( ) Cinematography. ( ) Photography. ( )
Stage lighting. ( ) Video editing. ( ) Sewing. ( )Dance. ( )
Play a musical instrument. ( ) Sing. ( ) Sound editing. ( ) Acting. ( )
Read/write. ( ) General history. ( ) History of your region. ( ) Culinary. ( )
Making art pieces. ( ) Painting. ( ) Botany and/or planting/agriculture. ( )
Cultural traditions. ( ) Local culture. ( ) Art. ( ) Museology. ( ) Poetry. ( )
Organisation of events. ( ) Traditional ( ) religious practices. ( ) Oral history. ( )
Brazilian rhythms. ( ) None of the above. ( )

(98) I prefer not to answer.
(99) I don't know.

13. Through the contact with [HERITAGE NAME], have you discovered any area of professional activity related to culture? (Check as many alternatives as you think you need).

Yes, I'm sure.
I think so, yes.
Maybe.
I don't think so.
No, I didn't.

(98) I prefer not to answer. ( )
(99) I don't know ( )

14. Did knowing and/or engaging with [HERITAGE NAME] lead you to perform any of the following cultural activities more often? (Check as many alternatives as you think you need).

Watch movies at the movie theatre. ( ) Watch movies on the internet. ( )
Watch movies by other means. ( ) Visit exhibitions. ( )
Watch virtual exhibitions. ( ) Watch TV. ( ) Go to the theatre. ( )
Listen to live music. ( ) Listen to music on the internet. ( )
Listen to music by other means. ( ) Read books. ( )
Go to the museum. ( ) Attend popular festivals. ( )
Watch poetry declamations. ( ) Dance. ( ) Act. ( ) Participate in cultural workshops. ( ) Sing. ( ) Play a musical instrument. ( )
Writing. ( ) Paint. ( ) Visit historical places. ( ) Visit sights in the city. ( )
Watch shows on the Internet. ( ) Participate in literary soirées. ( )
None of the above. ( )

(98) I prefer not to answer.
(99) I don't know.

➜ SOCIAL CAPITAL AND NETWORKS

15. Would it be possible to say that you met new people through your contact with [HERITAGE NAME]?

Yes, I'm sure.
I think so, yes.
Maybe.
I don't think so.
No, I didn't.

(98) I prefer not to answer. ( )
(99) I don't know. ( )

16. Would it be possible to say that you met artists, producers, museologists or other professionals related to culture from the contact with [HERITAGE NAME]?

Yes, I'm sure.
I think so, yes.
Maybe.
I don't think so.
No, I didn't.

(98) I prefer not to answer. ( )
(99) I don't know. ( )

➜ HAZARD PERCEPTION DIAGNOSIS

17. In your opinion, is the cultural heritage of your territory/region under threat from any of the following? (Check as many alternatives as you think you need).

Lack of public funding.
Environmental accidents (unplanned and unwanted events that can cause, directly or indirectly, damage to the environment, public health, society and economy).[69]
Difficulties to pass on habits, practices, knowledge and traditions to new generations.
Low interest/involvement by the population.
Lack of funding from private companies.
Economic difficulties affecting the population.
Environmental crimes (any avoidable damage or damage caused by environmental elements: flora, fauna, natural resources and cultural heritage). [70]
Threats to religious traditions and their manifestations.
Restrictions on the movement of persons and the holding of events for health reasons.

(98) I prefer not to answer.
(99) I don't know.

18. Do you consider that the cultural heritage of your territory/region is threatened by any of the following environmental problems? (Tick as many options that are relevant.)

Fires.
Water dam disruption.
Landslides.
Earthquakes.
Oil leaks that affect rivers.
Tailings dam disruption.
Lack of basic sanitation.
Air pollution.
Droughts.
Floods.
Chemical contamination of soil or groundwater.
Inadequate exploitation of natural resources.
Radioactive accidents.
Climate change caused by global warming.

(98) I prefer not to answer.
(99) I don't know.

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[69] <http://www.ibama.gov.br/component/content/article?id=744&Itemid=616>.

[70] <http://www.ibama.gov.br/component/content/article?id=744&Itemid=616>.

➜ SELF-CONFIDENCE AND EMPOWERMENT (FEELING OF EFFECTIVENESS)

19. After your contact with [HERITAGE NAME], do you feel confident to perform any of the following activities? (Check as many alternatives as you think you need).

Organise or participate in meetings to discuss problems and propose relevant improvements to your neighbourhood/territory/community.
Organise or participate in cultural events (e.g., dance, music, rehearsals, literature soirées, carnival, poetry recitals, cinema, religious festivals, theatre).
Work in an activity related to culture.
Organise or participate in social entrepreneurship activities.
Organise or participate in demonstrations, protests or campaigns related to matters affecting your territory/neighbourhood/community.
Organise or participate in educational activities (e.g., schoolwork, lectures, podcasts, videos, fairs and exhibitions, educational profiles on social networks).

(98) I prefer not to answer.
(99) I don't know.

20. Do you believe that you can influence the future and the preservation of the cultural heritage of your community/neighbourhood or region?

Yes, I'm sure.
I think so, yes.
Maybe
I don't think so.
No, I don't.

(98) I prefer not to answer.
(99) I don't know.

21. Do you consider that those responsible for preserving and maintaining the cultural heritage of your community/region consider what inhabitants like you have to say?

Yes, I'm sure.
I think so, yes.
Maybe
I don't think so.
No, I don't

(98) I prefer not to answer.
(99) I don't know.

➜ INVOLVEMENT AND BELONGING

Between 1 and 5, in which 1 means that you COMPLETELY DISAGREE and 5 that you COMPLETELY AGREE, what do you think of the following statements?

22. "After contact with [HERITAGE NAME], I identify more with the culture of my region."

I completely disagree.
I disagree partially.
I don't agree, I don't disagree.
I partially agree.
I completely agree.

(98) I prefer not to answer.
(99) I don't know.

23. "After contact with [HERITAGE NAME], I am interested in performing cultural/ artistic practices that are traditional in my region."

I completely disagree.
I disagree partially.
I don't agree, I don't disagree.
I partially agree.
I completely agree.

(98) I prefer not to answer.
(99) I don't know.

24. "After meeting and/or getting involved with [HERITAGE NAME], I feel part of the community where I live."

I completely disagree.
I disagree partially.
I don't agree, I don't disagree.
I partially agree.
I completely agree.

(98) I prefer not to answer.
(99) I don't know.

25. "After contact with [HERITAGE NAME], I started to frequent spaces and got involved in situations that address the problems of my territory/neighbourhood/ region more often".

I completely disagree.
I disagree partially.
I don't agree, I don't disagree.
I partially agree.
I completely agree.

(98) I prefer not to answer.
(99) I don't know.

26. "I feel that I know the culture and history of my territory better after I met and/or got involved with [HERITAGE NAME]."

I completely disagree.
I disagree partially.
I don't agree, I don't disagree.
I completely agree.
I totally agree.

(98) I prefer not to answer.
(99) I don't know.

27. Now, we'd like to know a little bit more about your view of culture. Do you recognise any cultural heritage in your region/community or territory? If so, what is the name of this area? What's it like? Why do you consider it part of the Brazilian cultural heritage? (Not required; 5-line limit).

_____
_____
_____
_____
_____
_____

ANEXO II – APPENDIX II – INTERVIEW GUIDE

➜ RELATIONSHIP WITH THE TERRITORY/COMMUNITY

- How long have you lived in city X?
- How long have you been part of the organisation X?/ How long have you worked at organisation X?
- How do you see yourself inside organisation X?
- What about your relationship with the city/neighbourhood/community X? How is it?

➜ HERITAGE PERCEPTION

- For you, what is cultural heritage?
- And what is the importance of cultural heritage to you?
- How do you relate to the cultural heritage of your region/city/community?
- In the workshops organised by PPP, we discussed a lot about local cultural heritage. Did you know these sites before the workshops? Have you ever regarded them as cultural heritage?
- Were there any specific pieces or types heritage that caught your attention at these events? Something you didn't think would be considered as heritage?

➜ HAZARD PERCEPTION

Agora, vou abordar um assunto delicado. Eu entendo que esse seja um assunto difícil. Sinta-se livre para não responder à questão e para se expressar como puder e quiser.

- Now, I'm going to talk about a delicate issue. I understand this is a difficult subject. Feel free not to answer the question and to express yourself in any way you can and want.
- The Iron Quadrangle region, in Minas Gerais, has already been victimised by environmental crimes. Do you think people in your city/community are at risk of being hit by other environmental crimes?
- Do you like living in the Iron Quadrangle?
- What about the cultural heritage of the region? Do you consider that it is threatened by these crimes? Why is that? What's that threat like?
- In your opinion, what is the greatest risk for your region/city/community cultural heritage? And do you think there are ways to preserve this heritage? Which ways?
- In your opinion, who are the main people responsible for the preservation of cultural heritage?

Do you believe that people like you can contribute to the preservation of the cultural heritage of the region itself? How?

➜ ENGAGEMENT AND BELONGING

• Do you often get involved in political affairs?
• In your opinion, are there ways in which civil society can get involved and contribute to political issues?
And do you think this involvement is important? What effects do you believe it could have?
• Do you believe that the fact there are threats to the cultural heritage of your region/city/community can end up encouraging people's involvement in political issues?

➜ NEWS CONSUMPTION

• Do you often read/listen/watch news about your community/region?
• Do you consider yourself well-informed about the risks to the cultural heritage in your region/city/community?
• How do you usually find out about this? How often? Can you name the main sources you use to be informed?
• Do you believe that access to this type of information is important for the environmental preservation and cultural heritage of your region/city/community?
• And how do you evaluate the information available/commonly conveyed on this subject?
• For you, if there is an adequacy of content, form and frequency of information disclosure about threats to the environment and the cultural heritage of your region, is it possible that these risks are minimised or avoided?

APPENDIX III – CURRENT LEGISLATION ON THE PROTECTION OF CULTURAL HERITAGE

Brazilian legislation on all levels – federal, state and municipal – is responsible for the protection of Brazilian cultural heritage and the reduction of risk and disaster. Here, we will present a brief but comprehensive overview of the normative instruments and public policies used in risk prevention and disaster impact mitigation related to cultural heritage.

1. FEDERAL LEVEL

On the federal level, the National Institute of Historical and Artistic Heritage (IPHAN) is the main body responsible for the preservation of cultural heritage and, in recent years, it has incorporated prevention and risk management into its strategy.[71] Its policy for the Preservation of Tangible Cultural Heritage, instituted in 2018 by IPHAN Ordinance No. 375, is noteworthy in the context of our research project. As well as sustainable development, active social participation and disaster prevention, the policy brings, as one of the purposes of its conservation actions, the institution of "parameters, strategies and procedures for the evaluation and reduction of risks to material cultural heritage".[72]

Currently, risk and disaster reduction actions are centralised within the agencies of Protection and Civil Defence, guided by the National Policy of Protection and Civil Defence (PNPD), instituted by Law No. 12,608/2012.[73] According to research conducted by the National Civil Defence itself, although the PNDP has advanced by indicating its integration with other policies, the culture of disaster prevention is still fragile in the country, with advances mostly of a reactive nature.[74]

Public dam safety policies exemplify this issue. Despite a history of disasters, it was only in 2010 that Brazil developed a National Dam Safety Policy (NDSP). Established by Law No. 12,334/2010, the NDSP includes in its objectives the fostering of a culture of dam safety and risk management, and to monitor the safety of dams with data transparency – creating, for this purpose, the National Dam Safety Information System, which contains data from dams under construction, in operation and those that have been decommissioned. [75,76] ,

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[71] Policy and new environmental licensing instructions, also incorporate prevention.

[72] Ordinance No. 375 of 19 September 2018. It institutes IPHAN's Tangible Cultural Heritage Policy and provides other measures, IPHAN, 2018, <http://portal.iphan.gov.br/uploads/ckfinder/arquivos/PORTARIA%20375%20-%202018%20-SEI_IPHAN%20-%200732090.pdf>.

[73] Mobilização comunitária para a redução de riscos de desastres', edited by Janaína Furtado, (Florianópolis: CEPED UFSC, 2015).

[74] GIRD+10: Caderno Técnico de Gestão Integrada de Riscos e Desastre, co-edited by Samia Sulaiman, (Brasilia: Ministry of Regional Development: National Secretariat for Protection and Civil Defense, 2021). Policies of prevention and/or response to disasters began to be structured by Brazilian states in the 1960s, with records of local policies in the 1980s. In 1988, the National Civil Defence System was created, which, in the following decades, expanded to states and municipalities, becoming integrated with urban policies.

[75] Sulaiman (2021).

[76] Minas Gerais, Secretary of State for Environment and Sustainable Development (SEMAD), Diagnóstico ambiental do Estado de Minas Gerais: suporte para o planejamento anual das fiscalizações ambientais, (Belo Horizonte: Semad, 2021). It is the responsibility of the different supervisory bodies to insert and keep updated the information in the system. At federal level, they are inspection agencies of tailings dams: National Water and Basic Sanitation Agency; National Mining Agency; and The Brazilian Institute of the Environment and Renewable Natural Resources.

After the Brumadinho and Mariana disasters, changes were made to the NDSP, which now has stricter safety rules. Among the main changes instituted by Law No. 14,066/2020 is the nationwide ban on tailings dams with upstream rising deposits,[77] such as those that collapsed during recent disasters.[78] New dams can no longer be built with this method and the existing ones must be deactivated by February 2022, though there is the possibility that the deadline can be extended.[79]

The law also mandates that companies that own mining tailings dams, regardless of their potential damage and risk classification, must have in place Emergency Action Plans (EAP). [80] In addition, it became mandatory for owners to present, through the EAP, "specific measures, in conjunction with the public authorities, to rescue those affected, people and animals, to mitigate environmental impacts, to ensure the supply of drinking water and to rescue and safeguard cultural heritage". [81]

animals, to mitigate environmental impacts, to ensure the supply of drinking water and to rescue and safeguard cultural heritage".

Other existing governance instruments of risk management found at federal level are the Statute of the City[82] and the Statute of the Metropolis. [83] The latter reinforces the principle of the democratic management of cities and the search for sustainable development, without directly dealing with any risks of disasters or cultural heritage. The Statute of the City, based on changes defined by Law No. 12,608/2012, provides a series of actions and instruments that must be implemented by municipalities with disaster-related areas. It also requires municipalities to present "specific guidelines and instruments for environmental protection of historical and cultural heritage" to expand their urban perimeter. However, none of these instruments make an explicit association between disaster risk prevention and cultural heritage preservation.

" people and animals, to mitigate environmental impacts, to ensure the supply of drinking water and to rescue and safeguard cultural heritage".

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[77] In this tailings dams' construction method, the containment dykes are built on layers of already deposited tailings, reducing their costs, but compromising the safety of the dams. See National Water and Sanitation Agency (ANA), *Relatório de segurança de barragens 2020*, (Brasilia: ANA, 2021).

[78] According to Law No. 14,066 sanctioned in September 2020. Previously, the National Mining Agency had made a similar prohibition, through ANM Resolution No. 04/2019 and by State Law No. 23,291/2019, which establishes the Minas Gerais State Dam Policy.

[79] *'Brasil tem nova lei de segurança de barragens'*, Senate News Agency, 01 October 2020, <https://www12.senado.leg.br/noticias/materias/2020/10/01/brasil-tem-nova-lei-de-seguranca-de-barragens>.

[80] EAP is the responsibility of company owners and should contain procedures to be adopted in emergency cases, including the description of scenarios and preventive, corrective and response procedures, training and information dissemination programmes to potentially affected communities, and the planning of self-rescue zones – areas in which, due to the government power lack of time to act in case of disaster, companies should enable mass evacuation with escape routes, signalling and other measures.

[81] *'Law No. 14,066 of 30 September 2020'*, *Presidency of the Republic, 2020*, <http://www.planalto.gov.br/ccivil_03/_Ato2019-2022/2020/Lei/L14066.htm#art2>.

[82] *'Federal Law No. 10,257, of 10 July 2021'*, *Presidency of the Republic, 2001*, <http://www.planalto.gov.br/ccivil_03/leis/leis_2001/l10257.htm>.

[83] *'Federal Law No. 13,089 of 12 January 2015'*, *Presidency of the Republic, 2015*, <http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13089.htm>.

2. STATE LEVEL

Since 1971, Minas Gerais has been home to the State Institute of Historical and Artistic Heritage (IEPHA), a foundation linked to the State Department of Culture. Like IPHAN, IEPHA operates in the research, identification, protection and promotion of the state's tangible and intangible cultural heritages. Among its many initiatives, it is worth highlighting the ICMS Cultural Heritage programme, which encourages management actions for the preservation of local cultural heritage by transferring parts of the proceeds from the ICMS tax collection to municipalities that maintain such actions. According to information from IEPHA, more than 80% of Minas Gerais's municipalities have a Municipal Council of Cultural Heritage.[84]

Risks and disasters management, in turn, are the responsibility of the State Coordination of Civil Defence, linked to the Military Office of the Governor. Although provided by the National Policy of Protection and Civil Defence as an instrument to be instituted by the states, no records of a State Plan for Protection and Civil Defence of Minas Gerais was found, even though the State Coordination has other specific plans. Thus, the main instrument of civil defence in the state is the State System of Civil Defence, which seeks to coordinate protection and civil defence actions with other public and private agencies.[85]

Among them are the agencies responsible for the safety of dams. In Minas Gerais, industrial waste dams, whose environmental licensing has been carried out at state level, are supervised by the State Department of Environment and Sustainable Development.[86] Other bodies and instruments linked to the department responsible for risk management and disaster impact mitigation are the State Environmental Foundation (FEAM); the State System of Environment and Water Resources (SISEMA), responsible for the Dam Management Programme; and the Minas Gerais Institute for Water Management (IGAM). In 2019, the State Dam Safety Policy was instituted, which, among other measures, determined the eradication of waste dams built on upstream rising deposits.[87]

Foto: Rapper Thiago SKP Itabira

[84] 'ICMS Cultural Heritage', IEPHA, 12 Dec. 2016, <http://www.iepha.mg.gov.br/index.php/programas-e-acoes/icms-patrimonio-cultural#o-que-%C3%A9>.

[85] Diego Araújo, *Sistema de Proteção e defesa civil nos instrumentos de planejamento de Minas Gerais*, (Belo Horizonte: João Pinheiro Foundation, 2019).

[86] National Mining Agency (ANM), II *Relatório Anual de Segurança de Barragens de Mineração, 2020*, (Brasilia: ANM, 2021). The supervision of industrial waste containment dams licenced at federal level is the responsibility of IBAMA.

[87] SISEMA (2020).

3. MUNICIPAL LEVEL

Respecting federal and state laws, Brazilian municipalities can establish their own instruments to preserve local cultural heritage. Based on their own legislation, municipalities can define their administrative processes for listing and recording municipal cultural heritage, their effects and instruments, and for designating one or more departments of the executive branch, such as foundations, secretariats, and municipal councils, as bodies responsible for the management of heritages. [88]

As for risk management, municipalities are responsible for implementing the National Protection and Civil Defence Policy on a local level. According to the Ministry of Regional Development, ideally, municipalities should map areas susceptible to geological and hydrological processes (Susceptibility Charter); create geotechnical guidelines for urban expansion (Geotechnical Charter of Aptitude to Urbanisation); and map risks with cartographic delimitation, considering the risks in the face of different uses (e.g., urbanisation).[89]

These instruments can support the preparation of Municipal Risk Reduction Plans and Municipal Plans for Contingency Protection and Civil Defence, which are plans usually

"As for risk management, municipalities are responsible for implementing the National **Protection and Civil Defence Policy on a local level."**

[88] Confederação Nacional de Municípios (CNM), 'Preservação do Patrimônio Cultural: O Tombamento e o Registro de Bens Culturais', (Brasília: CNM, 2018).

[89] Sulaiman (2021). Of the 5,570 Brazilian municipalities, 29% have risk mappings; 9% have Susceptibility Charters; and 1%, Geotechnical Charts of Urbanisation Aptitude.

4. LIMITS AND SETBACKS OF BRAZILIAN PUBLIC POLICIES

Despite recent advances, the implementation of risk management policies as well as environmental and heritage preservation policies have endured multiple criticisms and setbacks. Here, we present three outcomes of those setbacks: i) the relaxing of licensing and inspection rules; ii) the scrapping of public structures, which has led to rigging and attacks on public servants; and iii) a decrease in social participation.[88]

➜ RELAXING OF LICENSING AND ENFORCEMENT RULES

Often treated as a hindrance to development, environmental licensing has now been relaxed at all federative levels. In Minas Gerais, previously the licensing of medium or large projects with polluting potential – such as the construction of waste dams – was carried out in three stages: a temporary licence (after presenting the project), a licence for the construction of the work, and a licence for the operation. This ensured there was monitoring and supervision of the enterprise at every stage of the process.[90] However, since the implementation of Law No. 21,972/2015, this process[90] has been simplified and unified through concomitant licensing.[91]

Additionally, 2016 saw the creation of the Superintendence of Priority Projects. Directly linked to the Secretary of State for the Environment, the Superintendence has the power to make decisions on priority licensing. With these changes, critics have highlighted the pressure to accelerate licensing processes and thereby weakening them.[92]

On the federal level, the deconstruction of environment-related public policies was summarised by the idea of 'passing the herd': taking advantage of the Covid-19 pandemic to relax environmental rules.[93] According to a survey run by the newspaper Folha de São Paulo, the number of acts published in the Official Gazette related to environmental rules during 2020 was 12 times higher than during the same period in 2019. [94] Many actions were barred in the Supreme Court, such as the attempt to slow down the protection of the Atlantic Forest, which would even allow the regularisation of illegal deforestation in areas of permanent preservation. However, other actions were carried out, such as the changes in the National Environment Council, cuts of funds and the dismissal of public servants. [95]

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[90] After presenting the project and the environmental impact studies required for this type of project, the supervisory bodies could issue the temporary licence. If the environmental viability of the project was attested during this time, the project could follow and obtain the installation licence. If, during its installation, the standards were respected and the feasibility of the project was maintained, an operating license would be granted.

[91] 'O desmonte dos conselhos e o aparelhamento das câmaras decisórias do licenciamento ambiental em Minas Gerais', LEIA, 19 March 2019, <https://leia.org.br/o-desmonte-dos-conselhos-e-o-aparelhamento-das-camaras-decisorias-do-licenciamento-ambiental-em-minas-gerais/>.

[92] The overflow of the Vallourec group's dyke in January 2021 is an example of both processes: its licensing was carried out concomitantly and expedited, according to data from the Mining Observatory: Maurício Angelo, 'Exclusive: Vallourec's structure that gave way in MG had extraordinary meeting, express licensing and alerts from environmentalists about its expansion', Mining Observatory, 10 January 2022, <https://observatoriodamineracao.com.br/exclusivo-estrutura-da-vallourec-que-cedeu-em-mg-teve-reuniao-extraordinaria-licenciamento-expresso-e-alertas-de-ambientalistas-em-sua-ampliacao/>.

[93] In 2020, during a ministerial meeting, the then Minister of the Environment, Ricardo Salles (2019 - 2020), said it was time to take advantage of the press's focus on the pandemic to "pass the herd", that is, to change and simplify environmental rules. Andre Shalders, 'Passando a boiada: 5 momentos nos quais Ricardo Salles afrouxou as regras ambientais', BBC Brazil, 1 October 2020, <https://www.bbc.com/portuguese/brasil-54364652>.

[94] 'Governo acelerou canetadas sobre meio ambiente durante a pandemia', Folha de São Paulo, 28 Jan. 2020, <https://www1.folha.uol.com.br/ambiente/2020/07/governo-acelerou-canetadas-sobre-meio-ambiente-durante-a-pandemia.shtml>.

[95] Shalders, 2020.

➜ SCRAPPING PUBLIC STRUCTURES, LEADING TO RIGGING AND ATTACKS ON PUBLIC SERVANTS

The budget related to environmental and heritage preservation has steadily decreased in recent years. In 2020, for instance, IPHAN lost half its budget that had been approved in 2019, and there were accusations about recent appointments being driven by economic interests of federal government allies. [96] In 2019, the National Mining Agency (NMA), one of the bodies responsible for monitoring waste dam safety, only received a little over 20% of its designated budget from the federal government.[97] The NMA also suffered a severe staff shortage, with only four inspectors available to inspect around 360 dams in Minas Gerais in September 2020. [98] Additionally, the NMA had assigned 30 staff to supervise dams across the country, but 10 had been removed from this service because they were in a Covid-19 high-risk group.

Similarly, in 2020, the state government of Minas Gerais redirected only 38% of the amount defined by law for environmental inspection actions. According to a survey by the Public Prosecutor's Office, of the R$ 319 million collected with the Mining Resource Inspection Fee, at least R$ 223.8 million should have been passed to SISEMA, but only R$ 85.6 million was redirected.[99]

Budget cuts that stem policy choices also affect the production of monitoring data. The National Institute of Space Research (INPE) predicts that, from April 2022, it will have to discontinue the project that monitors the Cerrado – one of the biomes present in the Iron Quadrangle – due to budget difficulties[100] And this is not the first controversial episode involving INPE: in 2019, after the release of data pointing out the increase of deforestation outbreaks, President Bolsonaro questioned the data's veracity and the suitability of the director of the agency, Ricardo Galvão, who was later fired.[101]

According to a survey conducted by Imaflora, a socio-environmental institute, and Article 19, there was a backlash over the lack of transparency regarding environmental policies. This came after changes made in 2019 and 2020 to the communication protocols of environmental agencies that consequently restricted data disclosure. This led to threats made to public servants, document leaks and database blackouts. In addition, the government itself delegitimised the public agencies responsible for data generation.[102]

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[96] Gustavo Fioratti, '*Ações de Bolsonaro põem em risco bens históricos e culturais do país*', Folha de São Paulo, 2 June 2020, <https://www1.folha.uol.com.br/ilustrada/2020/06/acoes-de-bolsonaro-poem-em-risco-bens-historicos-e-culturais-do-pais.shtml>.

[97] The National Mining Agency should receive 7% of mining royalties. In 2019, R$ 4.5 billion in royalties were collected. ANM should receive a transfer of R$ 315.2 million, but had a budget of R$ 67 million.

[98] Thais Pimentel, '*"Tragédia iminente", diz associação de cidades mineradoras de MG sobre corte no orçamento da agência que fiscaliza barragens*', G1, 24 September 2020, <https://g1.globo.com/mg/minas-gerais/noticia/2020/09/24/tragedia-iminente-diz-associacao-de-cidades-mineradoras-de-mg-sobre-corte-no-orcamento-da-agencia-que-fiscaliza-barragens.ghtml>.

[99] Patricia Fiúza and Thaís Pimentel, '*Governo Zema repassou, no ano da tragédia de Brumadinho, só 38% da taxa para fiscalizar mineração, diz MP de Contas*', G1 Minas, 23 September 2020, <https://g1.globo.com/mg/minas-gerais/noticia/2020/09/23/governo-zema-repassou-no-ano-da-tragedia-de-brumadinho-so-38percent-da-taxa-para-fiscalizar-mineracao-diz-mp-de-contas.ghtml>.

[100] Poliana Casemiro, '*Brasil ficará sem dados de desmatamento no Cerrado a partir de abril*', G1, 6 January 2022, <https://g1.globo.com/sp/vale-do-paraiba-regiao/noticia/2022/01/06/sem-verba-inpe-desmobiliza-equipe-de-monitoramento-do-cerrado.ghtml>.

[101] Imaflora, Socio-Environmental Institute and Article 19, '*Mapeamento dos retrocessos de transparência e participação social na política ambiental brasileira - 2019 e 2020*', 2021, <https://acervo.socioambiental.org/acervo/documentos/mapeamento-dos-retrocessos-de-transparencia-e-participacao-social-na-politica>.

[102] Imaflora, Socio-Environmental Institute and Article 19, 2021.

➡ DECREASE IN SOCIAL PARTICIPATION

One of the main instruments of social participation in national policies is through collegial bodies such as councils, committees and boards. However, recently, federal decrees (Decree No. 9,759/2019 and Decree No. 9,784/2019) disbanded any created by decree or via lower regulations. Although bodies such as the Brazilian Climate Change Forum and the National Biodiversity Commission have been spared for now, their activities are under threat. [103]

Those that have been spared the axe have had dramatic cuts to their numbers. For example, the number [104] of councillors on the National Environment Council fell from 96 to 23, with only four seats allocated to civil society. Additionally, civil society representatives were previously elected but that was abolished in favour of selection by lot, which also meant the loss of the representation guarantee for traditional and Indigenous communities on the council. Similarly, the National Biodiversity Commission has also had its powers reduced. [105]

There have also been changes at state level. Since the passing of Law 21.972/2016, the licensing of medium/large projects that carry significant pollution risk factor are now assessed by Specialised Technical Chambers linked to the State Council of Environmental Policy. Previously, this process occurred through the Collegial Regional Units, which had a greater involvement of civil society and environmental agencies, as well as the representation of the Federal Public Prosecutor's Office. [106, 107]

"Those that have been spared the axe have had **dramatic cuts to their numbers.**"

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[103] Another disbanded body is the Council of Cities, which was created by City Statute in 2010 and regularly promoted a series of municipal and state conferences that culminated in the National Conference of Cities. The sixth conference set for 2016, however, was never convened, which, together with the differences regarding the extinction or not of ConCidades through the Decree 9.759, 2019, explains the weaknesses of the structures then created. 'Dossiê do desmonte da política urbana federal nos governos Temer e Bolsonaro e seus impactos sobre as cidades: violações de direitos humanos e os riscos de construção de cidades intolerantes, excludentes, injustas e antidemocráticas', 2020, National Urban Reform Forum, <https://www.observatoriodasmetropoles.net.br/wp-content/uploads/2020/02/Dossi%C3%AA-FNRU-2020-Final.pdf>.

[104] In a mapping conducted by the organisations Imaflora, Instituto Socioambiental and Article 19 (2021), 22 collegial bodies linked to ongoing social and environmental policies at federal level were identified in 2019. Between 2019 and 2020, 40.9% of these bodies were restructured and 18.2% were abolished.

[105] Imaflora, Socio-Environmental Institute and Article 19, 2021.

[106] 'O desmonte dos conselhos e o aparelhamento das câmaras decisórias do licenciamento ambiental em Minas Gerais', LEIA, 19 March 2019, <https://leia.org.br/o-desmonte-dos-conselhos-e-o-aparelhamento-das-camaras-decisorias-do-licenciamento-ambiental-em-minas-gerais/>.

[107] 'Law No. 21,972, of 01/21/2016', Legislative Assembly of Minas Gerais, 2016, <https://www.almg.gov.br/consulte/legislacao/completa/completa.html?ano=2016&num=21972&tipo=LEI>.

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