Engaging museum visitors with the biodiversity crisis through a natural history collection

Case study of the Suriname exhibition at Naturalis Biodiversity Center

Josje-Marie Vrolijk

I contribute to the forest's conservation.
I stand for courage. I see you before you see me.

'Keep on hiding, jaguar, remain a forest spirit. Without you, the rainforest has no chance of survival'. Humberto Tan

Abstract

This applied research aims to provide insights that will assist Naturalis Biodiversity Center, a leading institution in biodiversity research attracting around half a million museum visitors annually, in enhancing public understanding of biodiversity and motivating greater stewardship of nature. Over the past 50 years, wildlife populations have declined by 73% (WWF 2024, 7), and 1 million species face extinction (IPBES 2019, XVI). While 71% of people in Europe have heard of biodiversity, only 41% understand what it means (European Commission. Directorate General for Environment 2019, 7). There is an urgent need to inform the public about the significance of biodiversity and encourage them to protect it. As trusted public institutions that represent long-term societal meaning-making, museums can play a vital role in this effort. Naturalis' family-oriented exhibitions highlight the beauty and diversity of nature but hardly address human impacts on biodiversity. Its forthcoming exhibition on Suriname is the first where its new strategic goal to engage the public with the biodiversity crisis could be realised. Through a case study of this exhibition and a comparative analysis of other natural history exhibitions, this study explores how the ecological crisis is currently communicated and how museums aim to inspire visitors to help reduce the effects of unsustainable human pressures on the natural environment. It finds that in the Suriname exhibition, multivocality (i.e., the inclusion of non-Western worldviews alongside the scientific perspective) takes priority over ecological urgency. To achieve its ambitions of becoming a change agent in a biodiversity-positive society, Naturalis will need to strengthen its messaging in its upcoming exhibition about biodiversity and through interventions in its permanent exhibitions.

Keywords: biodiversity crisis, biodiversity conservation, natural history collection, exhibition, museum, culture-nature divide, intention-behaviour gap.

Engaging museum visitors with the biodiversity crisis through a natural history collection

Case study of the Suriname exhibition at Naturalis Biodiversity Center

Author: Josje-Marie Vrolijk

Date: 27-08-2025
Document: Research Report
Educational programme: master's programme Applied Museum and Heritage Studies, Reinwardt Academy in Amsterdam, The Netherlands
Reinwardt Academy supervisor: Edwin van der Veldt
Placement institution: Naturalis Biodiversity Center, Leiden, The Netherlands
Naturalis supervisor: Marijke Besselink

Cover image:
Jaguar from Naturalis' Natural History Collection (Panthera onca, RMNH.MAM.60132, photo: Naturalis), featured in the Suriname exhibition, with its label text. According to the IUCN Red List, the jaguar is classified as near threatened. Background pattern: The biodiversity stripes (Biodiversitystripes.info and Living Planet Index database 2024, n.d.) visualise that global biodiversity has declined 73% between 1970 and 2020.

All photographs in this report were made by the author, unless mentioned otherwise.
The document is designed by the author.

Naturalis Biodiversity Center

Reinwardt Academy
Amsterdam University of the Arts

Preface

Background to this research and the author
In 1787, botanist Gerardus Vrolik met botanist Caspar Georg Carl Reinwardt in Amsterdam for scientific exchange. Reinwardt's name would later be adopted by an academy for museum and heritage studies, while Vrolik remains known for his obscure collection of pathological preparations. Over two centuries later, another Vrolijk encountered a Reinwardt for engagement in a master's programme, again showing interest in collections of natural history.

Visiting a natural history museum depot is a captivating experience. The millions of pairs of eyes that gaze at you from those shelves evoke contemplation about their brutal deaths and the injustices inflicted upon the people and environments from which they originated. Their silent existence is occasionally disturbed by researchers and collection managers, although even their work predominantly involves only the data that these specimens provide. The required energy, both in terms of maintaining the required climatological conditions and the human workforce needed for their upkeep, is justified considering their significance in the narrative of the current state of nature. Can these dead specimens also come to life for the public? Can they help inspire the public to be more considerate of other-than-human life on the planet? I studied why and how natural history museums can play a significant role in engaging their visitors in addressing the biodiversity crisis through their collections, their most valuable asset.

This research aims to assist museums in overcoming their inertia and that of their visitors regarding the biodiversity crisis. Not for the sake of the planet, as Earth will endure the sixth mass extinction wave just as it has survived previous ones, although humanity will likely not be there to witness it. Rather, I am deeply troubled by the interaction of predominantly Western people, including myself, with our living environment and hope to foster and share a deeper understanding of a respectful relationship with other life forms.

I live in an apartment in Amsterdam and am not a 'nature' person. I rarely eat animals, but do not follow a plant-based diet. I prefer trains to flights, although I occasionally travel to other continents. I don't own a car, though I sometimes rent one. I don't have a garden and have no idea what others find appealing about them. However, I love natural history museums. They offer a kaleidoscope of tiny, bite-sized stories of non-human life, even though they only show dead animals. Perhaps it is impossible to truly imagine the reality of animals' lives, as we always view them through a human lens. Still, these museums provide an opportunity to contemplate our relationship with nature. I am particularly fascinated by how nature and culture are represented as distinct fields. My love for natural and cultural history collections likely stems from the Renaissance tradition of the Wunderkammer. This makes me part of the colonial system and narrows my perspective on the natural world. Despite my openness to 'other' perspectives, including non-human ones, considering research on displaying killed life is ethically questionable. However, I believe that allowing these collections to reach a broader audience, thereby promoting a more ethical approach to nature, is justifiable.

Acknowledgement
I'm grateful for the internship at one of my favourite museums, Naturalis, where I learned from the very best museum professionals. In particular, I am grateful for Marijke Besselink's expertise, kindness, friendship, and trust in me. I hope that despite the liberty I took to be critical of some of Naturalis' practices, the work I present here reflects the immense joy and the invaluable experience I gained during my placement. I thank Patricia Mensinga for taking me along to all meetings, and I thank the others who shared their interesting and expertise-loaded insights through interviews: Lizzy Bakker-van Bezu, Tolin Alexander, Daniël van Draanen and Sylvia Mota de Oliveira. I recall the warm and interesting conversations I had with Naturalis colleagues, including Sjan, Harold, Matthijs, Martine, Pieter, Henk, Peter and Eline. Thanks to Edwin van der Veldt for his guidance, inspiration, and patience with my concept documents and Csilla Ariese and Martín Andrade Perez for their research advice. Last but not least, I express my gratitude to John and Dimmen, for their patience with my many months of being 'elsewhere' with my mind and time, Fred for his reading along, and my co-students Fem, Maiko, Miki and Cecilia for their mental support and friendship.

Table of contents

Figure 1. Naturalis Biodiversity Center in Leiden, the Dutch national research institute for biodiversity.

Introduction

'Our bodies are as polluted as Earth's. Perhaps the greatest tragedy of all, in this ultimate nexus of crises, is the pollution to our minds. In a time when we need to find the very best of ourselves, we are collectively suffering through a crisis of imagination.'

(Rachel Donald 2025)

This research

Through a case study of an exhibition in development in Naturalis Biodiversity Center (hereafter 'Naturalis') and a comparative analysis of other natural history exhibitions, this study examines how the narrative of the ecological crisis is currently communicated in exhibitions, and how museums aim to inspire visitors to contribute to mitigating the effects of unsustainable anthropogenic pressures on the natural environment.

'More than three species per hour are driven to extinction' is a powerful and imaginative quote, most likely attributed to the equally imaginative species Woozle (see figure 2), which claims that Harvard biologist E.O. Wilson stated as early as 1993 that 30,000 species are driven to extinction annually. The original source is difficult to trace. However, this expression is easier to understand than more reliable and nuanced arguments such as the famous 2019 IPBES report's warning that '25 per cent of species in assessed animal and plant groups are threatened, suggesting that around 1 million species already face extinction' (IPBES 2019, XV), or the World Wildlife Fund (WWF) Living Planet Index stating that 'over the past 50 years (1970–2020), the average size of monitored wildlife populations has shrunk by 73%' (WWF 2024, 7). This example illustrates the paradox faced by natural history museums. As institutions that embody truthfulness and reliability, serving as sources of research and knowledge sharing, they are compelled to tell nuanced stories. However, to remain relevant, they must continually offer imaginative stories that inspire and activate their public within the current discourse on the planetary crisis.

Naturalis is a prominent institution in biodiversity research, attracting around half a million visitors annually to its museum. Its family-oriented exhibitions highlight the beauty and variety of nature. During previous research on how museums communicate environmental awareness, the researcher visited Naturalis in January 2024 and was surprised that its exhibitions hardly addressed the human impact on biodiversity loss. This prompted the researcher to submit

an unsolicited application for a research placement on this subject, which Naturalis welcomed, as it was then working on incorporating this issue into its strategic plans and was interested in applied research related to its museum practices. In collaboration with the Presentation Department, responsible for Naturalis' exhibitions, the researcher developed a research question and methodology that were both relevant to the museum and aligned with the researcher's sense of urgency. This research explores the challenges that Naturalis faces in realising its ambitions, through the analysis of the process of the development of the exhibition *The Forest of Suriname*, which is Naturalis' first exhibition in which its new strategic ambition to engage the public with the biodiversity crisis could take shape. It is a temporary, immersive exhibition set to open in October 2025. The exhibition amplifies the voices of the forest's inhabitants: the Maroons and Indigenous peoples of Suriname[1], along with the forest itself, a living, breathing organism in which everything is interconnected.

Figure 2. Winnie the Pooh and his friend Piglet trace the footsteps of the Woozle, which appear to be their own. In academia, the Woozle-effect occurs when something is referenced repeatedly, while the original source is no longer relevant or even exists (illustration by Ernest Howard Shepard from Winnie the Pooh, 1926, public domain).

1. This study frequently refers to the inhabitants of the Surinamese forest, which comprises eleven Indigenous peoples and six Maroon communities, descendants of enslaved Africans who escaped from plantations. Although the publication *Words Matter* (Modest and Lelijveld 2018, 117,122) suggests using the names of the specific groups when possible, both the Suriname exhibition and this research often refer to all inhabitants of the forest.

Problem statement

Three challenges that Naturalis faces and that will be addressed in this research are the discrepancy between its strategic goals and its exhibitions, the absence of a complete account of the true impact of humans on biodiversity in its exhibitions, and unmet visitors' expectations to learn about the biodiversity crisis at the museum. In its Strategic Plan 2025-2028, Naturalis asserts that it aims to 'raise awareness about biodiversity and the biodiversity crisis by informing people about the importance of nature and biodiversity and what the biodiversity crisis means and entails' (Naturalis Biodiversity Center 2024, 16). Yet, its nine permanent exhibitions primarily celebrate nature's beauty while neglecting its degradation (see figure 3). This incomplete portrayal of nature is the result of the belief that 'the museum is an imaginative experience, built to make people fall in love with nature' (ibid., 15). A visitor study conducted by a social design agency together with Naturalis in 2024, regarding the readiness of visitors towards learning about the biodiversity crisis in the museum, showed that visitors had already expected to find more about this topic and that 'they have many questions about the causes and consequences of the biodiversity crisis, including why biodiversity is not doing well and what the human role is in this' (Afdeling Buitengewone Zaken 2024, 18,24, translation by author).

Figure 3. Extinction Rebellion is handing out a biodiversity treasure hunt to young visitors at Naturalis' entrance on the 1st of May 2024, expressing their concern that Naturalis doesn't pay enough attention to the ecological crisis in its exhibitions.

Objective and research question

This study is motivated by the observation that Naturalis' current exhibitions do not sufficiently communicate the human impact on biodiversity. It analyses Naturalis' exhibition development process for an upcoming exhibition and compares it with both its strategic ambitions and current standards in other natural history museums. The study aims to offer insights that lead to concrete recommendations that will assist Naturalis in bridging this gap in future exhibitions and in interventions to current permanent exhibitions, thereby enhancing public understanding of biodiversity and encouraging greater stewardship of nature. This research places emphasis on the natural history museum's core vehicle for narratives: its collection. It will answer the following research question:

How does Naturalis engage its museum visitors with the human impact on biodiversity through a natural history collection in its developing exhibition about Suriname?

Sub-questions relating to the museum landscape:

- Why do visitors need to be engaged with the human impact on biodiversity?
- What is the responsibility of museums concerning the biodiversity crisis?
- How can visitors be engaged with environmental issues?
- How do other museums engage their visitors with the human impact on biodiversity?

Sub-questions relating to Naturalis' institutional context:

- How does Naturalis engage its museum visitors with the human impact on biodiversity in its current nine permanent exhibitions?
- What role can the collection play in Naturalis' narrative of human impact on biodiversity?
- What are Naturalis' ambitions regarding public engagement with the biodiversity crisis?

Sub-questions relating to the Suriname Exhibition:

- How will the Suriname exhibition address the human impact on biodiversity?
- What role does the collection play in the narrative of the Suriname exhibition concerning the human impact on biodiversity?
- How do Naturalis' ambitions for public engagement with the biodiversity crisis manifest in the Suriname exhibition?

Delineation and state of the art

This study centres on public awareness of the biodiversity crisis. Museums have numerous ways to become more sustainable. They can minimise their footprint and contribute to mitigating climate change or reducing pollution. They can favour greener sponsors, reduce carbon emissions in the production of exhibitions, ban meat from their restaurants, and more, embodying 'inside activities', or getting the house in order (Worts 2023). However, according to museums and sustainability expert Sarah Sutton, 'their greatest influence on climate action is grounded in their public-facing activities' (Sutton 2020, 624).

In their research on the relevance of museums amid societal changes, many scholars choose the more popular topics of global warming and the Anthropocene as protagonists (e.g., Merriman 2024; Nieroba and Geisler 2024; Harrison and Sterling 2021; Sutton 2020; Janes 2009). However, because Naturalis is a biodiversity centre, biodiversity is the primary focus of this study. This research expands upon the 2008 article 'Engaging the Public in Biodiversity Issues', by palaeontologist and curator at the American Museum of Natural History, Michael Novacek. He was one of the first to emphasise the need for continued public outreach to illustrate the importance of ecosystems for the sustenance of human life. To foster a greater commitment to biodiversity stewardship, he analysed potential audiences and messages and improved the mechanisms for delivering those messages to elicit engagement (Novacek 2008, 11572). Other academics studying the role of museums in the biodiversity crisis tend to focus on their collections' scientific value (Johnson et al. 2023; Naggs 2022) or their contribution to the Global Biodiversity Framework and the Convention on Biological Diversity (McGhie 2023).

Intervention, stakeholders and engagements

This research aims to enhance understanding and stewardship of biodiversity, in the interest of nature and future human generations. It serves as the final project for the master's programme in Applied Museum and Heritage Studies at the Reinwardt Academy in Amsterdam. The researched intervention is Naturalis' Suriname exhibition, which is currently in the development phase. The results and recommendations, however, aim to be of use for Naturalis' future practices and exhibitions. Naturalis, the placement provider, is the primary beneficiary of this research, which defines its interests. The researcher is committed to conducting independent and ethical research; however, fostering good relationships with Naturalis' staff and providing insightful analysis and valuable recommendations reveals Naturalis' influence. Three core heritage engagements valued by the academy are sustainability, inclusivity, and digitality. Biodiversity is vital for the sustainable future of human and non-human life. Global crises, often caused by people in the Global North, affect communities in the Global South. By addressing the sustainability of the planet's biosphere, this research will indirectly promote a fairer distribution of burdens to support its regeneration. Another aspect of inclusivity in this study is its focus on non-Western worldviews. Furthermore, nature itself is considered a stakeholder that should be included in forward-looking strategies. Lastly, inclusivity also involves museum visitors. By encouraging Naturalis to take responsibility for current societal challenges, its museum can become more inclusive of diverse audiences. In an increasingly digital world, this research seeks to contribute to the ongoing relevance and appreciation of the tangible: the physicality of the natural history collection.

Concepts

What is biodiversity, and why is it important

Naturalis integrates research, collection, data, technology and expertise, with biodiversity at its core. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) defines biodiversity as: 'The variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. This includes variation in genetic, phenotypic, phylogenetic, and functional attributes, as well as changes in abundance and distribution over time and space within and among species, biological communities and ecosystems' (IPBES 2019, 1033). The Royal Society explains why it is important: 'Biodiversity is essential for the processes that support all life on Earth, including humans. Without a wide range of animals, plants and microorganisms, we cannot have the healthy ecosystems that we rely on to provide us with the air we breathe and the food we eat. And people also value nature of itself' (Royal Society, n.d.).

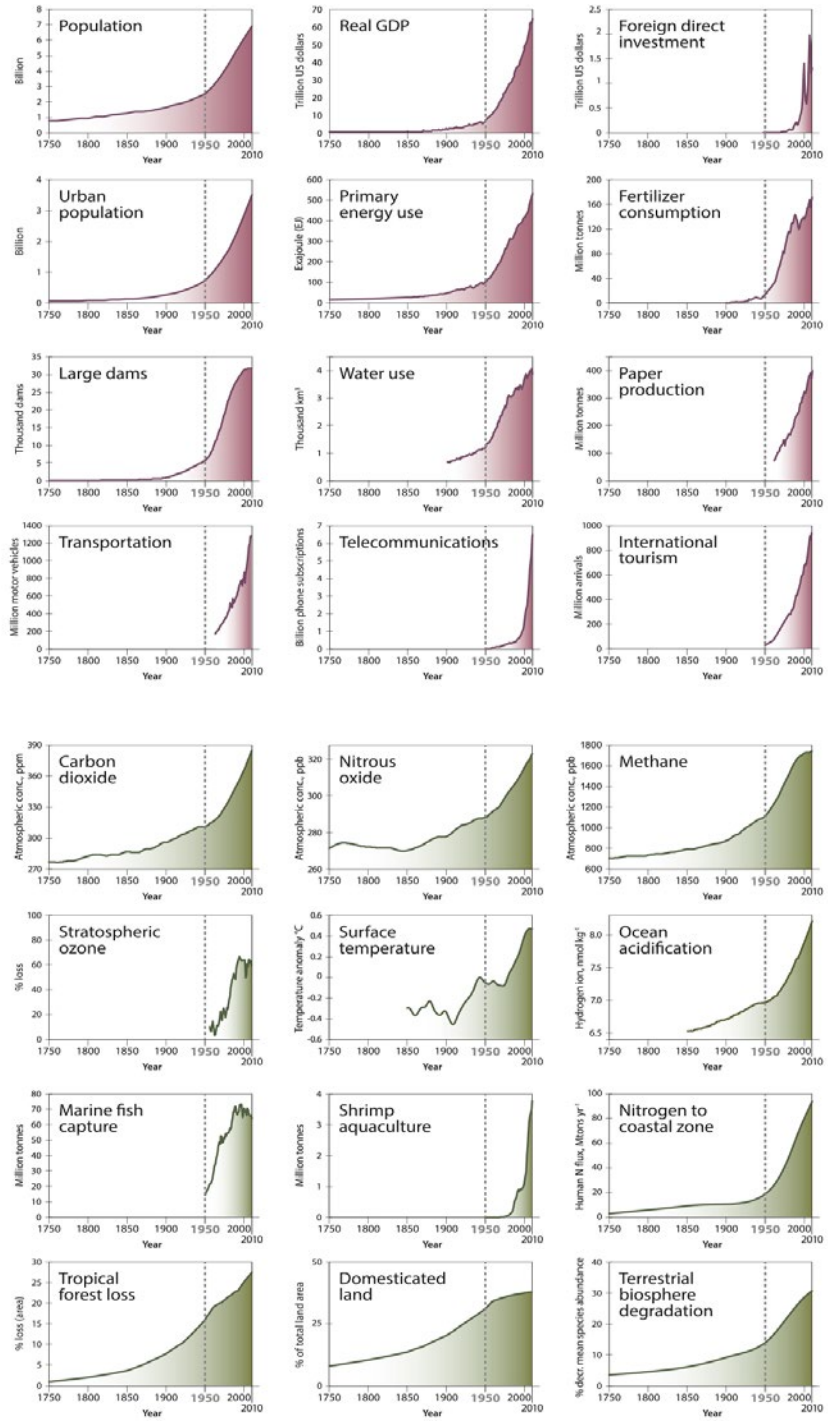
'Not all the winds, and storms, and earthquakes, and seas, and seasons of the world, have done as much to revolutionize the world as man.'

(George Perkins Marsh 1865, 1 in *Man and nature or, physical geography as modified by human action*; paraphrasing Horace Bushnell 1858, 169)

Human impact on biodiversity or biodiversity crisis

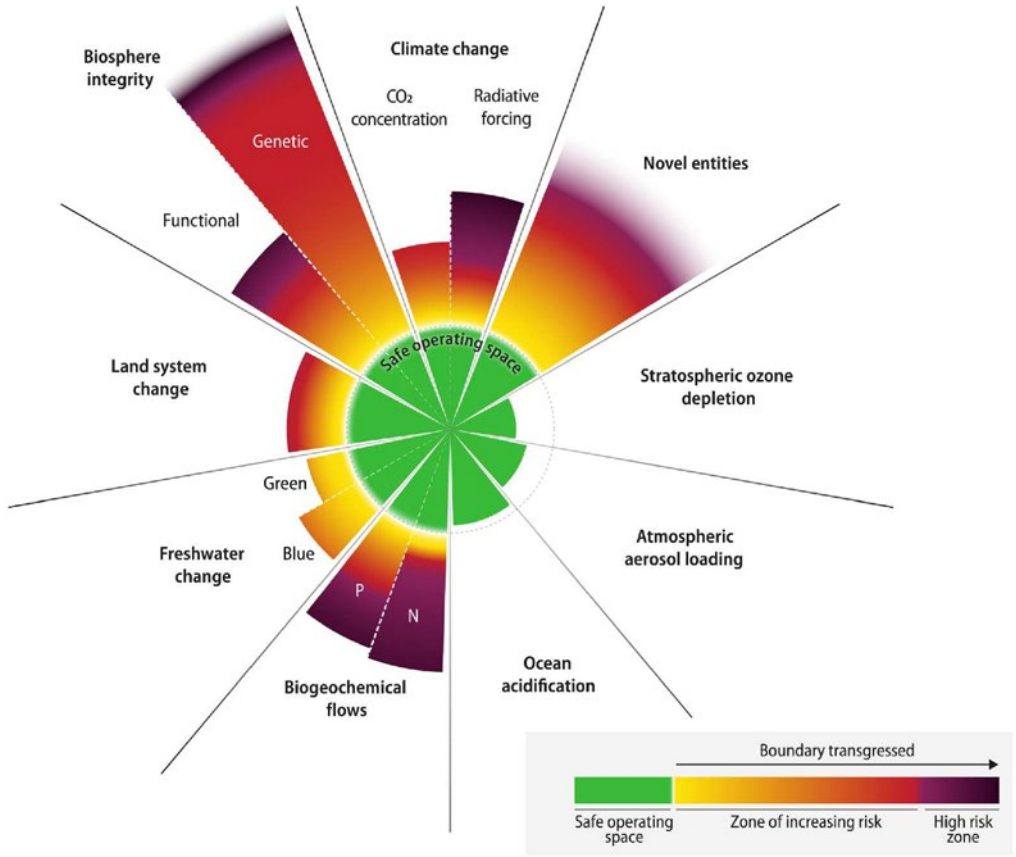
This research uses the concepts of 'human impact on biodiversity' and 'the biodiversity crisis' interchangeably, despite their differences. Humans have altered their environment since their control of fire (Goudie 2018, 27). Evidence of the extinction of other life by humans dates back as far as 55,000-45,000 years (Miller et al. 2016), and the global transformation of the Earth's surface by humans became evident 3,000 years ago (Stephens et al. 2019, 897). The human population has more than doubled since the Great Acceleration (see figure 4), leading to the overexploitation and depletion of Earth's resources. IPBES asserts that anthropogenic drivers of change, such as land use change, exploitation of organisms, climate change, pollution and invasive alien species have had a large negative impact on nature in the past 50 years, and states that 'the global rate of species extinction is already at least tens to hundreds of times higher than the average rate over the past 10 million years and is accelerating' (IPBES 2019, XVI–XVIII, XXVII). Six of the nine Planetary Boundaries, the safe environmental limits within which humanity can operate without causing irreversible harm to the Earth's life support systems, have been crossed (see figure 5), including Change

Figure 4. Great Acceleration: the relationship between socioeconomic trends (top) and earth system trends (bottom). Infographic: IGBP (Steffen et al. 2015, 4,7).



in Biosphere Integrity (Richardson et al. 2023). Nevertheless, despite the strong scientific evidence for the decreasing variety and abundance of species and ecosystems, the concept of 'crisis' is more difficult to substantiate scientifically. It is emotionally charged and does not signify the same thing for everyone. Scientific sources never use the word 'crisis'. In this document, the concept of 'human impact on biodiversity' is preferred. However, the term 'biodiversity crisis' is a common phrase in public media, reflecting current societal discourse, and is used by Naturalis in its Strategic Plan. It is a concept that emphasises the urgency to act. Considering that the objective of this research is to enhance public understanding that greater stewardship of nature is necessary for the continued existence of many species, including humans, the use of the word 'crisis' seems appropriate on several occasions.

Figure 5. Current (2023) status of control variables across the planet's boundaries. Genetic diversity has transgressed the high-risk zone (Richardson et al. 2023, 4).



The United Nations addresses biodiversity and climate issues through separate Conferences of the Parties (COPs). The Sustainable Development Goals are the UN's first attempt to view environmental problems intertwined with social injustice, as their impacts affect populations unequally. Considering Naturalis' focus on biodiversity, this research concentrates on the human impact on biodiversity. However, it draws parallels and insights from studies on global warming for inspiration as they often present similar challenges, and it aims to consider environmental and humanitarian aspects in a holistic manner.

The human impact on biodiversity can also be viewed positively. Many guardians of the Earth are undertaking inspiring conservation efforts every day, and international recognition for the importance of protecting and regenerating ecosystems is increasing.

Engaging, informing or activating museum visitors

Museums can inform visitors about complex topics, such as the biodiversity crisis, and even offer an action-oriented perspective. Sometimes, the distinction between these two is subtle. To engage means 'to interest someone in something and keep them thinking about it' (Cambridge Dictionary 2025). According to Michael J. Novacek (2008, 11571), it also means 'to develop meaningful connections with others […] or draw others into some agreed-upon action or service'. Within the realm of this research, 'engaging' encompasses the spectrum from informing to activating. Furthermore, this study defines museum visitors as individuals who voluntarily and independently visit exhibitions (alone or accompanied by friends or family), without the use of audio guides, museum docents, or participation in school programmes. This study focuses on what museums aim to provide and the tools they have to do so, rather than on whether and how visitors' behaviours actually change after visiting a museum.

Natural history collections

Although not strictly limited to specimens, collections are the primary focus of this study. Natural history collections are the *raison d'être* of most natural history museums and carry the potential to tell stories about human actions that have made or could make a difference for their survival. Naturalis describes the collection's value remarkably on a label in its exhibition Death: 'In a museum, we protect dead animals against their living counterparts. They are mounted, dried or stored in alcohol. We wage a never-ending war on fungi and bacteria. And against museum beetles, who love the bones and hair of prepared animals.' Death is the primary tool for scientists seeking to understand life (Dijs 1996),

Figure 6. One of the most imaginative specimens in Naturalis' collection: Darwin's finches, the palpable evidence of his famous theory of evolution. They are on display in the Evolution gallery (photo: Naturalis).

and the more than one billion dead animals, plants, and other species that are stored in depots of more than a thousand museums worldwide (Johnson et al. 2023, 1192), provide an important source for science. Many cultural institutions can offer digital experiences, but natural history museums have something that others do not have: a natural history collection. Although many specimens are not suitable for museum display due to their scientific value and their vulnerability to light, some objects are, and they are available at no additional cost. Their 'realness' fascinates many people and provides a unique, palpable experience compared to digital museum experiences (see figure 6). This study acknowledges the limitations of focusing on a natural history collection, as its characteristics for museum visitors are primarily visual. Other senses, which a museum can also stimulate, are beyond the scope of this research.

Methodology

To address the research questions, the researcher employed four qualitative methods: interviews, exhibition analyses (both at Naturalis and other museums), analysis of the exhibition development process of the Suriname exhibition, and a literature review. This study concentrates on museums' methods of engaging visitors, not on visitor perceptions. Naturalis had already conducted a visitor study on the topic of biodiversity in the museum (Afdeling Buitengewone Zaken 2024).

Six semi-structured interviews

Approach: The researcher conducted semi-structured interviews with six contributors to the Suriname exhibition half a year prior to its delivery, to learn how Naturalis staff consider the human impact on biodiversity. The interviewees were selected for their disparate roles in the development of the exhibition. An account of why they were invited to an interview, their roles, career backgrounds, and responses can be found in Appendix 2. The interviewees are:

- Marijke Besselink, scientific content developer for exhibitions
- Tolin Alexander, guest curator
- Patricia Mensinga, project manager
- Daniël Van Draanen, content developer for education
- Lizzy Bakker-van Bezu, head of Presentations
- Sylvia Mota de Oliveira, plant taxonomy researcher

Data collection: The interview questions centred around four themes: the institute, museums and biodiversity, the Suriname exhibition, and the process. Not all interviewees answered the same questions, as these varied according to their roles. The author recorded, transcribed, summarised and translated the interviewees' responses (see Appendix 2), which were then verified and approved by them.

Data analysis: The interviewees' answers were categorised by question and then compared for similarities and differences in their opinions and approaches, to help answer the research's sub-questions. To avoid losing the nuanced differences of this qualitative method, the results were not quantified (e.g. 'two interviewees say this, three say that'). The answers are interpreted in the Discussion chapter.

Ethical considerations: Interviewees were informed in advance about the implications of their participation and signed a consent form (see Appendix 2). Due to the limited word count, this study does not do justice to the interviewees' passion, dedication and expertise that they openly shared during the interviews.

Analyses of nine exhibitions in Naturalis and eleven exhibitions in eight other museums

Approach: The researcher analysed exhibitions to understand how Naturalis and other museums currently engage visitors with biodiversity loss through natural history collections. All nine of Naturalis' permanent exhibitions were examined to evaluate the institution's approach (see Appendix 3). Additionally, eight natural history museums were studied to compare engagement methods (see Appendix 4). Museums were selected based on complementary characteristics such as size and modernity. The exhibition analyses may not provide a comprehensive picture but serve as a representative benchmark.

Because of time and budget constraints (all visits and travel costs were covered by the author), most of the museums visited were Dutch, with two additional deliberate visits to London and Brussels, and two serendipitous stops during other travels in Mumbai and Lyon. Due to limited time, two of the ten museum analyses are not included in this report: the Natural History Museums of London and Rotterdam, however, the gained insights may have indirectly influenced the results. London is nevertheless worth mentioning, as it opened a dedicated exhibition about human impact on biodiversity in spring 2025. Although this exhibition opened after the researcher's visit to London, online access to the complete exhibition's label texts and photographs, along with an eyewitness account by the academy's supervisor Van der Veldt, provided enough information to include a brief description in the Results section of this report.

Although Naturalis aims to attract families with young children through immersive exhibitions that include many interactive elements, and concentrates on biodiversity rather than planetary welfare in general, the chosen museums were not selected based on these characteristics, as this would limit the range of stories to explore. Additionally, a topic as complex as the biodiversity crisis might not appeal to the youngest visitors, but it can still provide an informative layer for those seeking in-depth stories about their relationship with the Earth.

The study focused on exhibits and their accompanying information, which can be viewed independently without the need for a docent, audio guide, or app. Due to the investigative nature of the researcher's visits, the experience was not comparable to that of the 'average' visitor or family. For example, the visit did not include conversations or peer reflection. In small museums, all galleries were analysed, whereas in larger ones, exhibitions were selected that featured a high density of natural history specimens and offered the potential to disseminate knowledge regarding human impact on biodiversity.

Data collection: The researcher thoroughly examined every (yes, every!) exhibit, label, and text panel, ensuring no room or exhibit was missed. Any mention or visualisation of human-nature relationships or environmental issues was considered. When a 'hit' occurred, a photograph was taken of the exhibit or specimen with its label. Priority was given to information over experience, with objects and labels examined thoroughly, while soundscapes, lighting, and atmosphere were noted only if they added important context to biodiversity loss. Although the focus was on exhibits featuring natural history collection specimens, sometimes other objects, reproductions, models, or even interactive and digital media were considered when they offered an important story on the human impact on biodiversity.

Data analysis: The relevant part of the identified text was quoted and interpreted. Initially, a large spreadsheet was used to quantify the themes addressed in each exhibition and the level of activation of the visitors, which helped the researcher identify similarities and differences among the various exhibitions. However, along the way, the quantification of topics hindered the interpretation of the nuanced differences and was abandoned. The observations, interpretations and examples are now primarily used in the Discussion chapter to complement or juxtapose the other research results.

Figure 7. The visited and analysed museums. Not all of them made it into this report.

Analysis of the Suriname exhibition in development

Approach: The development process and concept outcomes of Naturalis' forthcoming Suriname exhibition were examined to determine how this exhibition addresses Naturalis' new ambitions to engage visitors with the biodiversity crisis.

Data collection: Over the course of 20 weeks, the researcher spent one or two days per week at Naturalis, learning about the exhibition's development by reading content and design-related documents, participating in informal conversations, and attending meetings alongside the project manager and content developer. These meetings included larger sessions with the steering group (2), the advisory board (1), the department team (5) and interdepartmental representatives (1), as well as smaller meetings with collection managers (4), biologists (5), a sound recording specialist (1) and individual team members. The researcher also completed tasks that, although not directly related to the research, provided insight into the decision-making processes, such as collecting photographs and sound recordings of birds and frogs, writing reports on meetings, and designing an alternative for an exhibit. These activities, together with the interviews, collectively provided an impression of the complexities involved in compiling an exhibition.

Data analysis: The concept texts for the exhibits, along with the understanding of the rationale behind their selection and the focus of the narratives they convey, were used to answer some of the sub-questions.

Ethical considerations: The researcher received no remuneration or travel expenses. During her placement at Naturalis, she was not a 'fly on the wall'. She asked numerous questions, both formally in interviews and informally during collegial interactions. These questions were often related to why specific biodiversity-related decisions were made. By asking these questions, the researcher may have influenced the development process and the exhibition's content, creating an unverifiable situation; however, given the research objective to enhance visitors' understanding of the importance of biodiversity and Naturalis' openness towards this research, this was deemed ethically acceptable.

Literature study

Naturalis' constitutional context was examined through policy and strategic documents. A literature review was conducted on topics such as public awareness of planetary crises, the theory-action gap, the human-nature divide, museum learning, and the role of museums and collections. Due to the extensive body of literature on the climate crisis and relatively less on biodiversity, both were considered, as many parallels can be drawn. This research aims to be relevant to an international audience; however, as both the researcher and the case study are based in the Netherlands, it draws on both international and Dutch literature. The literature was utilised to write the first sections of the results and to relate to the primary data collected for this research in the Discussion.

Additional ethical considerations

As an assignment for the master's programme in Applied Museum and Heritage Studies at the Reinwardt Academy in Amsterdam, this research has been conducted in accordance with the principles outlined in the Netherlands Code of Conduct for Research Integrity (KNAW et al. 2018, 13). In her internship agreement, the researcher agreed to adhere to Naturalis' rules, regulations, and instructions throughout her placement, including the *ICOM Code of Ethics* (ICOM 2017), and the *ICOM Code of Ethics for Natural History Museums* (ICOM and NATHIST, Ethics Working Group 2013).

The researcher gratefully utilised the AI-powered writing tool Grammarly Pro to enhance the language. However, experiments with Large Language Models such as ChatGPT were very unsatisfactory and, therefore, not employed, meaning that the contents and form of this document were all 'traditionally handcrafted' by the author. No life was harmed in this research, and travel to Naturalis and other museums was conducted as sustainably as possible, exclusively by train or bicycle. One flight was taken to Mumbai for a purpose unrelated to this research; however, whilst there, the researcher combined her visit with a museum analysis.

Results

This chapter presents the research findings organised according to the ten sub-research questions. It begins with an exploration of the museum landscape, followed by an analysis of Naturalis' institutional context, and concludes with details about the Suriname exhibition. The table below shows which methodologies were used to answer the sub-questions (see table 1).

Table 1. Research sub-questions and the methodologies employed to answer them.

	Literature • academic literature review	Exhibition analyses • other museums	Exhibition analyses • Naturalis	Interviews with Naturalis staff	Literature • Naturalis' institutional docs	Analysis Suriname exhibition dev. process
SUB-QUESTIONS MUSEUM LANDSCAPE:						
Why do visitors need to be engaged with the human impact on biodiversity?	●					
What is the responsibility of museums concerning the biodiversity crisis?	●					
How can visitors be engaged with environmental issues?	●					
How do other museums engage their visitors with the human impact on biodiversity?		●				
SUB-QUESTIONS NATURALIS' INSTITUTIONAL CONTEXT:						
How does Naturalis engage its museum visitors with the human impact on biodiversity in its current nine permanent exhibitions?			●			
What role can the collection play in Naturalis' narrative of human impact on biodiversity?				●		
What are Naturalis' ambitions regarding public engagement with the biodiversity crisis?				●	●	
SUB-QUESTIONS RELATING TO THE SURINAME EXHIBITION:						
How will the Suriname exhibition address the human impact on biodiversity?						●
What role does the collection play in the narrative of the Suriname exhibition concerning the human impact on biodiversity?					●	●
How do Naturalis' ambitions for public engagement with the biodiversity crisis manifest in the Suriname exhibition?				●	●	●

The museum landscape

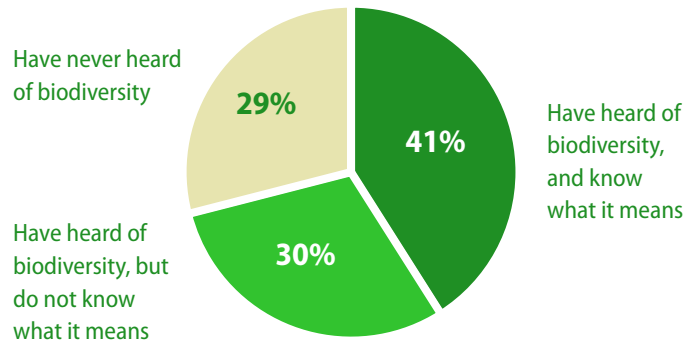
Why do visitors need to be engaged with the human impact on biodiversity?

Based on academic literature, this section explores why, according to scholars, museums should engage visitors with the human impact on biodiversity. It discusses how much visitors know about the topic, their perception of the biodiversity crisis, and the causes of environmental and social injustices.

Biodiversity illiteracy

Museums can educate people about the importance of biodiversity. Biodiversity is vital for a sustainable future for humans because it provides the so-called ecosystem services, such as air, food, pharmaceuticals, and resources for valued products. To protect it, people need to understand its importance. While 71% of people in Europe have heard of biodiversity, only 41% understand what it means (European Commission, Directorate General for Environment 2019, 7, see figure 8). Two years later, this figure is slightly higher in the Netherlands, at 51%; however, after being given a proper definition of biodiversity, only 31% think it is in poor shape (Nationale Denktank 2022, 5).

Figure 8. Have Europeans (N=27,643) heard of the term 'biodiversity? (European Commission, Directorate General for Environment 2019, 7).

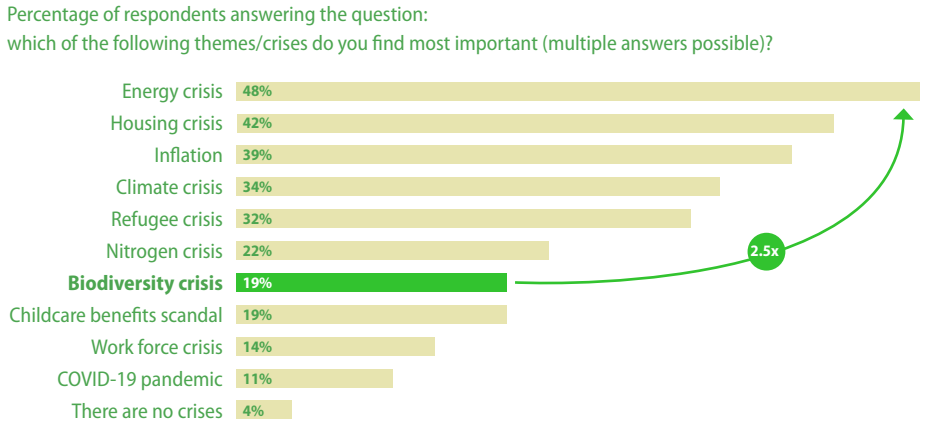


People are increasingly familiar with global warming, but most can only recall the dodo when asked about extinct birds (see figure 9). Humans have contributed to the extinction of at least 562 bird species over the past 130,000 years, accounting for 92 per cent of all extinct birds since the Late Pleistocene (Matthews et al. 2024, 386). Yet, despite similar scientific output, biodiversity loss receives less media attention than climate change (Legagneux et al. 2018, 2). Biologist Marc Argeloo (2022, 243) notes that Dutch media often overlook nature, with news relegated to categories such as 'domestic' or 'political', and that the Dutch Canon largely neglects the human impact on nature. He argues that this ignorance stems from a vicious circle: without awareness of natural history, the flow of information is limited. Naturalis director Edwin van Huis, in his preface to the first *Status Report Dutch Biodiversity*, affirms that Dutch media neglect nature. He discusses a prime-time news segment on 10 October 2024, which covered the WWF report stating that 73% of species populations have declined over the past half century, lasting only 18.8 seconds. A segment on the extinction of the wired telephone in the same broadcast ran five times longer at 97 seconds (Naturalis Biodiversity Center 2025a, 3).

Figure 9. Dodo, the only extinct species of birds that people can name (object in Naturalis' exhibition Death).

Media coverage alone doesn't cause biodiversity illiteracy. Wildlife documentaries that depict nature as devoid of human impact can give the false impression that biodiversity is thriving. If documentaries emphasised threats from agriculture, infrastructure, and mining, viewers might better connect these threats to Western lifestyles (Jones et al. 2019, 422). Another study finds that native species are underrepresented in Dutch media and education, while exotic species and pets are overrepresented. It also notes that most Dutch people visit a nature reserve once a month or less, which fosters alienation from nature (Nationale Denktank 2022, 5). This loss of experience has created an emotional disconnect from nature, which in turn reduces people's willingness to protect it, leading to a cycle of further decrease in natural encounters (Pyle 1993). The shifting baseline syndrome illustrates that perceptions of a 'normal' environment shift over generations, resulting in degraded standards (Pauly 1995), while individuals who witness environmental decline are more likely to be willing to pay for conservation (Argeloo 2022, p. 448). When asked which themes or crises Dutch people consider important, the biodiversity crisis ranks seventh on the list (Nationale Denktank 2022, 5; see figure 10). Lack of awareness about the importance of biodiversity lowers motivation to address it.

Figure 10. Important themes/crises according to Dutch people (Nationale Denktank 2022, 5, translation by author).



'Nowadays people know the price of everything and the value of nothing.'

(Oscar Wilde in The Picture of Dorian Grey, 1890, 55)

'I think we are not nature, because we pollute it.'

Quote from a child participating in Naturalis' visitor survey on biodiversity in its museum (Afdeling Buitengewone Zaken 2024, 22, translation by author).

The cause of environmental and social injustices: the Great Divide

Sensitivity to diverse human-nature relationships is crucial for engaging museum visitors with the biodiversity crisis. The root of biodiversity illiteracy lies in the disrupted Western view of nature as separate from human beings, which stems from the Enlightenment and has allowed for its exploitation. Recent planetary changes, such as global warming, biodiversity loss and pollution, are largely caused by people in the Global North, while they predominantly affect people in the Global South. According to museum professional Nick Merriman (2024, 4,5), the separation of culture and nature in distinct research institutes and museums bolsters the misconception that environmental and social injustices are not interconnected. However, philosopher Gérald Hess (2023, 85,87) asserts that 'with the Anthropocene, the opposition between humans and nature seems to become obsolete' because human activities now significantly affect the environment, and the Earth influences human history in return, implying that humanity and nature are inseparable. Nevertheless, sociologists Elzbieta Nieroba and Robert Geisler (2024, 7) find the term Anthropocene problematic because it constructs a shared identity that blames all of humanity for perpetuating changes in the biosphere and does not do justice to the activities of various social groups. This aligns with anthropologist Philippe Descola's nuanced understanding of the Great Divide between nature (non-human animals and plants) and culture (social norms and values). He observes that there are alternative ontologies, or fundamental ways of understanding existence, beyond Western thought (Descola 2013, original publication 2005).

What is the responsibility of museums concerning the biodiversity crisis?

This section outlines academic perspectives on the roles of museums and their natural history collections in times of profound planetary disruption. Museums can employ various methods to combat biodiversity illiteracy, clarify the culture-nature divide, connect with diverse audiences who hold conflicting perceptions of planetary challenges, and help reduce visitors' inertia in adopting sustainable behaviours. By causing a ripple effect, they can even transcend their relevance to visitors and become meaningful to the planet.

'If there is to be a future for museums, we need to do away with the false promise of authoritative neutrality. We need our museums to function as both educators and yes, as advocates for a sustainable and equitable future. Only then can we equip visitors with the stories and tools they need to truly understand the rapidly changing world, and to shape it for the common good for generations to come.'

(Steve Lyons and Beka Economopoulos, 2015, in an article about fossil fuel divestment)

Museums: neutral or change agent?

As accessible and trusted public authorities that 'preserve, interpret and promote the natural and cultural inheritance of humanity' (ICOM 2017, 1), museums can inform their visitors and help shape their opinions. Museums attract people with different backgrounds and views and can play a role in connecting with a large and diverse audience. Globally, over a thousand natural history museums offer perspectives on past and present life, increasingly providing glimpses of the future (Johnson et al. 2023, 1192). Together, they can reach a significant audience. Museums' contemporary key tasks include 'defining obligations to societies and humanity more broadly, formulating the challenges of the future rather than simply building social memory and protecting historical heritage' (Nieroba and Geisler 2024, 1). Consequently, museums can potentially become active agents in addressing urgent societal issues, such as the damaging human impact on the biosphere.

Museums can serve as intermediaries between international biodiversity protection endeavours and the public. Despite 75 years of international efforts to protect the natural environment (see figure 11), biodiversity continues to deteriorate at an accelerating rate. Yet, the public, who plays a vital role in a regenerative future, has not been motivated to meaningful action, while it is believed that individuals and communities hold the key to biodiversity

TIMELINE OF INTERNATIONAL BIODIVERSITY PROTECTION MILESTONES

1948 - Foundation of the International Union for Conservation of Nature (IUCN)
Leading global conservation body, sets standards, produces the Red List, promotes sustainable development.

1951 - Foundation of The Nature Conservancy (TNC)
Pioneering organisation in protected areas, science-based conservation, habitat restoration, and large-scale ecosystem protection.

1961 - Foundation of World Wildlife Fund (WWF)
Global awareness campaigns, fundraising, establishment of protected areas, wildlife conservation, sustainable development advocacy.

1964 - Introduction of IUCN's Red List of Threatened Species
Comprehensive classification system for species' extinction risk, guides global conservation priorities.

1972 - Establishment of the United Nations Environment Programme (UNEP)
Global platform for environmental governance, leads biodiversity initiatives, fosters international environmental collaboration.

1972 - Creation of the World Heritage Convention for Natural Sites (UNESCO)
Global framework for protecting natural heritage sites of outstanding universal value.

1992 - Rio de Janeiro Earth Summit adopts Convention on Biological Diversity (CBD)
First legally binding agreement on biodiversity, promotes sustainable development and global biodiversity conservation.

2010 - Adoption of Aichi Biodiversity Targets at COP10
Aiming to address biodiversity loss and integrate conservation into global policy by 2020.

2012 - Foundation of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)
Provides science-based assessments, connects policy with biodiversity conservation, supports informed decision-making.

2019 - IPBES Global Assessment Report on Biodiversity and Ecosystem Services
Landmark report confirms accelerating biodiversity decline, highlighting urgent need for global action.

2022 - Adoption of the Kunming-Montreal Global Biodiversity Framework (GBF) at COP15
Sets ambitious global biodiversity goals, aiming to protect 30% of land and marine areas by 2030.

Figure 11. Timeline of global environmental protection milestones (infographic by author)

regeneration: 'Governments, companies, and others have a responsibility to lead and inform the public, but finally it is individual choices, made billions of times a day, that count the most' (Secretariat of the Convention on Biological Diversity 2000, 19).

Visitors expect museums to inform them, yet museums hesitate to take a stance. A study among cultural audiences in the United Kingdom revealed that '72% think cultural organisations have a responsibility to influence society about the climate emergency', yet only 16% believe these organisations consider their role in it important (Indigo-Ltd 2024, 6). Naturalis' visitor study revealed that visitors not only seek information about the biodiversity crisis in the museum, but also that parents prefer their children to learn about it from the museum rather than from themselves, as they are not confident in their own ability to explain it (Afdeling Buitengewone Zaken 2024, 18, 27). However, several scholars assert that museums have been hesitant to engage their audiences in the climate and biodiversity crisis, fearing bias, political influence, or erosion of their perceived neutrality (e.g. Janes 2009, 146; Novacek 2008, 11575; Merriman 2024, 12; Sutton 2020, 624; McGhie 2020a, 9). Nevertheless, none of these academics support such a humble attitude and argue that museums should take a stance in times of profound planetary upheaval. According to Merriman (2024, 7), given their popularity, public trust, and long-term perspective, museums have an ethical responsibility to raise awareness of the ecological crisis and encourage their visitors to take action. Letelier (2024, 45) urges museums to tell the truth about the environmental collapse, to create opportunities for society to question and build new futures.

'Take a look at this hair clip. It's made of tortoiseshell. Now, can you imagine sailing halfway round the world and killing a hundred-kilo turtle just to keep your hair out of your eyes? And then… Not just once, but over and over again, to the point there's almost none of them left? We've had pieces like this in our collection for decades. The difference is now we're trying to use them to talk about the planet.'

(From a comic novel by Barker Langham and Tom Sears in Harrison and Sterling 2021, 30)

The collection as a vehicle for narratives

Natural history objects can help people learn about species; they are tangible assets in a digital age, and they can tell a story on their own or serve as a means for storytelling. Collections, as a record of the diversity of life, are the natural history museum's core asset for research. However, specimens can also educate the public about life. People will not cherish or protect what they do not know exists, and it is difficult to feel connected to nature when it remains distant. Natural history museums provide a unique opportunity to encounter tangible, real (although dead) animals and plants that would otherwise be impossible to see in person, thereby increasing visitors' appreciation for the natural world, which is exactly what Naturalis has aimed to achieve with its museum.

Digitising natural history collections is invaluable to science as it makes data linked to specimens more accessible and inclusive. However, although museum professionals have embraced new media to engage the digital-native generation, museums should not overlook the tangible qualities and cost-effectiveness of the presentable parts of their collections in an era of screen fatigue. According to constructivist theory, a museum object's primary meaning is created by the visitor in countless ways (Hein 1998); nevertheless, things also have 'the power to arrest, to captivate, to startle', and the capability 'to produce experience in the perceiving subject' (Dudley 2012, 6). Natural history specimens may carry intrinsic stories. For example, a collection may reveal that the abundance of certain species has diminished in specific areas, or that species have adapted to man-made environments. According to Sarah Sutton (2020, 622), by mining the collections for evidence of how humans have contributed to planetary disruptions, and by crossing disciplines to the arts and humanities, researchers, curators, and educators can 'engage a far wider public in learning, than can science alone'. In contrast, museum objects are sometimes 'being used as accessories within the interpretation of something else – as props in

the telling of a story rather than as the focus of the story themselves' (Dudley 2012, 6), but even so, historical specimens can serve as anchors for emotionally powerful stories of extinctions or rewilding initiatives that make biodiversity loss feel more real and immediate. Although natural history collections mostly offer opportunities to highlight the visible, recognisable species, focusing on a few charismatic species might divert attention from the critical issues of habitat destruction and the interconnectedness of all species, including worms, fungi, and microbes (Novacek 2008, 11572, see figure 12).

Figure 12. Exhibit with less cuddly animals in the Natural History Museum Rotterdam, such as roundworms (Nematoda), flatworms (Platyhelminthes) and molluscs (Mollusca). The labels explain their ecological function.

How can visitors be engaged with environmental issues?

Drawing on literature, this section examines why motivating people to act in the biodiversity crisis is so difficult. While not exhaustive, it aims to highlight a few potentially effective communication strategies to engage people with environmental issues.

The intention-behaviour gap

Individuals' primary motivation for visiting a museum is the construction and maintenance of identity (Falk 2013, 112); which provides curatorial opportunities to inspire sustainable action. The intention-behaviour gap, or green gap, shows that people often hold eco-friendly views but act otherwise. For example, a lack of understanding of the energy savings associated with particular activities causes individuals to favour easy actions, such as recycling, over more effective actions, such as reducing air travel. 'Correcting misconceptions about impact could thus direct effective action by increasing the response efficacy of high-impact behaviors' (Sinclair et al. 2025, 2). Recent Dutch research confirms a discrepancy between sustainable thinking and doing, and asserts that an open dialogue regarding norms and values that influence sustainable behaviour will have an impact (Versantvoort et al. 2024, 5,10,11), which is another task that museums could easily adopt. Other research proposes alternative solutions to overcome the green gap: spending time in nature increases the perceived importance of being connected to the natural world and, subsequently, encourages greater pro-environmental behaviour (DeVille et al. 2021, 13). Furthermore, conditional cooperation – that is, believing others are doing the same – strengthens an individual's sense of responsibility (Becchetti et al. 2025, 10). This implies that communicating sustainable practices can reinforce changes in individual ecological habits.

Selling the sizzle with fear or hope

While environmental movements, such as Extinction Rebellion, communicate fear about the future to encourage activism, hope appears to be the preferred emotion for museums in their efforts to engage the public (Nieroba and Geisler 2024, 8). According to Naturalis' visitor study, showing visitors that they can positively impact biodiversity helps maintain their hope and motivates them to make changes (Afdeling Buitengewone Zaken 2024, 25). Hope gives purpose to people's actions by suggesting that a solution can be found for a problem. However, like climate change, biodiversity loss is a complex and interconnected problem, difficult to resolve due to its intricate nature. In exhibitions, by presenting the human impact on biodiversity as a problem, museum visitors could be misled into the hopeful thinking that new technology can provide

a solution, which may result in a lack of motivation to work towards societal change (Nieroba and Geisler 2024, 7; Hulme 2009; Stibbe 2020, 51; Orr 1992, 89). Fred Naggs of the Natural History Museum in London states it even more boldly: 'The NHM's mendacious message of hope —that the show can go on— infantilises the public by assuming that they will only engage with optimistic messaging. It is an insult to public intelligence' (Naggs 2022, 94).

> *'We believe that climate action is no longer a scientist's job; it's now a salesman's job. […] As the ultimate salesman Elmer Wheeler taught in the 1950's the big secret to selling is that you don't sell the sausage – you sell the sizzle. And no, we don't mean the sizzle of climate-induced heat stress; we mean the desirable, tempting and enticing sounds and aroma that convince you to eat what is basically a dead pig.'*
>
> (Futerra Climate Communications 2009, 6)

Another 'problem with problems is that people don't want more of them', according to political strategist Anat Shenker-Osorio (2017, 6). 'Instead of leading off with problems, narratives that first link to shared values have proven much more effective at shifting opinions.' Moreover, she asserts that amelioration of harm, by using words such as *improving*, *fixing*, and *mitigating*, undermines motivation and long-term commitment, and she refers to Martin Luther King who had a dream, not a complaint, to explain that creating an appealing perspective sells better than describing the problem (Shenker-Osorio 2017, 10,11). Sustainable museum expert Henry McGhie shares the importance of offering solutions. 'Museums should focus on providing and exploring viable options and providing encouragement. Museums don't have to have the answers, but should support people with their explorations of challenges and potential solutions' (McGhie 2020b, 4).

Museums, like governments, often struggle to promote climate-friendly behaviour because they fear it will provoke resistance or spoil the fun. However, pro-environmental behaviour is associated with feelings of happiness (Zawadzki et al. 2020). De Lange et al. (2022, 2) argue that positive communication fosters collaborations and relationships that can address the biodiversity crisis. However, due to its long-term and complex nature, challenges like avoidance and fatigue can reduce engagement in pro-environmental actions. Different messaging is needed at each communication stage; feeling capable motivates initial action,

while positive emotions and social validation sustain long-term engagement (ibid., 3). They recommend balanced messaging: emphasising the crisis's urgency alongside positive alternatives, such as community restoration successes instead of highlighting ecosystem collapse (ibid., 4).

Awareness and the failure of facts

Awareness is crucial for prosocial behaviour, as people are unlikely to consider their duty to help others or the biosphere if they are unaware that assistance is needed and do not believe they can do anything to address a specific problem (De Groot and Steg 2009, 443). Nevertheless, awareness is only a precondition for pro-environmental behaviour, not a trigger, as personal norms, ascription of responsibility, and perceived control together contribute to intentions (Steg and De Groot 2010). Considering the issue of biodiversity illiteracy earlier in this chapter, it remains necessary to clarify the concept of biodiversity and its decline. However, facts do not inspire action in people. The reason fewer people smoke is not because they became aware of health risks; it is because the entire system around them changed: cigarettes doubled in price, smoking in public areas is restricted, and most people think it is not cool. Furthermore, a significant number of citizens are already well-informed about environmental degradation; reiterating facts and figures can lead to fatigue, disengagement, or resistance (Versantvoort et al. 2024, 9; De Lange et al. 2022, 2).

Facts are perceived by the rational part of the brain, while decisions are mostly driven by emotions and instincts, with logic justifying pre-made choices (Kahneman 2011). Neuroscientist Kris de Meyer builds on this knowledge to argue that sharing facts, just like other conventional wisdoms, such as telling the truth, balancing fear and hope, and even facilitating emotional responses (see figure 13), do not drive societal action and can cause polarisation instead. To activate people in the environmental crisis, he introduces the 'actions drive beliefs' process, which is based on the idea that people usually act first, without strong opinions at that moment. Later, through self-justification and self-persuasion, they gradually convince themselves that their actions are correct and important, which means that their actions influence how people think (De Meyer 2024). This implies that to motivate museum visitors to help reduce human-caused biodiversity decline, providing them with feasible activities, such as participating in or supporting local and global biodiversity conservation projects, or demonstrating concrete ways to promote mindful consumption, could be an effective approach. Furthermore, with visual and immersive storytelling, museums have the potential to reach visitors' emotions.

Figure 13. De Meyer's Bingo card of failing communication strategies in the environmental crisis (De Meyer 2024).

Messages and messengers

Museums, with their multidimensional nature, employ unique methods to engage visitors. Unlike literature, cinema, or theatre, which follow linear or singular perspectives, 'the museum offers a fully embodied experience of objects and media in three-dimensional space, unfolding in a potentially free-flowing temporal sequence' (Hourston Hanks et al. 2012, XXI). They enable visits with friends or family, promoting immediate discussion – something cinemas or books do not facilitate (see figure 14). As argued earlier in this report, dialogue and conversation are considered essential vehicles for sustainable action, and museums are the ideal place to facilitate this. Interactives, sensory stimuli, circular seating and playful or provocative questions within exhibitions can stimulate conversations. Trust in scientists, curators, peers, and the visiting company underpins museum learning, identity building and social or environmental action.

The 'messenger effect', the phenomenon that the person delivering a message is just as important as the message itself, is a tool that museums can use to make their message more effective. The Rijksmuseum in Amsterdam, for example, employed this technique with SnapGuide, an app featuring several influencers to guide visitors, including Auke-Florian Hiemstra, Naturalis' iconic biologist at Naturalis, who offers a 'green tour' through the art museum. The messenger can also be someone from the future. Intergenerational framing has proved to be an effective way to activate people. Writing a letter to one's (grand)child heightens people's awareness of existing concerns about how climate change might affect

them, and increases the willingness to donate to climate change mitigation (Shrum 2021, 18). This method also proved to be effective in an international study (N=59,440), that tested eleven interventions for climate change mitigation (Vlasceanu et al. 2024). Letters that motivate most action are written to one's own kin, a young child in the not-too-distant future, while imagining a different world that the author can still contribute to (Coren 2025). This outcome aligns with a study that found that 'reflecting on social relevance (relating climate change to people you know) was the most effective strategy to motivate people' to take sustainable action (Sinclair et al. 2025, 9).

Figure 14. The museum offers a non-linear experience and the opportunity for immediate discussion with peers. Photo in Naturalis' *Evolution* gallery.

How do other museums engage their visitors with the human impact on biodiversity?

An analysis of eleven exhibitions in eight museums was conducted to determine how museums currently engage their visitors in the topic of human impact on biodiversity, with a brief summary provided in this section (in alphabetical order). Appendix 4 gives a detailed analysis of all exhibitions. The method for analysis, as described in the Methodology chapter, prioritised information over experience, involved visits without peer conversations, and focused on collection items, which could influence the results. Furthermore, it appeared undesirable to quantify the results, as qualitative results often lack clear-cut answers. For example, Natuurmuseum Brabant is the only museum that explicitly explains the concept of biodiversity in a dedicated section of an exhibition, but most other museums implicitly explain the concept. Musée des Confluences emphasises the culture-nature divide as a driving force behind the environmental crisis; however, other museums, such as Allard Pierson, also explain this, although not as their primary focus. The Discussion chapter will interpret the subtle differences and distinct qualities of the analysed museums, in relation to literature and Naturalis' practices.

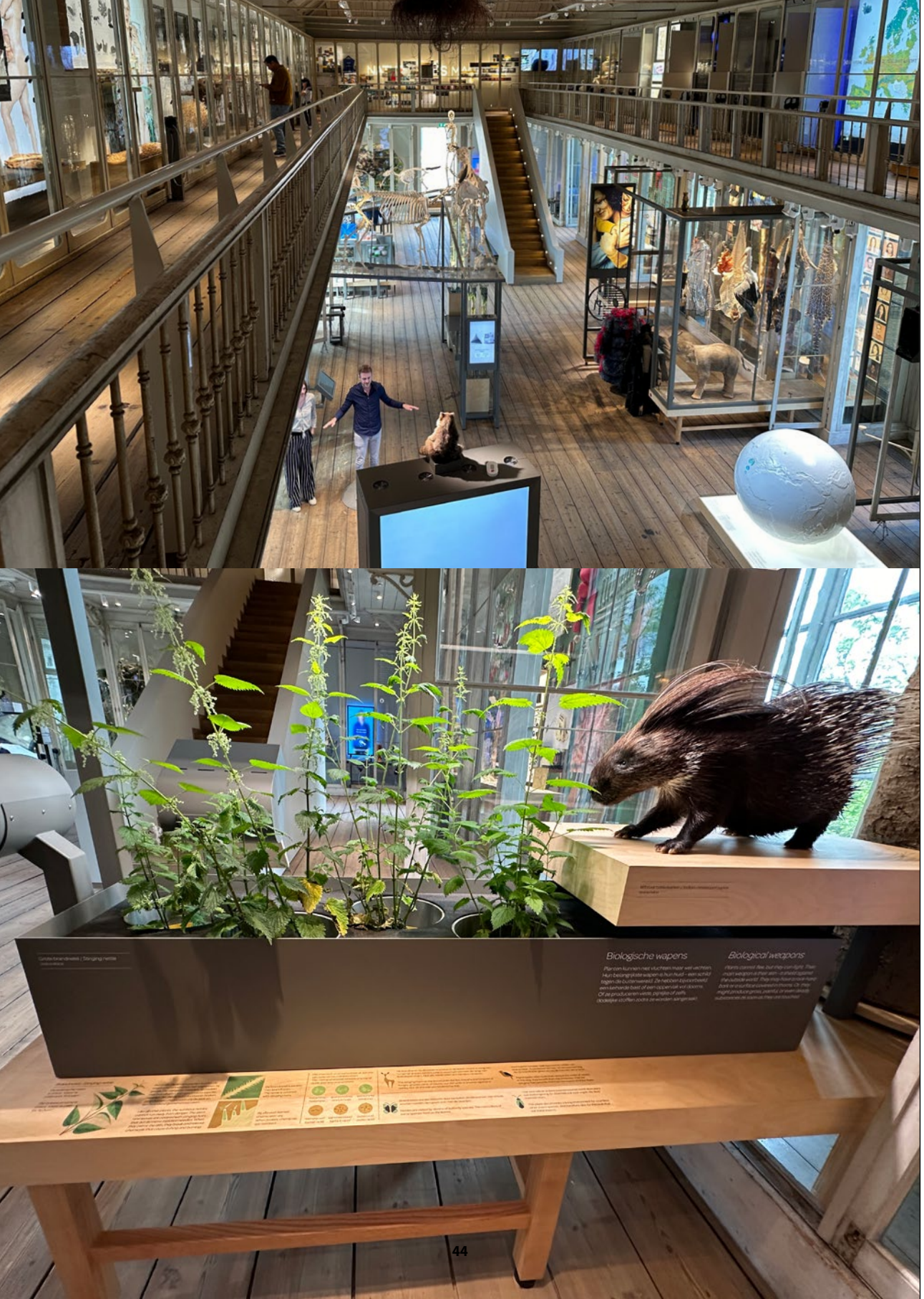
'Human beings interact with other living beings to meet their own needs. Today, the disturbing consequences of our impact on biodiversity mean that we are faced with societal choices that will determine our future in the living world.'

(Section panel in Musée des Confluences, Lyon)

Allard Pierson in Amsterdam

With *The Call of the O'o. Nature Under Pressure* (see figures 15-18), Allard Pierson explores the intersection of science and art to examine the human relationship with nature. The exhibition opens with a historic sound fragment of the call of the o'o and the text: 'The Hawaiian Kauai O'o has died out. The call of the male of this species was last heard in 1987. He sang in vain.' The exhibition takes visitors on a journey through how European people have viewed nature, showcasing ancient perspectives, collection and classification efforts, and modern art, as well as extinct animals caused by human action. It is the only exhibition that highlights how humans were once displayed in menageries as 'Wonders of Nature', and contemplates the complexity of sustainability versus inclusivity: 'Are we allowed to give names, isn't that a form of appropriation? Or should we give names because otherwise we don't know which animals and plants are in danger of extinction?' The concluding room, under the section title 'Hope', features contributions from individuals involved in sustainable practices, but without a collection to support this, the space feels uninviting. An interactive wall inviting visitors to share their feelings of despair and hope on stickers was well utilised.

Figures 15-18. Photos of *The Call of the O'o* in Allard Pierson.



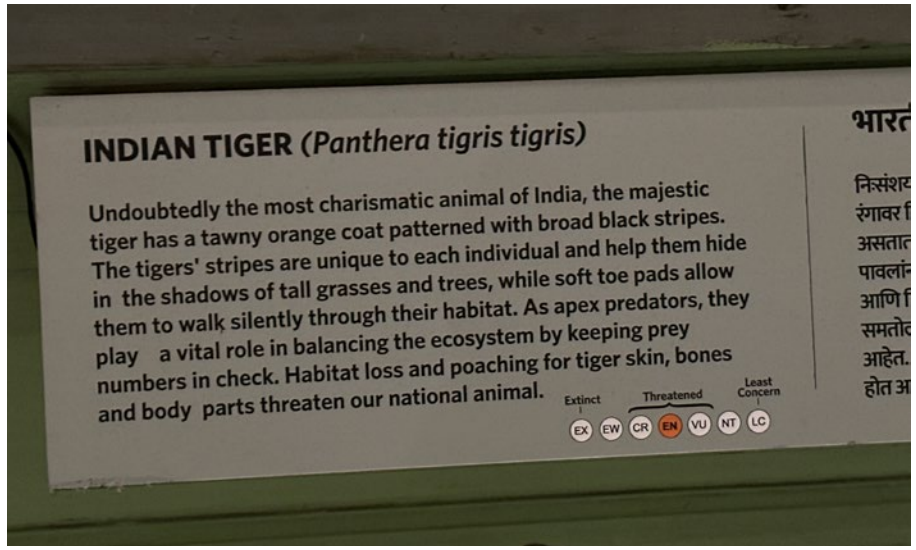
Artis-Groote Museum, Amsterdam

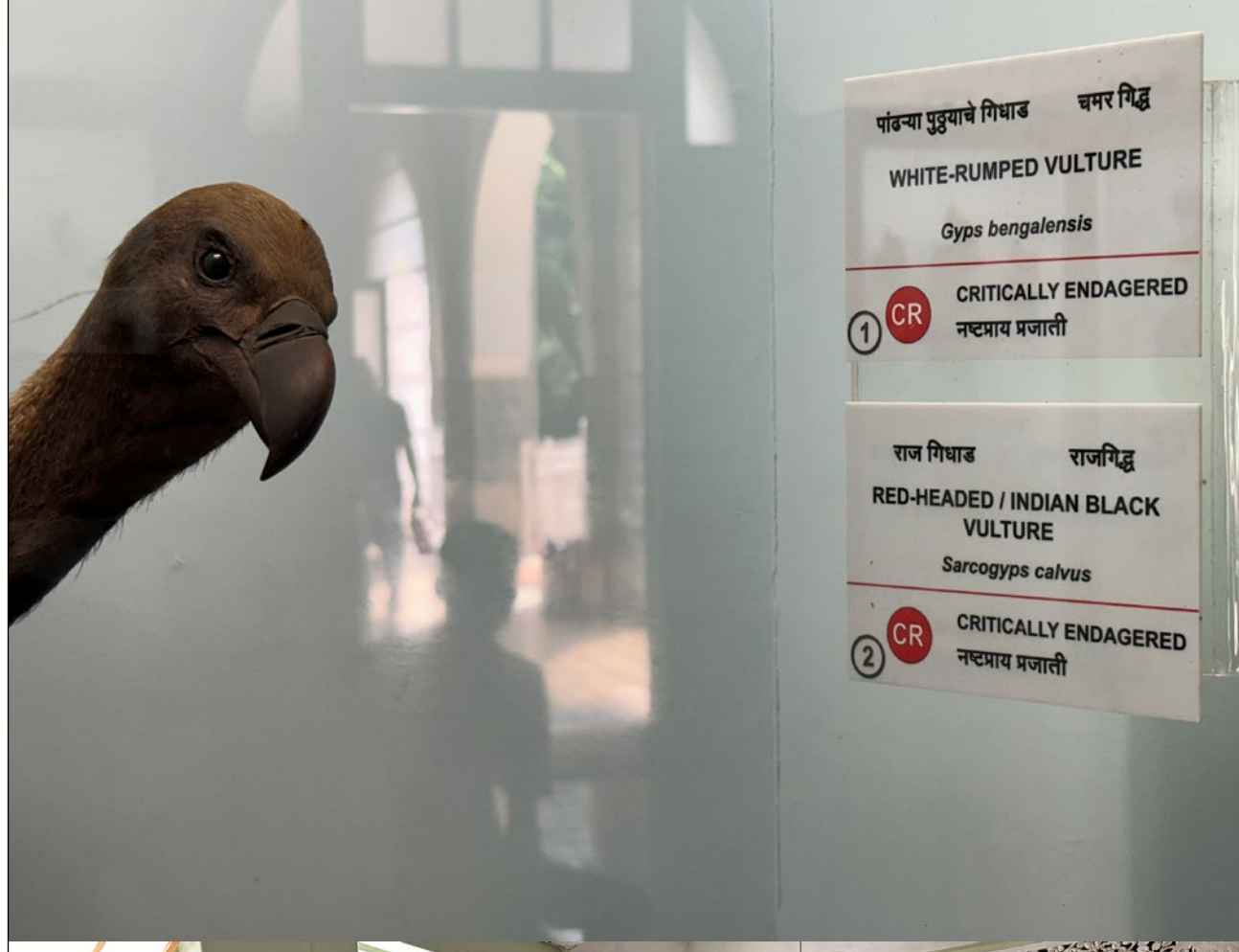
Artis-Groote Museum (see figures 19-21) aims to strengthen the visitor's relationship with nature and poses provocative questions, such as whether it is ethical to use birth control pills when their residue in groundwater disrupts ecosystems. Visitors will learn that everyday choices can have significant consequences for the world around us, and while this may not immediately change visitors' behaviour, it raises awareness that could lead to different decisions in the future. It hardly features a natural history collection, yet, because of the stylish presentation in the monumental building and the many interactives that engage all the senses, tangible qualities are still present.

Figures 19-21. Several photos of the Artis-Groote Museum.

Chhatrapati Shivaji Maharaj Vastu Sangrahalaya (CSMVS) in Mumbai
CSMVS (see figures 22-24) stands out as it consequently displays the IUCN statuses of all featured specimens as the only colourful aspect on the labels. In the bird gallery, 11% of the featured animals have a threatened status, and in the mammal gallery, 65%, which poses an urgent message, and the museum explains well how habitat loss and other human impacts are causing this. It does not offer interactives or solutions, except in the *Indigenous Biodiversity Garden*, which explains how to make butterfly gardens on your balcony to help biodiversity.

Figures 22-24. Several photos of the CSMVS.





Mission Museum Steyl

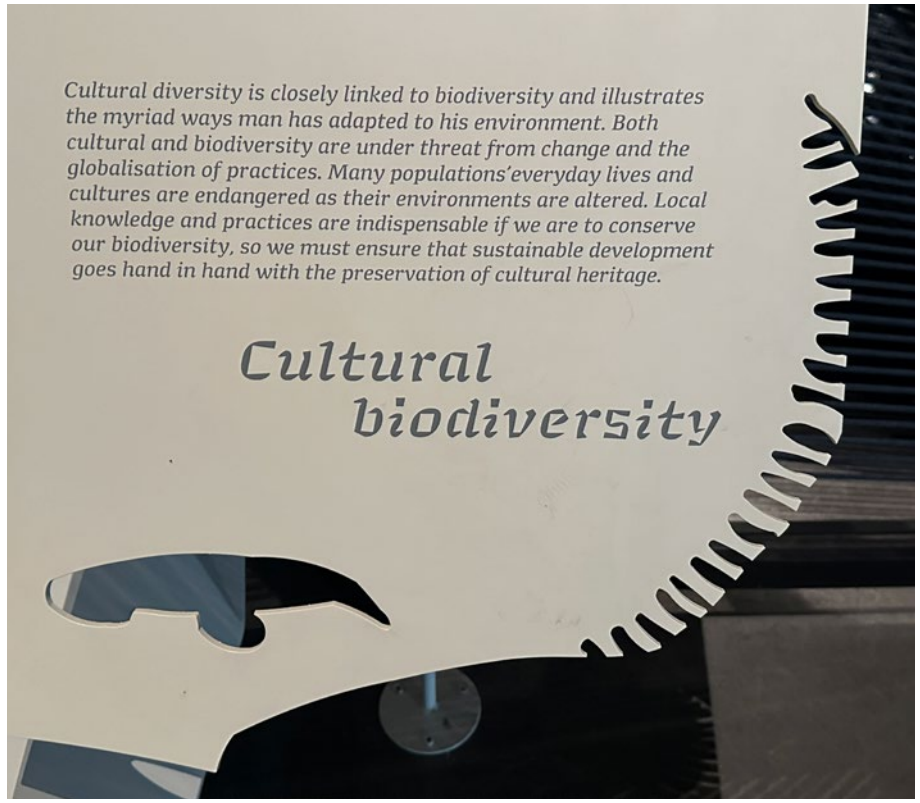
An extraordinary time capsule, the Mission Museum (see figures 25-27) features a permanent exhibition with no labels and no awareness of human impact on biodiversity at all. The temporary exhibition *Birds of God*, describes one century-old example of positive human impact on biodiversity: activism and resistance to buying contested things can result in the mitigation of ecological disruptions. The temporary exhibition is informative but not designed to engage a broad audience, including children.

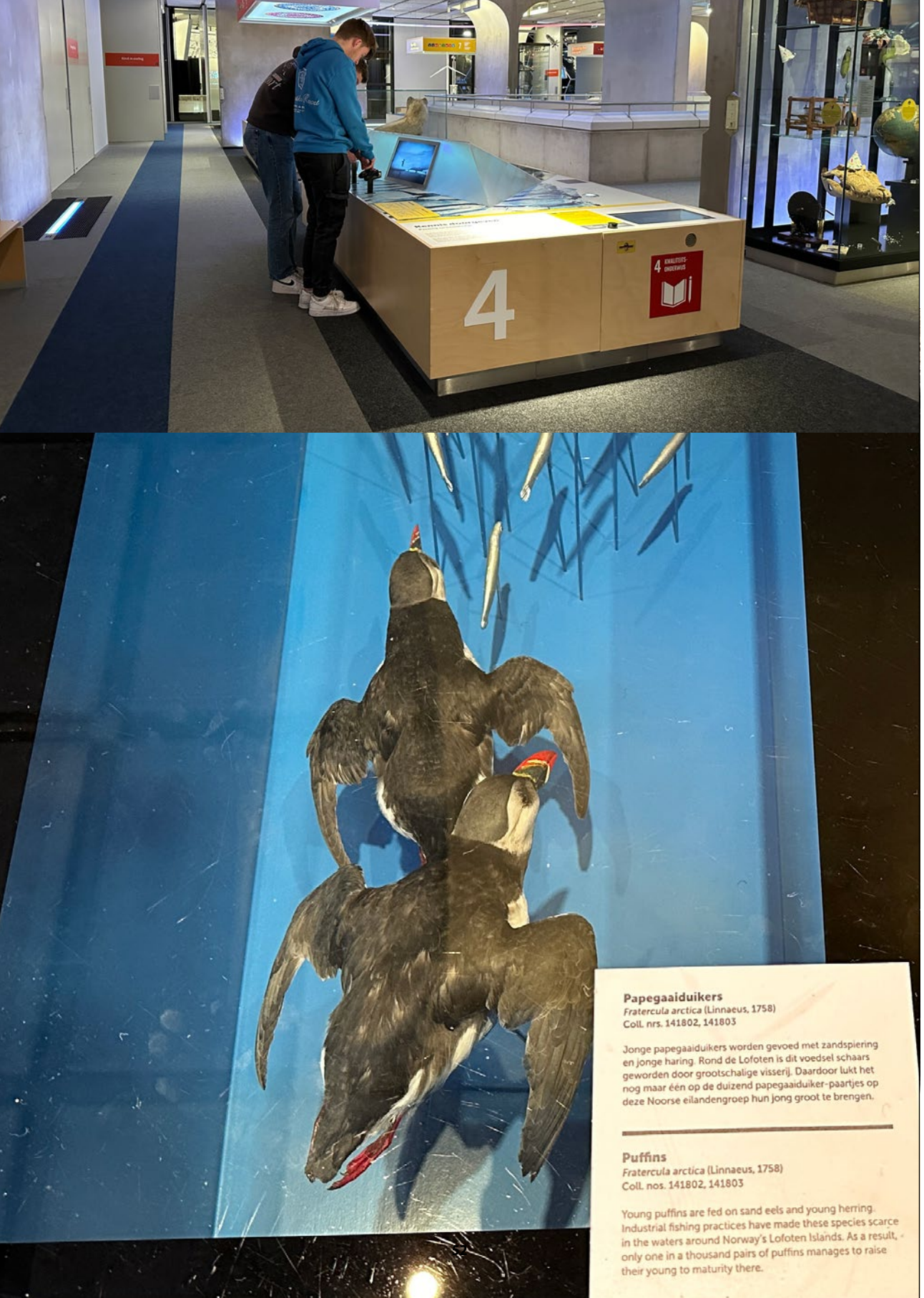
Figures 25-27. Several photos of the Mission Museum.

Musée des Confluences in Lyon

With its exhibition *Species – the web of life* (see figures 28-30), Musée des Confluences combines a natural history, a (modern) ethnography, an archaeology and a scientific collection, to celebrate different ontologies in a theatrical setting. The intro panel introduces 'the way human beings see the world, form part of it and contribute to its transformation.' The exhibition highlights that both cultural heritage and biodiversity are endangered, and offers a clear solution to address human overexploitation of natural resources by safeguarding cultural heritage through local knowledge and practices. 'If we stop thinking of humans as being separate from nature, it then becomes possible to suggest models of conduct where biodiversity and cultural diversity are respected and interlinked' (outro panel text).

Figures 28-30. Several photos of *Species – the web of life* in Musée des Confluences.





Museon-Omniversum in The Hague

Inspiring visitors of all ages to contribute to a sustainable future is Museon-Omniversum's mission. *One Planet Expo* (see figures 31-33) is a permanent exhibition that offers a highly interactive and playful journey through the United Nations' seventeen Sustainable Development Goals (SDGs). It combines natural, cultural, and ethnographic collections with videos and games, sharing perspectives from around the globe. Many goals focus on social sustainability, yet most exhibits also raise awareness of human interaction with the environment. Using a punch card with provocative questions, visitors learn how their choices impact the world.

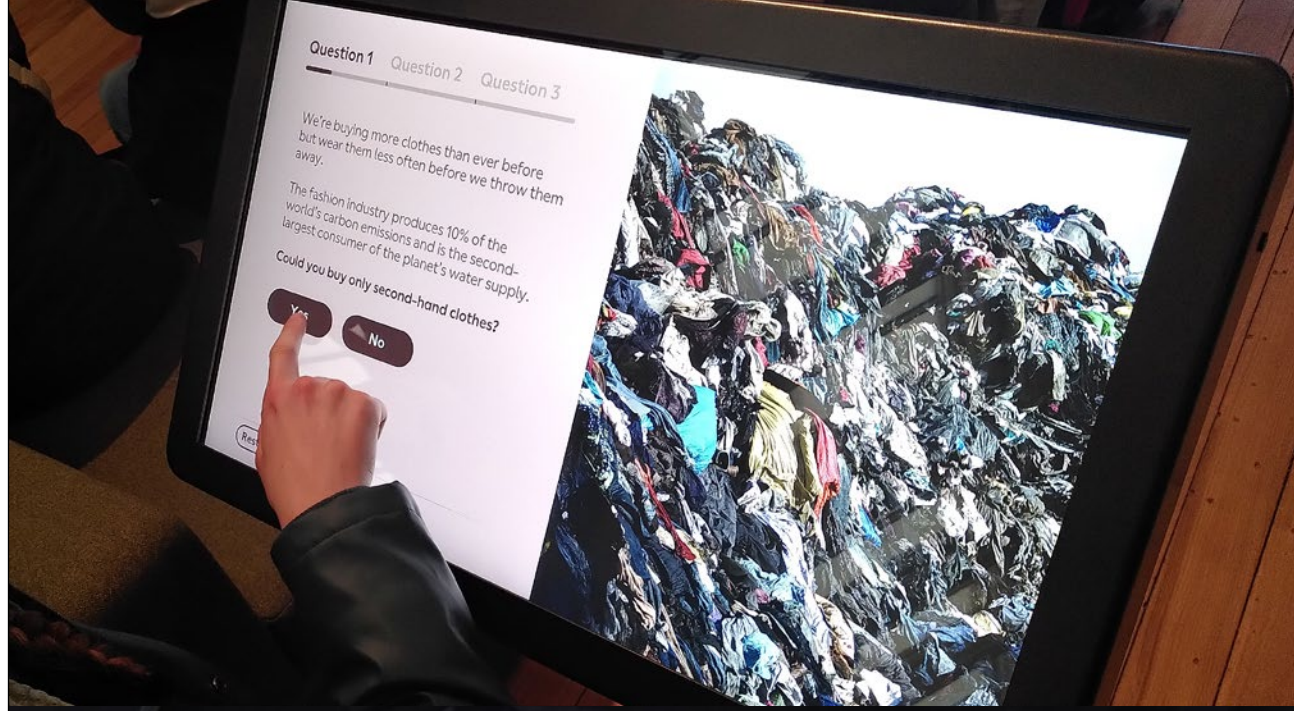
Figures 31-33. Several photos of *One Planet Expo* in Museon-Omniversum.

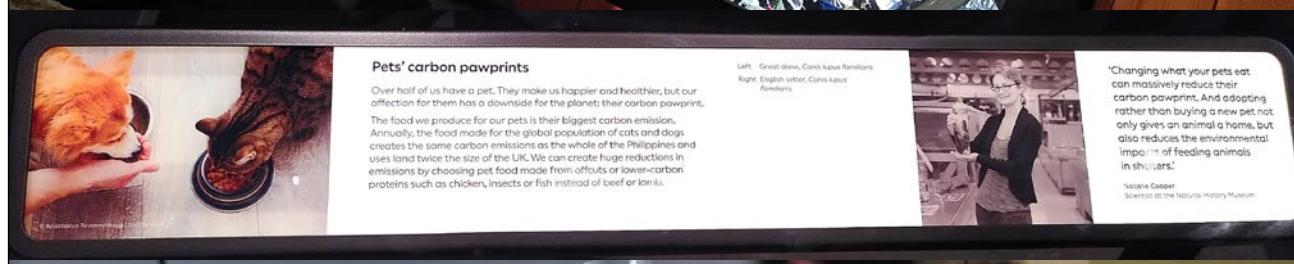
Natural History Museum (NHM), London[2]

The NHM has declared a planetary emergency and is changing its museum to inspire a global response. Many of its labels throughout the museum already pay attention to the human impact on biodiversity. The dedicated exhibition *Fixing our Broken Planet* (see figures 34-37) aims to provide visitors with information, hope and tools to create advocates for the planet. The exhibition explicitly engages its visitors with the biodiversity crisis through a natural history collection by linking scientists to the collection objects. Loaded with data, it gives a disturbing image of our planet's emergency. However, it also presents numerous suggestions for action, along with inspiring examples, making it one of the few exhibitions that dares to provide a concrete action perspective. The lack of interactive appeal is compensated for by the mixed reality experience Visions of Nature elsewhere in the museum.

Figures 34-37. Several photos of *Fixing our Broken Planet* in the NHM London (photos: Edwin van der Veldt).

2. As explained in the Methodology, this exhibition was not analysed live by the author, but through the analysis of the complete exhibition texts and many photographs as available online (Natural History Museum London, n.d.).

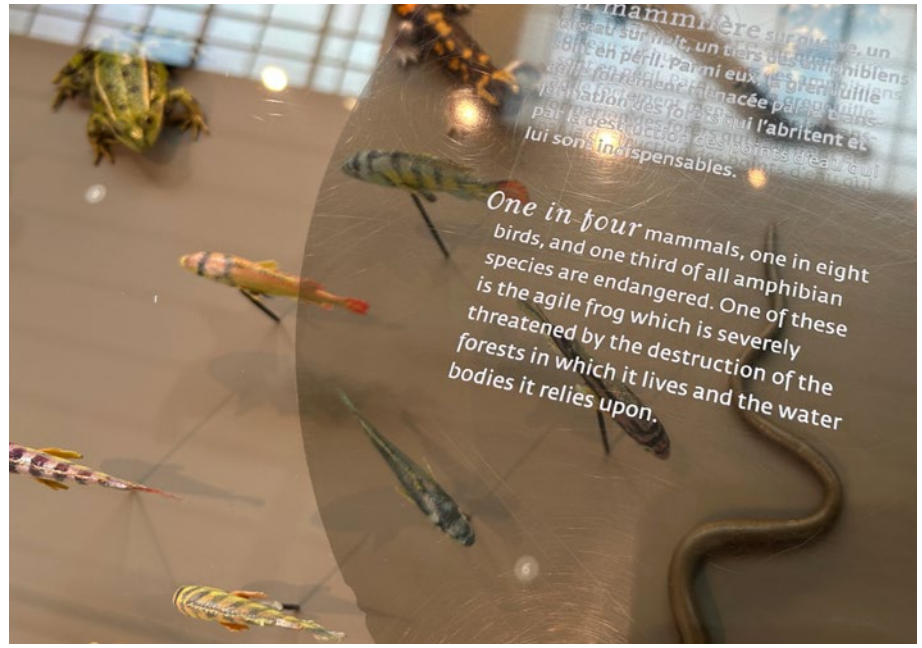




Natural Sciences in Brussels

Two analysed exhibitions in Natural Sciences (see figures 38-40), both very large, discuss the human impact on biodiversity, and both also feature some less iconic species such as bacteria. Neither is hopeful nor provides solutions. The *Gallery of Evolution* features several interesting stories about how human behaviour has changed the evolution of some species, from cod adapting to fish nets and lice becoming resistant to repellents. However, without the lure of digital interactives, it fails to attract young visitors. The exhibition *Living Planet* discusses nature's recovery after disasters, which is hopeful but unintentionally implies that the harm done is not as severe. Moreover, several times, it names the causative agents of biodiversity loss, but all of them happen to be in the Global South (e.g. Malagasy are ravaging the lemurs' habitat with their agricultural practices, and Indonesians are destroying the orangutans' habitat for profitable palm plantations), which gives a misleading impression of the cause of the planetary crisis.

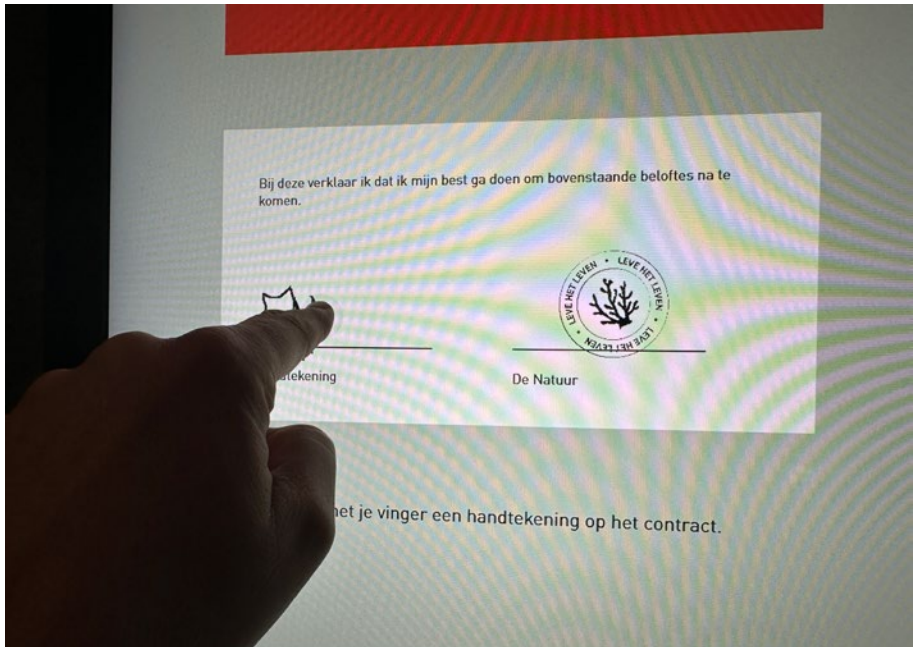
Figure 38-40. Several photos of Natural Sciences in Brussels.



Natuurmuseum Brabant in Tilburg

The exhibition *Long Live Life* in Natuurmuseum Brabant in Tilburg (see figures 41-43) explains the concept of biodiversity to families with children. It thoroughly covers all the essentials: explaining the importance of biodiversity and ecosystems, honestly presenting the state of nature and the human impact on it, highlighting successful biodiversity protection efforts, and providing several tangible activities to encourage a biodiversity-positive society. It uses its natural history collection to illustrate stories and also as a direct source for these stories. The end of the exhibition offers an opportunity to sign a contract with nature, which, through a digital questionnaire, allows visitors to understand that sustainable behaviour is accessible to everyone. By relating this behaviour to an individual species, it becomes clear who is the beneficiary of one's actions.

Figures 41-43. Several photos of *Long Live Life* in Natuurmuseum Brabant.



Naturalis' institutional context

How does Naturalis engage its museum visitors with the human impact on biodiversity in its current nine exhibitions?

A comprehensive exhibition analysis by the author (see Appendix 3) reveals that Naturalis' nine permanent exhibitions primarily celebrate nature's beauty while neglecting its degradation, with only a few exceptions, which will be explained in this section. It was a deliberate choice to focus on the *information* (revealed in the objects, text panels and labels) rather than the *experience* (of light, atmosphere, soundscapes, etc.), which may have influenced the results, as museum learning extends beyond the objects and their labels.

Naturalis current exhibitions: general observations

The museum does not explicitly explain what biodiversity is or why it matters. It barely illustrates the relationship between biodiversity and climate change or pollution. The IUCN Red List status of species is not mentioned anywhere. There are only two modest mentions of human contributions to extinctions and one preservation action to protect other species (bee counting). Although the study does not focus on it, the researcher also observed that the provenance of the specimens is not specified anywhere in the exhibitions, except for one information label at the entrance of the *Early Humans* gallery, because the collection presented there has been subject to a restitution claim by Indonesia. The museum galleries are accessible by stairs or elevator. When taking the elevator, visitors will most likely choose topics that interest them most. Visitors taking the stairs will pass by the galleries in the following order: *Life, Earth, Dinosaurs, Ice Age, Early Humans, Evolution, Seduction, Death,* and finally, *LiveScience*. The following description presents the galleries in order of the most references to the human impact on biodiversity, which is not representative of visitor numbers.

Gallery *Death*: several references to the imbalanced human-nature relationship

Death, the last gallery visitors will visit as they take the stairs, features a dark, theatrical gallery that showcases twelve references to the human impact on other life. Directly after entering the exhibition, a printed tyre mark on the floor leads to a fallow deer, suggesting a traffic accident. The deer is not behind glass; the visitor can come very close and even touch it, which creates a very intimate setting, as if you caused the accident yourself. The label does not mention anything; however, the image speaks for itself and sets the tone (see figure 44). A little bit further, the exhibition explains how the billions of insects killed in car

Figure 44. Fallow deer with tyre mark in the gallery Death in Naturalis

Figure 45. Insects killed in car accidents highlight the human impact on other species.
highlight the human impact on other species.

accidents each year may help researchers monitor their declining numbers, and it highlights the importance of insects to the survival of other species (see figure 45). The most remarkable exhibit is that of the dodo, the universal symbol of extinction due to human intervention. The label states: 'This bird died out when humans interfered with its environment. Which animal is next on the list?', which seems inappropriately modest in a time when many species go extinct every day due to human causes.

***LiveScience*: scientists working on the future of the planet**

LiveScience is not an immersive exhibition gallery but an interactive space accessible to the public even without a museum ticket, where visitors can meet scientists in their natural habitat. It offers several exhibits that are updated more frequently than those in other galleries and includes mentions of the human impact on biodiversity, such as the genetic adaptation of Herman the bull and a magpie's nest made of metal bird-deterrent spikes (see figure 46). In a video, marine biologist Katja Peijnenburg, who researches whether planktonic snails can adapt to the challenges of climate change, wears a dress patterned with climate stripes, literally embodying the message of climate change. The egg of

Figure 46. Magpie's nest made with bird-deterrent spikes in Naturalis' *LiveScience*

the Elephant bird of Madagascar is one of the two specimens in the museum whose label provides a description that explains the underlying causes of anthropogenic threats to species: 'the bird died out due to hunting and habitat loss from deforestation.' LiveScience features one clear call for action, in the bees' exhibit: 'Historical collections provide knowledge for the future. This is demonstrated by the Dutch bees at Naturalis. The bees in the collection can be used to identify which species are currently under threat. The distribution of 330 wild bee species today was compared with the situation in our country in 1950. Individual citizens are increasingly helping to provide up-to-date information about species, for example, by counting bees in their garden as part of citizen science projects. Scientists use the data to understand what climate change means for bees, and much, much more. Are you interested in becoming involved in important Naturalis research work? Please ask about the possibilities.'

Mineral cabinet: unexpected activation of visitors

Only one other label in the entire museum provides a call for action. The mineral cabinet in the gallery *Earth* mentions several applications for the displayed minerals, such as how aluminium is extracted from bauxite and the qualities and dangers of asbestos. The tantalite label suggests a potential activity to help preserve biodiversity: 'Tantalum is ideal for the production of wires for smartphones and tablets. It is very flexible and has an extremely high melting point. This is a specimen of the most common mineral bearing tantalum: tantalite. This mineral is found in the habitat of the gorillas that live in the Congo, Africa. Tantalite mining represents an even greater threat to the continued existence of these animals. That is why nature conservation organisations want us to recycle already used tantalum as much as possible' (see figure 47).

Figure 47. Tantalite in Naturalis' mineral cabinet. Its label stimulates recycling electronic devices to protect gorillas.

Other galleries: merely celebrating animal life

All other galleries overlook the human impact on biodiversity. The entrance exhibition, *Life*, is among the most popular galleries. It celebrates the diversity of life in a theatrical setting. According to the gallery introduction on Naturalis' website, the idea is that: 'part of our mission as the national institute for biodiversity is introducing you to the diversity of life. Trees, birds, insects, and whales all have their unique place in nature's grand design – as do we humans' (Naturalis Biodiversity Center, n.d.). Remarkably, it showcases only animals, the majority of which are vertebrates, excluding humans, consequently underlining the human-nature divide. The life portrayed in this gallery does not include Plantae, Fungi, and the kingdoms of smaller species; a more suitable title for this gallery could have been *Animalia*. The labels only display the species and specimen numbers; the gallery does not provide any additional information, despite showcasing species that are threatened, which would easily raise awareness of nature's vulnerability. The exhibition *Evolution* emphasises connections, enhancing the understanding of humans within the tree of life. However, it fails to specify that humans have a disproportionate impact on other life forms. *Ice Age* presents several animals that are now extinct due to human activity, yet it makes no mention of their extinction, nor does it acknowledge the human role in it. Furthermore, the label for the Eemian mentions a warm climate but does not clarify how this differs from the current rising temperatures induced by human activities. Nevertheless, even though the labels do not address the human impact on biodiversity, some interactive displays show an animation of life in the Netherlands during the Ice Age, featuring now-extinct animals moving through the landscape, which abruptly transitions to contemporary landscapes filled with highways and airports (see figure 48-49). This creates an experiential narrative of human impact on the landscape. The other exhibitions, such as *Seduction, Earth*, and *Dinosaur Era*, may not be the most obvious galleries to tackle the human impact on biodiversity. However, a further study could even reveal opportunities here.

Figures 48-49. Interactives on Naturalis' *Ice Age* gallery, animating now-extinct animals moving through the landscape, which abruptly transitions to contemporary landscapes filled with highways and airports.

What role can the collection play in Naturalis' narrative of human impact on biodiversity?

The analysis of the galleries, as summarised above, highlights a scarcity of narratives in Naturalis regarding the human impact on biodiversity, although the collection presents opportunities. The interviews (Appendix 2, question 5) indicate that the staff all recognise this potential but perceive different methods to realise it.

Collections' narrative and scientific value

Exhibition content developer Marijke Besselink (2025a) suggests that the collection is primarily utilised in exhibitions as an illustration of a story, yet stories of depletion are easier to convey through design or metaphors. She adds that 'many objects have been collected because of their scientific value and cannot be displayed due to exposure to light and other conditions'. Education content developer Daniël Van Draanen (2025) believes one can also start from the collection to identify stories about the human impact on biodiversity: 'the size and colour of bird species change due to their habitat in urban areas under the influence of selection pressure'. Furthermore, he identifies another narrative that begins with the collection but is currently not employed by Naturalis in exhibitions: the indication of the species' IUCN status. Guest curator Tolin Alexander (2025) asserts that you should not kill animals to tell a story. However, he considers the animals that are already part of the collection to be treasures that should be used to tell stories. Plant taxonomy researcher Mota de Oliveira (2025) contends that 'collections not only contribute to the results that science delivers, but also to discussions about how science is conducted'. Head of Presentations Bakker-van Bezu (2025), perceives natural history collections as 'a preserved memory that society has lost', and believes the specimens can illustrate the phenomenon of shifting baselines.

What are Naturalis' ambitions regarding public engagement with the biodiversity crisis?

The Strategic Plan 2025-2028 and the interviews reveal a widely supported intention to increase Naturalis' public engagement with the biodiversity crisis, and a recent visitor study has shown that the public expects this. Naturalis has initiated the development of a dedicated exhibition, set to open in 2026 or 2027. However, present short-term opportunities are not (yet) exploited. Remarkable is that the Strategic Plan identifies the need to activate its visitors, while the staff mostly prefer to limit themselves to informing and inspiring.

Strategic goals: enhancing awareness and activating visitors

The Strategic Plan 2025-2028 articulates Naturalis' goal to enhance its public engagement regarding the biodiversity crisis and to become a change agent for this topic (Naturalis Biodiversity Center 2024, 16). Naturalis acknowledges that raising public awareness of the importance of biodiversity is progressing too slowly and aims to 'inspire people to work towards a biodiversity-positive society' (ibid., 14). The publication of the first Dutch Biodiversity Status Report (Naturalis Biodiversity Center 2025a) is an important asset for increasing awareness among policymakers and the press. However, this document does not target the broad audience that visits the museum, which is why Naturalis plans to meet an increasing public expectation to find information about the planetary crises and intends to activate its museum visitors by 'referring to the biodiversity crisis and suggesting how to reverse the negative curve' and 'raise awareness about biodiversity and the biodiversity crisis by informing people about the importance of nature and biodiversity and what the biodiversity crisis means and entails'. It will show that 'our actions as a society and possible solutions (action perspective at the societal level) are effective' (Naturalis Biodiversity Center 2024, 16). This indicates that Naturalis intends to do more than just inform the public. Bakker-van Bezu (2025) affirms that Naturalis has begun the shift from inspiring admiration and wonder for nature to promoting the message of caring for it and bases this willingness on recent staff changes combined with societal transition, but acknowledges that exhibition practice is slow and that changes will not be immediately visible in Naturalis' exhibitions.

First steps in institutional transformation

Naturalis has taken actions to boost public engagement with the biodiversity crisis, including hosting master's students researching this topic. It also conducted a study about the visitors' openness to stories about the planetary crisis in exhibitions in collaboration with a social design office, which revealed that visitors are interested in the biodiversity crisis and expect to find more information on this topic in the museum, that they prefer to learn about the biodiversity crisis in an experiential way rather than by reading a story first, and that focusing on the visitors' immediate living environment, such as their own backyards or pets, greatly stimulates their connection to the topic (Afdeling Buitengewone Zaken 2024). The interviewed staff (Appendix 2, questions 3 and 17) appreciated this visitor study because, in general, detailed surveys on how visitors experience the content of exhibitions are often absent from museum practice. Project manager Patricia Mensinga (2025) explains that surveys typically reveal only how visitors rate the museum's facilities, such as the toilets, wheelchair accessibility, or the coffee corner's cookies. Van Draanen (2025) believes the study provided in-depth information on the level of children's engagement with biodiversity issues. Bakker-van Bezu (2025) discovered that several assumptions which used to inform her decisions were unfounded: the public was surprisingly open to learning about the biodiversity crisis, and even when sustainability-related exhibitions are designed flamboyantly, they can still be convincing to the public. Supported by the outcomes of this study, Naturalis has initiated the development of a dedicated exhibition about the importance of biodiversity, set to open in 2026 or 2027. That exhibition will, once again, not focus on the planetary crises but will aim to inspire people to commit themselves to a biodiversity-positive society by highlighting the indispensability of biodiversity for humanity's continued existence and showing the interconnectedness between species that provide humans with ecosystem services (Van Breemen 2025, 1,2). Furthermore, Naturalis aims to complement its 'look behind the scenes' in *LiveScience* with a link to society, demonstrating how Naturalis contributes to a world where nature and humanity coexist in harmony. Lastly, Naturalis plans to implement some small interventions in its current museum to boost visitor awareness of the biodiversity crisis, although these have not yet been visible at the time of this research.

Informing, activating or evoking systemic change

The interpretation of the concept of engagement in terms of informing or activating is not unequivocal, although all interviewees (see Appendix 2, questions 4 and 12) agree that a natural history museum should enhance visitors' understanding of biodiversity and explain that people are responsible for accelerating its degradation. Alexander (2025) refers to the immense scale of consumerism in urban societies, which contrasts with and impacts the inhabitants of forests. He suggests that museums can heighten visitors' awareness of this issue and encourage them to think differently. Besselink (2025a) sees most potential in touching museum visitors' hearts, inspiring them to see the intrinsic value of nature. Mensinga (2025) argues that museums should not take on an activist role but focus on informing. Both Mensinga and Bakker-van Bezu (2025) observe that museums' quests to activate people directly can easily result in commonplace examples. Mota de Oliveira (2025) sees exhibitions as a bridge between researchers and the public and feels that 'it is not the museum's responsibility to activate individuals, as the ultimate decision lies with each person'. Van Draanen (2025) shares this view and explains that the boundary between informing and activating is that 'a museum can show what happens when spraying poison on a lawn, but it should refrain from stating an opinion, such as 'it is bad''. He considers the information more useful when the museum explains which animals die due to lawn treatment, so 'visitors can learn and draw their own conclusions on how to act'. Both Besselink and Mensinga (2025) mostly see opportunities for education programmes to activate people, although Besselink believes that 'if you learn about bees and flowers and why bees are so important, you would also be willing to buy bee hotels' (Besselink 2025a). Bakker-van Bezu (2025) notes that one can never measure whether people genuinely change their behaviour after visiting an exhibition, and what exactly caused their altered attitude. Most interviewees are hesitant about evoking systemic change through exhibitions. Mota de Oliveria (2025) believes that 'people's power resides in their votes and their choice of government'. Bakker-van Bezu (2025) considers a more abstract level of systemic change, referring to the book You Matter More Than You Think (O'Brian 2021), which uses quantum physics to describe social change. By viewing an exhibition as an opportunity for entanglement, it can cause movement in a network and create a significant ripple effect.

Figures 50-51. Impressions for the Suriname exhibition (by Studio Harm Rensink, for the Final Design, April 2025).

The Suriname exhibition

How will the Suriname exhibition address the human impact on biodiversity?

The Forest of Suriname is a forthcoming temporary exhibition about ensouled nature. It marks Naturalis' first exhibition in which its new strategic ambition to engage the public with the biodiversity crisis could take shape. Although the Strategic Plan 2025-2028 was developed during the creation of the exhibition brief, Naturalis' ambition was not included in the assignment for the Suriname exhibition (Van Breemen 2024). However, this research reveals that the Suriname exhibition will nonetheless raise awareness of the human impact on biodiversity. At the time of this writing, the exhibition is still in development. The results of this section are based on a combination of the author's notes and internal, unpublished draft documents.

The exhibition's immersive character

The Suriname exhibition, set to open in October 2025, engages visitors, including families with children, with the stories of the forest's inhabitants: the Maroons and Indigenous peoples of Suriname, as well as the plants, animals, and spirits of the forest. The exhibition's key theme is that people understand and value nature in different ways, and that to protect it, it is crucial to acknowledge and bridge these different perspectives. Visitors will be immersed in the Amazon rainforest, with its captivating sounds of frogs and cicadas, alongside the occasional call of the distinctive screaming piha, locally known as busiskowtu (bush police). The exhibition centres around a three-dimensional, abstracted replica of a kankantri trunk (Ceiba pentandra), showcasing its characteristic plank roots, and is surrounded by various walls and objects adorned with photographs of the rainforest for visitors to wander through and explore. Projections of animals, lines of local poetry, and forest spirits appear and recede. Not every visitor will see the same, just as in a real forest. The invisible becomes visible and then vanishes once more. The spiritual narratives of Maroons and Indigenous peoples can be interpreted as a call for nature conservation and the transmission of traditional ecological knowledge. Surinamese individuals from other cultural backgrounds, such as Javanese, Chinese, or City Creole, do not live in the forest but in the city. They will recognise their cultures within a reflective space as part of the exhibition.

The exhibition invites visitors with a short video and text that addresses accountability, including the background of the collections, colonial aspects, and the use of language. A collection specimen of a king vulture greets visitors,

speaking in the first person and setting the stage from a spiritual perspective. A map of Suriname illustrates that the country comprises 93% forest. The accompanying text indicates that the forest and its inhabitants –plants, animals, and the people who reside there– are under severe threat, although it does not specify the cause. The exhibition features several *exhibits*, thematic clusters, each containing collection objects, texts, sounds, and interactive elements. All exhibits prioritise the exhibition's central theme of ensouled nature, with some focusing on colonial aspects, others on ecology, and some on the preservation of nature. Although the visual representation in the exhibition celebrates the beauty and rich cultural and biological diversity in the Surinamese forest, several texts will highlight the pressures on the forest and the need to protect it.

The human-nature relationship and the human impact on nature

The following description, based on internal draft documents for the exhibition texts (Besselink 2025b and 2025c) and the author's notes about the exhibits, focuses on aspects that highlight the human impact on biodiversity. The exhibition questions how humans relate to nature by illustrating perspectives of the forest's inhabitants. At the central kankantri exhibit, a quote by a forest inhabitant will mention that the tree is sacred and thus will not be cut, while a similar message will be shared about a snake that cannot be killed, as legends —serving as traditional laws— teach people to revere it. Several exhibit texts will clarify that in nature, everything is interconnected and interdependent, including humans. A description of an herb will explain that people rely on plants for their existence (i.e., food and oxygen), and even if one does not know the function of a plant, it still holds value. Another description will highlight the medicinal benefits of plants. The exhibit of the leaf-cutter ant will show that even insects cultivate their food, which helps relate visitors to less iconic animals. One label will mention the exhibition of humans in the International Colonial and Export Exhibition of 1883. The soil exhibit will reflect on the ownership of nature. People cannot possess soil, as it is the very foundation of nature and human existence.

Four of the more than thirty thematic clusters will describe the human impact on biodiversity. One features a jaguar with a label explaining that it was once plentiful but is now rarely seen and may soon disappear altogether. This decline is due to poaching for its skin, teeth, and bones, as some cultures believe the bones possess medicinal powers. Another exhibit about gold (see figure 52) will describe how the quest for gold has caused significant consequences for Indigenous peoples and the environment since the legendary tale of El Dorado

has attracted explorers to South America for centuries. It will raise the question of whether the suffering caused by this pursuit is justified by its value compared to that of the forest. A quote will state that 'gold mining is eating today, forgetting tomorrow'. Additionally, the exhibit will cover bauxite mining for aluminium and explain how the colonial government approved the construction of a dam and the Brokopondo Reservoir to supply power, highlighting who holds responsibility. However, it will not display any image of this iconic example of human impact on Suriname's biodiversity. Two exhibits will include a visual and experiential representation of the human impact on biodiversity. One exhibit showcases a river, illustrating how it is contaminated by mercury and cyanide left behind by mining companies and illegal prospectors, and how the forest inhabitants, who have not been part of the destruction, pay the price. In a projection of a river on the floor, visitors will see dead fish surfacing. The second is an interactive about frogs, where visitors can move a frog model along a slide bar. When the frog is positioned in a thriving forest, depicted by an aerial photograph of the rainforest, the sounds of numerous frogs can be heard. Conversely, when the frog is moved towards an aerial photograph of a forest cleared for mining activities, the sounds of the frogs fade away, demonstrating the risks of species extinction from human disruptions of the forest.

Although a dedicated space within the exhibition offers room for reflection, featuring questions to stimulate thought about what the forest means to you, the exhibition does not provide an opportunity for the public to express or leave behind their opinions. The exhibition will not provide visitors with concrete suggestions for protecting nature. The outro text summarises: 'I am the forest. My tree roots hold the earth. I provide oxygen and rain and offer a home to plants, animals and people. Without me, there is no life.' And it closes with a quote by a forest inhabitant: 'Protect the forest. With that, you protect our lives.'

What role does the collection play in the narrative of the Suriname exhibition concerning the human impact on biodiversity?

Naturalis' substantial collection of Surinamese specimens forms an intrinsic driver of the exhibition's narrative. Notable collection objects will be crucial in engaging visitors. However, their contribution to the story of human impact on biodiversity remains limited. The Dutch colonial context has enabled Naturalis to possess an extensive Surinamese collection and employ numerous researchers who work in Suriname. Consequently, the exhibition's theme has narrowed from the initial idea of the Amazon forest as its protagonist to Suriname (Besselink 2025a). From this vantage point, the collection can be viewed as a driving force behind the exhibition. Naturalis' Surinamese natural history collection previously derived its value from scientific research aimed at understanding biodiversity. Now, it will demonstrate how the collection can be interpreted through non-Western worldviews, honouring the exhibition brief's core value of creating a multivocal exhibition (Van Breemen 2024, 1). Featured objects include the renowned Hermann Herbarium (which contains the oldest preserved plant collection of Suriname, see figure 52), books and prints by Maria Sibylla Merian, and both wet and dry specimens. All specimens and objects will serve as illustrations of the narratives, rather than as the motive. However, as in all of Naturalis' other exhibitions, the collection will form the backbone to evoke visitors' awe for nature. Showing endangered species offers an opportunity to talk about the state of nature. A search on the IUCN website reveals that it has assessed 3,660 non-marine species in Suriname, of which 98 are threatened. However, the Suriname exhibition will display just a few endangered species, such as the vulnerable giant anteater and the near-threatened jaguar, and no specific search for them was conducted in Naturalis' collection, as this was not the main narrative.

< Figure 53. Page from the Hermann Herbarium (photo: Naturalis).

Figure 54. Opossum, also part of the Suriname exhibition (photo: Naturalis).

How do Naturalis' ambitions for public engagement with the biodiversity crisis manifest in the Suriname exhibition?

Naturalis' goal of addressing biodiversity in its exhibitions was not part of the Suriname exhibition brief (Van Breemen 2024). Most interviewees (Appendix 2, questions 8 and 9) see human impact on biodiversity as an implicit theme; however, since it's not an exhibition objective, the emphasis on cultural significance has overshadowed ecological values.

The exhibition's background and aims

Initially, Naturalis aimed to showcase Suriname's beauty, but the exhibition soon developed into a vehicle to include multivocality within the museum's narrative. According to Bakker-van Bezu (2025), Naturalis has traditionally taken a scientific approach in its exhibitions. 'However, there are many more ways to view nature. We chose to highlight the perspectives of Indigenous communities and Maroons.' Mensinga (2025) emphasises the growing need for Naturalis to address colonial aspects and to include more plants in its exhibitions. The exhibition brief states that the key message is that 'a respectful handling of nature is crucial for our survival' (Van Breemen 2024, 2, translation by author). However, it does not mention biodiversity or the biodiversity crisis at all, while at the time of writing, the management team was already drafting the contents of Naturalis' new Strategic Plan, which unambiguously clarifies the institution's ambitions on this topic. Bakker-van Bezu (2025) suggests that 'when discussing the Amazon forest, one inevitably addresses biodiversity loss', but admits that this was not a primary goal from the outset. Besselink (2025a) explains that the global biodiversity crisis is inherent in the subjects featured in the Suriname exhibition, such as gold and bauxite mining and logging, which contribute to biodiversity decline, and states that 'the accumulation of messages makes you realise that the whole world is your forest, so you must be careful with the greed that comes at the expense of biodiversity and nature'. Mensinga (2025) clarifies that 'incorporating all those requirements in such a small space is challenging, especially when texts cannot exceed 35 words'.

(Missed) opportunities to include the human impact on biodiversity

Two interviewees who were not directly responsible for the exhibition's content identified opportunities to highlight human impact on biodiversity (see Appendix 2, question 10). Mota de Oliveira (2025) criticised the global perception of *development* as economic growth, which fosters inequalities and the overconsumption of natural resources. She suggested encouraging visitors to prioritise quality of life, social equality, and biodiversity preservation over economic growth, to shift their economic thinking. Another idea was to feature Naturalis' scientists specialising in tropical flora and fauna in peripheral

programming, increasing public understanding of their role in conserving biodiversity. Van Draanen (2025) proposed multiple ideas during meetings to highlight the importance of biodiversity protection. For example, he explained that a tree such as the kankantri is a poor choice to discuss ecosystems, because 'the tree spreads pollen and consequently attracts fewer animals than a fruit-bearing tree like the Brazil nut'. However, this suggestion was not adopted because it did not align with the exhibition narrative, which prioritises cultural over ecological values, as the Brazil nut tree is not regarded as sacred as the kankantri. Another proposal by Van Draanen was to include the specimens' IUCN status in the exhibition or in an additional app, which was also rejected for being too far from the key theme. His third suggestion related to the fact that even the inhabitants of the forest are now often forced into damaging practices such as hunting exotic species and illegal gold mining as their only means of making a living, because large mining companies have expropriated the land they used for small-scale agriculture. He concludes: 'I am not so sure about the exhibition's motto that if you believe in ensouled nature, you are automatically a protector of all of nature' (ibid.).

Public engagement

In the context of questions regarding public engagement, several interviewees emphasise that pointing fingers is undesirable (Appendix 2, questions 4 and 12). Alexander (2025) asserts that 'the planetary crisis impacts the entire world; we should not focus on a specific problem or blame individuals', while Mensinga (2025) considers it inappropriate to state in the exhibition that people should stop logging and illegal gold mining, because 'who are we to say that? Particularly since we, from the West, the ones obsessed with money, have disrupted their society. People living in the forest didn't even have a concept of possession'. Alexander and Mota de Oliveira (2025), both born in the Amazon, explicitly discuss the fact that humans are part of ecosystems, that everything is interconnected, and that by disrupting nature through taking more than is necessary, humans will ultimately face the consequences, although those in the forest will experience this sooner than those in urban areas. Most interviewees prefer to convey the message of the biodiversity crisis indirectly or in a *poetic* manner. They fear blandness and repetition of the usual suggestions when attempting to engage visitors and suggest that the exhibition's message must be picked up voluntarily. Besselink (2025) believes that people come to Naturalis for a day out; 'they don't want to feel like they are in a classroom'. Both Besselink and Bakker-van Bezu (2025) note that educational and peripheral programmes have greater opportunities to convey additional messages.

Discussion

This chapter reflects on the results. Based on the topics that emerged from the literature review, it compares how Naturalis as an institution, the Suriname exhibition, and the other studied museums address these issues. It aims to demonstrate that Naturalis' activities and curatorial choices are options among various alternatives. Due to the word limit for this study, this chapter is not exhaustive; however, it discusses several notable topics.

'I want museums to be a place that gives the public not just what it wants, but what it needs.'

(Sutton 2020, 631, quoting Lonnie Bunch, secretary of the Smithsonian Institution).

Meeting societal urgencies

Addressing biodiversity illiteracy

Compared to other museums, Naturalis is slow to engage visitors with biodiversity, its importance, and the threats it faces, while half of the Dutch population does not understand what biodiversity is, and a third remain unconvinced it is threatened even after explanations (Nationale Denktank 2022, 5). The Suriname exhibition will not explain biodiversity but will mention threats from mining and poaching. Nevertheless, Naturalis is developing a dedicated exhibition to inspire a biodiversity-positive society, although it will not focus on the planetary emergency (Van Breemen 2025, 1,2) and it is planning to give more attention to the human-nature relationship in *LiveScience*. *Long Live Life* in Natuurmuseum Brabant explains biodiversity and ecosystems, emphasising human impact without mentioning the term 'biodiversity crisis'. *Fixing our Broken Planet* in the NHM London is dedicated to informing the public about the current state of nature, and *One Planet Expo* in Museon-Omniversum is also explicit in its storytelling about it.

Bridging the nature-culture divide

Naturalis' Suriname exhibition bridges the gap between nature and culture by highlighting Indigenous and Maroon worldviews to promote inclusivity and better care for the environment. Typically, nature and culture are separated into distinct research institutions and museums, with nature further divided into galleries about life (biology) and non-life (earth sciences), which reinforces the divide between humans and the environment (Cameron 2023, 3). This is strengthened by the pristine representation of nature in many museums, without the human impact on it. Natural history museums can act as interdisciplinary bridges, broadening perspectives to include the arts and humanities. The Suriname exhibition is the first at Naturalis to do this and is a prime example. Since Naturalis has traditionally adhered to a strict scientific approach, embracing a multivocal perspective marks a bold step that responds to a growing societal demand for inclusivity. Although it states that forest inhabitants are vital to ecosystems, emphasising the challenge of balancing local needs with ecosystem protection (Jones et al. 2019, 422), it remains implicit what this exactly entails. For instance, the snake exhibit suggests that reverence for nature motivates conservation. However, the increasing pressure on the habitats of forest inhabitants conflicts with their respect and care for their environment, as evident in the gold exhibit, which states, 'gold mining is eating today, forgetting tomorrow'. Several other museums are also working to bridge the gap between nature and culture. The Allard Pierson, with its *Call of the O'o*, explores Europe's historical relationship with nature and the potential for fostering more sustainable behaviour. *Species, the web of life* in Musée des Confluences, illustrates how different ontologies impact biodiversity in various ways, and how threats to cultural diversity impact biodiversity, combining natural history, ethnography, archaeology, and a science collection.

Figure 54. 'Gold mining is eating today, forgetting tomorrow' (label text in Suriname exhibition) (photo: Naturalis).

'Why should shouting louder about the climate and ecological crisis be a problem? The science is overwhelmingly clear, and it affects literally everyone: museums, their staff, their visitors. Given such an existential threat, as institutions of the long term, able to place what's going on into a wider context, it is an ethical imperative for museums to shout louder and take action.'

Nick Merriman in Museums and the Climate Crisis (2024, 12)

'I hope that by touching visitors' hearts in an exhibition, it will inspire them to see the intrinsic value of nature. However, I don't like pointing fingers. Visitors come for a day out; they don't want to feel like they are in a classroom.'

Marijke Besselink, scientific content developer at Naturalis, in an interview conducted for this research, 2025

The role of the museum and its collection

The museum's relevance

Although some of the interviewees are hesitant about assigning the museum an activist role, Naturalis aims to become a change agent in a biodiversity-positive society (Naturalis Biodiversity Center 2024, 16), an ambition that aligns with the urgency and ethical responsibility that academics prioritise over neutrality (Novacek 2008, 11575; Janes 2009; Merriman 2024, 7; Letelier 2024, 45). The Status Report Dutch Biodiversity (Naturalis Biodiversity Center 2025a) exemplifies how Naturalis advances public understanding of the current state of nature, and by targeting policymakers, it could even facilitate the systemic change required to tackle the biodiversity crisis. Exhibitions may not be the tool to change the system, but they can influence individuals who, in turn, can cause systemic change. Individuals' primary motivation for visiting a museum is the construction and maintenance of identity (Falk 2013, 112), which provides museums with the opportunity to contribute to the cultural shift necessary to address biodiversity loss. However, despite the museum's staff being aware of the urgency to increase awareness, the Suriname exhibition prioritised other topics, such as multivocality, colonial aspects, and the cultural significance of plants, over incorporating biodiversity issues. Furthermore, Naturalis' current exhibitions have not yet undergone any significant change. The importance that Naturalis places on providing a pleasant day out for families with children also seems to hinder this internal process of change. Other museums demonstrate

a range of approaches to addressing their public responsibility in the current planetary crisis. Natuurmuseum Brabant realised a family-oriented exhibition about the importance of biodiversity. The NHM London declared a planetary crisis and addressed it with a dedicated exhibition and an extensive peripheral programme. Museon-Omniversum sought to establish its relevance by creating an exhibition about the Sustainable Development Goals.

The experience of nature …with dead animals in the museum

Engaging people with biodiversity issues through displaying dead animals inside museum walls presents challenges. Bakker-van Bezu (2025) believes that when natural history collections represent 'a preserved memory that society has lost', they reveal a powerful image of the human impact on biodiversity. Yet, up to now, that story has hardly been told in Naturalis. Besselink (2025) explains that the collection is primarily utilised in exhibitions as an illustration of a story and believes that stories of depletion are easier to convey through design or metaphors. This is also the approach Artis-Groote Museum employs: the story comes first, and the exhibits are designed in service of the narrative. In contrast, London's *Fixing our Broken Planet* places its natural history collection at the heart. The curators asked their scientific colleagues: 'What are items in our collection that you think would tell really great stories about the planetary emergency?' (Hana Dethlefson in online lecture, NHM London 2025). The specimens are the protagonists rather than the illustration and become active agents in inspiring people to help mitigate unsustainable pressures on the environment. However, the way they are presented does not allow for diverse interpretations from visitors; they tell a single story in a traditional setup, with glass displays featuring stuffed animals in an almost scholarly layout.

Naturalis utilises its collection in exhibitions alongside other engaging techniques, such as digital interactives, videos, projections, models, games, and sensory experiences that incorporate sound, light, and touch. Its immersive presentation of stories and themes stands out compared to other museums and leans more towards 'fun' than just learning, although the Mission Museum Steyl demonstrates that 'fun' does not necessarily require modern digital assets; its century-old dioramas impress visitors of all ages. Both Naturalis and the Mission Museum incorporate their objects in experiential settings, making their tangible qualities and potential for interpretation less intrusive. Sarah Sutton (2020, 622) also sees opportunities in combining these qualities by mining the collections for evidence of how humans have contributed to planetary disruptions and crossing disciplines into the arts and humanities to 'engage a far wider public in learning, than

can science alone'. The Musée des Confluences has bridged these disciplines, juxtaposing natural history specimens with modern Indigenous art (see figures 55-56). A skeleton of the extinct Steller's sea cow illustrates how this species was exterminated within 27 years of its discovery by humans. An artwork by Aboriginal artist Dennis Nona recounts the poetic stories of hunting legends and the relationship between humans, dugongs, the ocean, and the cosmos. Naturalis, with its Suriname exhibition, links its specimens to art and re-ensouls them through the addition of stories from and about forest inhabitants. The difference from Musée des Confluences is that it rarely contextualises these stories within the Western human-caused devastation of nature, except for one mention of a colonial government that was responsible for the Brokopondo Reservoir, although this example is not illustrated.

Figures 55-56. Musée des Confluences crosses disciplines to combine natural history with art.

Encountering natural history specimens, even without modern interactive elements, can increase visitors' emotional connection with the natural world. Yet, literature warns that featuring foremost the charismatic, exotic animals in the museum's displays alienates people in urbanised areas from their own environment (Nationale Denktank 2022, 5), and that focusing on iconic, endangered species might divert attention from habitat destruction and the interconnectedness of all species, including worms, fungi, and microbes (Novacek 2008, 11572). An interactive in Natural Sciences Brussels is an exception as it explains the importance of the human impact on small species: 'The number of bacteria in our bodies is rapidly declining. Changes in our lifestyles are the cause of this. Excessive hygiene, the use of antibiotics and poor nutrition cause not only the bad bacteria to die but also the good ones. No bacteria means no healthy bodies!' However, it does not feature a collection item. Nevertheless, several museums spotlight the endangered and charismatic animals by mentioning their IUCN status on the labels of their specimens. In particular, in the CSMVS in Mumbai, it is the only colourful aspect on the labels, which presents a quite striking image of the deteriorating state of nature, although it nuances the iconic representation of the endangered species with stories that explain the causes, such as habitat destruction and the interdependence of species. Naturalis' content developer for education, Van Draanen (2025), also mentions the IUCN status as an opportunity to increase awareness of biodiversity loss, although this is not (yet) employed by Naturalis.

'A plant or animal in the collection cannot be compared to a plant or animal in the forest. There is no spirit or soul in a stuffed animal or wet specimen. For that, we need the voice of the inhabitants of the forest. Those who live with and in nature. Beautiful quotes and soulful songs bring the collection items back to life, infuse them with spirit, and recharge them once more.'

(Naturalis Biodiversity Center 2025b, 23, translation by author)

Engagement: from awareness to behavioural nudging

Stimulating dialogue

Arfvidsson and Follin (2020, 692), in their analysis of the exhibition *Human Nature*, herald the Swedish National Museum of World Cultures' shift from its traditional authoritative and didactic voice to a more open experience allowing for discussion and interpretation. Stimulating open dialogue regarding norms and values could activate people (Versantvoort et al. 2024, 5, 10). A shortcoming of the methodology of this research was the focus on the collection and its text labels, and the overlook of dialogue as a tool for visitor engagement. In hindsight, Naturalis does offer opportunities for this with the 'Vraagkasten' [question cabinets] in the galleries and with Spotlight lectures in *LiveScience*. However, the Vraagkasten are there for visitors to initiate conversation, so a visitor must already be interested in the human impact on biodiversity to learn something about this. The Spotlight lectures cover a wide range of topics; the likelihood that a lecture addresses the planetary crisis is limited.

Mota de Oliveira (2025) suggests that the exhibition could encourage people to think about the quality of life: 'If we learn that development should focus on social equality and biodiversity preservation instead of growth, then perhaps economic thinking could change. The economy is an enormous power, for example, in the Amazon, where intensive logging makes way for soy to feed our livestock. However, the economy could also prioritise life and quality of life.' Alexander (2025) shares this view. He believes that a museum can increase visitors' awareness of the vast scale of consumerism in urban societies and how it contrasts with and affects the inhabitants of the forests, encouraging them to think differently. The Suriname exhibition will feature a reflective space inviting visitors to contemplate what the forest means to them, but it does not relate this to nature protection or consumerism in a provocative manner.

Enhancing the relationship with nature

Most people can name more car brands than species in their direct living environment. The lack of interaction with nature makes it harder for people to care for it (Pyle 1993), and because of the shifting baseline syndrome, a gradually hollowed-out nature becomes the new normal (Pauly 1995). Willingness to pay for conservation is higher among individuals who have observed a decline in their surroundings (Argeloo 2022, 448). Naturalis' visitor study advised to 'start the conversation about the biodiversity crisis with something familiar, for example, the condition of your favourite animal' (Afdeling Buitengewone Zaken 2024, 27, translation by author). Although the Suriname exhibition aims to connect people with nature, it will still be an exhibition that is difficult for

many Dutch people to relate to their own experience of nature. Giving people the opportunity to spend more time in nature and familiarising them with their environment fosters greater pro-environmental attitudes and behaviours (DeVille et al. 2021, 13). CSMVS in Mumbai has facilitated this with its biodiversity garden, which, with its publicly accessible, paradisical appearance, contrasts with the otherwise stony, dirty city. Its information panels make the connection between cultural values and biodiversity protection. Other museums have gardens, such as NHM London, which is designed to welcome wildlife, but does not focus on biodiversity awareness. Naturalis is currently developing a parking facility to accommodate a biodiversity garden. The Suriname exhibition aims to immerse its visitors in the Surinamese forest, enhancing their appreciation for nature. However, further research should investigate whether a theatrical representation of nature with dead animals has the same impact as visiting living nature.

Setting good examples

Conditional cooperation is another tool that the literature recognises as a way to strengthen individuals' sense of responsibility regarding environmental issues (Becchetti et al. 2025, 10). By setting a good example and highlighting successful projects that tackle planetary challenges, museums can make a difference. Promoting the museum's efforts to reduce its footprint helps visitors see such actions as 'normal'. Naturalis' visitor study states that an exhibition does not need to be created sustainably to engage visitors with the biodiversity crisis (Afdeling Buitengewone Zaken 2024, 68). Yet, Allard Pierson, in its prominent colophon at the entrance of *The Call of the O'o*, explains how it created a sustainable exhibition by reusing display cases and opting for electric-powered transportation and eco-friendly printed materials. This effort had a very positive impact on the researcher's perception. However, with N=1, that is merely an opinion. Still, even if it is not for the sake of public engagement, it is not a bad idea to constantly ask if it is worth the carbon when developing exhibitions, according to the Head of Exhibitions and Environmental Impact Lead at the Design Museum in London (Foster van der Elst 2024), who has worked to optimise carbon-efficient exhibition development practices.

Setting an example can also be done by showcasing good practices. The final room of the O'o exhibition showcases interviews with individuals who have contributed to preserving nature and mitigating environmental changes through their projects. This demonstrates to visitors that everyone can make a difference. This approach can even be adapted for children. The Wereldmuseum Amsterdam, in its exhibition for children, *Council of the Raven*, has included several examples

Figure 57. Exhibition for children, *Council of the Raven* in Wereldmuseum Amsterdam, showcases children worldwide who have made an impact through their actions against climate change.

of children worldwide who have made a significant impact through their actions against climate change, which could be a powerful way to inspire other children to join the club of climate ambassadors (Wereldmuseum Amsterdam 2025, see figure 57). The Suriname exhibition will not feature any nature conservation projects. Although the design team has made an effort to use sustainable materials when possible, this will not be explained in the exhibition.

Pairing urgency with concrete, positive alternatives

'Martin Luther King had a dream, not a complaint', is an example from literature to explain that creating an appealing perspective sells better than selling hell (Shenker-Osorio 2017, 10,11). De Lange et al. (2022, 2) assert that 'positive communication can lead to the development of productive collaborations, relationships, and conversations, which may trigger actions to help address the biodiversity crisis'. Yet, none of the analysed museums offers beckoning perspectives. Naturalis' visitor study found that visitors preferred a positive and hopeful approach in exhibitions to boost their motivation for change (Afdeling Buitengewone Zaken 2024, 25, 64, 79). However, Naggs (2022, 94) asserts that an emphasis on hopeful messages to avoid frightening visitors is inappropriate: 'The NHM's mendacious message of hope—that the show can go on—infantilises the public by assuming that they will only engage with optimistic messaging. It is an insult to public intelligence' (Naggs 2022, 94). Allard Pierson uses the word *hope* as the title of its last room, which features interviews with people who make a

difference in planetary crises. However, after the serious messages in the prior rooms, it does not seem to tell a single story. Furthermore, it invites visitors to share both their hope and despair with stickers on a wall. *Living Planet* in Natural Sciences in Brussels suggests multiple times that nature will recover and even benefit from disasters, likely as a way of conveying a positive message. In this case, because of the lack of nuance, it seems indeed ill-suited. Naturalis does not express hope, fear or urgency in its galleries, and the Suriname exhibition will not, either.

Providing concrete sustainability actions

In the Museum for Central Africa in Tervuren, a tusk is displayed with a label that explains that under Leopold II, between 1889 and 1908, 4,700 tonnes of ivory, originating from 94,000 elephants, were exported from Central Africa to Antwerp. According to experts, presenting numbers and figures about planetary crises is not the most effective way to engage people (Versantvoort et al. 2024, 9; De Lange et al. 2022, 2; Kahneman 2011; De Meyer 2024). Nevertheless, numbers can evoke strong emotional responses, and Fixing our Broken Planet in London uses figures in many of its labels as a powerful way to express the current state of nature. De Meyer advocates the Action Drives Believes method for combating inertia in environmental emergencies. He asserts that by first taking action, the human brain will subsequently find arguments and support for the actions, which means that when museums offer the opportunity to engage in pro-environmental activities, it is a good way to activate the public. Museon-Omniversum lets visitors make active decisions on sustainable topics by letting them punch a card at every exhibit. At the end of the exhibition, the card is evaluated to see how willing the visitor is to contribute to sustainability. The Sonnenborgh Museum and Observatory in Utrecht invites its visitors to its *On Earth* exhibition to write a letter to the future, a method proven to be effective in activating people in the climate crisis (Shrum 2021, 18). Natuurmuseum Brabant lets its visitors sign a contract with nature, and specifies who exactly benefits from the actions. Several museums also offer barcodes for joining or donating to biodiversity protection programmes. Naturalis is modest in its provision of concrete sustainable actions, but invites its visitors in *LiveScience* to participate in citizen science bee counting programmes. The Suriname exhibition will offer several interactives that will engage various audiences, including children, to think about the human impact on nature, such as the frog slide. Yet, visitors will not be active in sustainability practices whilst in the exhibition.

Conclusions

'What lies ahead? Re-imaging the world. Only that.'

(Arundhati Roy, 2020, in Azadi: Freedom, Fascism, Fiction)

This chapter concludes how Naturalis engages its museum visitors with the human impact on biodiversity through a natural history collection in its developing exhibition about Suriname.

Naturalis utilises its natural history collection in the upcoming Suriname exhibition to illustrate the relationship between forest inhabitants and their environment, serving as inspiration to revere and care for nature. While it mentions the anthropogenic pressures on the forest, it does not explicitly motivate visitors to act in the urgency of the biodiversity crisis, which does not align with Naturalis' ambitions to become a change agent in a biodiversity-positive society.

A surprisingly large number of people in Europe and the Netherlands are unaware of the vital role biodiversity plays in the survival of many species, including humans (European Commission. Directorate General for Environment 2019, 7). The environmental crisis is connected to social injustices and stems from a disrupted relationship between individuals, primarily in the Global North, and the natural world (Descola 2013, original publication 2005). Museums have an ethical responsibility to raise awareness of the ecological crisis and encourage their visitors to take action, yet they are hesitant to take a stance, fearing bias, political influence, or the erosion of their perceived neutrality (Janes 2009, 146; Merriman 2024, 12; Sutton 2020, 624). Although not exhaustive, this study found several ways in which literature suggests museums can play a role in bridging the intention-behaviour gap and activate visitors in environmental issues, including educating people about misconceptions about their potential impact (Sinclair et al. 2025, 2), stimulating dialogue regarding norms and values (Versantvoort et al. 2024, 5, 10), enhancing visitors' relationship with nature (DeVille et al. 2021, 13), offering a beckoning perspective (De Lange et al. 2022, 2; Shenker-Osorio 2017, 10–11), setting good examples to stimulate conditional cooperation (Becchetti et al. 2025, 10), and providing concrete, sustainable actions (De Meyer 2024). Seventeen years after Michael Novacek's (2008) plea for increased efforts by museums to engage their visitors in biodiversity issues, based on comprehensive analyses of eleven exhibitions, this study demonstrates that most museums raise awareness about the state of the natural world.

Although further research, including the analysis of more museums, would provide stronger evidence, this study suggests that museums are making progress in this area. Some exhibitions thoroughly explain the concept of biodiversity and its importance, while others highlight the culture-nature divide as a contributing factor to the planetary crises.

In contrast, Naturalis, with its nine current exhibitions, primarily celebrates nature's beauty while overlooking its degradation, with a few exceptions in the exhibition *Death*. Moreover, Naturalis does not explicitly explain what biodiversity is or why it is important, and scarcely illustrates the link between biodiversity and climate change or pollution, although the interviewed staff see different opportunities to use the collection to tell this story, such as using specimens to illustrate this narrative or using the collection as a driver of storytelling. Nevertheless, Naturalis aims to enhance its public engagement regarding the biodiversity crisis and to become a change agent for this topic (Naturalis Biodiversity Center 2024, 16). It has initiated the development of a dedicated exhibition to inspire people to commit themselves to a biodiversity-positive society, set to open in 2026-2027, and it aims to implement some interventions in its current museum to boost visitor awareness of the biodiversity crisis, for example, in *LiveScience*.

The Forest of Suriname is a forthcoming temporary exhibition about ensouled nature. Although Naturalis' Strategic Plan 2025-2028 was developed during the creation of the exhibition brief, Naturalis' new ambition to address the biodiversity crisis in its exhibitions was not included in the assignment for the Suriname exhibition (Van Breemen 2024). However, this research reveals that the Suriname exhibition will nonetheless raise awareness of the human impact on biodiversity, albeit mostly in a poetic way. With a focus on the relationship of Maroons and Indigenous peoples with the forest, the exhibition will highlight worldviews beyond the scientific, allowing for multivocality –a pressing societal issue, which may help bridge the culture-nature gap. The exhibition will deepen visitors' appreciation of nature through an immersive presentation of the forest, engaging interactives and a kaleidoscope of stories that bring the collection objects to life. Immersive storytelling is a unique and powerful quality of Naturalis. However, for Dutch people, it may be difficult to link the Amazon to their own backyard, while relating environmental issues to people they know could stimulate their willingness to contribute to nature conservation (Sinclair et al. 2025, 9). Because Naturalis is concerned about commonplace examples, moralism and visitor discomfort, the exhibition does not activate visitors directly.

The Dutch colonial history has resulted in a substantial collection of Surinamese specimens, which forms an intrinsic driver of the Suriname exhibition's narrative. Notable collection objects will be crucial in engaging visitors. However, their contribution to the story of human impact on biodiversity remains limited. The exhibition will feature non-furry species, such as plants and insects, demonstrating that all aspects of nature are important for ecosystems; yet, kingdoms other than plants and animals, as well as many unknown phyla in the animal kingdom, remain unilluminated. Furthermore, the implicit messaging might not communicate the importance of protecting ecosystems to every visitor. The exhibition will provide a dedicated space for reflection, with an invitation to consider what the forest means to you. The methodology of this study, which prioritises information over experience and concentrates on natural history collections, limited this study's ability to recognise the significance of dialogue and experiential learning. Further research could yield a deeper understanding of the value of interaction and visitor experiences concerning the human impact on biodiversity.

In its Strategic Plan 2025-2028, Naturalis has identified its relevance to museum visitors during turbulent times of societal change and now faces the challenge of prioritising this strategic goal throughout the museum department to stimulate public action towards a sustainable future.

'Human power is extremely limited, and is infinitely surpassed by the power of external causes; we have not, therefore, an absolute power of shaping to our use those things which are without us.'

(Benedictus de Spinoza 1677, in Ethics, Part IV, Appendix 32)

Recommendations

Based on this research, many potential recommendations surface. Here, only a few are specified. The page numbers refer to the pages that explain the concepts (and authors) underlying these recommendations, as they are sometimes inspired by literature but do not directly refer to one particular author or paper.

Recommendation for Naturalis, as an organisation

Museums play a vital role as change agents in tackling environmental crises and providing the public with what it needs, not what it wants (see pages 31-33, 78-81). Naturalis has recognised this in its Strategic Plan 2025-2028. Consider who will be the custodian of those new values and ambitions, and appoint a dedicated team or include this responsibility in the job descriptions of current staff.

Recommendations for future exhibitions

Embracing an interdisciplinary approach to include culture in the broad sense, can help to address the culture-nature divide (see pages 79, 81). The Suriname exhibition is already a good example. For future exhibitions, consider continuing to reach out to the arts and humanities, as well as to Indigenous knowledge.

In exhibitions that depict nature as pristine, the public's understanding of the state of nature is undermined (see pages 28, 79). Consider visualising the human impact on nature in future exhibitions. A good example is the viewers at Ice Age that illustrate how the landscape has changed due to human activity.

Consider mining the collections and the knowledge of the institutions' scientists for collection specimens that tell stories about the human impact on biodiversity. Collection objects can be illustrative but can also contain powerful intrinsic stories (see pages 34-35, 66).

Consider including environment-positive visitor activities, because 'actions drive beliefs' (see pages 38-39, 87).

Hope is not the only positive emotion. Focusing on shared values and solutions rather than problems can activate people (see pages 36-37, 86).

Reduce the environmental impact of exhibitions and communicate those sustainable practices to the public, to maximise the effect of conditional cooperation (see pages 36, 85).

Consider stimulating discussion and interpretation in exhibitions (see pages 36, 39, 66, 84). With thought-provoking questions and room for reflection, peer interaction can be stimulated. This is already offered in the Suriname exhibition but can be done even more provocatively.

Suggestions for concrete interventions in current exhibitions

Life only features animals, the majority of which are vertebrates (excluding humans) and a few molluscs. This highlights the human-nature divide and fails to recognise the value of all life in ecosystems (see pages 35, 64, 83). Consider including specimens of other kingdoms, such as plants, fungi, or smaller species, or consider changing the name to *Animalia*.

Consider including the human impact on biodiversity in *Life* (see page 28). For example, include fragments of human activity in the video screens that now show pristine habitats, or place little stickers on the labels showing the animal's status.

Consider changing a few labels to convey the urgency and severity of the biodiversity crisis, for example, the dodo label in *Death* (see page 62). Several species per hour are driven to extinction, so instead of 'This bird died out when humans interfered with its environment. Which animal is next on the list?' the label could say: 'This bird died out when humans interfered with its environment. How can the current speed at which species are going extinct because of human behaviour be slowed down?'

Consider changing a few labels in *Ice Age*, to mention the fact that some of the displayed animals are now extinct due to human activity (see page 64).

The Allard Pierson featured information about the species identification project ARISE in its exhibition, inviting museum visitors to contribute to collecting data. *LiveScience* already offers 'behind the scenes' information about science. Consider extending this by showcasing the significant biodiversity identification and protection projects and achievements, such as ARISE, eDentity, and the Status Report on Dutch Biodiversity, more prominently in the museum.

Figure 58. Mining the collection depot for specimens for the Suriname exhibition

References

Published sources

Allard Pierson. n.d. 'About the Allard Pierson'. Allard Pierson. Accessed 19 July 2025. https://www.allardpierson.nl/en/about-the-allard-pierson.

Argeloo, Marc. 2022. 'Natuuramnesie: Hoe we vergeten zijn hoe de natuur er vroeger uitzag'. Doctoral dissertation, Utrecht University. https://doi.org/10.33540/1494.

ARTIS-Groote Museum. n.d.-a. 'Mission & Vision'. Accessed 28 December 2024. https://www.artis.nl/en/mission-vision.

ARTIS-Groote Museum. n.d.-b. 'What Is ARTIS-Groote Museum?' Accessed 30 December 2024. https://www.artis.nl/en/artis-groote-museum/what-is-artis-groote-museum.

Becchetti, Leonardo, Gianluigi Conzo, and Francesco Salustri. 2025. 'What about the Others? Conditional Cooperation, Climate Change Perception and Ecological Actions'. *Ecological Economics 227* (January): 108371. https://doi.org/10.1016/j.ecolecon.2024.108371.

Biodiversitystripes.info, and Living Planet Index database 2024. n.d. *Biodiversity Stripes.* biodiversitystripes.info.

Bushnell, Horace. 1858. *Sermons for the New Life*. Charles Scribner.

Cambridge Dictionary. 2025. 'Engage'. May 21. https://dictionary.cambridge.org/dictionary/english/engage.

Cameron, Fiona R. 2023. *Museum Practices and the Posthumanities: Curating for Planetary Habitability.* 1st ed. Routledge. https://doi.org/10.4324/9781315212067.

CERE India. n.d. 'Vriksha Valli, Biodiversity Garden at CSMVS'. Accessed 1 January 2025. https://cere-india.org/vriksha-valli/.

Chhatrapati Shivaji Maharaj Vastu Sangrahalaya. n.d. 'Who Are We'. CSMVS Accessed 31 December 2024. https://csmvs.in/who-are-we/.

Coren, Michael J. 2025. 'Writing to the Future Is One of the Most Powerful Climate Actions You Can Take'. *The Washington Post*, April 29. https://www.washingtonpost.com/climate-environment/2025/04/29/climate-action-letter-to-the-future/.

De Groot, Judith I. M., and Linda Steg. 2009. 'Morality and Prosocial Behavior: The Role of Awareness, Responsibility, and Norms in the Norm Activation Model'. *The Journal of Social Psychology* 149 (4): 425–49. https://doi.org/10.3200/SOCP.149.4.425-449.

De Lange, Emiel, William Sharkey, Sofia Castelló Y Tickell, Julia Migné, Ralph Underhill, and E.J. Milner-Gulland. 2022. 'Communicating the Biodiversity Crisis: From "Warnings" to Positive Engagement'. *Tropical Conservation Science* 15 (July): 19400829221134893. https://doi.org/10.1177/19400829221134893.

De Meyer, Kris, dir. 2024. *TED Talk: Feeling Stuck on Climate Change? Here's What to Do.* www.ted.com/talks/kris_de_meyer_feeling_stuck_on_climate_change_here_s_what_to_do.

Descola, Philippe. 2013. *Beyond Nature and Culture.* Translated by Janet Lloyd. The University of Chicago Press.

DeVille, Nicole V., Linda Powers Tomasso, Olivia P. Stoddard, et al. 2021. 'Time Spent in Nature Is Associated with Increased Pro-Environmental Attitudes and Behaviors'. *International Journal of Environmental Research and Public Health* 18 (14): 7498. https://doi.org/10.3390/ijerph18147498.

Dijs, Fred. 1996. 'De fuut in de gracht vangt bot'. *Bzzlletin* 26: 15–20.

Donald, Rachel. 2025. 'We Are Collectively Suffering through a Crisis of Imagination'. Opinion. *Dezeen*, April 28. https://www.dezeen.com/2025/04/28/crisis-imagination-rachel-donald-opinion/.

Dudley, Sandra H., ed. 2012. *Museum Objects: Experiencing the Properties of Things*. 1. publ. Leicester Readers in Museum Studies. Routledge.

European Commission. Directorate General for Environment. 2019. *Attitudes of Europeans towards Biodiversity.* 481. Special Eurobarometer. Brussels. https://europa.eu/eurobarometer/surveys/detail/2194.

Falk, John H. 2013. 'Understanding Museum Visitors' Motivations and Learning'. In *Museums. Social Learning Spaces and Knowledge Producing Process*, edited by Ida Brændholt Lundgaard and Jacob Thorek Jensen. Kulturstyrelsen - Danish Agency for Culture.

Foster van der Elst, Elise, dir. 2024. *ICOM Talk: Towards a New Model of Exhibition Making.* https://icom.nl/en/activities/activities/product/24/24.

Futerra Climate Communications. 2009. 'Sell the Sizzle: The New Climate Message'. https://www.wearefuterra.com/thinks/sell-the-sizzle.

Goudie, Andrew. 2018. *Human Impact on the Natural Environment: Past, Present and Future.* Eighth edition. Wiley.

Harrison, Rodney, and Collin Sterling, eds. 2021. *Reimagining Museums for Climate Action*. Museums for Climate Action. www.museumsforclimateaction.org.

Hein, George E. 1998. *Learning in the Museum.* Museum Meanings. Routledge.

Hess, Gérald. 2023. 'Nature'. In *Handbook of the Anthropocene*, edited by Nathanaël Wallenhorst and Christoph Wulf. Springer International Publishing. https://doi.org/10.1007/978-3-031-25910-4_14.

Hourston Hanks, Laura, Jonathan Hale, and Suzanne Macleod. 2012. 'Introduction: Museum Making - The Place of Narrative'. In *Museum Making: Narratives, Architectures, Exhibitions*, 1st ed, edited by Suzanne Macleod, Laura Hourston Hanks, and Jonathan Hale. Routledge. https://doi.org/10.4324/9780203124574.

ICOM, ed. 2017. *ICOM Code of Ethics for Museums*. ICOM.

ICOM and NATHIST, Ethics Working Group. 2013. 'ICOM Code of Ethics for Natural History Museums'. ICOM.

Indigo-Ltd. 2024. 'Act Green 2024 Benchmark Report'.

IPBES. 2019. *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. https://doi.org/10.5281/ZENODO.3831673.

Janes, Robert R. 2009. *Museums in a Troubled World: Renewal, Irrelevance or Collapse?* Museum Meanings. Routledge.

Johnson, Kirk R., Ian F.P. Owens, and The Global Collection Group. 2023. 'A Global Approach for Natural History Museum Collections'. *Science* Vol 379, Issue 6638 (March): 1192–94.

Jones, Julia P. G., Laura Thomas-Walters, Niki A. Rust, and Diogo Veríssimo. 2019. 'Nature Documentaries and Saving Nature: Reflections on the New Netflix Series Our Planet'. *People and Nature* 1 (4): 420–25. https://doi.org/10.1002/pan3.10052.

Kahneman, Daniel. 2011. *Thinking, Fast and Slow*. 1st ed. Farrar, Straus and Giroux.

KNAW, NFU, NWO, TO2-Federatie, Vereniging Hogescholen, and VSNU. 2018. 'Nederlandse gedragscode wetenschappelijke integriteit'. Data Archiving and Networked Services (DANS). https://doi.org/10.17026/DANS-2CJ-NVWU.

Legagneux, Pierre, Nicolas Casajus, Kevin Cazelles, et al. 2018. 'Our House Is Burning: Discrepancy in Climate Change vs. Biodiversity Coverage in the Media as Compared to Scientific Literature'. *Frontiers in Ecology and Evolution* 5 (January). https://doi.org/10.3389/fevo.2017.00175.

Letelier, Lucimara Anselmo Santos. 2024. 'Regenerative Museums: Reshaping the Museums' Role in Addressing Social and Environmental Collapse'. Master's thesis, University of Leicester. https://uploads.strikinglycdn.com/files/191acb48-b653-4523-b6b9-7fbc0c373cfa/RegenerativeMuseums%20Research%20Report%20LucimaraLetelier%202024%20RJanes.pdf.
Lyons, Steve, and Beka Economopoulos. 2015. 'Museums Must Take a Stand and Cut Ties to Fossil Fuels'. Environment. *The Guardian*, May 7. https://www.theguardian.com/environment/2015/may/07/museums-must-take-a-stand-and-cut-ties-to-fossil-fuels.
Marsh, George Perkins. 1865. *Man and Nature or, Physical Geography as Modified by Human Action*. Charles Scribner.
Matthews, Thomas J., Kostas A. Triantis, Joseph P. Wayman, et al. 2024. 'The Global Loss of Avian Functional and Phylogenetic Diversity from Anthropogenic Extinctions'. *Science* 386 (6717): 55–60. https://doi.org/10.1126/science.adk7898.
McGhie, Henry. 2020a. '"Information on Steps Taken by Global Museums to Implement the Doha Work Programme and in Relation to Action for Climate Empowerment, Including Activities and Results, Best Practices, Lessons Learned, and Emerging Gaps and Needs." Submission to UNFCCC in Response to Mandate Decision 15/CP.25, Paragraph 2'. www4.unfccc.int/sites/SubmissionsStaging/Documents/202002131238---Curating%20Tomorrow%20Doha%20Review.pdf.
McGhie, Henry. 2020b. 'Evolving Climate Change Policy and Museums'. *Museum Management and Curatorship* 35 (6): 653–62. https://doi.org/10.1080/09647775.2020.1844589.
McGhie, Henry. 2023. 'Mainstreaming Biodiversity in Museums: Museums and the Global Biodiversity Framework'. Curating Tomorrow, UK.
Merriman, Nick, ed. 2024. *Museums and the Climate Crisis.* 1st ed. Routledge. https://doi.org/10.4324/9781003347606.
Miller, Gifford, John Magee, Mike Smith, et al. 2016. 'Human Predation Contributed to the Extinction of the Australian Megafaunal Bird Genyornis Newtoni -47 Ka'. *Nature Communications* 7 (1): 10496. https://doi.org/10.1038/ncomms10496.
Missiemuseum Steyl. 2022. 'Beleidsplan Missiemuseum Steyl 2023-2028'. September. www.missiemuseum.nl/public/files/Openbaar%20Beleidsplan%20Missiemuseum%20september%202022.pdf.
Missiemuseum Steyl. n.d. 'Birds of God | Missiemuseum Steyl'. Accessed 19 July 2024. https://www.missiemuseum.nl/en/birds-of-god.
Modest, Wayne, and Robin Lelijveld, eds. 2018. *Words Matter, An Unfinished Guide to Word Choices in the Cultural Sector.* National Museum of World Cultures.
Musée des Confluences. n.d. 'About Us'. Musée Des Confluences. Accessed 11 August 2025. https://museedesconfluences.fr/en/about-us/project.
Museon-Omniversum. n.d. 'About Us'. Accessed 10 August 2025. https://www.museon-omniversum.nl/en/about-us.
Naggs, Fred. 2022. 'The Tragedy of the Natural History Museum, London'. *Megataxa* 7 (1). https://doi.org/10.11646/megataxa.7.1.2.
Nationale Denktank. 2022. 'Hoe Keren We Het Tij in de Biodiversiteitscrisis. Analyserapport Nationale Denktank 2022'. October 28. https://ndt22.nl/wp-content/uploads/2022/10/20221028_Analyserapport_vFinal.pdf.
Natural History Museum London. n.d. 'Fixing Our Broken Planet Gallery'. Accessed 12 August 2025. https://www.nhm.ac.uk/visit/galleries-and-museum-map/fixing-our-broken-planet.html.
Naturalis Biodiversity Center. 2024. *Strategic Plan 2025-2028*.

Naturalis Biodiversity Center. 2025a. *Statusrapport Nederlandse Biodiversiteit 2025*. Zenodo. https://doi.org/10.5281/ZENODO.15350844.
Naturalis Biodiversity Center. n.d. 'Life Gallery'. Accessed 5 June 2025. https://www.naturalis.nl/en/museum/galleries/life.
Natuurmuseum Brabant. n.d. 'Vision/Mission'. Accessed 28 December 2024. https://www.natuurmuseumbrabant.nl/en/about-us/vision/mission.
NHM London, dir. 2025. *Building an Ecosystem of Positive Change*, *Online Lecture for Museumnext.Com*.
Nieroba, Elzbieta, and Robert Geisler. 2024. 'Museums and Climate Change Discourse: The Selected Case Studies Analysis'. *Museum Management and Curatorship*, August 23, 1–21. https://doi.org/10.1080/09647775.2024.2393156.
Novacek, Michael J. 2008. 'Engaging the Public in Biodiversity Issues'. *Proceedings of the National Academy of Sciences* 105 (supplement_1): 11571–78. https://doi.org/10.1073/pnas.0802599105.
O'Brian, Karen. 2021. *You Matter More Than You Think. Quantum Social Change for a Thriving World.* cCHANGE press.
Pauly, Daniel. 1995. 'Anecdotes and the Shifting Baseline Syndrome of Fisheries'. *Trends in Ecology & Evolution* 10 (10): 430. https://doi.org/10.1016/S0169-5347(00)89171-5.
Pyle, Robert Michael. 1993. *The Thunder Tree: Lessons from an Urban Wildland.* Houghton Mifflin.
Richardson, Katherine, Will Steffen, Wolfgang Lucht, et al. 2023. 'Earth beyond Six of Nine Planetary Boundaries'. *Science Advances* 9 (37): eadh2458. https://doi.org/10.1126/sciadv.adh2458.
Roy, Arundhati. 2020. *Azadi: Freedom, Fascism, Fiction.* Haymarket Books.
Royal Belgian Institute of Natural Sciences. n.d. 'Mission & Vision'. Accessed 22 January 2025. https://www.naturalsciences.be/en/about-us/missions-vision.
Royal Society. n.d. 'Why Is Biodiversity Important?' Accessed 17 June 2025. https://royalsociety.org/news-resources/projects/biodiversity/why-is-biodiversity-important/.
Secretariat of the Convention on Biological Diversity, ed. 2000. *Sustaining Life on Earth: How the Convention on Biological Diversity Promotes Nature and Human Well-Being.* Secretariat of the Convention on Biological Diversity.
Shenker-Osorio, Anat. 2017. 'Messaging This Moment: A Handbook for Progressive Communicators'. Center for Community Change. www.communitychange.org/wp-content/uploads/C3-Messaging-This-Moment-Handbook.pdf.
Shrum, Trisha R. 2021. 'The Salience of Future Impacts and the Willingness to Pay for Climate Change Mitigation: An Experiment in Intergenerational Framing'. *Climatic Change* 165 (1–2). https://doi.org/10.1007/s10584-021-03002-6.
Sinclair, Alyssa H., Danielle Cosme, Kirsten Lydic, et al. 2025. 'Behavioral Interventions Motivate Action to Address Climate Change'. *Proceedings of the National Academy of Sciences* 122 (20): e2426768122. https://doi.org/10.1073/pnas.2426768122.
Spinoza, Benedictus de. 1677. Ethics. Translated by R.H.M. Elwes. https://www.gutenberg.org/files/3800/3800-h/3800-h.htm.
Steffen, Will, Wendy Broadgate, Lisa Deutsch, Owen Gaffney, and Cornelia Ludwig. 2015. 'The Trajectory of the Anthropocene: The Great Acceleration'. *The Anthropocene Review* 2 (1): 81–98. https://doi.org/10.1177/2053019614564785.
Steg, Linda., and Judith. De Groot. 2010. 'Explaining Prosocial Intentions: Testing Causal Relationships in the Norm Activation Model'. *British Journal of Social Psychology* 49 (4): 725–43. https://doi.org/10.1348/014466609X477745.

Stephens, Lucas, Dorian Fuller, Nicole Boivin, et al. 2019. 'Archaeological Assessment Reveals Earth's Early Transformation through Land Use'. *Science* 365 (6456): 897–902. https://doi.org/10.1126/science.aax1192.
Sutton, Sarah. 2020. 'The Evolving Responsibility of Museum Work in the Time of Climate Change'. *Museum Management and Curatorship* 35 (6): 618–35. https://doi.org/10.1080/09647775.2020.1837000.
Versantvoort, Maroesjka, Mirella Klomp, Millie Elsen, et al. 2024. 'Between Sustainable Thinking and Sustainable Doing. Attitude, Behaviour and Willingness to Change among Religious and Non-Religious Dutch Citizens in Relation to Climate Change. Summary.' Sociaal Cultureel Planbureau & Protestantse Theologische Universiteit, April.
Vlasceanu, Madalina, Kimberly C. Doell, Joseph B. Bak-Coleman, et al. 2024. 'Addressing Climate Change with Behavioral Science: A Global Intervention Tournament in 63 Countries'. *Science Advances* 10 (6). https://doi.org/10.1126/sciadv.adj5778.
Wereldmuseum Amsterdam, dir. 2025. *Council of the Raven: How to Create an Interactive Exhibiton for Young Children about Climate Change. Online Lecture for Museumnext.Com.* https://museumnext.mn.co/posts/green-museums-summit-council-of-the-raven-how-to-create-an-interactive-exhibition-for-young-children-about-climate-change.
Wilde, Oscar. 1890. *The Picture of Dorian Gray.* 1st ed. Ward, Lock & Co.
Worts, Douglas. 2023. 'Museums as Catalysts of Cultural Adaptation'. In *Museums and the Climate Crisis*, 1st ed., by Nick Merriman. Routledge. https://doi.org/10.4324/9781003347606-5.
WWF. 2024. *Living Planet Report 2024 – A System in Peril*. Gland, Switzerland.
Zawadzki, Stephanie Johnson, Linda Steg, and Thijs Bouman. 2020. 'Meta-Analytic Evidence for a Robust and Positive Association between Individuals' pro-Environmental Behaviors and Their Subjective Wellbeing'. *Environmental Research Letters* 15 (12): 123007. https://doi.org/10.1088/1748-9326/abc4ae.

Interviews

Alexander, Tolin. 2025. *Interview with Tolin Alexander, Guest Curator for the Suriname Exhibition at Naturalis, Interviewed by Josje-Marie Vrolijk, Online (Amsterdam-Paramaribo)*. March 18.
Bakker-van Bezu, Lizzy. 2025. *Interview with Lizzy Bakker-van Bezu, Head of Presentations Department, Naturalis, Interviewed by Josje-Marie Vrolijk, in Leiden.* May 6.
Besselink, Marijke. 2025a. *Interview with Marijke Besselink (Scientific Content Developer at Presentations Department Naturalis), Interviewed by Josje-Marie Vrolijk, in Leiden.* April 10.
Mensinga, Patricia. 2025. *Interview with Patricia Mensinga, Project Manager for the Suriname Exhibition at Naturalis, Interviewed by Josje-Marie Vrolijk, in Leiden*. February 13.
Mota de Oliveira, Sylvia. 2025. *Interview with Sylvia Mota de Oliveira, Plant Taxonomy Researcher at Naturalis, Interviewed by Josje-Marie Vrolijk, in Leiden.* April 8.
Van Draanen, Daniël. 2025. *Interview with Daniël van Draanen, Content Developer at Education Department, Naturalis, Interviewed by Josje-Marie Vrolijk, Online (Amsterdam-Leiden)*. March 25.

Unpublished sources

Afdeling Buitengewone Zaken. 2024. 'Naturalis Ontwerpsprint Biodiversiteitscrisis'. April 22.
Besselink, Marijke. 2025b. 'MB 0+A-Tektsen Suriname'. May 24.
Besselink, Marijke. 2025c. 'MB B+C-Tektsen Suriname'. August 24.
Naturalis Biodiversity Center. 2025b. 'Suriname, Bezielde Natuur. Voorlopig Ontwerp'. February 25.
Van Breemen, Marjolein. 2024. 'Opdracht Suriname Tentoonstelling [Exhibition Brief Suriname Exhibition]'. Naturalis Biodiversity Center, February 8.
Van Breemen, Marjolein. 2025. 'Opdracht Superkrachten [Exhibition Brief Biodiversity Exhibition]'. Naturalis Biodiversity Center, March 7.

List of tables and figures

List of tables

List of figures

All photographs in this report were made by the author unless mentioned otherwise.

Figure A1-1. The central hall of Naturalis

Appendix 1.

Declaration of Originality and Disclosure

I hereby confirm that I am the sole author of the Research Report submitted by me as partial fulfilment of the requirements for the master Applied Museum and Heritage Studies and that I have written it in my own words. Parts excepted are corrections of form and content by my supervisor(s).

Title of work: Engaging museum visitors with the biodiversity crisis through a natural history collection. Case study of the Suriname exhibition at Naturalis Biodiversity Center.
Authored by: Josje-Marie Vrolijk

With my signature, I confirm that:

- I have committed none of the forms of plagiarism described in the EER.
- I have documented all methods, data and processes truthfully.
- I have not manipulated any data.
- I have acknowledged all persons who were significant facilitators of the work.

I furthermore give my consent to make the Research Report publicly available through an open-access online repository without any additional conditions. There is an embargo on my Research Report until the opening of the Suriname exhibition on 8 October 2025.

I am aware that the work may be screened electronically for plagiarism and that instances of plagiarism can be penalised by a failure to complete the master's programme.

Place: Amsterdam
Date: 17-08-2025
Signature:

(not visible in this public version)

Appendix 2.

The interviews

About the interviewees

Marijke Besselink is a scientific content developer at Naturalis, with a long record of exhibition making, currently working on the Suriname exhibition. She has a background in museum studies and has been with Naturalis for fifteen years, following her prior experience at Teylers Museum in Haarlem and Tropenmuseum in Amsterdam (National Museum of World Cultures, now Wereldmuseum). She co-developed the overall concept for the new Naturalis. The galleries *Life, Death,* and *Evolution* exemplify how she translates science into stories that connect the museum collections to the audience. She takes pride in her previous exhibitions on Dodos for the Zoölogisch Museum in Amsterdam and in Mauritius, as well as her contributions to three earlier exhibitions about Suriname.

Tolin Alexander serves as the guest curator for the Suriname exhibition. He is a theatre maker and is responsible for sourcing and representing the stories of the inhabitants of the Surinamese forest. Of Ndyuja (Aukan) descent, one of the six Maroon communities, he ensures that the stories of all Maroon communities, as well as those of the Indigenous communities, are equally represented in the exhibition. Through regular online meetings and occasional live meetings, he is involved in all content development for the exhibition. He takes pride in often representing Suriname through art and culture for international exchange, and he created the film *Dee Sitonu A Weti* (Stones Have Laws), which depicts the Maroon people living in a spirit-infused environment and how logging and mining jeopardise the communities' relationship with nature.

Patricia Mensinga is the interim project manager for the Suriname Exhibition at Naturalis. With an education in industrial and spatial design, she soon specialised in interaction and experience design in her work. In recent years, she has worked as an internal project manager for exhibitions in museums. She takes pride in having worked on *Professor Plons* and the museum's harbour at the Maritime Museum in Rotterdam, integrating interaction, spatial, and public space design.

Daniël van Draanen works as a content developer for education at Naturalis. He has contributed to the Suriname exhibition from the beginning, co-formulating the concept and discussing the exhibits and ideas throughout the process, especially from the Education Department's perspective: how can the educational programme connect to the exhibition? With a background in biology and a master's degree in science education and communication, he has experience in classroom teaching as well as writing for a publishing agency. He always strives to create 'beautiful and qualitative things', whether it's good, delicious food or writing a special text.

Sylvia Mota de Oliveira is a plant taxonomy researcher based at Naturalis and teaches at Leiden University. She describes and classifies tropical plants from South America within an evolutionary context. One of her projects, Flora of the Guianas, is dedicated to the taxonomic treatment of all plant species occurring in French Guiana, Suriname, and Guyana. She was asked to examine the Suriname exhibition material and ideas and to discuss them in a meeting with Besselink and Mensinga. In particular, her expertise in spores and pollen was consulted to find inspiration and develop ideas for incorporating this 'invisible' part of nature into the exhibition.

Lizzy Bakker-van Bezu is the head of the Presentation department. She has a background in Biological Sciences and Science Communication and wrote her master's thesis on comparing the current biodiversity crisis with the five previous mass extinctions. She worked on several exhibitions for the Natural History Museum Rotterdam and NorthernLight Experience Design Agency, and she created exhibitions for the Nemo Science Museum Studio on societal themes such as the energy transition. As of 2023, she represents the link between Naturalis' management and the Presentation Department. Her engagement in the Suriname exhibition was interrupted for several months, which means she was not always decisive in that role. She is currently involved in developing an exhibition on the importance of biodiversity.

About the selection of participants

Scientific content developer Besselink, along with guest curator Alexander and project manager Mensinga, shaped most of the exhibition's content. Van Draanen participated in weekly meetings with the project team to synchronise the material between the education department and the exhibition team. Presentations Department team manager Bakker-van Bezu was not involved during a significant part of the Suriname exhibition's development; however, due to her work on an upcoming exhibition about biodiversity and its significance for people, as well as her previous experience with planetary crisis-related exhibitions, she was invited for an interview. She is also responsible for maintaining the continuity of the knowledge and experiences gained from the Suriname exhibition. Plant taxonomy researcher Mota de Oliveira represents the perspective of the 'scientific' part of the institute. What does a biologist at Naturalis, who usually does not engage with the museum section, think about exhibitions and their public role? The museum's director, Marjolein van Breemen, was invited for an interview but did not respond. The external exhibition designer, Harm Rensink, was not invited for an interview due to the limited scope of this research, which focuses on Naturalis' decision-making process and content development rather than design.

About the interviews

The interviews were conducted either live or online between February and May 2025, half a year prior to the exhibition's delivery. All interviewees signed a consent form and were given the opportunity to withdraw any of their statements at any time. Not all interviews included identical questions; this varied based on the interviewee's role. The author transcribed the interviews fully and literally. The text below is a translated summary of the interviewees' responses and has been checked and approved by them. The signed consent forms, audio recordings, and original transcriptions are available upon request from the author for further research. The interviews took place:

Patricia Mensinga – 13-02-2025 at Naturalis
Tolin Alexander – 18-03-2025 online
Daniël van Draanen – 25-03-2025 online
Sylvia Mota de Oliveira – 08-04-2025 – at Naturalis
Marijke Besselink – 10-04-2025 at Naturalis
Lizzy Bakker-van Bezu – 06-05-2025 at Naturalis

Interview Consent Form

Research project: Engaging museum visitors with the biodiversity crisis through a natural history collection
Purpose of the interview: Case study of the Suriname exhibition
Researcher: Josje-Marie Vrolijk
Contact details: hello@josjemarievrolijk.com
Programme: Reinwardt Academy, Amsterdam University of the Arts (AHK), MA Applied Museum and Heritage Studies

Thank you for agreeing to be interviewed.

By signing this consent form, you agree that:

- An audio recording of this interview will be made and transcribed into written form.
- The interview, its recording and its transcript will be analysed by the researcher.
- The results of the interview will be part of a research report in which sentences or information might be paraphrased or directly quoted.
- The research report could be made publicly accessible.
- Except for your name and function, no personal or contact details will be made public or shared with others.
- Your participation is voluntary and does not offer any benefits to you.
- You can choose not to answer a question if you do not feel comfortable with it.
- You can choose to discontinue your participation at any time.
- Upon your request, parts of the interview will be kept secret, removed from records or kept out of consideration.
- Upon your request, your contribution will be anonymised in the research report.
- Upon your request, you will receive a copy of the interview transcript and/or the research report.
- You can contact the researcher with any questions.

Name of the interviewee:
Function of the interviewee:
Date:
Signature:

The interviews

ABOUT NATURALIS

1. Is Naturalis Biodiversity Center an institute that is confined to biodiversity issues, or can 'biodiversity' be viewed in a broader context that encompasses climate and pollution?

Besselink: As a scientific content developer for exhibitions, I consult with researchers and understand that they face significant issues related to biodiversity, such as the climate crisis and biodiversity loss. I strongly advocate in the exhibitions that the Earth is a whole, that everything is interrelated, and that we, as humans, are connected and must be aware of this.

Mensinga: I believe that the researchers at the institute consistently engage with climate and pollution, whether directly or indirectly, as these factors impact populations. However, I also think that biodiversity is the primary focus of the museum.

Van Draanen: Naturalis is not only concerned with biodiversity but also with natural history, research on a wide spectrum of topics, and even collecting, managing, and securing heritage. In its vision, Naturalis places biodiversity at the centre. However, it is also engaged with other planetary issues, such as CO2 reduction, the energy transition, and creating a sustainable future for generations to come and for nature.

Bakker-van Bezu: Since biodiversity, climate change, and environmental pollution are interconnected and inseparable in what I think is called a Nexus of Problems, we cannot ignore the necessity of adopting a broader perspective. Nevertheless, as the Dutch national institute of biodiversity, I believe Naturalis should focus on biodiversity at its core.

2. In the new Strategic Plan 2025-2028 (Naturalis Biodiversity Center 2024) for the museum, a shift is proposed from primarily focusing on providing people with a fun day out and fostering their love for nature to placing greater emphasis on the biodiversity crisis. How did this shift come into being, and what are your thoughts on this?

Besselink: I was never happy with the expression 'falling in love with nature'. I've always said that we are part of nature. You must feel love for nature and for yourself, because if you destroy nature, you also destroy yourself. However, the strategy of the new museum was to make people feel admiration and wonder for nature, and now, after seven years, I believe we can say that this goal has been achieved. The logical next step is to share the important message of caring for it. You love it, so take care of it! But as far as I'm concerned, that has always been the underlying message.

Bakker-van Bezu: I remember visiting the museum shortly after it reopened in 2019. Like many other biologists, I felt a deep sadness upon discovering that, despite being the leading institute for biodiversity, it did not mention anywhere that biodiversity was declining. When I applied for a job here in 2023, I announced my aim to address that issue. With other recent changes in management, this topic became increasingly important. Actions by and conversations with Extinction Rebellion may have also played a role, although they prefer to see changes happen immediately, while exhibition practice is slow by nature. I believe we have done enough talking, and we need to start making a difference now. If we say we represent a scientific perspective, we cannot remain silent any longer. When you say nothing, that says something, too. Not everything you do needs to be permanent, so let's experiment!

3. Last year, Afdeling Buitengewone Zaken conducted research with Naturalis to explore the public's interest in or openness to stories about the planetary crisis in exhibitions. What do you remember most from this research, and what inspired you?

Besselink: Well, I must admit that I am not very familiar with that research and its conclusions. I think it is important, and I believe it will be further developed through some small interventions we aim to implement in the museum. Additionally, there will be a large exhibition on biodiversity following the Suriname exhibition, and the study's principles will undoubtedly be included. I hope the Suriname exhibition will also serve as a prelude to that biodiversity exhibition because our message, 'take care of the forest, then the forest also takes care of you', aims to touch the heart, with the forest being a metaphor for the earth and all nature. I hope that the idea that we can learn from Indigenous peoples and Maroons who have cared for the forest for centuries will resurface in the exhibition about biodiversity.

Mensinga: I believe Afdeling Buitengewone Zaken is enthusiastic, creative, and genuinely aims to listen to the public, adapting their approach daily, which I admire. However, I heard some of their conclusions, and based on that part that I heard, I think a good two-hour chat with six colleagues could have achieved the same. In my opinion, their method was interesting, but their results were mediocre.

Van Draanen: I was closely involved in that project, and what I really enjoyed was talking to visitors personally. Some indicated that this was the first moment in their entire museum visit when they had a moment of reflection, and they really enjoyed going into the depths. Such interaction with visitors is quite unique because they often focus on the museum experiences. Furthermore, I really liked involving children because for them, biodiversity is often a bit of an abstract concept, and it was nice to see that they can still engage with it in their own way. Many children knew a lot about their own pets, for example.

Bakker-van Bezu: Some time ago, I spoke with someone who had researched sustainability as a topic in exhibitions and concluded that when presenting this type of information, the exhibition should not appear too flashy or plastic, as that would undermine its message. We tested that assumption with our visitor research with Afdeling Buitengewone Zaken, and I was pleasantly surprised that the public did not seem to care about this very much. Another thing that resonated with me was that we always think the public will be bothered when we mention the biodiversity crisis in the museum, but this turned out to be unfounded. I was very pleased with this research because we have so many frames in our minds that we rarely test, and on which we base our decisions, and now it seems that things may be different from what we thought. Very interesting.

ABOUT MUSEUMS AND BIODIVERSITY

4. Biodiversity is fundamental to the continued existence of humans. What role do you envision for natural history museums? Can museums only raise awareness, or can they inspire individual action, or can they even facilitate systemic change to protect biodiversity? And how?

Besselink: A museum fostering systemic change seems quite complicated to me, but I believe that museums can provide action perspectives to help protect

biodiversity. If you learn about bees and flowers and why bees are so important, I think you would also be willing to buy bee hotels or something similar. I believe natural history museums can contribute to that. Additionally, they can indicate in exhibitions that people are responsible for accelerating the degradation of biodiversity. I find that an important theme. I hope that by touching visitors' hearts in an exhibition, it will inspire them to see the intrinsic value of nature. However, I don't like pointing fingers. Visitors come for a day out; they don't want to feel like they are in a classroom. I view the exhibitions as a foundation on which everyone should be able to find recognition and feel safe. The exhibition does not have to include all the messages for all visitors and school groups. Ideally, museums and school programmes should be well coordinated, and in that respect, the Education Department naturally has a greater role than exhibitions. In an exhibition, you can be happy when one message is clear, understood, and touches the public's heart.

Alexander: People in urban environments do not see themselves as part of nature. Urban societies are the largest consumers. While it may be fashionable to adopt a vegetarian lifestyle nowadays for environmental reasons, the countless city lights remain illuminated at night. People discard furniture that is not broken simply to purchase something more stylish, and they acquire new devices every few years due to their design for rapid obsolescence. The immense scale of consumerism in urban society contrasts with and impacts the inhabitants of the forests; this makes me very emotional. A museum can heighten visitors' awareness of this issue and encourage them to think differently.

Mensinga: Museums can enhance public awareness of biodiversity and broaden or deepen visitors' understanding, especially through (school) education programmes. However, I find it challenging to provide an action-oriented perspective. People, or societies, must address pollution —not just from plastic bottles but also from significant industrial sources. Nevertheless, as a museum, we don't want to take on an activist role, so we tend to stick to obvious points like 'don't waste food' and 'separate your paper waste'. This approach means museums are unlikely to introduce anything new or surprising. A while ago, an activist group visited a garden centre, placing new labels on flowerpots stating: 'This plant is full of insecticides and pesticides; don't buy it'. While this action frustrated the garden centre, leading to reduced sales and a damaged reputation, it may have prompted them to reconsider their products and encouraged customers to choose organically grown plants or be more mindful in the future. However, that isn't the role of a museum. This illustrates my concern

with the action perspective —either we are not surprising at all, or if we aim to be surprising, we risk becoming activists in our quest to make a difference. Of course, by choosing what you communicate, you indirectly influence, so in that sense, museums do play a role. But personally, I don't think museums should be explicitly activist.

Van Draanen: Foremost, it is important to explain what biodiversity is and how significant the problem is. I believe many people are unaware of this or have a very limited understanding of it. I think people genuinely want to know what happens when they spray poison on their lawn, feed birds in winter, or throw tiles in their gardens or remove them. It is crucial to clarify what biodiversity is and what it does; this is a vital role of a museum. In exhibitions, natural history museums can also offer an action perspective by asking questions and facilitating conversations about how individuals can contribute to the preservation of biodiversity. The boundary between informing and activating lies in the fact that museums should not prescribe how to act and behave; that responsibility falls to each individual. A museum can show what happens when spraying poison on a lawn, but it should refrain from stating an opinion, such as 'it is bad', because that does not provide any useful information. When the museum illustrates which animals die due to lawn treatment, visitors can learn and draw their own conclusions on how to act. Another example is that it is informative to display extinct animals and explain the human impact on species. However, a museum should not express the opinion that when we all stop eating meat, we can save the world. And regarding driving systemic change, Naturalis can contribute to political discourse because it hosts many researchers who can provide substantive information in important venues. However, I don't view a museum as a political actor demonstrating with banners.

Mota de Oliveira: I think natural history museums play a crucial role in educating society about research in general, particularly research that illustrates the human relationship with biodiversity. People often perceive biodiversity as something external to them, but in reality, they are an integral part of it. Exhibitions serve as a bridge between researchers and the public. Scientific literature can feel distant from everyday life. Exhibitions act as a window that reveals the knowledge being produced. I believe the museum's role is primarily to inform in a responsible manner. This also includes informing about potential actions. However, it is not the museum's responsibility to activate individuals, as the ultimate decision lies with each person. I feel that people's power resides in their votes and their choice of government.

Bakker-van Bezu: You can never really measure whether people genuinely change their behaviour after visiting an exhibition. Moreover, it is challenging to identify the exact origins of a behaviour change –whether it was influenced by what they encountered on their way to the museum or by events afterwards. An exhibition provides a context in which people can shift their frame of mind. It's not about processing a group of visitors through the sausage maker and then producing the same sausage each time. I recently came across a compelling metaphor for this. If you drop one grain of rice onto a pile of rice, the pile shifts a little, nearly impossible to see. If you repeat this, the pile shifts again. Eventually, one grain of rice may suddenly trigger an avalanche. An exhibition is like that grain of rice; you never know what state your visitor is in when it drops. It may cause an invisible shift, and you need more grains of rice to truly make a difference for someone, or it may be that one grain that causes the avalanche, inspiring the visitor to influence others and create a ripple effect. What is so great about exhibitions is that you can truly immerse people in a kind of hyperreality, allowing you to powerfully fire that grain of rice onto that mountain, so to speak. Because an exhibition is experiential, sensory, and a shared memory, it is likely to impact people in some way.
When you see museum visitors as parts of a machine, one screw may not make a large difference. However, I was very inspired by Karen O'Brien's book You Matter More Than You Think, which introduces a different way of thinking about social change. She uses quantum physics to describe social change. In quantum science, there is entanglement, which allows one particle, or person, to have a much bigger impact than when viewed from a mechanical perspective. When I used to write a concept for an exhibition, I approached it quite mechanically: this is the exhibition, this is the message, these are the learning goals. But by considering an exhibition in this different way, we can explore how to maximise an entangled network to create the greatest possible ripple effect. It's a very abstract and complex approach, but there might be something to it!

5. Do you see opportunities to use the dead animals and plants that make up the natural history collection to tell stories about the biodiversity crisis? If so, how would you do this?

Besselink: That is very difficult. Naturalis' collections themselves already convey something about biodiversity and its loss, but that is mainly visible in data sets. It is quite a challenge to provide insight into this in an exhibition. I believe that showing stories about depletion should be achieved through design, small jokes,

or metaphors. A well-known metaphor for biodiversity is the game Jenga. You take one block out of the tower, and the whole tower collapses. Naturalis uses that metaphor in its email signature as well. However, how can you demonstrate a decrease in biodiversity from a collection or a single object? Many objects have been collected because of their scientific value and cannot be displayed due to exposure to light and other conditions. You might be able to work with insects, but I envision mostly cinematic solutions. For the Suriname exhibition, we are currently attempting to create an interactive experience that compares the diminishing sounds of frogs from decades past to today, inspired by Fragments of Extinction, an eco-acoustic artwork by David Monacchi that captures the sonic heritage of ecosystems. That is a powerful way to raise awareness of what we are losing in the current extinction wave. Still, that does not start with the collection. In an exhibition, it is often the other way around. You do not look at the collection and come up with a story; instead, it begins with a clear message, based on which you seek ways to convey that story, such as a collection, a sound, or a graphic expression. The collection is primarily used as an illustration of a story.

Alexander: Well, you should not kill animals to tell a story. However, the animals that are already part of the collection are treasures. Let them keep those and tell stories with them.

Van Draanen: Definitely! The extinct animals are a good example of what once existed and what is still present today. With the natural history collection, you can indicate when a species' IUCN status is threatened, which has not yet been addressed in Naturalis. It does not necessarily need to be specified on the exhibit labels; it is also possible to add this layer of information in a museum app, for example. Furthermore, the collection has the potential to tell stories. For example, the size and colour of bird species change due to their habitat in urban areas under the influence of selection pressure. That is a story that clearly illustrates how humans impact biodiversity, and collections are very suitable for demonstrating that.

Mota de Oliveira: The collection is where I believe it should start and end. Much of biodiversity research is based on natural history collections. Collections not only contribute to the results that science delivers, but also to discussions about how science is conducted. Not long ago, scientists would travel to tropical countries, take samples, and bring them home without sharing their findings with the place of origin. That is almost unthinkable now. Regarding the

collection's role in exhibitions, I would like to see more preserved plants! For instance, Naturalis has a herbarium with really nice handwritten notes on those sheets next to the plants that provide opportunities to explore the historical context.

Bakker-van Bezu: One of Naturalis' tropical botanists, Angelica Jaramillo, is currently researching how a museum collection can illustrate the phenomenon of shifting baselines. She views natural history collections as a preserved memory that society has lost. Her goal is to demonstrate how the Dutch landscape has been drastically altered and how Naturalis' collection can reconstruct biodiversity in specific areas across different time frames. This way, collections can reveal biodiversity loss. You may think, 'Oh, once there was a dodo'. But when you see the real dodo, you may realise that it's lost forever. And that is a powerful image.

6. Have you ever seen or worked on an exhibition —not at Naturalis— that focused specifically on biodiversity loss or other planetary crises, like climate change or pollution? What were the success factors there, and why? Or what aspects did not work well?

Besselink: I have not yet seen a good exhibition about it, except in art museums featuring works that engage the imagination. For example, Jan Fabre expresses certain topics using stuffed animals and insects. Taxidermists Sinke and Van Tongeren utilise natural history collections to shift perspectives. They employ a natural history collection to illustrate their message while adding a different layer. An object in itself? No. You must wrap the message around it.
Well, in fact, the exhibition The Call of the O'o at the Allard Pierson in Amsterdam recently featured a powerful story. You can supposedly hear the last call of the o'o, a sound recording of a bird that was the final member of its species, and its call was never answered. That is very powerful. The exhibition also displayed our quagga. I say our quagga, but of course, it is the quagga from Artis Zoo in Amsterdam that died in 1883. With the death of that individual, the entire species went extinct. The dodo is also a significant symbol of extinction caused by humans. You can use that to ponder what our current dodo is. Which animal is near extinction? And can we stop that? Can we still keep those ships from sailing off to Mauritius? That is what we are trying to explain in the Suriname exhibition. Leaving the kankantri in peace protects an entire ecosystem.

Figure A2-1. Naturalis' Quagga in Allard Pierson Museum's Call of the O'0 exhibition.

Mensinga: As a member of the Suriname exhibition project group, I visited an exhibition at Het Nieuwe Instituut in Rotterdam that showcased a historical account of the Brokopondo Reservoir in Suriname. This lake was created to generate electricity for the bauxite mining industry, resulting in the destruction of a significant portion of nature. It truly impressed me to see how powerful and dominant humans can be. The exhibition simply presented how it happened and what it meant for the people living in the affected area. I found it quite upsetting that these people —just to oversimplify— were happily living in charming little huts arranged in circles, forming a community with a central square where everyone belonged, and then suddenly, they were relocated to rows of houses lined up neatly next to each other. Awful. The individuals involved in the creation of the lake were not concerned with the people living in the forest; they were only focused on their wallets. So, that exhibition lingered with me.

Alexander: Biodiversity and climate issues are trending not only in museums but everywhere. It used to be standard to purchase items in a store and have them wrapped in a plastic bag with a beautiful design, but plastic bags are starting to vanish. I have seen a few exhibitions and artworks that address these topics, but nothing specific comes to mind at the moment.

Van Draanen: In Terra Maris, a very small museum in Zeeland, they recently had a lovely exhibition about various choices regarding material use, transportation, and similar topics. The interactive elements allowed you to try, feel, and touch things. I truly appreciated how they made different aspects visible with a minimal budget. You could learn that cotton clothing is not always superior to synthetic clothing. They also juxtaposed nature from many years ago with today's nature, utilising the natural history collection. That was quite beautiful. I also visited the Call of the O'o at the Allard Pierson, which I really liked. They presented history without bias, just as it was. It began with the Bible and later explored the history of classification. People had just been loyal to what was considered normal at the time. What stood out was an insightful video about how otters and sea urchins coexist in balance. Moreover, at the very end, there was a reflection space featuring stories of individuals working to support biodiversity. In this room, visitors were invited to contemplate and place a sticky note on the wall with their hopes and/or despair, to inspire and be inspired by others. I found that to be very impactful.

Figure XX Terra Maris
Photo: Daniel van Draanen

Mota de Oliveira: Of course, as a biologist, I enjoy visiting natural history museums. Last year, I visited one in Tahiti that was particularly interesting because it featured a mix of plants, animals, and anthropological and archaeological findings. By displaying everything together, it highlighted that people are part of the ecosystem. While there was no explicit message about biodiversity loss, the timeline you followed made the impact of humans on the animals and plants evident. The Society Islands archipelago formed only recently, with the first human inhabitants arriving around two thousand years ago. The second colonisation occurred with the French, who introduced new species that also affected the ecosystem's balance and dynamics. The exhibition helps to put that into perspective. Sometimes, people think that impacting the environment is an all-or-nothing scenario. I've observed this tendency in society as well; it quickly veers towards extremes. However, it doesn't have to be that way. There is a middle ground. That's why I appreciated this timeline. People arrived and altered the environment. If more people come and change it too much, problems will arise. We must coexist on this planet, so it's better to seek ways to integrate and have discussions about it. The exhibition was very well done, and it has lingered with me.
Another example is an open-air natural history museum in Manaus, Brazil, which is part of a park in the Amazon. They provide a lot of information on biodiversity loss, primarily through statistics. I believe that informing is important, and there are multiple ways to do that. Activating is somewhat more challenging. A nice way to achieve this, which I observed in Manaus, is to showcase successful conservation projects from around the world that respect Indigenous peoples. A combination of conservation without native populations is impossible; you don't want that. You don't want to displace people from their habitats to declare that you are now conserving the forests. Therefore, I think presenting good and successful initiatives may be an effective way to activate visitors.

Bakker-van Bezu: Well, not to pat myself on the back, but it worked well in the exhibition I created about the energy transition. It featured an exhibit on what individuals can do to contribute to the necessary change. The exhibit consisted of a scale, and visitors were given a yearly CO2 budget, representing half of what an average visitor would currently emit with their consumption. Several bags represented activities with their corresponding greenhouse gas emissions translated into relative weights. Visitors could then choose activities to hang on that scale and see how they were willing to spend their budget. If you choose a flight, you may not have enough budget left for new shoes. It received positive evaluations! The reason it worked well was that it included an action

perspective as a sub-theme of the exhibition's main narrative, rather than being an afterthought. This is much different from the Suriname exhibition, which is all about the various perspectives on the forest. Furthermore, we are not going to tell people who live in the forest how to treat their environment; that would be very inappropriate. Another exhibition I created that gave me the impression I could make a difference was for the Borneo Cultures Museum in Sarawak, Malaysia. It was a children's exhibition about the river. Three indicator species —a dragonfly, a fish, and a bird— were the visitors' River Guardians. In the end, after learning about the pollution in the river and what they can do against it, children could become River Guardians themselves.

Figure A2-3. Nemo exhibition Energy junkies - Photo New Scientist - Bob Bronshof

ABOUT THE SURINAME EXHIBITION

7. The Suriname exhibition shares stories of the forest. Did you spend your childhood in the forest? What does the forest mean to you?

Alexander: I was born and partly raised in a Maroon community in the forest. Until the age of 15, we had to go inland almost every season, where my mother lived permanently and had a small farmyard ['kostgrond']. Therefore, I know no other way than to go to the forest because you obtain your essentials from there. I am connected in that way, but also in the sense that I was raised with the idea that we are all part of nature, as are our guiding spirits. Furthermore, we are taught that we all come from a certain place. Sometimes we live in an urban area, but we often have to return to where we come from, so I hold that place in my heart.

Mota de Oliveira: I am from Brazil. Although I grew up in several cities, I always enjoyed being outdoors in the lush environment of the forest. As a child, I was very adventurous, and in the forest, you can experience all the adventures you can imagine. There is always the unexpected. One day you see it, the next day you don't. I miss that in the cultivated environment of the Netherlands. Thus, my connection with the forest began as a source of joy. Only later did I decide to become a biologist.

8. Which ingredients did you start with for the Suriname exhibition? What were the main objectives from the beginning?

Besselink: Actually, we had always wanted to create an exhibition about the Amazon. With 2025 marking the fiftieth anniversary of Suriname's independence, we transformed that idea into Suriname. It was initiated by Caroline Breunesse, then Director of Exhibitions at Naturalis, who desired an exhibition showcasing the beautiful nature of Suriname, giving visitors the feeling of being in the rainforest, with its captivating sounds and scents. I soon realised that it was not sufficient to display only that distant beauty. We discussed the forest's inhabitants and how they have long protected it, which inspired us about the ensouled nature and how the belief in enspirited nature can aid in forest protection. I found a Surinamese guest curator, consulted with many experts, for example, tropical botanist Tinde van Andel, who is an expert in this area, and gradually developed pillars for the exhibition that were more substantial than

merely the rainforest's beauty. Ninety-three per cent of Suriname is still forest, but it is disappearing rapidly, particularly due to capitalism and greed. So, that's an important message.
Of course, it helped that Naturalis has a large Surinamese collection and many scientists who work in Suriname. I had previously made three other Suriname exhibitions, which was an advantage. Furthermore, the current museum was sometimes criticised for showing too few plants, and for this exhibition, we could utilise the large economic botany collection to emphasise that aspect further…

Mensinga: The exhibition had several objectives. We needed to focus on plants, as that aspect of biodiversity is not as well represented as animals in the museum. We aimed to showcase Indigenous and Maroon perspectives alongside colonial history. Furthermore, as Naturalis anticipated a shift in its new strategic plan, we were asked to give a bit more attention to biodiversity than the current exhibitions do. So yes, biodiversity is important, but it is not the sole focus. Incorporating all those requirements in such a small space is challenging, especially when texts cannot exceed 35 words.

Bakker-van Bezu: The most important objective of the Suriname exhibition was to include multivocality. Naturalis, as a scientific institute, has always chosen a scientific perspective for its exhibitions. However, there are many more ways to view nature. We chose to highlight the perspectives of Indigenous communities and Maroons. Naturally, when discussing the Amazon forest, one inevitably addresses biodiversity loss and the colonial past. Nonetheless, these were not primary goals from the outset.

9. I understand that the Suriname exhibition is Naturalis' first exhibition to genuinely address the biodiversity crisis. How is this accomplished?

Besselink: No immediate attention is given to a global biodiversity crisis in the Suriname exhibition. It is inherent in the subjects we feature, such as gold and bauxite mining or logging, which cause a decline in biodiversity. The accumulation of messages makes you realise that the whole world is your forest, so you must be careful with the greed that comes at the expense of biodiversity and nature.

Mensinga: The exhibition's slogan is: 'If we care for the forest, the forest will care for us', conveying the message that the forest provides us with oxygen and

helps preserve biodiversity. While the exhibition does not explicitly mention the biodiversity crisis, it will address species loss by discussing issues such as gold mining and intensive logging. For instance, it will depict fish dying from mercury and cyanide contamination in the water.

Alexander: The people who believe that nature has a soul take good care of it. Naturalis, as a scientific research institute, has a different view of biodiversity. One of the agreements we made in the beginning, when I committed to working with Naturalis on the Suriname exhibition, was that even if the Maroons and Indigenous peoples of Suriname held a perspective that might conflict with the scientific viewpoint, it would still be included as long as both perspectives enhanced the conservation of biodiversity. For instance, when the forest inhabitants believe that a cayman possesses a spirit or a second life after death and, therefore, cannot be eaten, this illustrates their method of protecting nature. Despite Naturalis' otherwise strong emphasis on the scientific trustworthiness of its exhibitions, this non-scientific view will still be respected in the Suriname exhibition to encourage the public to recognise that there are multiple perspectives on protecting nature.

Van Draanen: The ambition to pay more attention to biodiversity did not arise in the initial plan for the Suriname exhibition because the new strategic plan had not yet been finalised. It was only after working on the exhibition for a few months that I learned about this shift in ambition. I made an effort to connect this to the exhibition by asking myself where biodiversity was actually incorporated and discussing this with the project group. As far as I understand, at this point, there will only be three exhibits that mention biodiversity loss. The exhibit featuring the anaconda addresses how reverence for nature can help conserve it. However, according to the IUCN Red List, the anaconda's status is Least Concern. This is comparable to deciding that you will no longer shoot pigeons here to protect the species. Not a very strong story, in my opinion. The exhibit that discusses the fish dying due to gold mining seems to lack depth. The only exhibit that will genuinely feature biodiversity loss is the one with the jaguar. Its status is Near Threatened, and the exhibit will mention the conservation of forests and ecosystems.

10. What opportunities do you see for engaging the public with the biodiversity crisis through the Suriname exhibition?

Mota de Oliveira: While helping my daughter with her geography homework, I read a sentence in her book about the economy: the more countries develop, the greater the inequality. I realised the sentence is true, but it's not good. Development is economic growth, and it is crazy that we just accept this. We should be aware of how damaging it is because it creates differences in the social field and consumes many natural resources. So maybe a nice aspect for the exhibition would be to encourage people to think about the quality of life. If we learn that development should focus on social equality and biodiversity preservation instead of growth, then perhaps economic thinking could change. The economy is an enormous power, for example, in the Amazon, where intensive logging makes way for soy to feed our livestock. However, the economy could also prioritise life and quality of life.
Another interesting aspect of the Suriname exhibition is that many scientists in this building have valuable insights about tropical flora and fauna. Perhaps the additional programming could better highlight these scientists, enhancing the public's understanding of how they contribute to preserving biodiversity… I would love to be involved in something like that!

Van Draanen: I promoted the idea of explaining what biodiversity is in the exhibition and demonstrating a good example of an ecosystem with the kankantri, so that visitors can better understand the effects of disrupting ecosystems, for instance, by removing a species or cutting down a tree. I discovered that the kankantri is, nevertheless, a poor choice to illustrate this story because the tree spreads pollen and consequently attracts fewer animals than a fruit-bearing tree like the Brazil nut. The Brazil nut tree requires a very specific ecosystem to grow; the tree is economically valuable and is also considered an important forest tree in the Surinamese jungle. However, this has not been incorporated into the exhibition. Ecosystems will nevertheless play a pivotal role in our education programme.
Another suggestion I made was to display the IUCN status of the featured specimens, but that too was not included because it does not align with the core message of the exhibition. Research into the status of Suriname's flora and fauna is, in fact, very limited, and the scope of the problem may be greater than the number of threatened species currently indicated in the Red List. However, the Amazon Conservation Team and the Green Heritage Fund are conducting

research on certain species and their occurrences, such as the giant otter. I am curious about what the Maroons and Indigenous people know regarding threatened species. There used to be some hunting in the forest for the inhabitants to be self-sufficient. Now, increased contact with the outside world, and thus with capitalism, has led to demand-oriented hunting for the market on a scale that is no longer balanced. Another problem is that larger gold companies expropriate land, which ensures that the locals can no longer be self-sufficient in their own environment, resulting in their need to make a living through (illegal) gold mining. This has an enormous impact. Maybe the Maroons and Indigenous peoples believe the kankantri is sacred, and they don't cut it, but they do cut down other trees, so I am not so sure about the exhibition's motto that if you believe in ensouled nature, you are automatically a protector of all of nature. The link between social aspects and nature conservation, in my opinion, would be very interesting, but it is not emphasised much in the exhibition.

11. The Surinamese forest presents numerous starting points for discussing ecology and biodiversity. The kankantri is central to the exhibition, while a tree like the Brazil nut supports a larger ecosystem because it bears fruit and is much more sensitive to ecosystem damage.

Figure A2-4. Kankantri, or kapok tree, Ceiba pentandra (iStockphoto: Paralaxis).

Why was the kankantri, or kapok tree (Ceiba pentandra) chosen as the protagonist of the exhibition?

Besselink: That relates to the Maroon and Indigenous perspectives on ensouled nature. Both groups view the kankantri as a sacred tree, making it highly protected. The tree hosts several forest spirits that prefer not to be disturbed. The kankantri remains truly undisturbed in the forest. Additionally, I have observed that some people from the Indigenous communities outside the forest regard it almost like a temple, around which various rituals are performed. This signifies that the tree is deeply respected.

12. The Suriname exhibition will not provide a direct call for action for its visitors. Instead, it focuses on raising awareness about connectedness and responsibility. Why this choice?

Besselink: It relates to me as an exhibition maker. My exhibitions usually blend collection and experience, allowing you to pick up messages voluntarily. You could also create a different type of exhibition; for example, a science centre might choose to include more interactive elements. However, that is not really my style of exhibition. To me, the overarching message –that we are all connected and everything is interrelated– is important. I have woven that message into the exhibitions Life, Death, Evolution, and now again in the exhibition about Suriname. Someone else will create another exhibition with a more action-oriented perspective. I see it this way: this exhibition offers many opportunities for education to build upon, and for our LiveScience peripheral programming, such as lectures and so on.

Mensinga: In the project team, we've had countless discussions about the level of activating the museum visitors. It feels inappropriate to state in the exhibition: 'stop logging and mining for gold because it damages biodiversity', especially when focusing on Suriname. Who are we to say that? Particularly since we –from the West, the ones obsessed with money– have disrupted their society. People living in the forest didn't even have a concept of 'possession'. In this exhibition, we give Maroons and Indigenous peoples a platform, highlighting their efforts to live in harmony with nature, which is crucial for biodiversity conservation. They take resources from the forest but never more than necessary. They refrain from certain consumption when they sense it's not the right time, either because young are being born or because they recognise, they have taken too much

and now see the negative impacts on nature. We in the West —in the city— remain unaware that buying sneakers may harm the world; we only realise that they will make us look cool at school. Those living in the forest perceive these changes directly; that is why they strive to maintain balance. The exhibition seeks to educate visitors indirectly: there are people who consume less when nature is suffering. We do not say 'this is how you should live', but we provide a different perspective for reflection. It's more abstract, focusing on creating awareness of other viewpoints, which I believe ultimately enriches the conversation about biodiversity.

Alexander: The planetary crisis impacts the entire world; we should not focus on a specific problem or blame individuals. Instead of presenting thresholds for the biodiversity crisis, I hope the exhibition will allow visitors to feel and experience the forest, enhancing their understanding of how the forest provides sustenance for all its inhabitants, including humans and animals. I believe the idea that 'caring for the forest means the forest will care for you' embodies the spiritual perspective of avoiding interference with certain species. Humans are part of the ecosystem; not only are plants and animals at risk, but humans are too. While humans may have become a nuisance to nature due to their capitalist tendency to take more than necessary, they still exist within the ecological web. If humans were to become extinct, it would also disrupt the balance of nature in some areas.

Bakker-van Bezu: I haven't seen a good example yet where action perspective doesn't become bland in an exhibition and where you do not repeat what can already be found everywhere. I think an exhibition can be engaging in terms of its story, but then you must ask yourself afterwards, what can I do? In the Suriname exhibition, this is done in a poetic way. The message is 'we are lost, we must find our way back', which of course translates to the planet, not just Suriname. However, visitors will need to make that connection themselves. Nevertheless, Naturalis' exhibitions are always part of a broader programme, including education and peripheral activities. I believe action perspective fits those programmes better than the exhibition.

13. What roles have biologists and ecologists played in developing the content? Did you primarily consult them for specific questions, or did they also contribute to the narrative that Naturalis aims to promote about Suriname from the very beginning?

Besselink: I usually develop a substantive concept first, and then I add the content, not the other way around. Of course, it's important to know something, but it starts with that idea. The content does not ultimately create the concept. If the idea is strong and you can envision a storyline, then the content naturally fits in, and you can seek out the researchers who can provide that content. For example, Tinde van Andel has played a significant role in shaping the story.

14. The stakeholders most affected by the biodiversity crisis —namely, nature and future generations— were not directly consulted during the development of the Suriname exhibition. For instance, children's contributions could have been sought, or an empty chair could have been placed in meetings to symbolise Nature's voice. How have you nonetheless considered these stakeholders?

Mensinga: Honestly? No. I wonder what you hoped children would contribute to a subject such as biodiversity. What I personally regret is that we had an advisory group of seven people, most of whom were of Surinamese descent. All were highly educated. At the Maritime Museum, we had similar advisory groups, but they always included different perspectives, such as a dock worker with basic education. Highly educated people speak and perceive differently. I haven't missed input from children as much, though it might have been nice, and I did use their input in previous exhibitions. However, I would rather have heard from less educated individuals.

Alexander: I come from a Maroon community that believes everything we do must benefit our offspring. We believe that humans are part of the ecosystem and that our children will continue the world. When humanity goes extinct, biodiversity will also be out of balance. Consider your ancestors from a thousand years ago; they collected seeds, saved them for the next spring, and sowed them. As a result, birds were able to eat the grains, and some animals now even depend on humans. When you study communities that truly live in nature, you see they are genuinely part of it. However, this does not apply to urban societies; they do not give; they only consume. Humanity consumes too much now; we have become a plague. But essentially, we are part of the ecology.
Should we include children in the development of the exhibition? I had an assignment that I approached with skill and expertise. How do local communities in the Surinamese forest experience spirituality? My aim was to discover the source of this knowledge. Spirituality is not an easy topic, which

is why I spoke to elderly individuals who understand nature. We create an exhibition for families, not just for children, and that involves upbringing. Those with more years possess greater wisdom and are therefore better suited to impart their knowledge of nature to the younger generation rather than the other way around, especially regarding spiritual aspects. You can check with children if your ideas resonate; for instance, in a game, ask them how they experience it and allow them to express themselves.
As a creator –that is the artistic person in me– you are in a process. I have a clear vision about this. But if you remain in your cocoon, you don't grow. Now that you ask me this question, I find myself wondering if I have considered this enough.
I noticed that the mothers in our team were always thinking about what their children would think of what we were making. It is important to consider the child's perspective. Probably, it is primarily a role for the Education Department, and I believe they are making good progress with that challenge.

Van Draanen: I see children as the most important group anyway. They are the ones to whom the world will soon belong. My hope was, from the beginning, that the exhibition would include many engaging activities for children to do and learn. However, that is limited to a few elements.

15. What is your favourite exhibit in the Suriname exhibition so far?

Mensinga: Well, I really hope my jaguar idea will work. Visitors' shadows are projected on a wall; the real visitors, so it can also be someone in a wheelchair. Their shadow gradually transforms into a jaguar. I hope it's affordable because it is highly effective and inclusive. Another thing I like is the herbarium sheets. Here at the institution, they're often considered brown and uninteresting, while I genuinely enjoy those pressed leaves with those pieces of tape on them. For me, there's a kind of Peter Greenaway aesthetic in them. I once said in a meeting, 'these five sheets look gorgeous; can't we display them all?' So, that's my contribution to the exhibition [giggles]!

Alexander: I prefer to keep that answer to myself. Imagine if I say something now, and in the end, it is not included… Everything we have done has been done with dedication. Currently, I am discussing all the exhibits with people. I ensure that what we are proposing and saying is genuinely true. I maintain the same commitment to all exhibits. Of course, some are more comfortable than others, but it is a learning process for me to delve into, and it helps me grow.

Van Draanen: Of course, some of the usual suspects are simply beautiful, such as the Pipa pipa and Merian's book. However, I tend to favour the underdogs, so I really appreciate that the leaf-cutter ant and the fungal garden may be included. That group is often underrepresented, which I find appealing. Furthermore, the ecologist in Suriname sent some fascinating photos of animals that live on and around the kankantri, such as swallows that build nests from kapok, feathers, and their own saliva, which I adore. Additionally, the Ceiba Borer, the Euchroma giganteum, is a beetle featured in Merian's book and is incredibly beautiful. Unfortunately, neither will be included in the exhibition, but that beetle would be my absolute favourite.
I would like to add that I prefer to see a good representation of nature in an exhibition. The cuddly, furry animals we all adore are merely a small part of vertebrates, which are a subset of the phylum Chordata and the kingdom Animalia. Animals represent just a fraction of life, as life also encompasses plants, fungi, bacteria, and more. The animal kingdom contains some 35 phyla. For instance, insects, which constitute over half of all animal species, belong to the phylum Arthropoda. Many phyla are rarely mentioned at all. For example, our contact in Suriname discovered a velvet worm, which is just great because the phylum Onychophora is seldom acknowledged. Understanding species enhances our appreciation of nature. When you recognise four or five species of birds or trees, you begin to cultivate an interest and can comprehend when something deviates from the norm.

Figure A2-5. Ceiba Borer, the Euchroma giganteum - Photo Bits & Bugs

16. Has working on this exhibition given you insights or new knowledge about the human impact on biodiversity?

Mensinga: No. But, well, secretly, I am highly educated, and I also have a husband who talks about this stuff all day… So, naturally, I read articles about it, and I have developed a genuine interest in adopting a responsible attitude. I understand how everything is connected in ecosystems; it can cause a domino effect. I didn't learn anything new. Such a shame! [Giggles.]

Alexander: I have discovered that what is taken for granted while growing up in the forest is not apparent to others. Maroons refer to whatever grows in their farmyard as 'herbs' [in Dutch: kruiden], while the Dutch label what they do not eat as 'weeds' [in Dutch: onkruid, or 'un-herbs']. The Dutch weed them, whereas for Maroons, every plant has its purpose. While I worked at Naturalis, I encountered some of the weeds in the natural history collection. Now, I view those plants in my farmyard differently: I pay more attention to the question of why they grow there and what their function is, and I consider taking a picture before weeding them to capture the fact that they have grown in my garden. However, the biggest takeaway from working on this exhibition so far has been my growing awareness that humans are an indispensable part of ecosystems.

Besselink: I do not delve very deeply into ecology because it is so specific. There are ecosystems within ecosystems, then what are you going to focus on? I prefer the big story and the big gestures.

Van Draanen: Well, I found it shocking to hear that nearly all rivers in Suriname are polluted due to gold mining, even as far as Paramaribo, and that mercury can be found even in the hair of the Maroons.

ABOUT THE PROCESS

17. What happens after the exhibition is delivered? Will Naturalis reflect on its original ambitions compared to the outcomes that were realised at the end of the process?

Besselink: Ideally, you would always want to get together afterwards to reflect on what has been good and what has not. However, you are usually overtaken by the next assignment. Currently, many Indigenous communities try to convey that they have always cared for the forest, that they are not part of the destruction, but they do pay the price. I hope this exhibition is not an 'alien snack' that introduces their perspective on biodiversity, which will be forgotten after the exhibition closes. My recommendation for future exhibitions is to continue including these different perspectives. Also, listen to Extinction Rebellion and take advantage of it. Different perspectives often do not conflict with the scientific view; it is mainly a matter of mutual understanding. You have to listen differently. For example, Naturalis researcher Menno Reemer specialises in hoverflies and has researched them in Suriname. Then Tolin Alexander said,

I don't know that animal, what is it? But when you show him an image, he says, oh, yes, of course I know that! Listening to each other is the most important ingredient to include in future processes here at Naturalis.

Mensinga: I don't know about Naturalis' evaluation process specifically. Many museums have good intentions, but daily demands often cause evaluation to fall by the wayside. I'm sure it's built into the process here, but I can't say if it's strictly followed. At the Maritime Museum, we were required to submit evaluations to the management board. However, the evaluations I completed there were mostly valuable for internal processes rather than for assessing the actual quality of exhibition content. The issue is that, although you work with a team, there is only one content developer who essentially evaluates themselves. My historian at the Maritime Museum might say that these are the six most important ships. During the evaluation, the other team members don't suddenly develop a different opinion about that, so I don't recall ever truly evaluating the content. Instead, you assess visitor flow or accessibility, or whether the client —in Naturalis' case, the steering group or, at the Maritime Museum, the management— has formulated clear questions or changed their minds repeatedly throughout the process. There's much to evaluate in that regard, which allows you to refine your organisation's processes. But when it comes to content, there's very little evaluation. The research that usually gets done —which I always find unfortunate— consists of visitor surveys that report things like toilets scoring a seven and biscuits in the bar scoring a six. The exhibitions typically receive some form of score or rating as well. This creates a sense of 'this exhibition performed better with our audience than that exhibition', but as an exhibition-maker, I never know what caused that. I am unsure if they simply like the topic, specifically enjoy the interactive games, or are enthusiastic because the texts are beautifully written. We spend money on this, so I have previously asked if we could conduct –for example– ten in-depth qualitative interviews instead of many general questionnaires. Ten is very few, but if nine people say the same thing, it might still hold some value. However, I've never received that kind of feedback, although I'd find it very interesting as an exhibition-maker. What one should actually do as an exhibition-maker is spend more time in the exhibition itself. Unfortunately, often, you're already consumed by the next project.

Bakker-van Bezu: The project manager usually organises an evaluation to document everything that went well and wrong, as well as what we have learned. This information is shared within the department and with departments that include members from the project team. It addresses both process and content,

but there is no visitor survey associated with it. Thus, it focuses on the lessons about the content that you have learned personally, rather than on how it is perceived by visitors. Conducting visitor surveys would be interesting.

18. Do you have accountability to sponsors or stakeholders in terms of sustainability goals within the exhibitions?

Mensinga: We apply for funding, and the Communication and Partnerships Department will ensure accountability when the time comes. We, the project group, provide input for that.

Bakker-van Bezu: While our sponsors and stakeholders do not require sustainability, we have implemented sustainability goals within the organisation. For instance, we have an agreement with three construction companies that will build our exhibitions over the next few years, and we established sustainability requirements during the tender process.

19. You are closely involved in a subsequent exhibition on the importance of biodiversity. How will the knowledge gained in this Suriname exhibition, such as multivocality, be considered in the future?

Bakker-van Bezu: I do not know whether we will incorporate many lessons from the Suriname exhibition into the new exhibition because it has a completely different approach. The Suriname exhibition is more cultural-historical, as it focuses on the perspectives of Indigenous communities and Maroons. The idea, or at least my idea, for the biodiversity exhibition currently in development is that no matter who you are or what your background may be, after visiting that exhibition, you can no longer be indifferent to biodiversity loss. That must be abundantly clear. My heart beats for the notion of continuously considering various perspectives to view the world alongside the scientific view. However, in the new exhibition, because of its different concept, it will not be as explicit as in the Suriname exhibition.

Appendix 3.

Analyses of Naturalis' nine permanent exhibitions

Introduction

The analysis of all Naturalis' permanent exhibitions aimed to reveal how Naturalis currently engages its museum visitors with the human impact on biodiversity loss. The researcher visited all exhibitions, studied all exhibits and read all the text panels and labels. Any mention or visualisation of the human-nature relationship or any type of environmental problem or crisis was taken into consideration. The analysis focused on exhibits and their accompanying information that can be viewed independently, without the need for a docent, an audio guide or an app. When a 'hit' appeared, a picture was taken of the exhibit or specimen and its label. The (relevant part of the) identified text is cited and sometimes interpreted in the analyses.

The museum galleries are accessible by stairs or elevator. When taking the elevator, visitors will most likely choose topics that interest them most. Visitors taking the stairs will pass by the galleries in the following order: Life, Earth, Dinosaurs, Ice Age, Early Humans, Evolution, Seduction, Death, and finally, LiveScience. The following description presents the galleries in alphabetical order, which is not representative of visitor numbers.

Figure A3-1. Exhibition Death: an exhibit about extinction, with the dodo.

Figure A3-2. Exhibition Death

Death

Death is an exhibition that seeks to illuminate the fact that life cannot exist without death, as death creates space for new life to emerge. This exhibition is filled with natural history specimens and is designed as a labyrinth, symbolising the mysterious and unpredictable nature of death. It features a dark, theatrical room showcasing eleven references to the human impact on life, primarily regarding the human-nature relationship. While animals killed in car accidents or by pest treatments do not necessarily mean that the species becomes endangered, the exhibition ultimately leads visitors to realise that humans are responsible for more deaths than other species. However, one is left pondering what to do with that information.

Immediately upon entering the exhibition, a printed tyre mark on the floor leads to a killed fallow deer, suggesting a traffic accident, which sets the tone of the exhibition: humans are responsible for the death of other species. The deer is not behind glass; visitors can come very close and even touch it, creating an intimate setting, as if they caused the accident themselves. The label does not mention anything; however, the image speaks for itself.

Dino and dodo:
'There is even a shelf life for entire species. Around 99.9% of all species that ever existed are in fact now extinct. Extinction is a natural phenomenon. However, the process is sometimes hugely accelerated by human interaction.'

Dodo
'Right now many species of plants and animals are on the verge of extinction. It seems like we are in the middle of another wave of extinction but this time caused by humans. The dodo has become the icon for the extinction of species due to human intervention. This bird died out when humans interfered with its environment. Which animal is next on the list?'
> This label seems inappropriately modest in a time when many animals go extinct every day due to human causes.

Fur coat
'Coat made from the fur of around 40 - at one time alive and kicking - mink.'

Blood coral
'Coral is made up of an entire colony of tiny sea creatures. In the past, the skeletons of blood coral were used for making jewellery. The blood coral was harvested while still alive. This is no longer allowed.'

Red squirrel
'The red squirrel wears out very quickly. Its fast metabolism and relatively high body temperature require a great deal of energy. As a result, squirrels only live to the age of seven years. In fact, many die at an even younger age due to predation, illness or as the victims of a road traffic accident.'
>This does not mention human impact on biodiversity, it is about human-nature relationship.

Protection against the living
'In a museum, we protect dead animals against their living counterparts. They are mounted, dried or stored in alcohol. We wage a never-ending war on fungi and bacteria. And against museum beetles, who love the bones and hair of prepared animals.'
>This does not mention human impact on biodiversity, it is about human-nature relationship. However, it is an interesting notion of the museum's role on animal killings.

Bumper stickers
'Every year, billions of insects are killed on the roads in the Netherlands. By regularly logging data of this kind, researchers are able to monitor approximate numbers of insects living in the Netherlands. A fall in the number of insects could have a huge influence on nature; 80% of wild plants and 60% of birds are dependent on insects for their continued existence.'
>This is the most explicit label highlighting the human impact on other life.

Run chicken, run
'In the Netherlands we eat around 75 kg of meat per head of the population, every year. Of that total, more than 22 kg is poultry.'
>This does not mention human impact on biodiversity, it is about human consumption.

Pests
'An animal that is described as a pest is viewed as harmful, problematic and undesirable. As a rule, pests do not die a natural death.'
>This does not mention human impact on biodiversity, it is about human-nature relationship.

Fatal collision
'In 2005, the cinereous vulture Carmen spent four months in the vicinity of the Oostvaardersplassen nature reserve, as a vagrant in the area. Unfortunately, her life came to an end following a collision with the train travelling between Almere and Lelystad.'
>This does not mention human impact on biodiversity, it is about human-nature relationship.

Man versus animal
'Seabirds run a serious risk of succumbing to oil pollution at sea. The oil causes their feathers to stick together, destroying the insulating effect. As a result, the birds suffer hypothermia and die.'

Hunter or prey?
'The arch enemy of the tarantula is the spider wasp. This wasp paralyses the spider with its sting, and then drags it off as a live food store, for its larvae.'
>Would spider wasps be greater enemies than humans?

Figure A3-3. Exhibition Death, exhibit Fatal Collission

Dinosaur Era & Rexperience

No mention of human impact on biodiversity.

Figure A3-4. Exhibition Dinosaur Era

Early Humans

No mention of human impact on biodiversity.

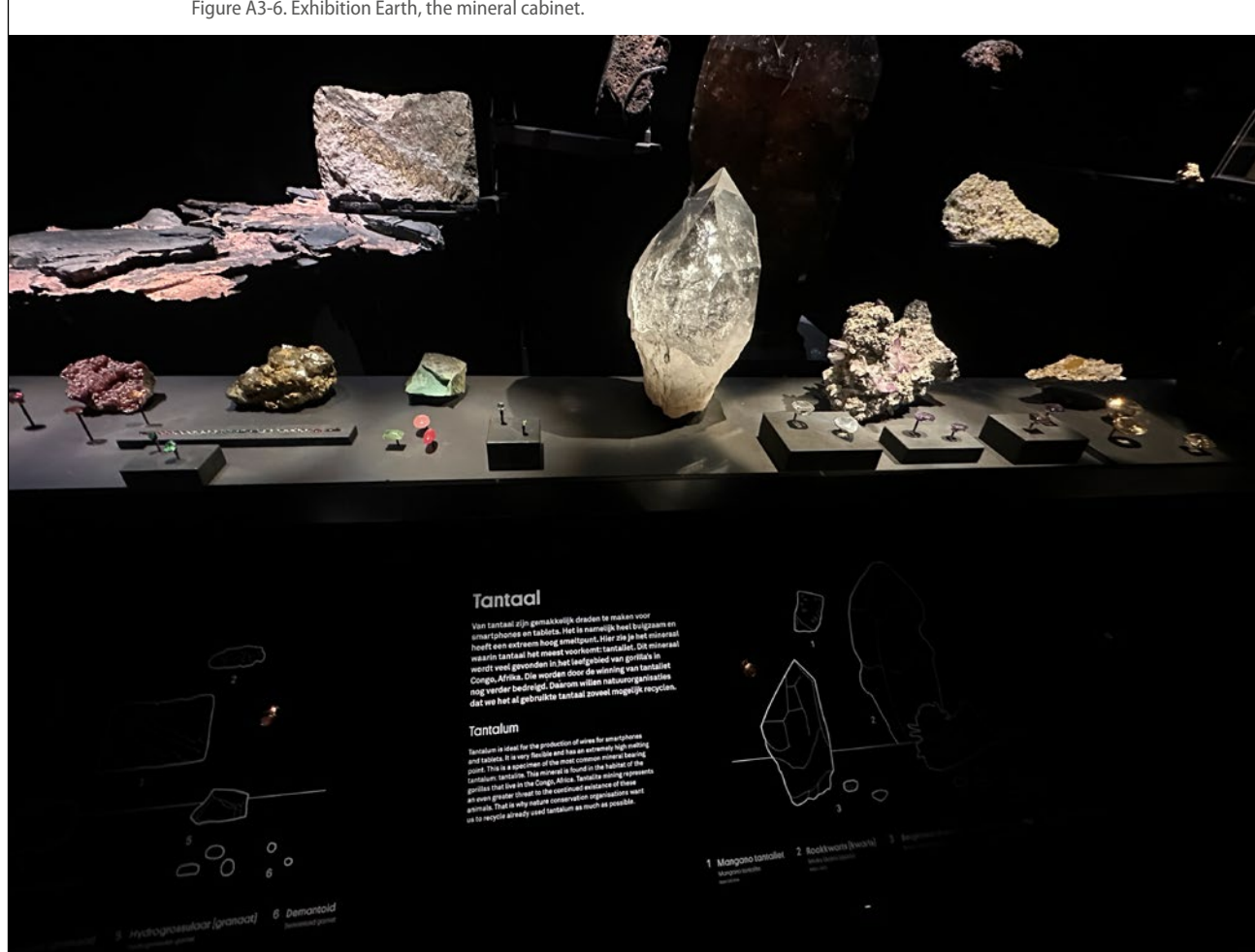
Figure A3-5. Exhibition Early Humans

Earth & Mineral Cabinet

The Earth gallery demonstrates the effects of plate tectonics: volcanic eruptions, earthquakes, and the movement of plates. No mention of human impact on biodiversity. In fact, it aims to show nature untouched by humans, although it does not include life.

The mineral cabinet mentions several applications for the displayed minerals. How aluminium is extracted from bauxite, and for what purpose, and the qualities and dangers of asbestos. One object label describes the human impact on biodiversity: 'Tantalum is ideal for the production of wires for smartphones and tablets. It is very flexible and has an extremely high melting point. This is a specimen of the most common mineral bearing tantalum: tantalite. This mineral is found in the habitat of the gorillas that live in the Congo, Africa. Tantalite mining represents an even greater threat to the continued existence of these animals. That is why nature conservation organisations want us to recycle already used tantalum as much as possible.'

Figure A3-6. Exhibition Earth, the mineral cabinet.



Evolution

The Evolution Gallery's entrance sign states: 'Evolution: we are family. Animals, plants, fungi… All life is interconnected. Because all life, past and present, is related through evolution: the process by which species emerge and adapt.' That this exhibition is about connections is made clear in various exhibits. It starts with a large rock of banded iron. When visitors touch the rock, a soundscape will appear as if there is an explosion (of life). A powerful tool to literally connect people to the origins of life. Other exhibits explain this in more detail: 'Do we descend from apes? Apes appear similar to humans. But do we descend from them? Modern-day apes are our cousins, not our ancestors. But we do share a common apelike ancestor.' And also: 'We share almost 99% of our DNA – our hereditary material – with the chimpanzee. But we also share 50% with bananas. Does that make bananas half human? A banana is just as complete as you are. Because we descend from the same ancestors, we share pieces of the same DNA, for example the so-called housekeeping genes that are responsible for the building and functioning of cells.' This may enhance the understanding of our place in the tree of life. Nevertheless, the exhibition does not mention the human impact on other life, despite some opportunities. Especially in the 'move your feet, lose your seat' exhibit, which shows the impact and opportunities of the previous extinction waves, would have been a quick win.

Figure A3-7. Exhibition Evolution

Struggle for life
Everything is a matter of survival and reproduction. But there is not enough food or space for everything and everyone. Only the best adapted organisms survive. They pass on their beneficial characteristics to their descendants.
>While it is not primarily about biodiversity loss, this gives the impression that it is the species' 'own fault' if they do not survive.

Move your feet, lose your seat
Species have a shelf life. Around 99.9% of all species that ever existed have already become extinct. However, they have given way to other species.
>This label gives the impression that it does not matter if species go extinct.

Between two waves of extinction
The Earth has been hit by several waves of extinction. The largest extinction wave was the Permian-Triassic extinction, around 251 million years ago. Volcanic eruptions caused a decline in the oxygen content of the air, wiping out 90% of all life on Earth. Some of the ancestors of the dinosaurs survived this period. As did the ancestors of the mammals.
>Remarkable that it does not mention the current extinction wave, caused by humans.

The dino age
Dinosaurs gradually occupied so many niches that they became the dominant group. For more than 160 million years, they were the most successful vertebrate animals on Earth. Their reign was ended by a meteorite. All non-avian dinosaurs disappeared during the Cretaceous-Paleogene boundary.

The mammal age
Mammals also developed between the two major waves of extinction. Some of them survived the Cretaceous-Paleogene boundary. It was not until the dinosaurs became extinct that the mammals succeeded in taking over their supremacy. Without the extinction of the dinosaurs, you would not be here either.
>Missed opportunity: now humans are the new meteorite, killing lots of life.

Ice Age

The Ice Age gallery introduces the Dutch prehistoric 'Big Five', in a room with a giant scale model of the Netherlands of 30,000 years ago, surrounded by hundreds of fossils of the woolly mammoth, the woolly rhinoceros, the steppe bison, the cave lion, and the cave hyena. There is no mention of human impact on biodiversity in the labels. However, some viewers depict life in the Netherlands during the Ice Age with small animations of animals moving through the landscape, only to suddenly switch to contemporary landscapes featuring highways and cities. This creates an experiential narrative of human impact on the landscape.

Remarkable: Of the mammoth, the steppe bison, woolly rhinoceros, cave hyena, cave lion, brown bear, wolf, horse, reindeer, alpine marmot, ground squirrels, wolverine white-tailed eagle, barnacle goose, greylag goose, carrion crow, Atlantic samlon, dwarf birch and humans, it is not even mentioned if they are extinct or not.

Another missed opportunity: the section Hunt. 'Hunting uses up a great deal of energy, and not every hunt is a success. Hunters must decide whether it is worth making the effort to chase after their prey. Preparation is vital. Cave lions spent a great deal of their time observing the herds, above all focusing their attention on stray young, older or weaker animals. The menu of predators also included smaller animals such as ground squirrels, alpine marmots and geese. Self-caught or carrion; they could not afford to be choosy.' This would have been very easy to connect to the hunt by humans, and their (partial) role in the extinction of some animals.

Additionally, the Eemian label describes the warm climate. However, nothing is mentioned that the current climate is not a natural phenomenon, but rather one caused by humans, and it is occurring at a significantly faster rate than previous climate changes. The label: 'The warm period immediately preceding the last Ice Age is known as the Eemian. At the time it was a few degrees warmer in the Netherlands than is the case today. We can conclude this from the animals that lived here. Hippopotamus swam in the rivers and in the woodland along the riverbanks, straight-tusked elephants ate to their heart's content. The sea level was several metres higher than it is today, so parts of the Netherlands were under water.'

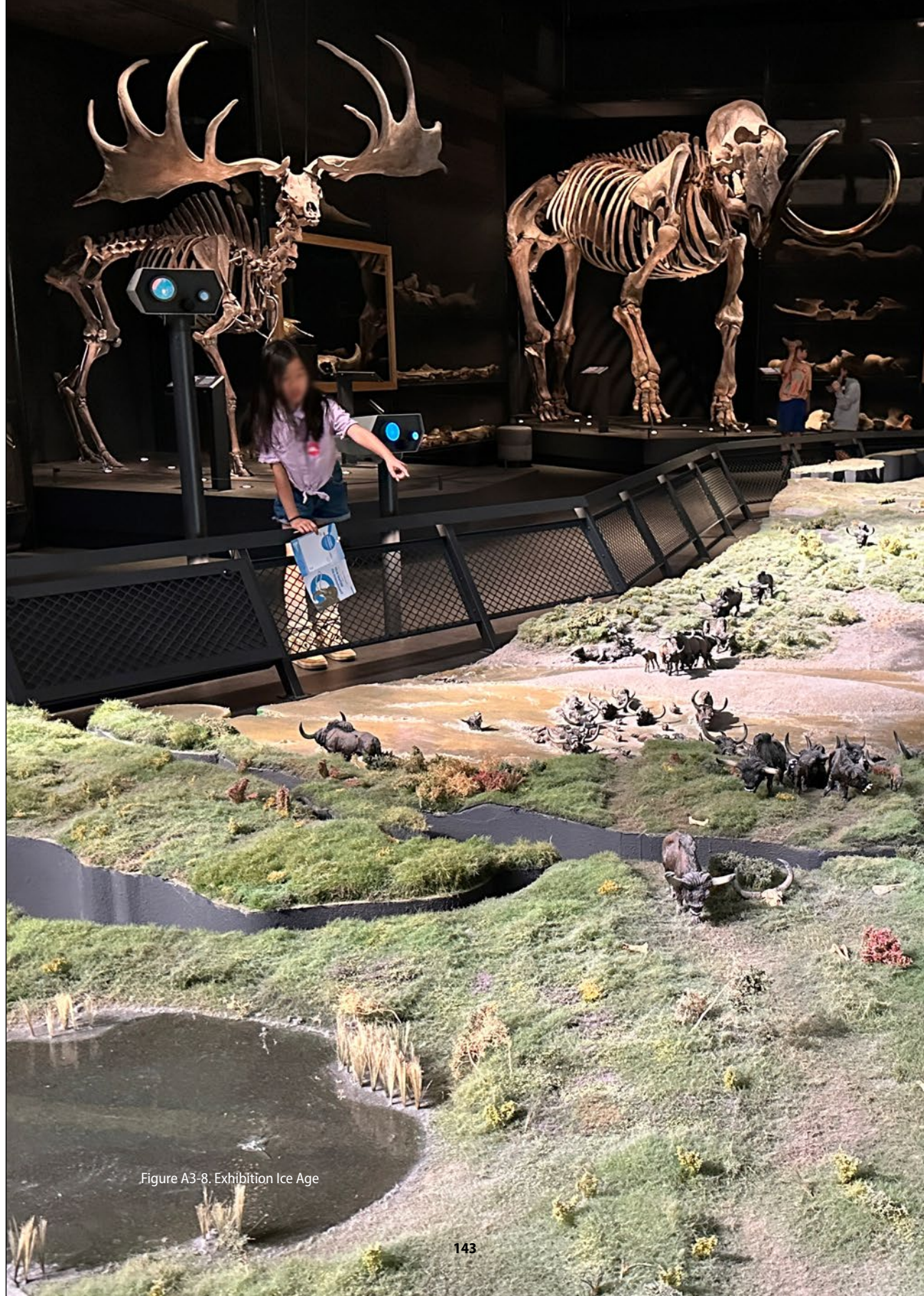


Figure A3-8. Exhibition Ice Age

Life

The entrance exhibition, Life, is among the most popular galleries. It celebrates the diversity of life in a theatrical setting. It starts with projections of deepwater hydrothermal vents, the source of life. It continues underwater and then climbs up to terrestrial habitats. However, it is not very clear how the animals are organised, by habitat, location of origin, or by genetic relatedness. According to the gallery introduction on Naturalis' website, the idea is that: 'part of our mission as the national institute for biodiversity is introducing you to the diversity of life. Trees, birds, insects, and whales all have their unique place in nature's grand design – as do we humans' (Naturalis Biodiversity Center, n.d.). Remarkably, it showcases only animals, the majority of which are vertebrates, excluding humans, consequently underlining the human-nature divide. The life portrayed in this gallery does not encompass other kingdoms, such as plants, fungi, or the smaller species. A more suitable title for this gallery could have been Animalia. The labels only display the species and specimen numbers; the gallery does not provide any additional information, despite showcasing species that are threatened, which would easily raise awareness of nature's vulnerability. A few large video screens on the walls above the dead animals display live animals in their natural habitats, although it is unclear how these videos relate to the exhibits. They make the specimens appear even more lifeless than they already are.

Figure A3-9. Exhibition Life

LiveScience

LiveScience is not an immersive exhibition gallery but an interactive space accessible to the public even without a museum ticket, where visitors can meet scientists in their natural habitat. It offers several exhibits that are updated more frequently than those in other galleries and includes mentions of the human impact on biodiversity.

Herman the bull
'It was the first bovine into whose cells a human gene was introduced. The aim was for his daughters to produce the anti-inflammatory agent lactoferrin, in their milk. However, the dose of this medicine in the milk was too low. Nonetheless, Herman the bull represents a milestone for science. […] He is still a subject of discussion. How far can we interfere with life?'

Bees under threat
'Historical collections provide knowledge for the future. This is demonstrated by the Dutch bees at Naturalis. The bees in the collection can be used to identify which species are currently under threat. The distribution of 330 wild bee species today was compared with the situation in our country in 1950. Individual citizens are increasingly helping to provide up-to-date information about species, for example, by counting bees in their garden as part of citizen science projects. Scientists use the data to understand what climate change means for bees, and much, much more. Are you interested in becoming involved in important Naturalis research work? Please ask about the possibilities.'
>This is a clear call for action, and it even gives an idea of what your contribution means.

Nest of thorns
This is a bird's nest, made using bird spikes. Researcher Auke-Florian Hiemstra could not believe his eyes when he came across this magpie's nest made from 1500 metal bird-deterrent spikes. The spikes were torn off the roof of the University Hospital in Antwerp by the magpies themselves. They even used them to build protective domes over their nests to prevent crows from stealing their eggs or young. In nature, birds use branches with thorns as a means of protection, but in the city, the spikes do the same job. The magpies in fact used the spikes precisely for their intended purpose: to scare away birds!

Global warming stripes
One exhibit specifically addresses the human impact on biodiversity, although it lacks a collection item. It features climate change, showcasing a video about

Figure A3-10. LiveScience: Largest egg

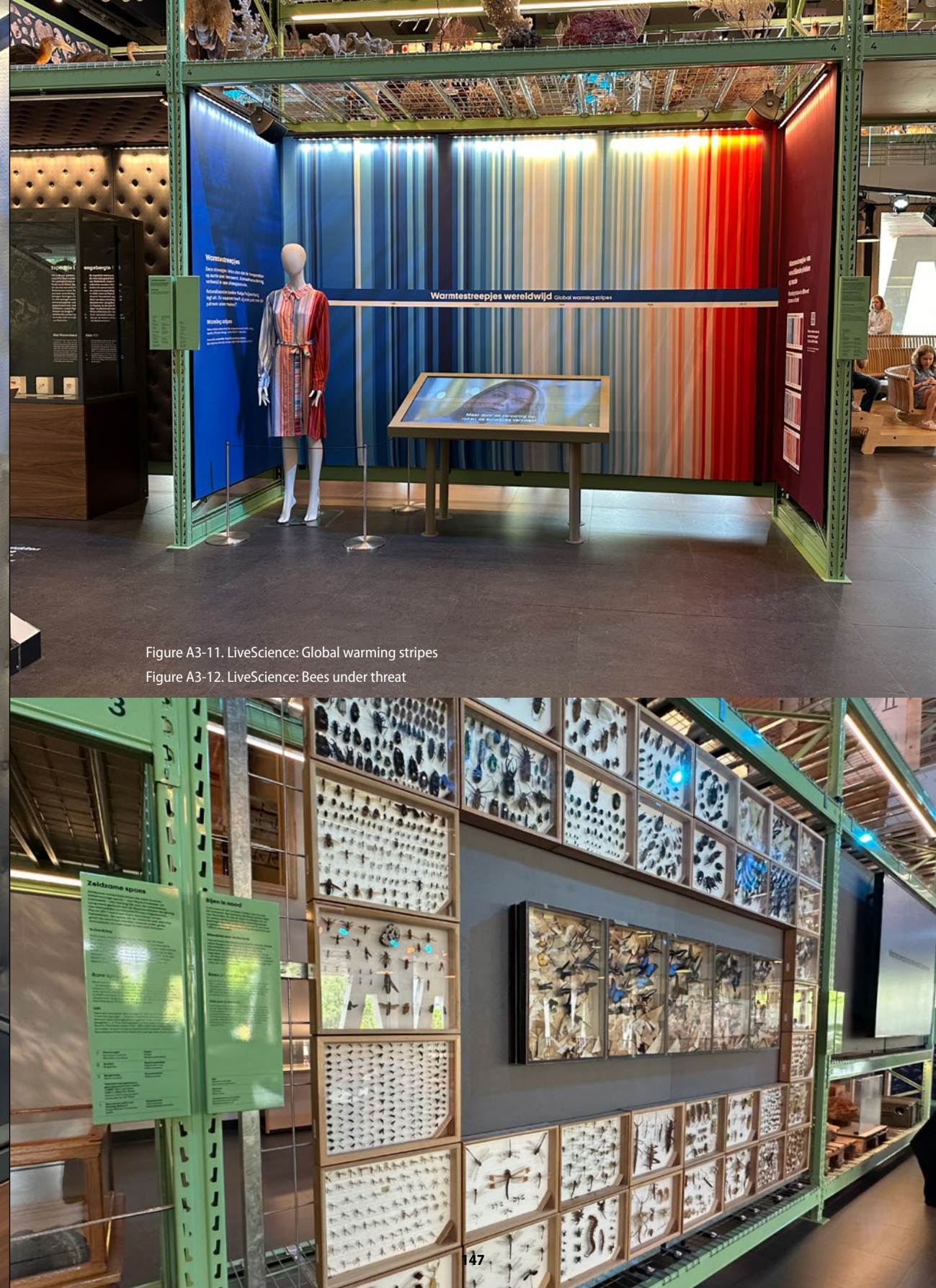


Figure A3-11. LiveScience: Global warming stripes

Figure A3-12. LiveScience: Bees under threat

Katja Peijnenburg, a marine biologist. She clarifies how the effects of climate change are illustrated by planktonic snails, which construct their shells from calcium carbonate and maintain the chemical balance in the ocean. However, due to ocean acidification, there is less carbonate available for building their shells. The ocean acidifies because it absorbs CO2 emitted by human activities, disrupting its balance. She researches whether these planktonic snails can adapt to the challenges of climate change. She wears a dress with a pattern of climate stripes, literally embodying the message of climate change.

Confiscated
'These tortoises and crocodiles were confiscated by customs officers at Schiphol Airport. Every year, the customs service seizes hundreds of (endangered) plants and animals.'

Largest Egg
'The largest egg in the collection at Naturalis does not come from a dinosaur but from an extinct Elephant bird. This giant egg is around 30 centimetres long, 20 centimetres wide and has a shell three millimetres thick. Its content is equivalent to 160 chicken eggs. The egg was collected around 1865 by the French naturalist Alfred Grandidier. The museum acquired the egg via the company Frank, which traded in natural history specimens.
The bird that laid these eggs was of course itself gigantic. The Elephant bird of Madagascar was a heavily built flightless bird that measured more than three metres tall and weighed up to five hundred kilogrammes. It owed its enormous size to the fact that it lived on an isolated island. In the absence of predators, as evolution progressed, it grew ever larger and lost its ability to fly, Eventually, its greatest enemy turned out to be man. The bird died out due to hunting and habitat loss from deforestation.'

Seduction

No mention of human impact on biodiversity.

Figure A3-13. Exhibition Seduction

Appendix 4.

Analyses of eleven natural history exhibitions in eight museums

This Appendix contains the analysis of eleven exhibitions in eight natural history museums or natural history exhibitions in multi-themed museums, both in the Netherlands and abroad, to identify how they engage their visitors with the biodiversity crisis, employing a natural history collection. They are presented in alphabetical order. Other museums and exhibitions in the analysed museums were visited; however, due to the limited scope of this research, they were not analysed comprehensively.

The visited museums (in alphabetical order) are:

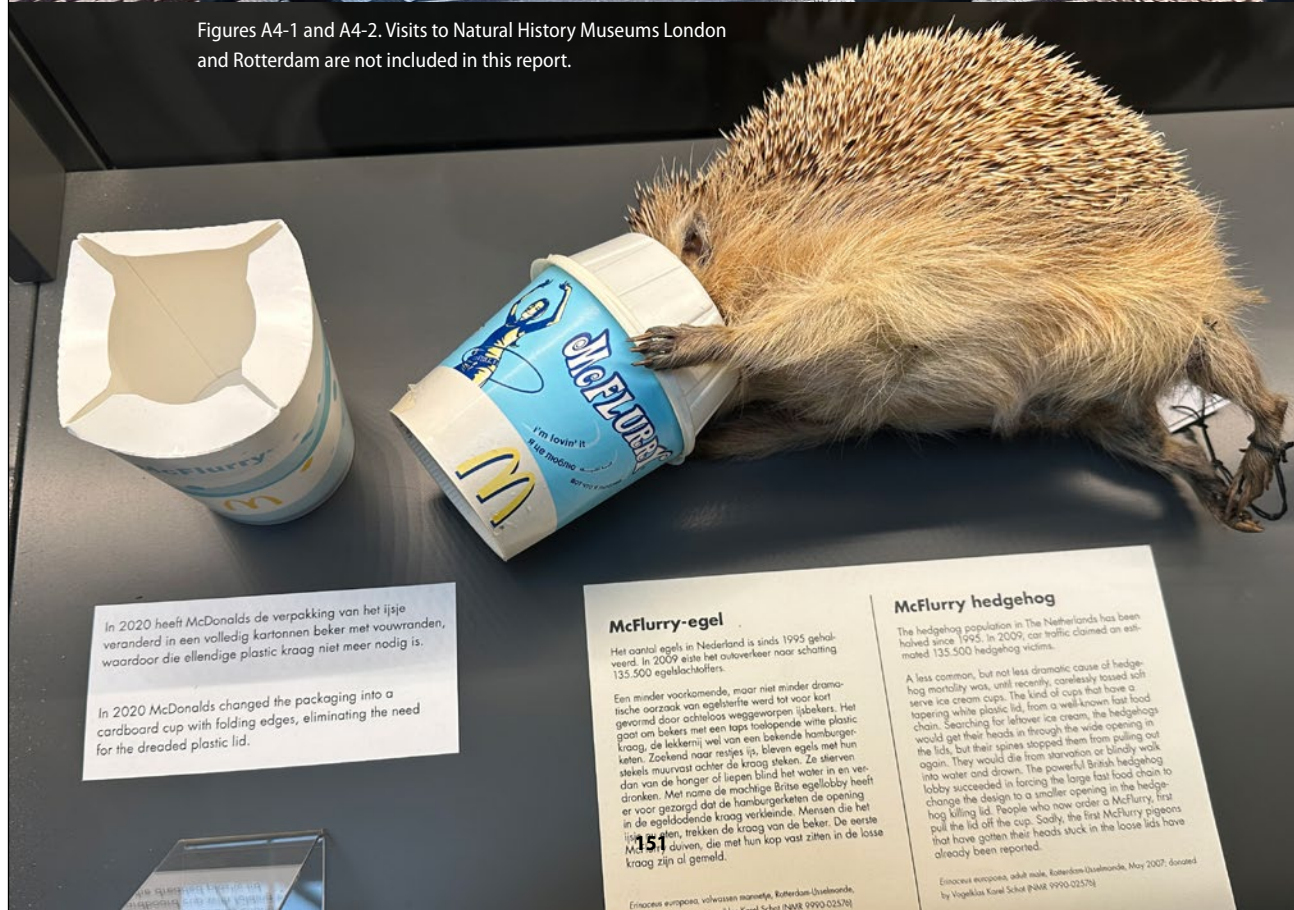
- Allard Pierson, Amsterdam
- Artis-Groote Museum, Amsterdam
- Chhatrapati Shivaji Maharaj Vastu Sangrahalaya (CSMVS), Mumbai
- Mission Museum, Steyl
- Musée des Confluences, Lyon
- Museon-Omniversum, The Hague
- Natural Sciences, Brussels
- Natuurmuseum Brabant, Tilburg

Museums that were visited and analysed on site, but not comprehensively described in this report:

- Natural History Museum, London
- Natural History Museum, Rotterdam

The methodology is explained in the main report.
References are included in the references list of the main report.
The images are meant as general illustrations and are not numbered or described. They are all made by the author.

Figures A4-1 and A4-2. Visits to Natural History Museums London and Rotterdam are not included in this report.



Allard Pierson, Amsterdam

About the visit
Date: Friday 24-12-2024
Visited exhibitions: The call of the o'o. Nature under pressure.
Skipped exhibitions: all the rest: permanent exhibition.
Considerations: Dedicated exhibition about the human impact on nature, and opportunity (nearby).

About the museum
Website: https://www.allardpierson.nl/en
Mission: 'We illuminate the past from various perspectives while keeping our finger on the pulse of today's world. With collections that are available to everybody, and supported by the knowledge and expertise of committed staff, researchers, artists and visitors, we offer pluralistic visions of the future. We also work with local, national and international partners in the social and cultural domains. Our core values are connection, transparency, deepening, quality and innovation' (Allard Pierson, n.d.)
Target group: professionals, academics and a broad audience.
Description: A museum in an old building in the city centre of Amsterdam, with several notable collections on archaeology, book history, cartography, graphic design, Jewish cultural history, performing arts and even some natural history.

Analysis of the exhibition The call of the o'o. Nature under pressure
The Call of the O'o. Nature Under Pressure is an exhibition that explores the intersection of science and art to examine the human relationship with nature today, the potential for counteracting biodiversity declines and mitigating the climate crisis and promoting more sustainable behaviour. The museum is open to everyone, but by nature, it does not attract visitors with young children. Although the label texts are written to cater to a broad audience, the information density, the abundance of old books, and the lack of interactive elements will most probably not engage most Dutch children. It focuses on books, prints, and artworks, showcasing the history of the human relationship with nature.

Entrance
In its prominent colophon at the entrance, Allard Pierson explains how it has made an effort to create a sustainable exhibition by reusing display cases and opting for electric-powered transportation and eco-friendly printed materials.

Section 1. Introduction
The intro features the famous o'o specimen from Naturalis' collection and the sound fragment of this now extinct bird. The intro panel states: 'The Hawaiian Kauai O'o has died out. The call of the male of this species was last heard in 1987. He sang in vain. There was no female to hear him. The extinction of the o'o is symbolic of nature lost to human activity. Humankind's impact on life on earth is certainly large, and even dominant. The geological epoch that we are now living through is called the Anthropocene, the epoch of humankind.' The text highlights the downsides of the exploration of nature, such as colonisation and climate change. 'How can we behave sustainably towards nature? How do we counter a continuing decline in biodiversity and a life threatening climate crisis? Is there still hope?'

- The exhibition opens with Ancient Greek and biblical notions that humans rule over other species, and features an illustrated bible, open to the page of Genesis that describes how man rules over the rest of nature.
- An exhibit of 18th and 19th-century artworks features several depictions of animals, arranged according to their importance. God is at the top, below him a painting of the fall of man, followed by mammals, then birds, then fish, and at the bottom, reptiles and insects.

Section 2. Collected.
A section with old books, an herbarium, and watercolours of butterflies and caterpillars from the Seba collection on the wall.

- Section panel: explains how in the 16th century, Europeans changed their relationship with nature from considering it as a resource for food and medicines, to studying His Creation, nature, as well as searching for new trade routes. 'Europeans compiled their new knowledge about nature in books. Dead nature was collected in curiosity cabinets and living nature in menageries and botanical gardens.'
  > The label does not generalise humans but specifies that it was Europeans who changed their relationship with nature. It also does not restrict its story to iconic animals.

The individual labels explain the relationship of the creators of the books with nature, but do not specify the human impact on nature.

Section 3 and 4. Colonial knowledge
This section shows 17th and 18th century books, herbaria, aquarelles and one modern artwork by Darwin, Sinke & van Tongeren. Several labels highlight the colonial past of the Netherlands, none of the labels mention the human impact on nature. It shows not only books and artworks of non-human life, but also of humans.

- The label of Jan Velten's Wonders of Nature explains how the menagerie of Blauw Jan also featured people. 'They exhibited themselves. Like Giacomo Poro from Genoa who toured Europe with his Siamese twin brother Matteo on his chest. He earned his income this way.'

- A label on the wall, without a collection item, explains ARISE. 'Biodiversity loss is one of the biggest threats to humanity's survival. But we need to know what species are all there, before we can make efforts to conserve them. To map this out, we urgently need better tools to identify species and monitor biodiversity. To this end, the ARISE project is building a new infrastructure that collects and combines information from eDNA and AI-based recognition from video images, audio and radar data. This should give us a comprehensive picture of biodiversity in the Netherlands. It will also bring together many new insights in artificial intelligence and data science. ARISE's ambition is to name all species in the Netherlands and you can help collect useful information! Want to participate or find out more? Then scan the QR code.'
  > Remarkable that Allard Pierson shows this info, while Naturalis, one of the collaborators of ARISE, does not.

Section 5. Named
This section highlights the history of nomenclature. It features books, including a first edition of Systema naturae by Linnaeus, as well as several works of modern art that challenge the categorisation of species.

- Section panel: 'Collecting and describing plants and animals is one thing, naming and ordering is another. They are called differently in every language. Natural history books often contained lists with the names in different languages, but even thn you often did not know which plant or animal it was. Carolus Linnaeus came up with a way of distinguishing types of organisms from each other based on specific characteristics. In 1758, he introduced in his Systema naturae a binominal nomenclature, based on genus and species names, that is still in use. Humankind got the name Homo sapiens. Linnaeus had included humankind in the animal kingdom, among the quadrupeds, earlier in 1735. This meant that humans were no longer above nature. Are we allowed to give names, isn't that a form of appropriation? Or should we give names because otherwise we don't know which animals and plants are in danger of extinction?'
  > This panel highlights the human-nature divide and asks a provocative question about appropriation versus danger of extinction, an interesting challenge in combining sustainability and inclusivity values.
- A portrait of Carolus Linnaeus comes with a label that explains how there is no holotype for humans, but how Linnaeus was put forward as the holotype on the 200th anniversary of Systema naturae.

Section 6. Changing
This section explains how the sciences of the earth and the discovery of fossils contributed to the understanding that life was not created unchanging. It introduces Darwin's ideas about evolution and features several books that contributed to the understanding of evolutionary change.

- The label of the 1798 book by priest Thomas Robert Malthus explains how Malthus already predicted problems because the population was growing more quickly than food production, and proposed birth control.
- An audio-based interactive exhibit explains that tits in the city sing at a higher tone than those in the countryside due to the many ambient noises. They no longer recognise each other as a species. Night rays harder, great tits higher. The large red button is very attractive in terms of its interactive appeal.
- An infographic of geological layers shows the concept of the Anthropocene: 'This age of man begins with the industrial revolution in the eighteenth century. Since then, more CO2 has been released into the atmosphere, causing the earth to heat up more and more. This affects many life forms, but not the earth itself, which will continue to rotate for another few billion years. In this overview, the Anthropocene only lasts 250 years. This will be followed by a new era that we have made up and named: the Futurocene. In it, some animal and plant species will remain and others will disappear. Who knows, maybe new species will emerge. But where is mankind?'
  > This infographic does not include a natural history specimen and does not really speak to the imagination in its appearance, but it is unequivocal about the human impact on the biosphere, and provocatively asks what this means for humankind.

Section 7. Interwoven
This section features several modern art works, and some books.

- The section panel explains how Merian was the first to depict species together with their food plants. 'We now know that this interwovenness goes much further. Coral, for example, is at the basis of a long food chain. If coral dies, this has consequences for the entire chain of life. And it goes even further. Humans are not outside of nature, we know now. We are part of it. The deterioration of our habitat has direct consequences for the quality of our existence. All organisms, including us, live alongside billions of bacteria. We need to take good care of those too. The realisation that life is interwoven should stimulate us to cherish the life around us. We are dependent on it.'
  > This panel is very clear about the fact that humans are part of nature and depend on all of it. It even stimulates visitors to take care of nature, although it does not say how.
- Diana Scherer's 2024 Tissue of plant roots artwork: 'Sherer's root tissues, on the one hand, show how humans can bend nature to their will, and on the other, reveal the limits to this.'
- Book with Mark Catesby's Hawksbill sea turtle: 'Like Merian, Catesby described and showed animals in their habitat, often with their food. This sea turtle is critically endangered. This is the result of declining availability of food (specific sponges), a growing number of predators and the collection of eggs by humans.'
- Book with Mark Catesby's Ivory-billed woodpecker: 'At the time that the author of this book, Mark Catesby (1683-1749), lived, the ivory-billed woodpecker led an uneventful existence. America's largest woodpecker is now under

severe pressure from the disappearance of its habitat as a result of human activity (human habitation and agriculture). Whether specimens still exist is unknown.

- Manuscript with ink and watercolour of the honeybee by Johannes Schepens: 'Insects are essential for the pollination of plants. An iconic example of an insect of this kind, is the honeybee. […] Things are not going well with the bee. And if things are not going well with the bee, they are not going that well with the flowers, and they are not going well with us either.'
- Display of the first book that describes a word for interconnectedness, or Ökologie (ecology), by Ernst Haeckel, 1866.
- Damien Hirst's Waste artwork from 1994: 'This display case by Damien Hirst is filled to the brim with medical waste. Hospitals produce half a kilogram of waste per bed per day on average. High-income countries generate the most waste. Medical waste is often incinerated, dumped or discharged into water, contributing to environmental pollution and climate change. This has major consequences for life on earth and so also for humankind. Healthcare is there to cure people and keep them alive. But without a reduction in waste, life on earth will become increasingly difficult for human beings.'
- An animation of a food web clarifies how ecosystems collapse when one species is removed. No collection item.
- Label of the artwork by Abel Rodriguez, Terraza alta, from 2020, explains his relationship to the Amazon forest, where he grew up in the Nonuya community. '[…] Whereas European naturalists in the colonial period appropriated nature in Latin America and made it subordinate to humankind, Rodriguez sees nature as a spiritual space where by contrast the relationship

between humans and nature is essential for wellbeing.'
> Label makes a comparison between Indigenous perspectives and Western perspectives, and does not generalise, but names the community where the artist is from, keeping it very specific and precise.

Section 8. Disappeared
This section features several natural history specimens and books with images of extinct animals. The room only shows iconic animals, no plants, fungi or other kingdoms, and the most recent, possibly extinct animal was last seen in 1947, which does not make clear how bad the current state of nature is. However, it is still an impressive room, and the artwork by Mark Dion is meaningful.

- Section panel: 'Species extinction is not something from the distant past, but is still going on. Humankind is playing a sad central role in this. Overhunting sealed the fate of the quagga, the passenger pigeon and the great auk. Species that were endemic to an island, like the dodo and the o'o, fell prey to animals introduced to the islands by humans. There are other consequences of human action. Temperature rise and the increasing acidity of surface water as a result of the absorption of CO2 in the atmosphere are the most significant causes of coral dearth. Five mass extinctions are visible in geological layers, periods in which more than 70% of life on earth went extinct as a result of a catastrophe. The last mass extinction spelled the end of the dinosaurs 66 million years ago. It is now assumed that we are experiencing a sixth mass extinction, caused by human action.
  > This panel is unequivocal about the human impact on other life. It solves the fact that the sixth mass extinction has not been accepted by everyone by the words 'it is assumed.' However, it does not distinguish between humans. The whole exhibition is very clear about the difference between European actions and that of the rest of the world, but in this panel it is suddenly 'humanity' in general, not mostly the Western part of it.
- Artwork The Flamingo by Mark Dion, 2019: 'This flamingo, covered in tar, finds itself in a perilous predicament. How has this come about? The packaging crate, the tar, they all lead back to humankind. By this work, Mark Dion is highlighting the fact that humans are contributing to species extinction by production, consumption and transport on a large scale and by generating waste. Three of six flamingo species have 'near threatened' status according to the International Union of the Conservation of Nature, which means that they will probably soon run the risk of extinction.'
- Book with illustration of the Japanese wolf mentions its year of extinction: 1905.

- Book with illustration of the o'o by Scott B. Wilson: 'In this room you can listen to the song of the last male Kauai o'o. This bird, which occurred only on the Hawaiian island of Kauai, was hunted to extinction. The recording is from 1985; the last sighting was in 1987. This male was unable to find a mate.'
- Book illustration with first drawing of a living Dodo by Joris Joostensz Laere: 'After the dinosaurs, the dodo is the iconic example of species extinction. The dodo was endemic to Mauritius, an island to the east of Africa. The Dutch took possession of the uninhabited island in the first half of the seventeenth century. The dodo was hunted for food. Not everyone enjoyed the taste of this flightless pigeon: it was also referred to as the 'walgvogel', or disgusting bird. Hunting was no good for the bird. But it was primarily the pigs, dogs and rats introduced by humans that sealed the fate of the dodo.' The exhibit also shows other illustrations of the dodo.
- Exhibit with a mounted specimen and a hand-coloured lithography on paper of the Quagga, by C. de Last (remarkable name!): The quagga was a subspecies of the plains zebra. Its black and light brown stripes faded towards the rump. The quagga was widespread in southern Africa. It was hunted intensively as it was seen as a competitor to livestock. By the second half of the nineteenth century, the last specimens were confined to European zoos.'
- A mounted specimen of the slender-billed curlew: 'Even though the slender-billed curlew is believed to be extinct, sightings continue to be reported on occasion. In most cases, they will be of the Eurasian curlew, a highly similar bird. But it still cannot be entirely ruled out that individuals remain of this bird, which bred on the steppes of Russia and Kazakhstan. The slender-billed curlew was last seen in the Netherlands in 1947 on the Boschplaat nature reserve on the island Terschelling. This specimen was caught in 1889.
- A mounted specimen of the great auk: 'The great auk lived in the northern Atlantic Ocean. This penguin-like bird was flightless, but was an outstanding diver and swimmer. On land, the great auk was easy prey. The bird was eaten, the down was used for all sorts of purposes, and lamp oil was even made from the fat. Only a few individuals were left by the end of the eighteenth century. For that reason, they were in high demand from collectors. Efforts aimed at securing a great auk for private collections probably killed the last specimen.'
- Book with illustration of John Gould of the Norfolk kākā: 'This bird lived on the small island of Norfolk to the northwest of New Zealand. After settlement by the British, the Norfolk kākā was hunted for food and domesticated. This illustration in John Gould's book was done in 1836. The last specimen of the species died in London in 1851.
- Book with illustration of John Gould of the Huia: 'The huia lived in New Zealand. The last sighting of this bird species was at the beginning of the twentieth century. Even though the huia had lived for some time with people, like the dodo it had not developed an instinct that led it to flee danger. Tales about hunting the huia relate that the bird was easy to lure by imitating its song. The huia was a weak flier and could then be caught by hand.
- Book with illustration of Tasmanian tiger by John Gould: 'The Tasmanian tiger was placed on the list of protected species in 1936. It didn't work. Two months later the last specimen died in the Hobart zoo in Tasmania. The Tasmanian tiger, a carnivorous marsupial, unrelated to the wolf, had lived only in Tasmania for the past 2,000 years. It was hunted intensively, because farmers believed that it was eating their sheep, even though its jaws were probably too weak for this. There have been regular sightings of the Tasmanian wolf since 1936, but not one of them has been confirmed.'

Section 9. Hope

The outro room, Hope, summarises that humans are part of nature, and that two phenomena, species and ecosystem disappearance, and climate change, 'are a direct threat to the survival of ourselves, Homo sapiens.' This room gives the floor to individual, bottom-up projects featured by World Wildlife Fund and Klimaatmuseum, which slow down or even stop practices that devastate nature. Text panels with portraits of six interviewed people, show that people just like you and me, do small things that everyone can relate to. A student who is also an activist and sees potential in connecting with others to share goods and knowledge. A scientist who founded the Green Mosque Alliance, aiming to install solar panels and energy-efficient lighting in mosques. Two farmers who started a regenerative farm, a spiritual caregiver promoting activism from a Christian world view, and more. Without a collection to support this, the room feels unattractive. However, an interactive wall invites people to share their feelings of despair and hope on stickers was well used.

Conclusion: the human impact on biodiversity

The Call of the O'o. Nature Under Pressure is an exhibition that explores the relationship between humans and nature. The exhibition opens with the text: 'The Hawaiian Kauai O'o has died out. The call of the male of this species was last heard in 1987. He sang in vain. There was no female to hear him. The extinction of the o'o is symbolic of nature lost to human activity.' The exhibition

explores the intersection of science and art to examine the human relationship with nature today, the potential for counteracting biodiversity declines and mitigating the climate crisis and promoting more sustainable behaviour. The museum is open to everyone, but by nature, it does not attract visitors with young children. Although the label texts are written to cater to a broad audience, the information density, the abundance of old books, and the lack of interactive elements will most probably not engage most Dutch children. The exhibition is constructed using reused display cases and transported via electric vehicles, aiming to contribute to a more sustainable exhibition practice, as noted at the entrance. In appearance, it is a 'classical' exhibition, with simple display cases to look at, and just one, very basic interactive. This lack of immersiveness demands the visitor's dedication and patience. It focuses on books, prints, and artworks, showcasing the history of the human relationship with nature and opens with Ancient Greek and biblical notions that humans rule over other species. In the sixteenth century, according to the exhibition text on the wall, 'dead nature was collected in curiosity cabinets and living nature in menageries and

botanical gardens.' A section about classification and nomenclature wonders if we are allowed to give names, or if that is a form of appropriation. 'Or should we give names because otherwise we don't know which animals and plants are in danger of extinction?' The gallery of Change delves into the discovery of evolution and features an exhibit about tits, which showcases the difference in sound between tits in urban and rural areas, the only interactive element in the exhibition. The gallery Interwoven details the importance of ecosystems; some of its labels refer to the human impact on the shown species, for example, by describing their current threatened status. A label accompanying a 1994 artwork by Damien Hirst about medical waste is very explicit in the human impact on the environment: 'Healthcare is there to cure people and keep them alive. But without a reduction in waste, life on earth will become increasingly difficult for human beings.' A more recent artwork by Abel Rodriguez highlights the artist's vision that nature is a spiritual place, in which the connection between man and nature is vital for human well-being. The last gallery, Disappeared, features several natural history specimens and books with images of extinct animals. The section panel is unequivocal about the human impact on other life and explains that 'it is now assumed that we are experiencing a sixth mass extinction, caused by human action.' The featured specimens are both illustrations of a story and its foundation. Each label in this gallery explains what caused the species' extinction, primarily hunting for consumption or to protect livestock. An artwork by Mark Dion shows an oil-covered flamingo on a transport case, according to its label, 'highlighting the fact that humans are contributing to species extinction by production, consumption and transport on a large scale and by generating waste.' The room only shows iconic animals, no plants, fungi or other kingdoms, and the most recent, possibly extinct animal was last seen in 1947, which does not make clear how bad the current state of nature is. The outro room, Hope, summarises that humans are part of nature, and that two phenomena, species and ecosystem disappearance, and climate change, 'are a direct threat to the survival of ourselves, Homo sapiens.' This room gives the floor to individual, bottom-up projects featured by World Wildlife Fund and Klimaatmuseum, which slow down or even stop practices that devastate nature. Text panels with portraits of six interviewed people show that people just like you and me do small things that everyone can relate to. Without a collection to support this, the room feels unattractive. However, an interactive wall that invites people to share their feelings of despair and hope on stickers was well used. The exhibition does not provide clear suggestions to contribute to the mitigation of the human impact on the biosphere, but the example projects do help to break visitors' inertia.

Artis-Groote Museum, Amsterdam

About the visit
Date: Friday 31-05-2024 + 11-01-2025
Considerations: Young, modern museum, central, accessible location.
Analysed exhibitions: Permanent exhibition, all galleries and mezzanines. This concerns the whole museum, except for the display of the temporary exhibition.

About the museum
Website: www.artis.nl/en/artis-groote-museum
Mission: 'We strengthen our connection with nature together, to ensure a liveable future for everyone' (ARTIS-Groote Museum, n.d.-a).
Target group: broad, including families with children of 8 years and older.
Description: The Artis-Groote Museum, like the Artis-Micropia Museum, is part of the Artis Zoo, although it can be visited independently. The museum has been rebuilt in its original building but no longer holds its collection since it closed in 1947. Most of the former collection was transferred to Naturalis. Nonetheless, the museum showcases the beauty of nature with various specimens. It is small, featuring two galleries with a permanent exhibition, a display for temporary exhibitions, and a large space for lectures and educational programmes (on the main floor in the east gallery). The museum aims to inspire visitors''wonder at the beauty of the earth'. It focuses on connections, demonstrating how your body parts resemble functions and forms in nature. 'As it turns out, you appear to be connected to every other living thing, right down to the tiniest fibres in your body. And you are much more dependent on other life than you realised' (ARTIS-Groote Museum, n.d.-b). The museum shows life in many forms, not only animal life. It includes microbes, plants, and even more abstract notions of life, such as sounds and smells.

Analysis of the permanent exhibition
The general, permanent exhibition is built around body parts, such as the spine, the heart, or the skin. The west gallery and its mezzanine offer eight sections. The east gallery hosts a bleacher stair for lectures and four sections for the permanent exhibition in the gallery and mezzanine. The exhibits are associative and seemingly chaotic. They offer some information through labels and general texts on the glass of the displays, which are full of content, but most of the time in a language that is accessible to a broad audience. However, if one wants to dive deeper, there is no option for it. A few interactives engage visitors, and the museum aims to stimulate several senses, including a smell tunnel.

Section 1. Go or stay, about the spine and plant time, does not mention human impact on biodiversity.

Section 2. Taking steps features the interactive display 'How many Earths?' that shows visitors, based on their postal code, how many Earths are needed to sustain their lifestyle. In the author's case, living in the centre of Amsterdam, it would be 4.8 Earths. In an image of Google Earth, the author's house is surrounded by an island, the size of which is needed to feed her. The exhibit does not feature a collection object.

Section 3. IQ is for the stupid, contains an exhibit about emotions and one about intelligence. The latter features an agenda. Although not a natural history specimen, the label describes the human-nature relationship: 'Planning is looking ahead. A chimp looks for a stone to crack nuts but has no clue what "Wednesday" is. We, however, do, and are great planners. But which agenda provides a liveable future for our children?'

Section 4.

- Handmade, questions the ethical challenges associated with eating meat and manufactured meat. It features a reproduction of a sandwich containing a human leg. Accompanying this is a video explanation in which someone tells a story and poses provocative questions. The video states that reducing the number of farmed animals could lessen both animal cruelty and our carbon footprint. Additionally, it suggests that if you can produce meat, you could also produce human meat or even meat from your own cells, and it asks: 'Would you eat that'?
- Manufacturable Life displays a model of a baby in an incubator. It comes with an interactive video, in which a person tells a story and asks provocative questions to make visitors aware of the ethical challenges of our technological innovations that alter life. The video asks if it is ethical to alter human DNA to exclude hereditary diseases and to use birth control pills even if their residue in groundwater causes disruptions in ecosystems. Human impact on biodiversity in the literal sense of the word.

Section 5. Packed in! Exhibit Stinging nettle introduces life specimens of nettles. The label describes how nightingales make their nests in between nettles to protect their offspring, and how the plant offers a living environment for many more species. This provides awareness of the importance of any life, even the stinging ones.

Plastic – It's a wrap is a colourful set of plastic wraps that is exhibited next to real fruits in glass jars. The label says: 'A ripe, juicy fruit is nothing more than an appetizing package. From seed, that is, that is spread by gluttonous animals via their faeces. Other fruits, such as nuts, intentionally have a hard shell only to be eaten by certain animals. In any case: all-natural packaging is in service to the survival of the species. They conserve, breathe, protect against disease, allow moisture in, and repel water – all at the same time. Oh, and they are completely recyclable.' This label challenges our view of plastic. Do we need it?

Section 6. Round and round and round… All exhibits show lots of awareness of biodiversity, cycles, and 'nature has no waste', but not of the human impact on it.

Section 7. A World Full Of Sounds contains a Silence Map. The map with potential silent areas, and the quote 'It's sad that when nature speaks, man doesn't listen', both bring awareness of the human-nature relationship, but fail to provide a layer of information. Not even what is meant by silence. Is this about human-caused sound? The map suggests that there are silent areas in Europe, but the sound of aeroplanes is most probably not included, because that would limit the number of silent areas significantly.

Section 8. The meaning of life.

- The Artis Zoo tree slice reveals important events that occurred in the tree's surroundings. Although the events are mostly (anti) social, such as the deportations of Jews, or the protests during the queen's coronation, it does show the relationship between man and nature.
- Where is it going to? This exhibit shows natural and cultivated species, such as wolf and chihuahua who are genetically almost identical. The label says: 'We humans evolved from a whole sequence of humanoids and have only been around for a few hundred thousand years. We used to look a bit unpolished according to our current taste. Many plants and animals have also changed with us, from wild to cultivated. We 'tamed' them into vegetables, fruits, herbs, pets and livestock. Sometimes so much so that we would no longer recognize their previous form. This process continues. And what will we look like later?'
- Goudreinet, Kanzi, Elstar and umm…: The apple exhibit shows many reproductions of drawings of various apples, probably from a book. This label explains the impact of human interference in the natural environment and its consequences on biodiversity: 'Not so long ago, there were thousands of apple varieties. Far too cumbersome for the supermarkets, which limited their repertoire to a few standard varieties. As a result, an enormous variety of flavours, bites, smells and colors disappeared along with the ability of apple trees to adapt to new conditions. Because the diversity, and thus the health, of all plant and animal species is rapidly declining, genetic material is stored in seed banks and 'frozen zoos'.

- Socorro dove: It is not clear from which collection this dove is. Label: 'Species are dying out at lightning speed due to human activity. We cannot predict the impact of the loss of unique organisms. That is why we archive cells from as many animal species as possible in freezers ('frozen zoos'). Extinct in the wild: the Socorro dove, the Dutch also call it the 'weeping dove'. Very appropriate.'
- Cavendish banana reproduction: 'Because we grow more and more 'production-friendly' crops, such as the Cavendish banana, we get more and more of the same. That means: loss of biodiversity, of varied and high-quality food. The world seed bank in Spitsbergen archives seeds to store genetic information. But not from this banana, because it doesn't even have seeds.'
- Audio Spitsbergen vault: There is no direct mention of human impact on biodiversity and no direct link to a collection item. However, it explains that even the permafrost is now melting, threatening the seed bank.
- Who's really in charge here: 'Plants can contain chemicals that are unappetizing or toxic to potential gnawers. In contrast, for us humans, these

substances are often tasty, stimulating, medicinal, intoxicating, comforting or hallucinatory. "Enjoy!", those plants seem to say: "Grow us!", "Spread us all over the world!". Mankind obeys well.' This label highlights the human-nature relationship. However, in this case, it suggests the natural impact on humans instead of the other way around, indicating natural resilience and strength.
- All other exhibits: no mention of human impact on biodiversity.

Section 9. Good soil, good health
- Delicious food for a healthy planet: this exhibit contains three video screens and a cabinet of living edible sprouting plants. An employee offers visitors to taste the plants to define their flavours and explains how these sprouts have a much higher nutritional value than fully grown ones, so you do not need to eat as many of them as full-grown plants. This offers the potential to feed more people worldwide. Section panel: 'What do your gut, a worm, and the roots of a plant have in common? They all extract nutrients from the soil (in your case, with some intermediate steps) and digest them thanks to billions

of microbes – the microbiome. The richer the soil, the richer the microbiome, and the richer the poop and plant remains that return to the soil as the basis for new food. Healthy food. And so, your health is inextricably linked to that of your supplier, the Earth.' This text implicitly makes clear the importance of biodiversity. The digital label of one of the three screens: 'Is it possible – to have enough, healthy and delicious food while keeping the planet healthy? Absolutely. Scientists have drawn up guidelines for a 'menu of the future'. It is mostly plant-based, but a little bit of animal products is still allowed.' This label suggests guidance for action to keep the planet healthy, by changing your menu.
- All other exhibits: no mention of human impact on biodiversity.

Section 10. The space in between. All exhibits: no mention of human impact on biodiversity.

Section 11. Depends on how you look at it, concerns a mezzanine corridor with printed posters of infographics about nature, with several mentions of the human impact on biodiversity. Although not natural history specimens, a few interesting topics are worth mentioning. An unsourced photograph of a light mast with insects around it suggests that the number of insects is declining dramatically due to the use of electric light at night. An infographic illustrates our addiction to plastic and visualises the massive quantities of plastic water bottles sold worldwide every minute, hour, day, and year, comparing them to famous monuments such as the Eiffel Tower. Another infographic shows the difference between carbon emissions per country and per capita. This makes clear that China, as a country, produces the most carbon emissions in the world; however, its emissions per capita are very low. For small states and islands that rely heavily on imports, the carbon footprint per capita is significantly higher. Several infographics show the biomass of mammals on earth, with wildlife just being a small fraction, and livestock to feed humans, the largest part. A traditional Taoist print views the human body as a reflector of the outside world. Humans and nature are connected.

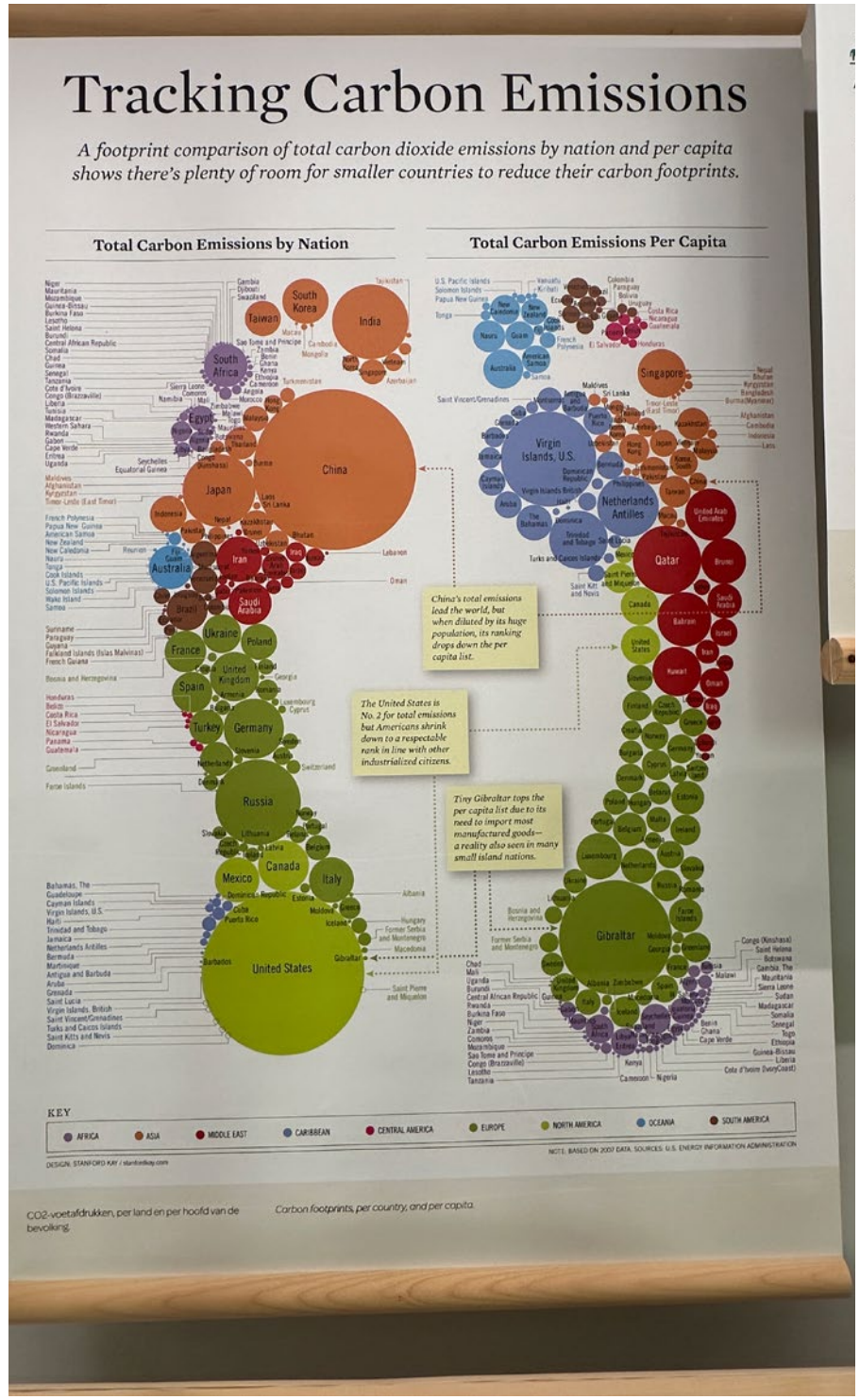
Section 12. Follow your nose: No mention of human impact on biodiversity.
Temporary exhibition space: no mention of human impact on biodiversity.

Conclusion: the human impact on biodiversity

The information is written in a style and at a level that is accessible to many visitors, including older children. The amount of text in the exhibition is limited, which makes it very approachable and not discouraging, but it also restricts visitors who want to learn more.

There are several notions of human impact on biodiversity in the Artis-Groote Museum, but hardly any of them involve natural history collection objects. This museum does not mention the IUCN Red List status of any of the displayed species, although it does show the Soccoro Dove, an extinct species, as an illustration of the text 'Species are dying out at lightning speed due to human activity.' The apple and banana displays mention the reduction of species due to human behaviour. Three labels refer to seed banks and frozen zoos as desperate actions to preserve some of the lost biodiversity, and with it, the health of species.

In some exhibits, such as the footprint calculator, visitors are informed about their impact on the planet without being given any solutions. However, a call for action appears on some labels. 'We […] are great planners. But which agenda provides a liveable future for our children?' and 'The reduction of farmed animals could mitigate animal cruelty as well as our carbon footprint' are clear examples. Nevertheless, the museum also subtly emphasises the importance of biodiversity for human survival. By posing provocative questions about ethical issues, such as whether it is ethical to use birth control pills when their residue in groundwater disrupts ecosystems, visitors learn that everyday choices can have significant consequences for the world around us. While this may not immediately alter visitors' behaviour, it raises awareness that could lead to different decisions in the future.



Chhatrapati Shivaji Maharaj Vastu Sangrahalaya (CSMVS) Museum, Mumbai

About the visit

Date: Friday 22-08-2024
Considerations: Non-European museum and opportunity.
Visited exhibitions (= all open sections including natural history collection): Natural History Section – Bird Gallery and Mammal Gallery, Indigenous Biodiversity Garden

About the museum

Website: https://csmvs.in
Target group: Not clearly defined by the museum. However, it seems to target a broad public, including children. Several school classes and families were present during the visit.
Mission: 'Our aim at Chhatrapati Shivaji Maharaj Vastu Sangrahalaya (CSMVS) is to create awareness and sensitivity towards our rich heritage through a visitor-friendly museum for the purposes of education, study and enjoyment of the public' (Chhatrapati Shivaji Maharaj Vastu Sangrahalaya, n.d.).
Description: Housed in a palace-like, Indo-Saracenic style building in the south of Mumbai, this century-old museum houses a large, diverse collection of both local and international historic art, archaeology and natural history. The museum lacks air conditioning or climate control, yet it presents a professional style of display, contrasting with the city's otherwise predominantly impoverished appearance. Three galleries focus on natural history, of which two were open during the visit. These galleries only show animal species. The publicly accessible garden extends the natural history collection with live specimens of plants in its 'Indigenous Biodiversity Garden'.

Analysis of the Vriksha Valli or Indigenous Biodiversity Garden

In the museum's garden, which one needs to cross to access the museum, the visitor is introduced to the Indigenous Biodiversity Garden, with information panels. Developed in 2023 by the museum, together with the HT Parekh Foundation and the Centre for Environmental Research and Education (CERE), 'this garden [aims] at educating visitors about the critical importance of biodiversity. This space seeks to convey the deep-rooted connection we share with plants and the urgent need to protect and conserve them for the benefit of current and future generations. Through the Vriksha Valli, we hope to inspire younger generations visiting the Museum to appreciate natural beauty and understand that the actions we take today can help determine the fate of human communities, wildlife and plants' (CERE India, n.d.).

This garden is, in the strict sense of the word, not exactly a natural history collection because it shows live specimens (plants) only. However, the garden is worth mentioning because the panels (in the local language Marathi and English) do provide awareness of the importance of biodiversity. This is remarkable because of the city's characteristics. For a city with 24 million inhabitants, Mumbai is surprisingly non-metropolitan, meaning that the city is hardly visited by non-Indian business travellers and tourists alike. Enough food and water seem to reach most of the population; however, waste management appears to be a big problem. Every potential recreational space, such as beaches, boulevards, parks or non-built sites, is covered in a blanket of plastic waste, and the people present at these sites don't show any signs of being bothered about it, adding their waste without embarrassment. So, to enter the publicly accessible museum garden, an oasis of plants and birds without any litter, and to read about safeguarding the natural environment, is a rather unexpected experience.

- The Historical Garden features plants significant to Indian culture. It explains the historical connection between humans and plants, as well as the relationship between the garden and the artefacts in the museum. However, there is no mention of human influence on biodiversity.
- The Butterfly Garden features plants specifically selected to attract butterflies. A simple information panel not only provides knowledge on the importance of biodiversity but also offers hands-on solutions to help protect it: 'Butterflies are colourful insects that play a vital role in the food chain and their presence signifies a healthy ecosystem. India is blessed with a rich diversity of over 1,500 species of butterflies. They require nectar plants for food and host plants to lay their eggs on and for their caterpillars to grow. Butterflies need a pesticide-free environment and tiny mud pools for their daily dose of salt and minerals. To help increase butterflies you can create small "Butterfly Gardens" on your balconies and terraces.'
- The Kitchen & Spice Garden shows plants that are used for cooking. The information panel heralds the diversity of India's spices, making it the 'spice capital of the world'. No mention of human impact on biodiversity.
- Medicinal Garden: As the birthplace of Ayurveda, the ancient Indian system of medicine, this garden shows plants that could benefit the treatment of ailments. The information panel states that these medicinal plants 'highlight the importance of plants in maintaining human health', illustrating a human-nature relationship: nature's impact on humans.
- The Vertical Garden combines medicinal, butterfly and edible plants in a vertical setup. It states that 'it forms beautiful vertical screens that help improve air quality and serve as a sound barrier', offering a solution for an environmental problem. Nonetheless, it does not specify the cause of bad air quality or noise.

Analysis of the Bird and Mammal Galleries

The Natural History Section is displayed in a set-up of classical showcases, with stuffed animals shown behind glass, some of them in a diorama setup, accompanied by very basic labels, with the species' scientific Latin name and its name in English, Marathi and Hindi. A few labels for the extraordinary setups of animals explain stories about the lives and habits of the animals. Those are in English only, and sometimes in English and Marathi. Only a few labels explicitly mention the human impact on biodiversity. However, most labels indicate the animal's IUCN Red List status.

The main introduction panel of the Natural History Section explains (in a way that is understandable for children of about eight years and up) who collected the animals and offers an informative section about the art of taxidermy. It also clarifies in a visual way why beaks, flying patterns and wing shapes of birds vary. Furthermore, it highlights the museum's 'aim to increase awareness about the surrounding flora and fauna', and explains that the dioramas which depict the animals in their natural habitat, are 'helpful to make people aware of the shrinking forests and the animal species that are close to extinction'.
The two accessible galleries are large room-sized and can be overlooked in one glance, with most displays along the walls. Most objects have a label with a clear, colourful indication of the IUCN's Red List Status, with either coded circles or coloured text. This setup was so explicit that it inspired to count the numbers a particular status appeared.

In the Bird Gallery, not all labels include Red List status, only the threatened ones. A manual count by the author shows that of the 385 birds displayed, 43, or 11%, have a threatened status. Two labels specifically mention human impact on biodiversity.

- Indian vulture: 'Did you know that these birds have suffered a significant population decline of 97% from 1992-2007 caused by kidney failure after consuming the veterinary drug diclofenac, found in dead cattle? Without these 'nature's cleaners', we face severe problems, increased pollution, spread of diseases, and proliferation of feral dogs and rats.' This label clearly explains the human-nature relationship. When humans kill the birds, this will in turn affect human lives. It also suggests a solution: the use of diclofenac or other medication for cattle may cause harm to nature and should be used with (more) caution.
- Great hornbill: after a long description of the fascinating breeding techniques of these birds, the section panel states: 'The population of the Great Hornbill of India is declining, possibly due to poaching for food, and for its casque used as a headdress by local tribes. It is 'Vulnerable' and protected against [sic] Wildlife Protection Act, (1772) of India.'
- Indian Rhinoceros: One mammal is featured in the bird gallery, probably because of its size. According to the intro panel of the gallery, all animals in this room are original specimens, prepared by the art of taxidermy. That suggests that this rhino, which is easily accessible, on human eye level and without glass protection, still has its original horn. That would be really interesting, considering the dozens of cases of horns reported stolen from natural history museums. The complete and only text on the label says: 'The Rhino horn is pure keratin, like human fingernails and it was thought to be used in south-eastern Asia for love potions. This has led to the mistaken belief that the demand for rhino's horn has brought it close to extinction.' This is a remarkable label because it does not explain anything else, for example, that other reasons for its vulnerable state are habitat loss or political conflict. It is

the only label in this whole research (of all visited museums) that explicitly denies a particular human impact on a species' existence, without a nuance. In the mammal gallery, two Indian Rhinoceros skulls are displayed, both with replicated horns. The label of the skulls does not mention if the horns were poached before or after their entry into the museum or why the horns were replaced in the first place. Nevertheless, even without a description, it still becomes clear that humans are a threat to rhinos.

In the Mammal Gallery, of the 49 labels, 32, or 65%, have a threatened status, and one is extinct (manual count by author). Labels that mention the human impact on biodiversity:

- Blackbuck: The label heralds their long-distance endurance and speed. 'The only predator they cannot outrun is the cheetah which princely families historically used to hunt these graceful antelopes.' Remarkably, human guns are not considered predators they cannot outrun...
- Indian tiger: 'As apex predators, they play a vital role in balancing the ecosystem by keeping prey numbers in check. Habitat loss and poaching for tiger skin, bones and body parts threaten our national animal.'
- Hangul: 'Their numbers have declined due to habitat fragmentation, poaching, and by domestic livestock.'
- White tigress: 'Since 1951, not a single specimen [of the white tiger] has been recorded. It is gratifying therefore that the present (March 1968) Maharaja of Rewa having acquired a white male captured as a cub and reared in captivity, has been successfully breeding white tigers and is thus saving this rare variety from total extinction.' This note on the white tiger's display appears to have been there since 1968. The label beside the tiger indicates the status 'endangered' and includes a map showing areas in India where the tiger's habitat is found. This label seems to refer to tigers in general, not specifically the white variety, because the white tiger has been extinct in the wild since 1958 and only exists in captivity due to breeding programmes.
- Striped hyena: 'In some areas, its body parts are considered magical, and are used as charms or talismans. IUCN (International Union for Conservation of Nature) classified the Striped Hyena as Near Threatened.'
- Jungle cat: 'Major threats to the survival of the jungle cat include the destruction of wetlands, trapping and poisoning.'
- Indian fox: 'Hunting for its skin and flesh as well as conversion of its grassland habitat to agriculture and industry, have affected its population density. In addition, its body parts are used in traditional medicine, and in some areas the fox is eaten.' This label clearly shows the human impact on biodiversity.

- Fishing cat: 'In 2008, the IUCN (International Union for Conservation of Nature) classified the fishing cat as Vulnerable. Wetland destruction is the primary threat facing this species as over 50% of Asian wetlands are under threat and disappearing.' This label clearly shows the human impact on biodiversity.

Conclusion: the human impact on biodiversity

In a city where everything is broken and dirty, and in a monumental building without climate control, the Chhatrapati Shivaji Maharaj Vastu Sangrahalaya Museum offers its visitors a greater environmental awareness than many other museums in Europe. It is accessible in multiple languages and caters to a broad age range. The natural history galleries are classical in their display of objects with labels and do not offer interactive elements. The IUCN Red List status next to all the specimens is clearly visible, serving as the only colourful item on the labels. This makes it stand out and unconsciously conveys a strong message that many animals are threatened. Particularly in the Mammal Gallery, more than half of the displayed species are threatened. This creates a significant sense of urgency to contemplate the state of nature. In the larger labels that contain additional information, numerous mentions of human impact on biodiversity are noted. All of the mammals' labels addressing biodiversity loss refer to habitat destruction, while some also mention poaching. One of the bird labels is particularly specific in explaining how the use of diclofenac in cattle decimated the vultures that depended on their carcasses for food. Although the Biodiversity Garden is inspirational in helping people understand their dependence on plants and animals, and offers a concrete solution for protecting them by creating butterfly gardens on balconies and terraces, the labels in the galleries are more implicit in their provision of tools to combat biodiversity loss.

Mission Museum, Steyl

About the visit
Date: Friday 19-07-2024
Considerations: Old museum, original displays, remote location.
Visited exhibitions (=all): Permanent collection and temporary exhibition Birds of God, journey of the bird of paradise

About the museum
Website: www.missiemuseumsteyl.nl
Mission: 'With an impressive time capsule, the Mission Museum shows a world view from more than 100 years ago. The museum wants to share this rich collection from all parts of the world and its special history in its historical context with the public and to discuss the motives of the past and the perspectives of today' (Missiemuseum Steyl 2022, 5).
Target groups: Current: culture lovers, niche target groups, education, families and traditional visitors. Future (aimed): families, youth and young adults.
Description: A small museum based on the collection of the Mission House St. Michael, established by German priest Arnold Janssen. Fifty years after its founding, the collection had grown so much that a dedicated museum was built for it, which opened in 1931. Since the death of Brother Berchmans, the museum's first curator, the arrangement of the exhibits has remained unchanged. The museum mixes cultural artefacts and a natural history collection. However, the natural history collection is limited to animals, including a few human skulls. The museum works on contextualising its presentation while keeping the exhibits intact, but this was not yet visible during the museum visit.

Analysis of the permanent exhibition

The permanent collection is an extraordinary display of a natural history collection. It takes visitors on a journey back to a time of great exploration. The original, exuberant display cases, nearly a century old, are filled with moulds and casts of animals arranged in scenic, thematic compositions. The gallery combines animals and cultural artefacts; however, the cases are organised thematically by country (e.g., New Guinea or China) or by type of species (such as large cats, bears, etc.). The objects feature original-looking labels in Dutch and German. These labels provide only basic information: the country depicted in the display, the animal's name, or the object's function. They do not include collection numbers, material details, whether it is an original mould, a cast, or details about where it was found, killed, stolen, or purchased.

- Entrance room and corridor: Two large cabinets and an interactive screen, shell cabinet (no label). Story box for children. No mention of (human impact on) biodiversity.
- Room 1. Brother Berchmans' Study: Desk, carpet and large display cabinets with a mixed natural and cultural collection. Basic labels, no mention of human impact on biodiversity.
- Room 2. Butterfly Room: There is a separate room for the insect collection. The butterfly room has a sign at the entrance that briefly explains what the room is about. Inside, a label (in Dutch only) describes how butterfly collectors are nature lovers, but how this was different in the past. By the end of the 19th century, butterflies were killed and collected for their beauty. Today, they are caught for identification and released after collecting the necessary data. Although there is little mention of the environmental crisis, the relationship between humans and nature is implied.
- The main gallery showcases many natural history objects, but there is no mention of the human impact on biodiversity. A few QR codes in the main gallery link to additional 'did you know' information. Although a systematic search on the website reveals around 25 pages with information, only a few barcodes are actually present in the gallery. The information provided on the web pages linked by the QR codes is inconsistent and sometimes incomplete. Some pages share interesting facts and stories (in Dutch only). However, no details about provenance, dating, species, or other relevant information are shared. Not a single text reveals anything about the human impact on biodiversity.

Analysis of the temporary exhibition Birds of God

The temporary exhibition about birds of paradise is a modern counterpart for the time capsule of the permanent collection. The intro panel informs the visitor about the exhibition and the museum's ambition to 'position itself in the current discussion about colonial heritage', for example, by provenance research. The website page (Missiemuseum Steyl, n.d.) states: 'What is unique about this exhibition is that the story of the bird of paradise is told from three different perspectives: Indigenous, colonial and missionary. The perspectives of three real-life historical figures: the hunter Tiliauw de Sawia, the writer Rudolf Voorhoeve in New Guinea and Brother Berchmans in Steyl.' However, these stories were not so recognisable in the exhibition itself. The exhibition is in Dutch only; all the following paraphrases and citations are translated by the author.

- Room 1. Celestial Beauty showcases various moulds, as well as some books, comics and maps. The labels for the natural history collection items only show the name of the bird. The section panel next to some displayed hunting tools explains the techniques of hunting without the animal's blood spoiling the nice feathers. Now air rifles are more effective, 'but at the same time cause a greater threat for birds of paradise'.
- Room 2. Products. The second part involves the products for which the birds were hunted: hats. The exhibit Paris Demands describes the popularity of birds' feathers in 1900 and explains that 'with the growing trade, resistance to the bird of paradise hunt also grew. In various countries, ladies of the state speak out against these practices and the use of the bird of paradise feathers is greatly reduced.' This describes the human impact on biodiversity in a positive sense: activism and resistance to buying contested things can result in the mitigation of ecological disruptions.
- Room 3. The here and now. The third section takes the visitor back to the 'forest', but in the here and now. With a photo projection on the wall, the current construction of palm plantations in Papua is shown. The section panel next to it, Powerful Symbol, describes: 'Despite the symbolic status, birds of paradise are threatened. Illegal sales of dead specimens are on the rise and the rich rainforest is being cut to make way for oil palm plantations. The habitat of the birds is getting smaller and smaller. The birds of paradise's future is uncertain.' This is a rare example of visual storytelling about the human changes to the landscape.

Conclusion: the human impact on biodiversity

The permanent collection of the Mission Museum in Steyl is century-old, monumental, and has limited options to offer extensive labels. An attempt to disclose more stories using a QR code has not yielded the desired depth of information, likely due to limited time and resources. The few visible QR codes are hidden or not inviting. A few modern trunks offer questions or activities specifically designed for children. The temporary exhibition makes up for that lack of information. The labels (in Dutch only) are informative and offer interesting facts about the displayed items. They are written in clear and easily readable language, but the type of information is not targeted at children. There are no questions or thought-provoking texts, so the information feels somewhat formal and is not written to actively engage the audience.

In the permanent collection (including digital information accessible through incidental QR codes), the only mention of human impact on biodiversity describes a new, more animal-friendly approach to catching butterflies. The Birds of Paradise exhibition highlights the threatened status of the birds, the rising illicit trade of dead specimens, and the shrinking habitat caused by deforestation: 'The birds of paradise's future is uncertain.' Although an attentive visitor might interpret the information about shrinking habitat in the Birds of Paradise exhibition as an encouragement to buy fewer palm oil products, there is no explicit call for action. The Paris Demands label suggests that activism can positively impact the fight against species extinction, but it does not connect this message to modern opportunities for protecting biodiversity.

Musée des Confluences, Lyon

About the visit
Date: Saturday 12-10-2024
Considerations: Opportunity (affordable: combined with another programme), non-Dutch location, modern museum.
Visited exhibitions: Species - the web of life
Skipped exhibitions: Eternities - visions of the beyond, Origins – Stories of the world, Societies - human theatre, Émile Guimet Gallery

About the museum
Website: https://museedesconfluences.fr/en
Mission & vision: 'The Musée des Confluences creates conversations between the sciences to understand the history of life and humanity. […] By opening up the sciences to each other, the museum reveals new ways of understanding and unravelling the complexity of our world. These perspectives encourage curiosity and invite us to learn with emotion and wonder' (Musée des Confluences, n.d.).
Target group: A broad and diverse audience, including adults, families, youth, school groups, foreign visitors, and individuals with disabilities.
Description: The Musée des Confluences, a modern museum in Lyon, combines natural and cultural collections. Although the exhibitions are mostly classical, without interactives, the dark, theatrical setting and the shaped walls and display cases give it a theatrical setting.

Analysis of the exhibition Species - the web of life
The theatrical exhibition Species, the web of life, aimed at a broad audience including visitors with children, questions 'the way human beings see the world, form part of it and contribute to its transformation. Our world is one in which the living, human and non-human, interconnect with each other in a variety of ways and form a web of life' (entrance intro panel). The exhibition showcases diverse approaches to nature, rooted in cultural history and ethnographic collections.

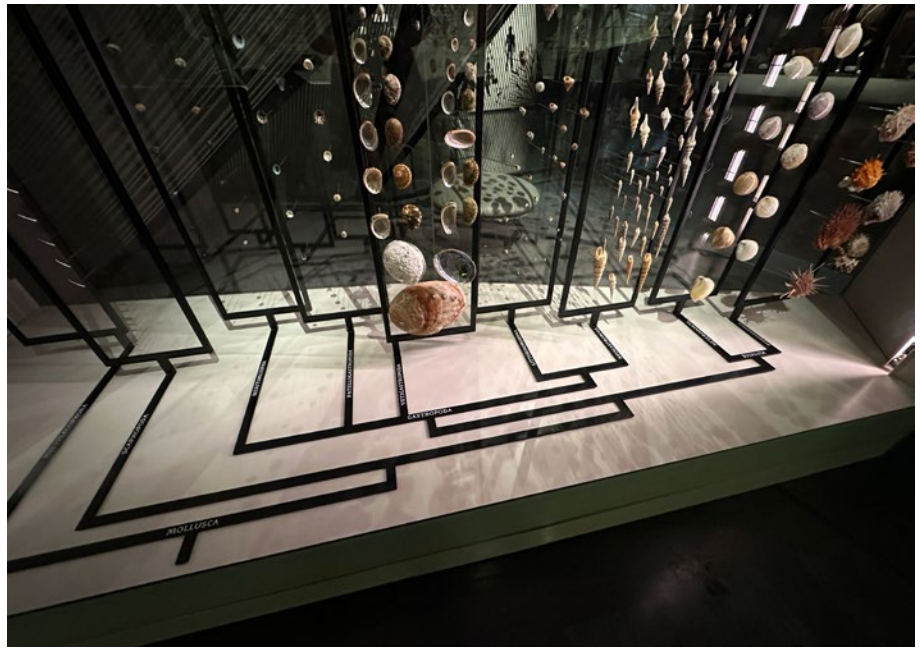
Section 1. The human being: a symbolic animal
The first part of the exhibition features mummies, microscopes, and modern Indigenous art, highlighting different perspectives on nature.

- Section panel: Being in the world. 'Each group of human beings confers its own reality on the world and finds a way of living in it and making sense of it. These different approaches mean that humans have different ways of relating to nature and forming links with other living beings.'
- Mummies exhibit. A harmonious existence. 'Ancient Egypt saw the world as a single unit within which all living beings were organised. All were

different, physically and spiritually, but all were connected by a network of similarities. In this balanced world, everyone had their place and their role. A fundamental solidarity existed between humans, other animals and the rest of nature.' This exhibit displays several mummies of animals, with animals as divine incarnations and animals as ex-votos. Although in the past, it shows another way of looking at other life.

- Sphinx. Half-man, half-animal. A common creature in Ancient Egypt.
- Untitled modern artwork of kangaroo and emus, shows how the Aboriginal people of the totem kangaroo see the appearance of animals as temporary embodiments of itself.
- Several modern Inuit artworks. Exhibit panel: 'In the Canadian Far North, the Inuits think of their relationships with other living beings as being person-to-person relationships. All beings have a culture and possess moral and social qualities similar to those of humans. It is only the species' morphology, and hence way of life, that enables one to be distinguished from another. In this animist thought, humans form only one group among many caught up in a greater whole where a permanent dialogue is carried on between the souls of each identity.' Other text panels explain how, according to Inuit thought, the soul circulates from one bodily form to another, and how Inuits communicate directly with other animals and acknowledge their consciousness. 'There is no domination and the hunter must be able to convince the game to offer themselves to him.' A very clarifying explanation of other worldviews.

- Amazonia exhibit: A cultural continuum. Explains how the Amerindians of Amazonia consider all living beings as connected in a network where no single element is important in itself. It features feathered head dresses, symbolising the identity of cultural groups who could, otherwise, not be distinguished by their ethnicity, but are perceived as belonging to different species. The Kunana woven mat with ants and wasps for rituals is shaped like a mythical being. Feathers for armbands are selected based on the identification with birds.
- Microscope exhibit: 'The human-animal boundary' panel explains that it is only in Western thought, since the 17th century, that the separation between nature and culture has meaning. 'Over a period of time the Western worldview became anthropocentric. Nature became no more than man's environment, something to be studied, mastered and possessed. This new vision was instrumental to the development of scientific thought.' The exhibit panel explains how microscopes have contributed to the objectification of nature. 'Observation by means of an instrument increases the sense of distance between it and the observer.' The exhibit also explains how the habit of collecting natural specimens in cabinets of curiosities transformed nature into a collection piece.



Section 2. Humanity in the diversity of life
The second part primarily features stuffed animals and explains the place of humans in the world through a Western, scientific lens.

- The section panel explains how 'Science identifies, describes, classifies and makes inventories of living beings without employing metaphysical considerations or making value judgements, and so, in this way, it provides objective and universal knowledge. Humans are 'Homo sapiens', one species among many.'
- A film by Pauline Brunner and Marion Verlé, explains that 'Initially, the idea of the great chain of being was popular in western thought. It was then followed by the concept of the tree of life, incorporating genealogies and ranges of values. It was not until the end of the 20th century in the West, that the classification of living beings was really separated from the consideration of values.'
- Mammals exhibit: clarifies that Homo sapiens is one of the 5,400 living species of mammals.
- Molluscs exhibit: no mention of human impact.
- Insects exhibit: no mention of human impact.
- Birds exhibit: digital labels, no mention of human impact.
- Who are we?: 'Like them, we are all Eukaryotes'. This exhibit shows a large

three-dimensional tree of life, resembling the roots of a tree. The digital display shows how some related animals, based on their DNA, look different, and how others look similar although not related. 'The classification of species makes it easier to appreciate their immense diversity. […] This tree of life mirrors […] shows neither a specific direction nor a particular place. Its branches simply reflect the characteristics and evolutionary history that living beings have in common.'

- Exhibit Environments and appearances: it shows how species have evolved based on habitats. No mention of human impact.

Section 3. The human being: a particular animal
The third section focuses on Homo sapiens, comparing them with other animals in use of tools, awareness of the body and transmission of acquired knowledge.

- Section panel: 'Human beings have developed specific characteristics in a number of areas, such as social and cognitive behaviour, body awareness, etc. Such specific characteristics do not set human beings apart from other animals; man is just one particular animal among others.'
- Exhibit A Social Being: highlights how primate societies are distinguished by their complexity, and how humans even go as far as questioning their own lifestyle and social structures. 'They have invented an infinite number of

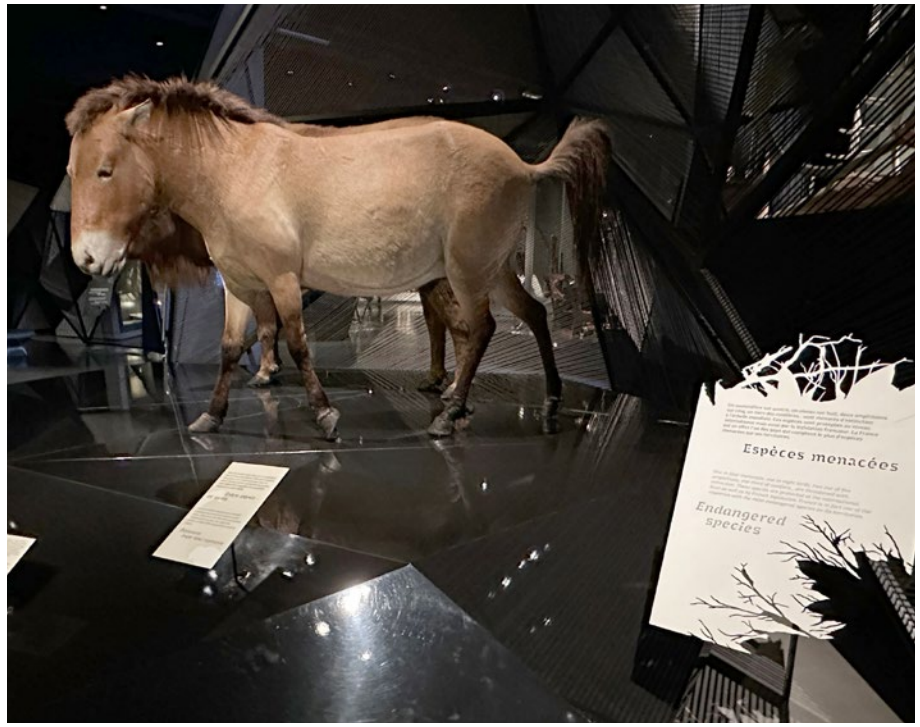
values, practices and artefacts which are used to govern their relationships and place in society.'

- Exhibit Childhood Learning: shows ethnographic objects of human figures. Explains how the particularly long period of learning gives human beings a great adaptability to their environment and society.
- Exhibit Noh theatre: highlights the high range of emotions, and the complexity of identifying emotions of other cultures.
- Exhibit An Intelligent Being: 'Human beings have developed formidable cognitive abilities, so we tend to regard them as the only intelligent species and when we talk of other animals we prefer to use the term instinct. However, such a restriction seems hard to justify, given that the very concept of intelligence is difficult to define and even more challenging to quantify. We need to acknowledge that there are as many forms of intelligence as there are different animals, and they all have their own perceptions of the world. We should no longer characterise humans by their intelligence, but rather try to find out what characterises human intelligence.'
- A capacity for technical evolution is shown by prehistoric tools. No impact on biodiversity.
- Exhibit A capacity for abstract and symbolic thought: shows prehistoric engravings and cuneiform tablets. It highlights how writing has had an impact on humanity.
- A being conscious of its body… explains that if we were not self-aware, we would not be aware of others. It highlights the difference to other animals. The exhibit with prostheses shows how humans impact their own bodies: 'Prostheses are part of our lives in the way they are used to overcome our deficiencies or extend our capabilities. Today, technological tools are not just means of simple reconstruction, but are used to transform the human body by means of bionic enhancement.' The exhibit of radiology equipment highlights how we can see inside the body without opening it.

Section 4. Humans faced with their impact

This section highlights the human impact on the biosphere. The section panel explains: 'The population explosion, technological advances and the idea that nature is inexhaustible have led to a growing exploitation of natural resources. Humans are now faced with an ethical dilemma: immediate profit or sustainable development to improve the world for all.'

- A video projection shows the human impact on the Earth's surface. The following words accompany impressive images: World population in 1900: 1,5 billion. World population today: Over 7 billion – Sao Paulo – A threat to fauna and flora – Dams – Cities – Rubbish - Plastic continent - A fate we can avoid - Protection of endangered species - Nature reserves - Crop quotas - Constructed wetlands - Curitiba: biodiversity and urban development.
- Exhibit A being linked to the natural environment: 'Human beings interact with other living beings to meet their own needs. Today, the disturbing consequences of our impact on biodiversity mean that we are faced with societal choices that will determine our future in the living world.'
- Exhibit of extinct species. It includes a skeleton of a dodo, a mounted



specimen of a Tasmanian tiger, an elephant bird egg, a skeleton of the Eastern moa, a huia and a passenger pigeon. Exhibit label: 'Human beings and their activities are implicated in the disappearance of many species. Population pressure, the overexploitation of living resources, the destruction of natural habitats, pollution, the introduction of non-native species and the globalisation of flora and fauna are the principal causes.'

Dodo: 'The dodo, discovered in 1598 by Dutch explorers, was a victim of intensive hunting and the introduction to the island of predators, like cats and dogs. Only 64 years elapsed before it vanished completely.' There are no mounted specimens and only a few rare bones remain.'

Tasmanian tiger: 'Dingoes were dogs introduced by the Abiriginal people and seem to have eliminated this marsupial from Australia. In Tasmania, the arrival of European settlers proved fatal for it. As it attacked their livestock it was decided that it should be eradicated. The species has been considered extinct since 1936.'

Elephant bird egg: 'The elephant bird, which measured up to 3 metres, probably disappeared between the 15th and 17th centuries because of hunting and deforestation.'

Eastern Moa: 'When the Mairis arrived in New Zealand between the 9th and 11th centuries, the moas, large flightless birds, were easy prey. They were hunted for their meat and eggs until their complete extermination in the 15th century.'

Huia: 'Huia were hunted by the Maoris for their feathers and were also prized by collectors in the 19th century. No specimens have been seen since 1907.'

Passenger pigeon: 'Flights of pigeons used to form clouds of hundreds of millions of individuals. Within 40 years they were hunted to extinction.'

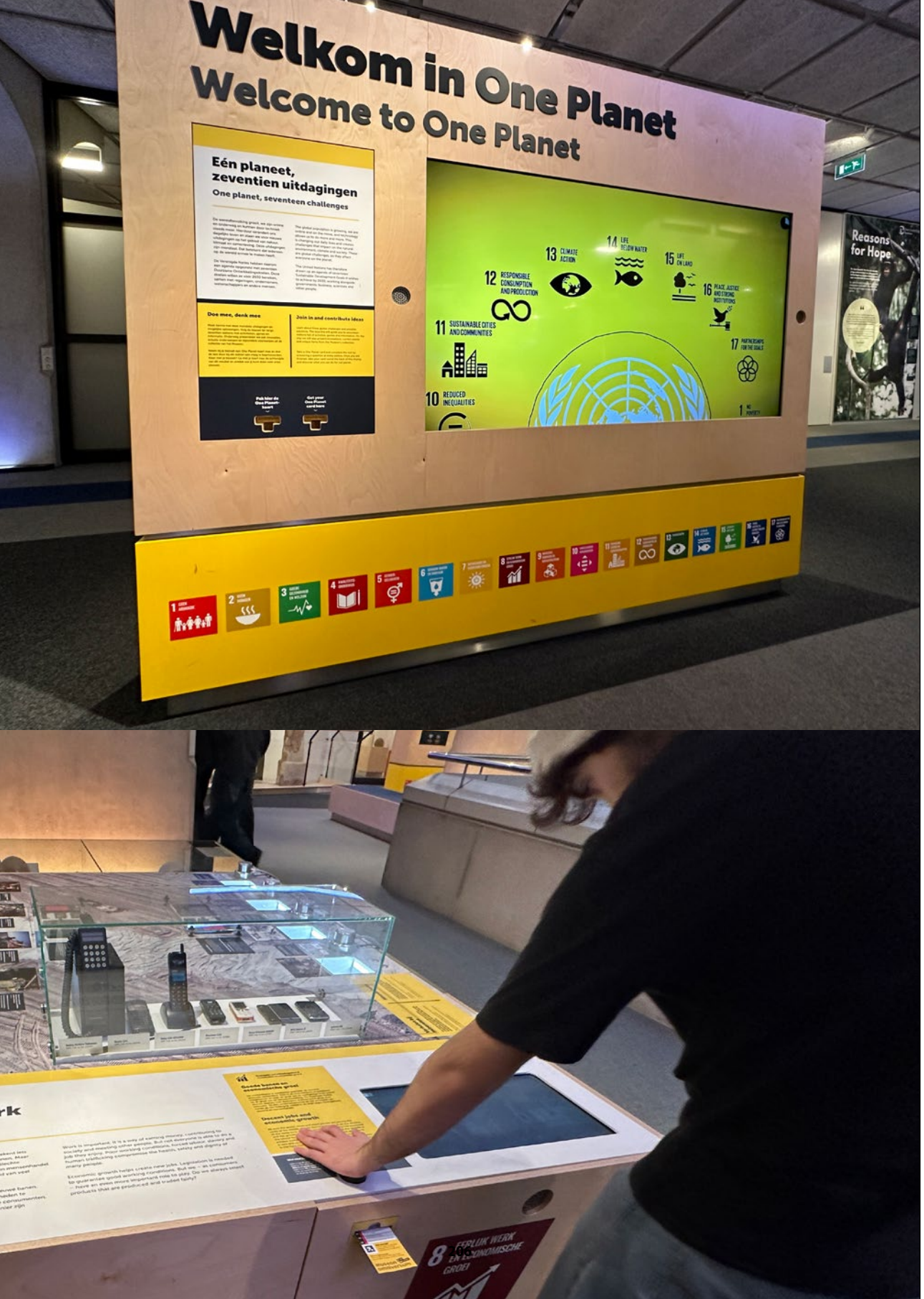
- Endangered species: 'One in four mammals, one in eight birds, two out of five amphibians, one third of conifers… are threatened with extinction. These species are protected at the international level as well as by French legislation. France is in fact one of the countries with the most endangered species on its territories.'

  Exhibit Between hope and reprieve: 'From the 1980s onwards zoos initiated breeding programmes for species under threat. Returns to the wild were sometimes crowned with success, but today the balance of these little populations remains fragile.'
- Przewalski's horse: 'Man came very close to rendering the wild horse extnct. In 1960 there were no more than 13 of them, all in captivity. Despite breeding programmes and campaigns for returns to the wild the current population only rises to around 2,000 horses and is therefore still in danger of extinction.'

- Europeal bison: 'Starting from the Middle Ages hunting and the extension of land under cultivation gradually got the better of the bison. When the last wild specimen was killed in 1921 the species was no longer represented except by around fifty individual bison in captivity. Thanks to programmes of returns to the wild we can count today just over 3,000 individual wild animals.'
- Exhibit Cultural biodiversity: 'Cultural diversity is closely linked to biodiversity and illustrates the myriad ways man has adopted to his environment. Both cultural and biodiversity are under threat from change and the globalisation of practices. Many populations' everyday lives and cultures are endangered as their environments are altered. Local knowledge and practices are indispensable if we are to conserve our biodiversity, so we must ensure that sustainable development goes hand in hand wwith the preservation of cultural heritage.'
- Exhibit The dugong and the Torres Strait people: a skeleton of an extinct Steller's sea cow, and an artwork of a mother and baby dugong combine natural and cultural history. Exhibit panel: 'The remaining populations of this marine mammal seem only to be found in northern Australia, ironically the sole region where it is still the subject of a ritual hunt. It is thanks to very strong ties between the dugong and local Indigenous culture that its preservation seems to be successful.'
- Steller's sea cow: 'Sailors have slaughtered this peaceful marine mammal for its meat, fat and skin ever since it was discovered in 1741. Just 27 years was enough to exterminate the largest of the sirenia and now only a few rare skeletons of them are left in the world.
- Apu Kaz, or mother and baby dugong, is an artwork by Aboriginal artist Dennis Nona: The lines engraved on these dugongs are inspired by motifs relating hunting legends which decorate certain Aboriginal masks. Here they show the Milky Way and how marine currents are used to flush out dugongs.
- Outro panel: 'When we view the world and our place within it we need to understand that we share a common history with other living beings. We should realize that we are part of a very diverse whole, both in terms oof life forms as well as in ways of doing and being. If we stop thinking of humans as being separate from nature, it then becomes possible to suggest models of conduct where biodiversity and cultural diversity are respected and interlinked.'

Conclusion: the human impact on biodiversity

The exhibition Species, the web of life, aimed at a broad audience including visitors with children, questions 'the way human beings see the world, form part of it and contribute to its transformation. Our world is one in which the living, human and non-human, interconnect with each other in a variety of ways and form a web of life' (entrance intro panel). The exhibition showcases diverse approaches to nature, rooted in cultural history and ethnographic collections. It explains how, from the seventeenth century in the West, the notion emerged that nature was merely 'man's environment, something to be studied, mastered and possessed' (label text). Only recently has the classification of living beings been detached from valuation. The exhibition displays numerous natural history objects and, in the end, showcases several animals that are now extinct due to anthropogenic reasons. It aims to provoke a more holistic view of nature without concrete action perspectives. However, it also outlines some activities to combat biodiversity degradation, such as endangered species protection plans, fishing quotas, and constructed wetlands. The exhibition identifies that both cultural heritage and biodiversity are under threat and proposes a clear solution to challenge the human overexploitation of natural resources by preserving cultural heritage in the form of local knowledge and practices: 'If we stop thinking of humans as being separate from nature, it then becomes possible to suggest models of conduct where biodiversity and cultural diversity are respected and interlinked' (outro text). Although there is much to observe for everyone, and during the author's analysis, several visitors attended the exhibition with even very young children, the level of information is quite profound and caters to an audience expecting to learn. The exhibition is limited to showing animals only, and does not highlight ecosystems. Nevertheless, it mentions several times how species are dependent on each other and how nature and culture are related.



Museon-Omniversum, The Hague

About the visit

Date: Wednesday 12-04-2024 and 27-11-2024
Visited exhibitions: One Planet Expo
Visited, but not analysed exhibitions: themed rooms, temporary exhibitions and One Planet Now!
Considerations: Modern exhibition with extra attention to environmental awareness and sustainability. Accessible, city location, family and school target groups.

About the museum

Website: https://www.museon-omniversum.nl/en
Mission: 'At Museon-Omniversum, we inspire visitors of all ages to contribute to a sustainable future. Discover the challenges and solutions for our planet through impressive films, interactive exhibitions, and a unique collection. Together with the public, schools, government, and businesses, we strive for a better world' (Museon-Omniversum, n.d.).
Target group: Visitors of all ages
Description: Finding its origin as a library for natural history and ethnographic objects for education, Museon-Omniversum has re-invented itself to become a sustainability-focused museum targeting families and school classes. It addresses ethical issues, such as the ownership of its colonial collection and infamous Dutch historical figures such as Coen.

Analysis of the exhibition One Planet Expo

One Planet Expo is a permanent exhibition that offers an interactive and playful journey through the United Nations' seventeen Sustainable Development Goals (SDGs). It combines natural, cultural, and ethnic collections with videos, games and interactives, sharing perspectives from around the globe. Using a punch card with provocative questions, visitors learn how their choices impact the world. For example: 'Do you ever eat food that is still fine but is past the 'best before' date?'

SDG 1 • No Poverty
This exhibit highlights solar energy as a means to combat poverty, as it provides light for studying, refrigerates food, and powers computers. There is no natural history collection. The cultural history and ethnographic collection present non-Western perspectives on the significance of the sun.

SDG 2 • Zero Hunger
With models of snakes and insects, this exhibit poses the question of whether agricultural land should not be used to feed people instead of livestock, since people can get their proteins from soya and insects.

- Snake: 'Eating snake is quite a normal thing to do in southern China, so lots of snake species are threatened with extinction there. As a result, the number of rats and mice is on the increase, and they are eating up rice stocks. So what is best: snake or rat for supper?'
- Preserving proteins: 'These preserving pots contain examples of vegetable sources of protein and edible insects. Vegetable proteins come from the bottom of the food pyramid, and it takes very little space to breed insects. Both of these sources of protein therefore reduce the pressure on farmland. If you regularly eat a meal without meat and replace it with other proteins, you can help protect the environment and make our planet sustainable.'
- Bug eaters: 'Breeding insects is a serious alternative source of protein for the world's population. Around 80% of the world's population already eats insects, choosing from some 1400 edible species. Haven't tried them yet? In fact, though you may not know it, you eat around half a kilo of insects a year, because they accidentally end up in products like ketchup, flour and chocolate.'
- Pulses: 'India has a population of 1.2 billion. Around 30% of them are vegetarian for religious reasons. Around 5% of people in the Netherlands are vegetarian.'

SDG 3 • Good Health
This exhibit focuses on food, obesity, and exercise. No natural history collection, no mention of the human impact on the biosphere.

SDG 4 • Quality Education
This exhibit highlights the importance of passing on knowledge, including Indigenous knowledge. It features the game 'Never Alone', which you can play, about the dying out culture of the Iñupiat, an Arctic people. One label explains the origins, purpose and value of the museum.

- With your own eyes: 'What does a marine crocodile look like? How does electricity work? How do people in Indonesia live? Nowadays, you type something like this into a search engine and you immediately get an idea. We now have access to a wealth of knowledge about the world without travelling. Things were different at the start of the previous century. Photos, films, travelling and outings were mainly for the elite. However, there was a growing realisation that children can understand things much more easily if they have an image of them. That's why this museum was founded exactly 120 years ago. Students got a better idea of all those abstract concepts and names from nature, culture and technology in the exhibitions and in the cinema, which came soon after. You can see a selection of objects that visitors also encountered at that time in this display cabinet.'

SDG 5 • Gender Equality
No natural history collection, no mention of the human impact on the biosphere.

SDG 6 • Clean Water
This exhibit highlights the importance of clean water and the risks associated with pollution. It suggests ways to prevent water pollution and demonstrates how nature can assist in water purification. None of the objects mention biodiversity; however, it still becomes clear how humans impact their natural environment.

- Zeolites: natural cleansers: 'Zeolites are minerals found mainly near volcanoes. They are created in the cavities in solidified lava, and also when volcanic ash weathers in water or on land. Their light structure enables zeolites to absorb harmful substances like heavy metals. This makes them a useful tool in water purification. Zeolites are also produced artificially nowadays.'
- Exhibit with poison sprays, Bugged by mosquitoes? 'For much of the twentieth century, many people had a flit spray in their home, which was generally used to spray DDT. This poison is highly effective at killing mosquitoes and other insects, but it is not degradable. It pollutes the soil and water and accumulates in the bodies of animals. DDT has been banned in the Netherlands since 1973.'
- Pills down the toilet: Medicines are a source of water pollution. Drug residues that leave the body in urine end up in the sewer. The use of medicines is increasing in the Netherlands, partly because the population is ageing, so pollution from drug residues is also increasing. However, water purification plants are finding ways of filtering more and more substances out of waste water.
  Jerry: an exhibit about an award-winning water filter that could save millions of human lives. Not so much about biodiversity, but by highlighting the young age of the Dutch inventor, it may stimulate other children to come up with innovations for environmental problems.

SDG 7 • Affordable Energy

- Section panel: 'Our homes, factories, cars and mobile phones all need energy. Global energy consumption is on the increase. The majority of the energy we use comes from oil, gas and coal. However, they contribute to the greenhouse effect, and they are gradually running out. Luckily, there are alternatives: energy sources that will never run out or are easy to replenish. Wind and solar power, for example, and a host of other experimental forms of sustainable energy that are being explored all over the world.'
- The text at the punch card slit: Clean and affordable energy: 'Global energy

demand is growing. Fossil fuels are running out, and their consumption contributes to the greenhouse effect and climate change. We will therefore have to switch to sustainable energy. To ensure that everyone, everywhere, has access to clean, renewable energy, we will need to invest in alternative sources like solar, wind and geothermal energy. It is also important that we make buildings and industry more energy-efficient.'
  > Although not easy to do as an individual action, this text does provide solutions that visitors may contribute to by choosing a particular profession.
- Coal: 'As foreign coal prices fell and the Groningen gas field was discovered, the last coal mine in Limburg closed in 1974. Burning coal releases large quantities of CO_2. Nevertheless, the Netherlands still imports and burns coal to generate electricity, as this type of fossil fuel is still cheaper than sustainable energy.'
  > This exhibit, with a large chunk of coal, describes the main problem of sustainable behaviour: money.
- Building blocks of the world, object Plastiglomerate: 'This artificial type of rock is a conglomerate of natural materials such as sand, shells, and coral, bound together with molten plastic. The material is created when plastic waste melts, for example, in campfires on the beach, and fuses with natural components. Plastiglomerate is a new type of rock that symbolises the influence of humans on the earth: the "Anthropocene"' (translation from more elaborate Dutch text label by author). Second label: 'This is the most recent type of rock found on earth. It was dubbed 'plastiglomerate' in 2014. Without people it would never have existed, as it consists partly of plastic.'
  > The ultimate human impact on the planet.

SDG 8 • Decent Work
Exhibit about economic growth, good working conditions and fair trade. Although it shows the minerals needed for electronic devices (a natural history collection) and it comes with interactive sound fragments, it only describes the impact on human lives, not on non-human life. The only label that discusses the environment is the label of the Fairtrade telephone: 'The Dutch company Fairphone makes sustainable smartphones, produced with respect for people and the environment. The company invests in fairtrade gold and tin, tantalum and tungsten from conflict-free mines. The components of the Fairphone can also be replaced, giving them a longer lifespan.' By mentioning the Dutch production, it may bring the fair production closer to the visitors. Showing that work on the devices we use on a daily basis is not only done far away, but accessible work around the corner. Everyone can contribute to a fair world!

SDG 9 • Industry and Innovation
This exhibit explicitly mentions the human impact on the biosphere, but does not feature a natural history collection. Smart food networks: 'The food on our plate comes from all over the world. Transporting all this food takes energy and causes carbon emissions. What is more, some food is always lost along the way. So would it not be better to eat local produce? Not always. Imported food can be more sustainable than locally produced food, if production takes less

energy in another country, for example. It is however important that we invest in infrastructure and logistics, in order to prevent food wastage, conserve energy and reduce carbon emissions.'
This exhibit fails to go into detail. It would be interesting to see the figures for the carbon emissions of an Italian tomato versus a Dutch greenhouse tomato. It could have easily offered action perspective.

SDG 10 • Reduced Inequality
Important topic of discrimination, but no human impact on the environment.

SDG 11 • Sustainable Cities
Focus on human fairness and sustainability, missed opportunity to talk about non-human life in cities. The exhibit discusses wildfires due to global warming, and proposes to prepare for more wildfires instead of mitigating global warming, however, with a QR code it provides access to a website by the Wageningen University where you can discover how you can help. Display cases next to the SDG 11 exhibit show high hats, cultural heritage and something about babies. Although they feature collections, they do not mention the human impact on biodiversity.

SDG 12 • Responsible Consumption
This exhibit highlights fishing.

- Main panel Fish for tomorrow: 'Fish is healthy, but most fisheries are being exploited to capacity, or even overfished. In many cases, more fish are caught than are actually needed, or the techniques used are harmful to the ecosystem. Fish are sometimes caught before they are mature enough to reproduce. As a result, fish stocks are in decline. So should we stop eating fish? Sustainable fishing techniques do not damage the marine ecosystem. They prevent by-catch and overfishing, ensuring that future generations can continue to use the oceans as an important source of food.' And the text for the punch card, Responsible consumption and production: 'How do we ensure more jobs and prosperity while reducing pollution and energy consumption? This will require new ways of producing, more efficient use of natural resources and less wasteful patterns of consumption. Simply avoiding food wastage during production, transport and consumption would be an important step towards ensuring we use natural resources far more sustainably.'
- An exhibit with several models of fish: 'Cod live in the Atlantic Ocean. This species is vulnerable, as it matures late and guards its spawn in shoals. After

reaching a new low point in 2006, cod stocks in the North Sea have now recovered to a healthy state. […] Sea trout occur in the northern Atlantic, the North Sea and the Baltic Sea. They live at sea but breed in freshwater rivers and streams. Fishing for sea trout is banned in order to protect the population. […] Chinook salmon live in the northern Pacific and other regions. They hatch in rivers, but grow to maturity at sea. After several years they return to the place where they were born to spawn. They breed only once, and die shortly afterwards. Fishing for Chinook salmon is subject to restrictions, in order to preserve the species.

- An exhibit with mounted puffins: 'Young puffins are fed on sand eels and young herring. Industrial fishing practices have made these species scarce in the waters around Norway's Lofoten Islands. As a result, only one in a thousand pairs of puffins manages to raise their young to maturity there.'
  > These numbers are unimaginably large.
- Exhibit with flatfish: 'Plaice and other flatfish live on the seabed. Fortunately, trawling with nets over the seabed is being phased out, as it disturbs fish and other wildlife that live there. This is better for flatfish populations.'
- Two aquariums with living plants and fish, label Forest on stilts: 'Mangroves grow in shallow mud along coastlines in tropical and subtropical regions, marking the transition between land and sea. Mangroves are important habitats for many terrestrial and marine animals, and a nursery for many species of fish. Mangroves also protect the land from erosion and are an important source of food for the region's inhabitants. More and more mangroves are being lost all over the world, partly because of aquaculture, or fish farming. Trees are cut down to create nursery ponds and the chemicals and medicines used in the industry are bad for organisms in the water.'
  > This brings awareness of the human impact on organisms.

SDG 13 • Climate Action

This exhibit shows several mounted specimens from four different climate regions, and a clear text about human impact on biodiversity as well as suggestions for environmental action. It explains how campaigning is effective, which is an easy action that could empower visitors and make them less helpless. The labels also clearly show the IUCN's status, with a colourful indication.

- Main panel Action on climate change: 'We burn gas, oil and coal for energy, but this releases large amounts of carbon and is changing the earth's climate. This in turn has a huge impact on humans and on animals, causing damage to ecosystems, heatwaves, flooding, failed harvests and an increase in tropical plagues and diseases. All over the world people are working on solutions

to this problem, from schoolchildren to world leaders. It is important that everyone is aware of the problem, because if lots of us campaign for the environment, politicians and companies will be forced to find a solution.' And label next to punch machine, Combat climate change: 'The impacts of climate change can be felt all over the world. The increased flooding, failing harvests and heatwaves are caused by global warming. This in turn is caused by burning oil, gas and coal, releasing large quantities of carbon dioxide into the atmosphere. We must reduce emissions drastically by replacing fossil fuels with renewable energy and by natural 'cleaners' removing CO_2 from the atmosphere.'

- Continental climates: 'Przewalski's horse: The only truly wild horses on the planet almost died out, but thanks to breeding programmes in Mongolia are now back in nature. However, climate change is causing more periods of extreme cold, which the horses cannot always survive.' And 'Red panda. The red panda lives in the Himalayas, at 2200 to 4800 metres, in a temperate region with few changes in temperature throughout the year. However, deforestation and climate change are causing its habitat to shrink gradually.
- Polar climates: Southern rockhopper penguin. 'The southern rockhopper penguin got into difficulties in the past because it was used as bait, and because its eggs were collected. Though it is no longer at such great risk, it is still vulnerable. It is not entirely clear why, but it is highly likely that changes in the food chain caused by global warming are a factor.' And Atlantic puffin: 'Climate change is causing the temperature of sea water to rise, and the population of animals on which puffins prey is declining. Puffins are also more frequently subjected to extreme weather conditions like heavy storms.'
- Dry climates: Chilean flamingo. 'The water level has to be just right for a flamingo, not too high and not too low. Temperature increases as a result of climate change cause drought. At the same time, sea level rise causes flooding, so the flamingo's habitat is shrinking.' And Kowari. 'There is less and less space for the kowari in Australia, as farmers allow their cattle to graze its habitat. More frequent drought caused by climate change has exacerbated the problem.'
- Tropical wet climates: Southern cassowary. 'Hunting for cassowary is popular in Indonesia and its habitat is disappearing, particularly in Australia. Nor can it withstand the cyclones which are increasing in frequency due to global warming.' And Secretarybird. 'The secretarybird, which occurs south of the Sahara, has difficulty withstanding drought. This makes it vulnerable to climate change. Its habitat is shrinking and it faces competition from other species that also want to live in wetter areas, such as humans.'

SDG 14 • Life Below Water

A display case with many molluscs and corals. It explains the importance of biodiversity and ecosystems for life on earth, including humans, it is unequivocal about the human impact on species and ecosystems, and explains the exact causes of the dangers.

- Main label: Protecting underwater life. 'The oceans are hugely important for life on this planet. Pollution, acidification and overfishing threaten the health of our oceans. A large proportion of coral reefs – some of the richest ecosystems on the planet, home to 25% of all marine life – are at risk. To preserve coral reefs for the future it is important that local communities are involved in their protection. Studies are also exploring the use of cultivated corals to restore reefs.'
- Label next to punch machine: 'Protecting the seas and oceans. Billions of people rely on the biodiversity of the oceans for food and income. However, a large proportion of the planet's seas are overfished. The oceans also absorb around 30% of all the carbon dioxide produced by human activity, resulting in rising levels of acidity in the water. Another problem is pollution due to plastics, fertilisers and industrial waste. The United Nations has agreed that we should tackle these problems together and restore the world's oceans to good health.'
- Parrotfishes: 'Parrotfish are 'grazers' that live in and around coral reefs. They eat the algae that grows on the coral, keeping it healthy. Overfishing and

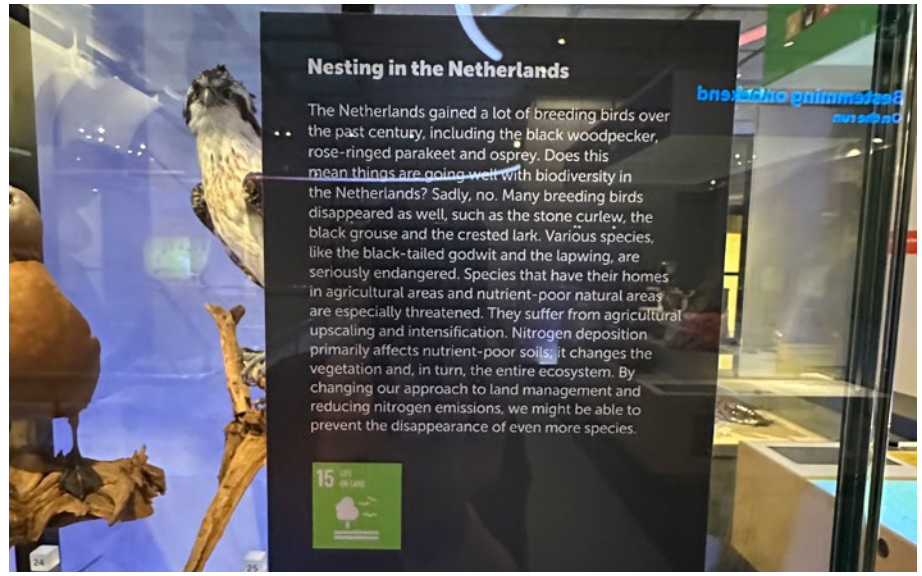
pollution has caused more and more of these fish to disappear. As a result, the coral is dying off as it becomes overgrown with algae.'

- Crown-of-thorns starfish: 'Crown-of-thorns starfish are bad for the reef as they prey upon coral polyps at night. Just one of these spiny starfish can eat a piece of coral equivalent to its own size – up to 40 centimetres in diameter – in a single night. The crown-of-thorns starfish has no natural predators.'
- At the molluscs: 'Chalk as protection. A thin membrane on the outside of the mollusc contains 'shell glands' which allow it to produce its own shell to protect it from enemies and from drying out. Increased carbon dioxide levels in the air are raising carbon dioxide levels in the water, making it more acidic, and dissolving the calcium carbonate. The shell thus becomes less robust and it becomes more difficult for the mollusc to create a new one.'
- Exhibit with specimens of two sea turtles: 'Sea turtles are found in tropical and subtropical regions. They travel thousands of kilometres to reach feeding areas and nesting sites. Populations are in decline and some species are even listed as endangered. Turtles are hunted for human consumption and also get caught accidentally in fishing nets. Another threat is the disappearance of nesting sites due to beach development. Finally, like many other forms of marine life, sea turtles are suffering from climate change and pollution.'

SDG 15 • Life On Land

Exhibit about regreening. It shows photographs of successful regreening initiatives, an interactive to move a sand dune, and some artefacts representing Indigenous spiritual tools to stimulate rain.

- Main exhibit label: Ensuring a green future. 'Climate change, deforestation and unsustainable land use are causing a lot of the world's vegetation to disappear, leading to parching and desertification. This disrupts water systems and other natural systems, and causes the loss of valuable agricultural land, which in turn leads to hunger and poverty. It increases the chance of flooding during wet periods, and water shortages during dry periods. Global measures are therefore needed to combat deforestation and desertification in order to prevent further damage. Reforestation and increased afforestation can help repair the damage already done.'
- Label next to punch machine: 'Restoring ecosystems and preserving biodiversity. Forests are important for clean air and water. They are also home to a wealth of plants, animals and insects. Deforestation and desertification cause the loss of this biodiversity and the degradation of farmland. The United Nations therefore wants to protect the natural environment, restore ecosystems and promote sustainable land use.'



- Interactive of the sand dune: 'Turn the wheel until the fan blows the sand away. Cutting down trees in dry regions makes the soil there even drier, and it means there is nothing to stop the wind blowing the sand away. Sand dunes shift and the sand ends up on the fields, so nothing can grow there. You cannot plant anything in such dry soil. The sand and seeds simply blow away and the soil does not retain enough moisture.'
- Modern artwork 'Trophee' by Fleur Beemster, offers a reflection on the battle against poaching. The artwork aims to shed light on the human responsibility in the hunting of endangered species, illegal wildlife trade, and the delicate state of nature.
- Display case Nesting in the Netherlands: 'The Netherlands gained a lot of breeding birds over the past century, including the black woodpecker, rose-ringed parakeet and osprey. Does this mean things are going well with biodiversity in the Netherlands? Sadly, no. Many breeding birds disappeared as well, such as the stone curlew, the black grouse and the crested lark. Various species, like the black-tailed godwit and the lapwing, are seriously endangered. Species that have their homes in agricultural areas and nutrient-poor natural areas are especially threatened. They suffer from agricultural upscaling and intensification. Nitrogen deposition primarily affects nutrient-poor soils; it changes the vegetation and, in turn, the entire ecosystem. By changing our approach to land management and reducing nitrogen emissions, we might be able to prevent the disappearance of even more species.'

> This display also shows various smaller labels that provide details about the habitat changes and the consequences for particular species.

SDG 16 • Peace And Justice
Focuses on social sustainability.

SDG 17 • Partnerships
This exhibit does not mention biodiversity, however, it highlights climate issues and solutions:

- 'The air around us becomes the newest water source. Due to climate change, we are having to deal with more extreme weather: heavy rainfall or conversely, long periods of drought. Because the temperature is rising, more water is evaporating and the air is becoming more humid. What if we took that moisture from the air? Could this do something about the drought this way? This machine, the SunGlacier, is meant for exactly that. It extracts water from the air through condensation. The sun supplies the energy with which the cone in this rain machine is cooled down. The air collides with the cone and the water inside it turns to cold droplets. Exactly like the droplets that appear on a cold can of soft drink on a summer's day. Collect the droplets and you have clean drinking water!'

Conclusion: the human impact on biodiversity
The Museon-Omniversum aims to inspire visitors of all ages to contribute to a sustainable future. One Planet Expo is a permanent exhibition that offers an interactive and playful journey through the United Nations' seventeen Sustainable Development Goals (SDGs). Using a punch card with provocative questions, visitors learn how their choices impact the world. It combines natural, cultural, and ethnic collections with videos, games and interactives, sharing perspectives from around the globe. Although many goals focus on social sustainability, most exhibits raise awareness of human interaction with the environment. One exhibit showcases the building blocks of the Earth, highlighting the most recently discovered type of rock on the planet, named plastiglomerate. This rock would not exist without human intervention, as it is partly made from plastic. A few exhibits integrate a natural history collection to clarify the human impact on biodiversity. SDG 12, Responsible Consumption and Production, uses specimens and models of animals, such as cod and puffins, with its label explaining the human impact on species: 'Young puffins are fed on sand eels and young herring. Industrial fishing practices have made these species scarce in the waters around Norway's Lofoten Islands. As a result, only one in a thousand pairs of puffins manages to raise their young to maturity there.' The addition of the scale of impact makes such a label powerful. Furthermore, SDG 13, Climate Action, employs a natural history collection to illustrate the stories of how certain animal species are threatened by global warming. This display case shows the species' IUCN status. SDG 14, Life Below Water, explains the consequences of increasing CO2 levels in the air, which cause higher acidity in water, as demonstrated in the collection of molluscs. The exhibition is very explicit about the causes of environmental disruption, it explains all kinds of causes of habitat destruction or changes which impact life. It engages audiences of all ages with interactives and provocative questions. It features several good examples, that may inspire people to become activated. It does not avoid concrete examples of projects and people who address sustainability challenges. Although the immense size and information density of the museum is high, it is ticking all the boxes with its sustainability-focused approach.

Museum of Natural Sciences, Brussels (Royal Belgian Institute of Natural Sciences)

About the visit

Date: Friday 30-08-2024
Considerations: Non-Dutch, large, national scale, international audience.
Visited exhibitions: Section D: Gallery of Evolution and Living Planet
Skipped exhibitions: Dinosaur gallery, Discovery of the Iguanodons and Mosasaurs, Giants (temporary exhibition), Minerals, Gallery of Humankind, BiodiverCITY and 250 Years of Natural Sciences.
The choice of exhibitions was based on impressions from the website beforehand. Section D appeared to offer the most potential for sharing knowledge about human-caused biodiversity loss through a natural history collection. During the visit, the exhibition BiodiverCITY also provided a lot of information on the importance of biodiversity; however, it contained fewer specimens than the exhibitions in section D and was therefore skipped.

About the museum

Website: NaturalSciences.be
Mission: 'To provide the scientific community, public authorities and civil society with relevant, high-quality science, useful advice and an attractive discovery of nature, its long history and its sustainable management. This commits us to […, and] increase the knowledge and understanding of citizens, particularly through the Museum, so that they can make informed choices about their lives and their future' (Royal Belgian Institute of Natural Sciences, n.d.).
Target group: Not specified in publicly available documents. Based on visual analysis, it attracts an audience ranging from families with young children to individual visitors with scientific interests, and based on its website, school groups are an important audience as well.
Description: One of the most visited museums in Belgium, the Museum of Natural Sciences, established in 1846 and renovated and extended until as recently as 2020, is famous for its collection of dinosaurs displayed in the largest dinosaur hall in the world. It is located in the district that now also houses the European institutions. All text labels offer four languages: French, Flemish, English and German. This increases the sensation of a discouraging amount of information, while in reality, it is not that much text.

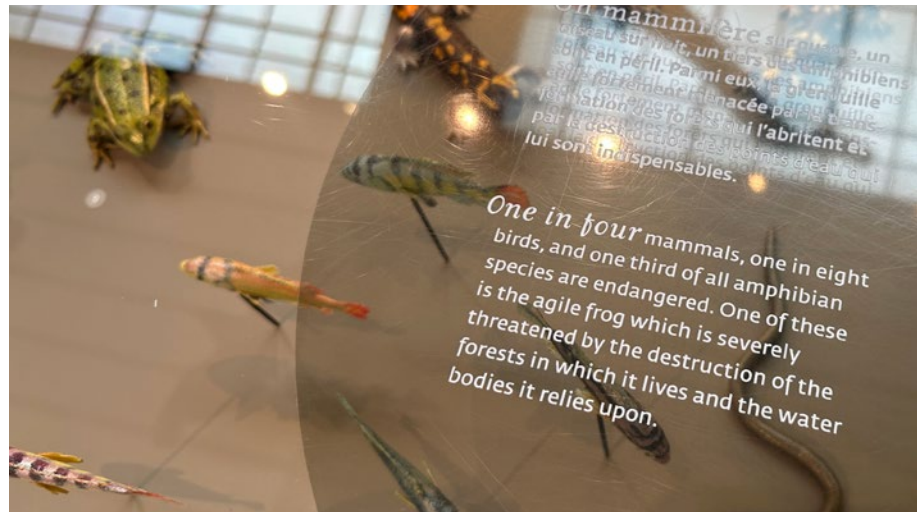
Analysis of the exhibition Gallery of Evolution

A Timeline of Evolution in a large, open hall, offers a combination of a natural history collection, casts, sculptures, interactive elements and video. It is presented in a traditional manner: how evolution works, which crucial elements evolved when (spine, jaw, etc). It offers a great amount of information in text panels and labels. There is too much to read; however, when one just skims the headlines, one gets the idea. In case one is interested in a particular subject, there is a lot to learn. There are several families with young children. The children are mostly interested in the parts where they can touch, slide, turn or do something. The parents are often very patient in explaining things to their children but seem to select just two or three spots in the whole gallery. One mother with an older child just move from screen to screen, and only seem interested in the digital, interactive elements.

In the Timeline of Evolution, the grey section (current time frame) is the only part that mentions the human impact on the environment, which is expected because that is the part where humans joined the rest of nature. One part at the end of the grey section of the exhibition is about human intervention. Everyone skips this part and walks by quickly. It is hardly interactive, and apparently not very appealing, although the information supply is thorough and, upon inspection, quite interesting.

Grey section: Evolution Continues in the Present

- One mention of the vulnerability of ecosystems, at a section panel next to several species: a bear, a lion, a penguin, rabbits, a king crab, insects, and fish sculptures: 'Today, the earth is home to almost 1.6 million species of animals and plants. The richness of life helps to ensure the stability and survival of ecosystems. But for how much longer? Excessive urbanisation, climate change, and the destruction of wild areas have drastically affected and even destroyed primary ecosystems, threatening many species.' This text is very clear to the educated visitor. However, it may not be very clear for children that humans are responsible, or why it is important.
- One mention of threatened species, in the display of the agile frog: 'One in four mammals, one in eight birds, and one-third of all amphibian species are endangered. One of these is the agile grog which is severely threatened by the destruction of the forest in which it lives and the water bodies it relies upon.' This does not mention human impact explicitly, and it does not offer any solution.
- Mosquitos in the Underground explains how a new species of mosquitoes has evolved in the London underground in a few decades, and that interbreeding with the other, above-ground species is difficult but possible, leading to a new population in the station entrances. Human-built structures have created new species.
- One mention in a section panel next to a giraffe, a bison, a hunting cheetah and some chickens, about how humans affect evolution: 'Humans are not like other animals. Our daily activities compromise the ability of other species



to survive and reproduce. Human lifestyles lead to deforestation, climate change, and urbanisation, which threaten other species. Man can also be a predator, hunting and fishing some species to extinction.' This label is very clear about human impact on biodiversity. It does not provide a solution or hope.

- In the beef cattle evolution panel, Always More Meat, the title suggests that we eat a lot of meat. The text explains how humans bred the animal to its current form for optimal consumption purposes. 'Humans have therefore deliberately influenced the evolution of the breed.'
- The display of the salmon, Victims of Breeding, mentions the threat to the wild salmon due to human artificial selection: After 25 years of artificial selection, the gene pool of the Atlantic salmon has changed dramatically, and farmed salmon are very different to wild salmon. Meanwhile, escapes from salmon farms have led to matings between the two, and hybrid salmon are spreading their genotype through the wild populations. There is a real danger that the wild salmon could die out within the next 25 years.' This label is very clear about the human impact on a species, but it does not offer a solution for acting. Should we stop eating and breeding salmon? Is it bad that the wild salmon dies out?
- The pig label: 'Pigs' appearances have changed as a result of domestication […] the hind quarters are much larger in order to provide more meat.'
- Artificial selection, a section panel next to a pig, a wild boar, a chicken and a cow: 'When People are rearing animals or cultivating plants, they select, modify, and deliberately favour some of the species' characteristics which are useful to them. In this way, they direct the species' evolution. This is no longer natural selection, but artificial selection done for aesthetic or economic reasons.'
- Man the predator, a general label not belonging to a particular exhibit: 'Whether through hunting or fishing, humans exert a selective pressure on some animals. For example, studies have shown that cod are becoming smaller. This is because the fishing nets allow only the smallest fish to escape. Since size is partly hereditary, smaller cod are becoming proportionally more numerous.' This label mentions studies into the human impact on biodiversity.
- Catch me if you can, a label next to two cod and a photograph of a full fishing net being hauled in on a vessel: 'The mesh size of fishing nets is a selection factor that has lead to populations of smaller adult cod. These smaller adults have a greater chance of escaping through the nets, surviving, and reproducing. As size is partly determined genetically, they pass this tendency

on to their offspring, and the size of adult cod has gradually decreased.' A clear example of the human impact on biodiversity change.

- The power of guns, a label not belonging to a specific collection item: 'Elephant poachers, hunting for ivory, exert selection pressure on elephants. Because ivory is so sought after, the elephants with the biggest tusks are more likely to be killed. An elephant with shorter tusks has a higher chance of survival and being able to reproduce. The genes for shorter tusks are therefore passed on more and more frequently and there are more and more frequently and there are more and more short-tusked elephants. In this way, hunting is modifying the gene pool of the species.'
- Antibiotics, a label next to a microscopic photograph of resistant bacteria: 'Antibiotics are used to wipe out bacteria. They are very effective, but there are nearly always a few bacteria that have a mutation that allows them to survive. These few surviving individuals reproduce, pass their mutation on to their offspring, and create whole new resistant populations. New antibiotics must therefore be used, and this particular arms race will likely go on forever.' The human fight against some bacteria is a clear example of human impact on biodiversity, even though these species are invisible to the human eye.
- Mutate and resist, a label next to a microscopic photograph of lice: 'We have been fighting off lice for over 60 years now, thanks to insecticides which attack their nervous system. Gradually, lice that are resistant to these chemicals have appeared. Analyses of their genotype have shown that two mutations were making them immune. Because the surviving lice reproduce and pass on these mutations, the resistant lice make up an ever greater proportion of the population.' This is another clear example of human attempts to eliminate pests, killing life concurrently.
- All other labels and exhibits: no mention of human impact on biodiversity.

Analysis of the exhibition Living Planet

Living Planet is a large exhibition with several sections in two galleries and two discovery areas. The upper floor is about an Abundant Planet. It explains relationships between species and with their environment.

Section Dazzlingly Diverse/A Magnificent Mix is a large, white gallery with several animal specimens. It shows the beauty and diversity of life, with positive stories about family behaviour, food, habits, etc. The specimens are accompanied by interactive touch screens (accessible for children and people in wheelchairs) with info about each displayed animal: a moving picture of the animal in its natural environment, its occurrence on earth, whether it's a young or adult, male or female, and its status in four levels (least concern, threatened, endangered or not evaluated).

- The intro panel mentions that 'scientists have so far identified 1,800,000 species. And many more have yet to be discovered.' This indicates the human curiosity for nature.
- Satin bowerbird: 'The bowerbird loves a splash of colour. Males attract females by building elaborate stick structures, called bowers, which they decorate with shiny treasures: berries, flowers, even human rubbish, such as bits of plastic, drinking straws and ballpoint pens. The shinier, the better. The bowerbird's favourite colour is blue.' This label mentions the nature-human relationship and seems to suggest that waste is not so bad, as this bird collects it.
- All other exhibits: no mention of human impact on biodiversity.

Section Such a Jumble/An essential Division is about classification. It explains how scientists classify living beings, for example, by criteria such as vertebrae, paws, hair, feathers or scales. An interactive element lets you play with blocks in different colours and shapes to understand this classification method. A large installation of a tree of life explains ancestry and nomenclature. Exhibits featuring various chickens illustrate how they are related but appear different, while exhibits with various bears show that they look similar but are not closely related. Complex words, such as, 'biosphere' or 'intraspecies diversity' are not avoided but explained in an accessible way. Families with children take their time in this gallery. Not a single mention of human impact on biodiversity.

Section Life at Every Level/Welcome Aboard! shows specimens of animals in their ecosystems. Modern dioramas highlight the unique features of each ecosystem. Digital labels are accessible again at every diorama, offering 'did you know'

facts, and the status, maturity and gender. Dioramas include forests, deserts, mountains, and many more. One side room is the discovery area, Tetrapodium, showing all kinds of skeletons, with interactive and playful elements.

- Section panel: 'From the depths of the ocean to the highest peaks… Life has gained a foothold in even the most challenging environments. Every species has its own particular niche and its own particular role. Together, those different little ecosystems ensure the proper functioning of the whole biosphere.'
- The Forest? No, the forests! This label explains the variety in forests. 'In each of them there is a strict ecological balance, in which every plant and animal plays its part.'
- A system within a system: 'Trees are forest's masterpieces. Each tree is a complex system: it eats, breathes, and communicates with its surroundings. But a forest consists of more than just trees. It develops because of its mineral wealth and because it is also home to a host of other plants and animals. Every beautiful forest is teeming with life.' The three labels all stress the interrelation and interdependence of species.
- All other exhibits (including the tetrapodium): no mention of human impact on biodiversity.

The lower floor of Living Planet, A Changing Planet, aims to bring awareness of climate change and the biodiversity crisis.

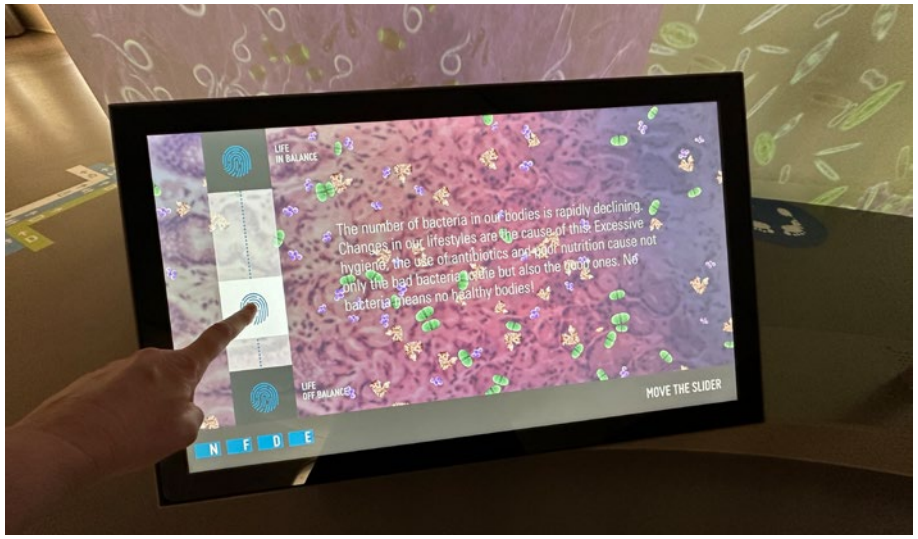
Section Networking / Eating… and being eaten shows many large specimens on islands in a large gallery.

- The section panel describes how all living things depend on each other.
- First exhibit: Bon appetit! Who eats who? No mention of humans. But very interesting interactive display about scavengers on a whale's carcass. 'Organisms can live on the carcass of a whale for almost a century. In nature, nothing is wasted and everything is recycled.'
- Second exhibit: Each link is important. Explains how all species have their function and play a role in the natural equilibrium. No mention of humans, except an interactive screen next to a specimen of a wolf, which shows what happened after the wolf was first hunted to extinction, and then played a pivotal role for the ecosystem after it was reintroduced.
- Third exhibit: One way traffic. No mention of human impact on the environment.
- Fourth exhibit: Come to dinner. Bizarre: The exhibit is about predation, who eats who. 'Every animal takes what it needs to survive.' But humans are not mentioned on any of the labels!
- Discovery area Arthropodium, about insects and spiders and everything with 6+ legs. No mention of the human impact.
- Fifth exhibit: tough competition. No mention of the human impact.
- Sixth exhibit: Taking advantage. 'Sometimes, unlike parasites, one species profits from another, without causing harm. Scientists call this peaceful coexistence 'commensalism'. An increasingly common example is the red fox. In towns and cities, foxes have learned that people equals garbage equals food.'
- Seventh exhibit: Indispensable to each other. No mention of the human impact.
- Eight exhibit: Real partners. No mention of the human impact.

Section Biodiversity: a matter of life and death.

- Section panel: 'Biodiversity benefits every living organism. Especially humans. Masters of all we survey, we still depend on other life and on the fruits of that life, even the very tiny. The microscopic algae in the oceans, for example. They provide much of the oxygen in our atmosphere. Without them we'd barely be able to breathe.'

- Interactive wall: the importance of bacteria for human health and the reason they are declining. You can do the interactive together with a partner or alone. Although it does not feature a collection item, it provides an important message about the human impact on small species. The screen shows the text: 'You will discover how close man is to nature and what the benefits are for us. […] Our intestines are home to 100,000 billion bacteria. The interactions between different bacteria and between bacteria and our bodies help us to obtain vitamins, improve our digestion and protect ourselves against disease. […] The number of bacteria in our bodies is rapidly declining.



Changes in our lifestyles are the cause of this. Excessive hygiene, the use of antibiotics and poor nutrition cause not only the bad bacteria to die but also the good ones. No bacteria means no healthy bodies!'

Section A perpetually changing planet / Today's order is tomorrow's chaos

- Section panel fails to highlight the human impact on the environment: 'Volcanic disruptions, forest fires, tsunamis, earthquakes… Earth has to endure a lot of disturbances. But after each disaster, nature picks itself up, dusts itself off and carries on. Life rebounds.'
- First exhibit: All in the same boat, is clear about climate change. 'Climate change is a global disturbance. It affects us all. No one can escape it. Biodiversity is in decline. More and more species are threatened with extinction. Scientists agree: human activity is largely responsible for this global disaster.' The exhibit features audio recordings of four personal stories about climate change. How does it impact human life? No collection items though. The label: 'Man is the problem and the solution. Man has tamed nature. He exploits it for his own benefit and he is the chief beneficiary of all its bounty. But man is also chief among the dangers facing the Earth. And because he lives on Earth those dangers are also threatening him. Man has no other option, if he wants to survive, he will have to save the planet.' This text is remarkable for several reasons. It suggests that all humans are equally responsible. It highlights the human-nature gap. And it suggests that activity is needed, but it does not clarify what that could be, leaving the visitor in uncertainty.

- Second exhibit: Lava. Life after death, offers a hopeful story of recovery after disaster. No human aspects.
- Third exhibit: Too much disruption: danger! It is a clear story about the decline in biodiversity. The section panel offers the good news that nature is resilient, but warns about radical change that could cause species to disappear. A label for the orangutan is unambiguous about the human impact: 'The forests of Borneo and Sumatra – home to the orangutan – are rapidly disappearing. Trees are being felled to provide land for palm oil plantations, other industrial crops, mining and road building. With their habitat melting away, the number of these great apes is failing alarmingly.' However, words such as 'melting away' are disturbing. It sounds as if humans did not cause and cannot change this. A label for the Tawny owl suddenly shows its status (not threatened), and is also superficial when it comes to human cause or solution: 'Pesticides bring death to many species. The most harmful, such as DDT, accumulate as they pass through the food chain, from prey to predator. The result for the animals at the top of the chain is decreased fertility, or even death. Fortunately, DDT is nowadays largely prohibited.' A missed opportunity to explain what pesticides still need to be prohibited. The label of the Black and white ruffed lemur shows that it is endangered. 'Lemurs don't like rice. In Madagascar the lemur is threatened by tavy, the local name for slash-and-burn agriculture. Forest is burned to clear the land for rice cultivation. This naturally results in the loss of many plants. Including the fruit-bearing plants on which lemurs depend.'
- Fourth exhibit: Blowing hot and cold. Explains how hurricanes and storms sow death and destruction, but also spread seeds and animals to new places, which is 'good for biodiversity.' It exemplifies Storm Katrina, which caused a

local drop in biodiversity, which is now restored by the arrival of new species. The shown specimens' status is all 'least concern.' An interactive screen shows how the mangrove swamps recovered after Storm Hugo, resulting in even richer forests than before.

- Fifth exhibit: Time to heal: 'An oil spill is a major ecological catastrophe. Marine animals, seabirds, algae, plankton, micro-organisms… everything suffers. The polluted area takes decades to recover, but recover it does. The traces of the disaster are slowly erased and nature heals, as long as there is no new disaster.' This text mentions less iconic species; however, it does not mention humans, and it suggests that oil spills are not so bad. A label mentions that chronic pollution problems are a disaster for biodiversity, but it mentions nowhere who caused the pollution or what to do about it. The label Goodbye coconut, barracuda, tilapia… says: 'Nigeria is one of the world's leading producers of petroleum and natural gas. Unfortunately, this oil extraction has caused an alarming succession of natural disasters. Nature is barely recovering from the one oil spill before it is hit by the next. And the future is looking bleak…' This label is really disturbing because it suggests that a country in the global south is the causer of the harm, while it is not the country, but foremost the Western companies that exploit it are.
- Sixth exhibit: Fire, bringer of life. Highlights how a wildfire gives opportunities for new life. It shows the Hermann's tortoise, status 'vulnerable',

which is too slow to escape France's forest fires and therefore threatened. It explains how eucalyptus and sequoia need fire to release their seeds. And that the fire is the friend of North American forests, because it sweeps away the conifers and helps the porcupine reach its food: poplar bark. 'Fire may therefore also be conductive to diversity.'

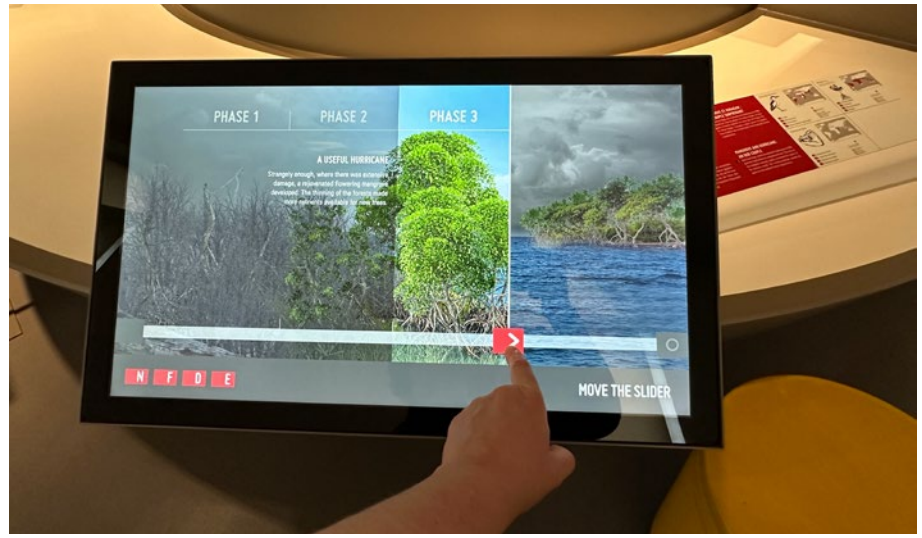
- Seventh exhibit: Deep wounds. 'A nuclear disaster is an exceptionally serious disturbance of the environment. But even then, flora and fauna bounce back. Some species survive the disaster, others slowly return. Their offspring are sometimes deformed by radiation, or changed in colour or size. Recovery takes a very long time.' A label explains how nuclear disasters damage the DNA of affected species, but how eventually species settle again and reproduce, such as the wolf, lynx and deer, that are not bothered by the 'surprisingly coloured flowers, oddly shaped spider webs and deformed pinecones.'

Conclusion: the human impact on biodiversity

Natural Sciences aims to 'increase the knowledge and understanding of citizens, particularly through the Museum, so that they can make informed choices about their lives and their future' (Royal Belgian Institute of Natural Sciences, n.d.). Remarkable is the amount of text in four languages, and the patience with which children go along with their parents, reading, listening, and discussing the exhibits. The two analysed exhibitions, Gallery of Evolution and Living Planet, refer to the human impact on biodiversity multiple times.

In Gallery of Evolution, a classical display of collection items along a historic timeline, only the final section, which features humans, mentions their impact on other species, doing so very directly in almost every label. It explains in detail, in four languages, how humans have altered their environment, covering topics such as urbanisation and modifying animal breeds. For example, the section panel next to a giraffe, a bison, a hunting cheetah and some chickens, is very clear about human impact on biodiversity: 'Humans are not like other animals. Our daily activities compromise the ability of other species to survive and reproduce. Human lifestyles lead to deforestation, climate change, and urbanisation, which threaten other species. Man can also be a predator, hunting and fishing some species to extinction.' However, just like in all the other mentions, it does not provide a solution. Although the stories are very informative, up-to-date, and at times even surprising, the layout of the exhibits is scholarly. Visitors with children are primarily attracted by the interactive elements, and do not show interest in the more classically displayed specimens and their labels.

Living Planet is a large exhibition on two floors, with several galleries or sections. It is modern and interactive in its design, clearly attracting a broad audience. One section explains in detail how classification works, and although it features difficult words, such as biosphere, children and their parents spend a lot of time here. Other sections clarify ecosystems in modern dioramas and highlight the networks within them. The last section is most explicit about human impact on biodiversity. It explains the connection between humans and their own ecosystems of bacteria, and how our hygiene practices threaten those tiny species. The section panel states: 'Climate change is a global disturbance. It affects us all. No one can escape it. Biodiversity is in decline. More and more species are threatened with extinction. Scientists agree: human activity is largely responsible for this global disaster.' Another text panel explains that man is both the problem and the solution, and claims that if man wants to survive, 'he will have to save the planet.' It features recordings of personal stories and offers interactive elements. Several specimens are used to illustrate how human activity has led to an alarming decline in their numbers. Remarkably, none of the labels specify that Western lifestyles are the cause of the harm. On the contrary, it suggests multiple times that countries in the global south cause the trouble. Malagasy are ravaging the lemurs' habitat with their agricultural practices, and Indonesians are destroying the orangutans' habitat for profitable palm plantations. Nigerians are causing oil disasters. Moreover, by suggesting that nature will always recover and even benefit from disasters, the exhibition implies multiple times that the harm done is not as severe.



Natuurmuseum Brabant, Tilburg

About the visit
Date: Saturday 28-12-2024
Considerations: Family-targeted nature museum, potential stories about biodiversity loss, partner museum of Naturalis.
Details of the visit: The visit took place during the Christmas holidays. Many children of all ages, mostly under 10 years old, and some slightly older. Many visitors engage in the activities.
Analysed exhibition: Long live life
Analysed exhibitions without the comprehensive description: From Inside Out, Your Brabant My Brabant.
Analysed exhibitions with no mention of biodiversity issues: OO-zone explore and research room, Killer whale room, Ice-age, Comedy Wildlife Awards, Kikker is hier, Forest.
Skipped exhibitions: Museum theatre, Explore it yourself.

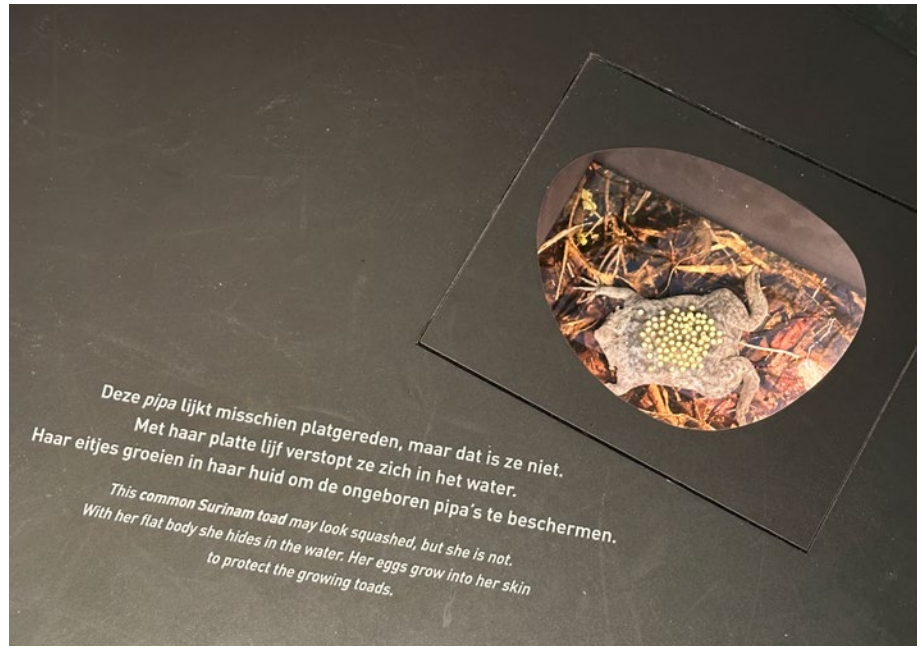
About the museum
Website: https://www.natuurmuseumbrabant.nl/en/
Mission: 'Igniting and encouraging knowledge of the natural world and our place within that as humans' (Natuurmuseum Brabant, n.d.).
Description: The museum clearly engages families with children of all ages. Even for the youngest visitors, there are activities designed to foster a connection with nature, and it is focused on interactives and activities throughout the museum. In various exhibitions, references to the human impact on biodiversity can be found. For example, in the exhibition From the Inside Out, which showcases mounted animals, preparations, models, mushrooms and more. The labels are only available through a digital display, with information on demand, featuring nice stories about the animal's qualities and properties, and each digital label comes with a caption 'status' including the IUCN Red List of Threatened Species. It includes many mentions of human impact on biodiversity. The exhibition Your Brabant, My Brabant, also mentions several times how humans have impacted biodiversity. For example, there is a large display case with local insects, grouped by the reasons why they decrease or increase in number: habitat loss, pollution, climate change, etc. Another display shows locally found bones of animals that are gone forever due to human activity.

Analysis of the exhibition Long Live Life
The exhibition Long Live Life aims to explain the concept of biodiversity. It introduces various biotopes, shows how the species within these biotopes are interconnected, and discusses the impact humans have on them. The exhibition features several specimens. It guides visitors along a clear path between printed panels and curtains, showcasing several large displays. The exhibition features larger animals, smaller insects, and even quite a few plants.

Section 1. Biodiversity
The exhibition begins with a short video explaining what biodiversity is.

Section 2. The Amazon
The Amazon rainforest hosts 1,300 bird species, whereas Europe, despite being larger, has only 450 bird species. This exhibit features many specimens, ranging from the Surinam toad (Pipa pipa) to a large display of birds.

Section 3. The European forest
This section explains how everything is connected, and how species live together around a carcase, a beaver dam, or in a clearing. They need each other and keep each other in balance. It explains in simple words how small changes

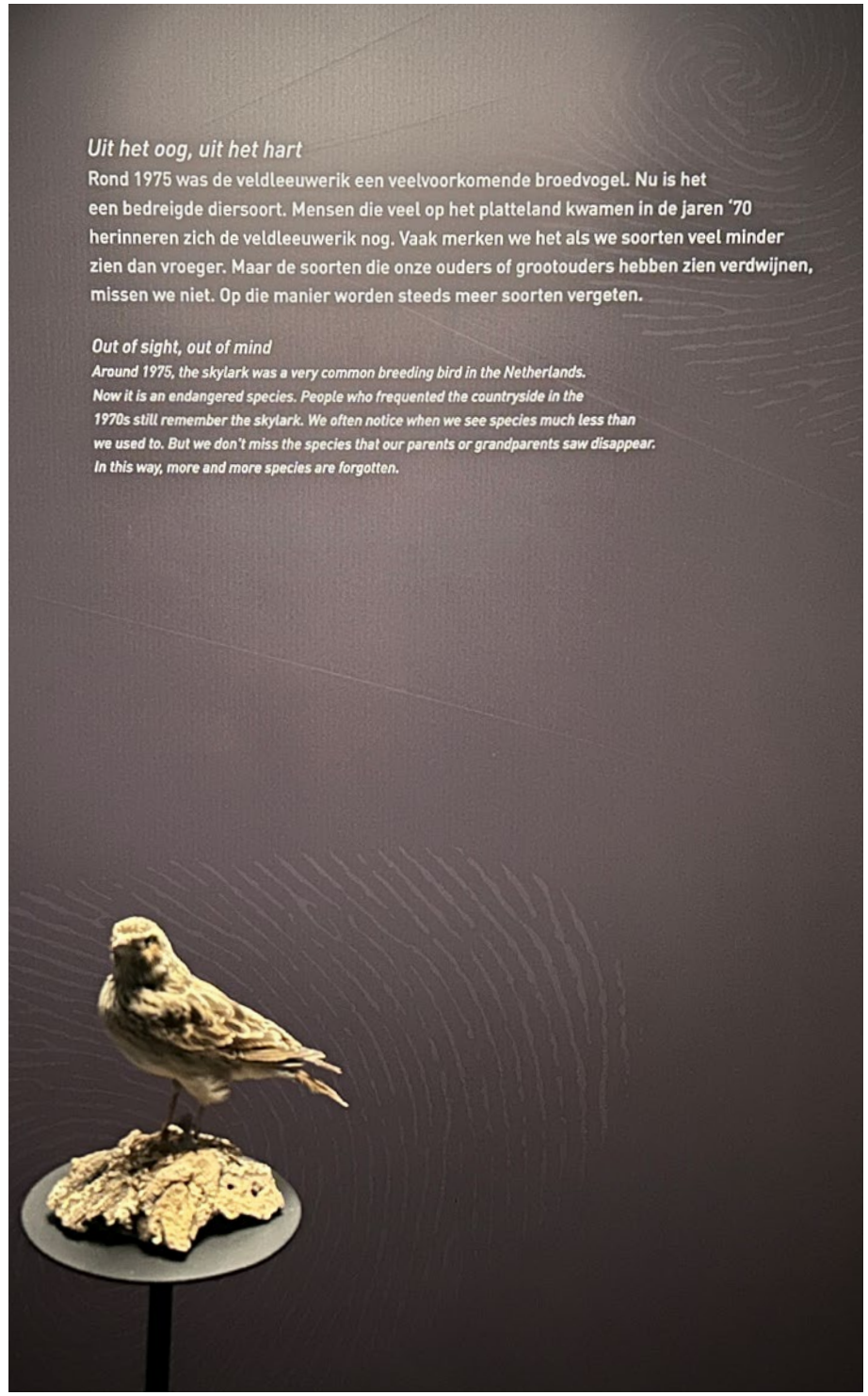


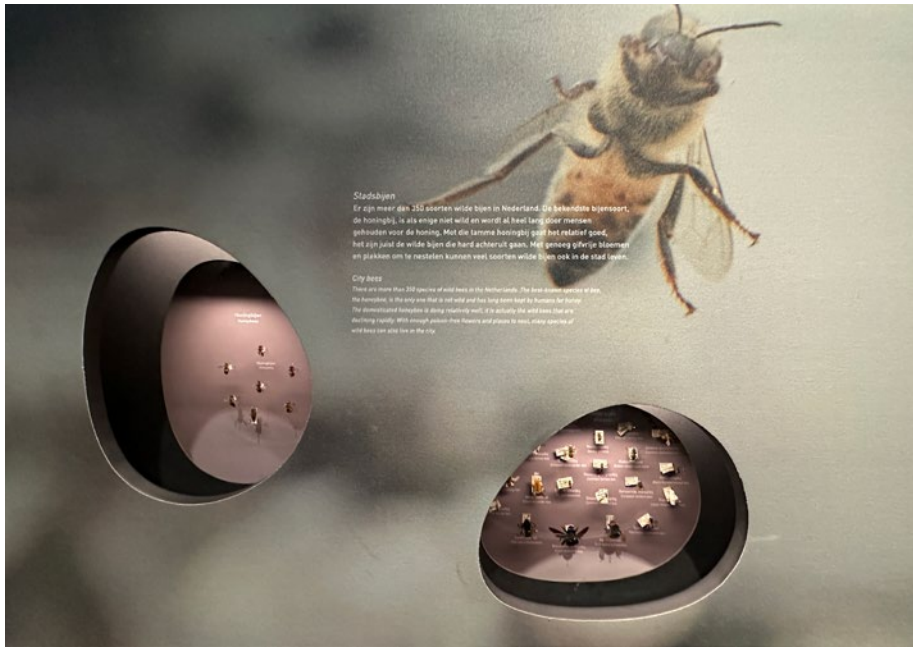
in ecosystems can have big consequences. It features a large and remarkable display case with plants, clearly making a point that nature is not only about iconic animals. It does not mention humans.

Section 4. And then came men…
This area shows a 'room of doom', which explains how 'no other species has had as great an impact on biodiversity as humans.' It is a display behind a frame in the shape of a human fingerprint; it draws attention because it is difficult to see at a glance, and it demands an effort to understand it. It narrates the story of the rapid decline of biodiversity caused by pollution, climate change, and human overexploitation, accompanied by photographs of the human impact on nature and a slideshow featuring extinct animals. Its label describes that since 1970, 65% of wildlife populations have disappeared, but that we do not know what was lost before that. Furthermore, this exhibit displays one specimen of an endangered skylark, its label subtly references the shifting baseline syndrome: 'We often notice when we see species much less than we used to. But we don't miss the species that our parents or grandparents saw disappear. In this way, more and more species are forgotten.' It also shows a short, animated video about the human impact on biodiversity.

Section 5. From reintroduction to rewilding
The next part of the exhibition discusses the 'positive' human impact on nature, with efforts to reintroduce and rewild areas, create squirrel bridges, run breeding programmes in zoos, and gather toads to help them cross roads. It explains the history of rewilding and some success stories, and also how humans first chased out animals, to then save them again

Section 6. The city
An larger section at the end of the exhibition shows how birds, foxes, and plants have adapted—or even evolved—to urban environments (and how urban environments become increasingly biodiversity friendly), for example illustrating the differences in sounds made by tits in the city versus rural areas, with an interactive sound exhibit. It explains that the shells of snails are lighter in the warmer city environments to reflect more sunlight. It shows the hoverfly that is seen more often in cities because of the increasing urban temperatures. The house sparrow originates from the time that people started growing grains. Birds that build their nests with trash may come across problems feeding their young rubber bands, which look like worms. One exhibit of a photo of a dandelion explains how it adapts to city life by making heavier seeds that stand a better





chance of surviving in areas with little open ground. A display with a crow explains: 'Black crows are found almost everywhere in the world. That's because they are extremely smart and they'll eat anything. Urban black crows have been known to drop nuts on roads so car tyres crack them open and to remember when restaurants take out their rubbish.' An explanation about declining wild bees, suggests that 'with enough poison-free flowers and places to nest, many species of wild bees can also live in the city', something that visitors can easily interpret as a call to plant poison-free flowers on their balconies. It also highlights exotics, 'species that people have brought to a place where it did not previously exist.' It nuances that not all exotics are invasive, however, that 'Japanese knotweed is an invasive exotic that has spread very quickly. The rapid growth and dense foliage means that other plants no longer have a chance to grow.'

Section 7. Do you dare to make a promise to nature?
The end of the exhibition encourages people to contribute to citizen science and offers an engaging interactive experience: an opportunity to sign a contract with nature. In a digital questionnaire, visitors can include activities such as planning to buy second-hand clothes or reduce their dairy intake. The contract is emailed to you and explains what you will do, why you will do it, and for whom. Especially that last part makes it easier to commit: for example, 'I share or rent

IK LAAT VOOR KORTE RITJES DE AUTO STAAN

CATEGORIE VERVOER

Wat
Pak voor korte afstanden binnen de stad of het dorp de fiets of ga lopen.

Waarom
Een kort ritje binnen de bebouwde kom zorgt voor meer CO2-uitstoot dan een rit van dezelfde afstand buiten de bebouwde kom.

Voor wie
Veel soorten hebben last van de opwarming van de aarde. Door opwarmend zeewater verdwijnen koraalriffen. Door minder CO2-uitstoot gaat die opwarming minder snel. Dat is bijvoorbeeld fijn voor de oranjegestipte vijlvis, die afhankelijk is van koraal.

IK NEEM EEN ABONNEMENT OP DE BIBLIOTHEEK

CATEGORIE SPULLEN

Wat
Koop boeken en tijdschriften niet zelf, maar leen ze bij de bibliotheek.

Waarom
Een biebboek of -tijdschrift wordt misschien wel door honderden mensen gelezen. Zo hoeven er minder gemaakt te worden dan wanneer iedereen ze zelf zou kopen.

Voor wie
Zelfs boeken van gerecycled papier moeten nog steeds gemaakt en vervoerd worden. Minder productie betekent minder houtkap, minder CO2-uitstoot en minder vrachtwagens op de weg. Dat is goed nieuws voor bijvoorbeeld de naaldbomen in de Europese bossen.

IK STEUN DUURZAME ORGANISATIES EN BEDRIJVEN

CATEGORIE WONEN EN DAGELIJKS LEVEN

Wat
Doneer aan duurzame goede doelen of ga vrijwilligerswerk te doen. Of bankier bij een bank die alleen in duurzame doelen investeert.

Waarom
Door bedrijven en organisaties te steunen die de natuur belangrijk vinden, kunnen zij zich inzetten om biodiversiteit te behouden en beschermen. In de buurt of juist ver weg.

Voor wie
Door natuurorganisaties te steunen kunnen sommige natuurgebieden en bepaalde soorten blijven bestaan. Bijvoorbeeld de Amerikaanse bizon.

things. What: Rent items you do not need often, instead of buying them. Or buy them together with friends or neighbours. Why: Many belongings are stored away most of the time. What a shame! Think of a hedge trimmer, a drill, or a karaoke machine. These are easy to share! For whom? By sharing or borrowing items, no new resources are needed for your product. That benefits all kinds of species affected by mining pollution, like the capybara from the Amazon.' Connecting your action to an individual species makes it very tangible. You understand who your actions benefit. However, the categories neglect spiritual aspects. Nothing about education, research, or actions that go beyond the individual.

Conclusion: the human impact on biodiversity

Natuurmuseum Brabant in Tilburg clearly engages families with children of all ages. Even for the youngest visitors, there are activities designed to foster a connection with nature, and it is focused on interactives and activities throughout the museum. In various exhibitions, references to the human impact on biodiversity can be found. The exhibition Long Live Life aims to explain the concept of biodiversity to families with children. Although it might not seem the most engaging experience at first glance, upon closer inspection, it thoroughly covers the essentials: explaining the importance of biodiversity and ecosystems, honestly presenting the state of nature and the human impact on it, highlighting successful biodiversity protection efforts, and providing several tangible activities to encourage a biodiversity-positive society. It uses its natural history collection to illustrate stories and also as a direct source for these stories. The exhibition includes plants, insects, and other than iconic mammals. A room of doom highlights the devastating effects of human activities on nature, explaining the baseline syndrome and extinction of species. The end of the exhibition offers an opportunity to sign a contract with nature, which, through a digital questionnaire, allows visitors to understand that sustainable behaviour is accessible to everyone. By relating this behaviour to an individual species, it becomes very concrete. You understand who you do it for.