

# The Global Risks Report 2020

Abstracted Chapter:  
Save the Axolotl - Dangers of Accelerated  
Biodiversity Loss

Insight Report | 15th Edition

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# The Global Risks Report 2020 15th Edition

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# Save the Axolotl

Dangers of Accelerated Biodiversity Loss



Human-driven nature and biodiversity loss is threatening life on our planet. The previous chapter assessed where the world stands in 2020 in the face of existential climate risk. This chapter considers the other side of the same coin: how destabilizing tipping points in

nature could exacerbate the social and economic consequences of climate risk. At the same time, understanding nature's benefits could help societies leverage opportunities to stem the planetary emergency.



The axolotl, arguably one of the world's most recognizable salamanders, has a unique ability to regenerate severed limbs, which unlocks medicinal and scientific opportunities for everything from tissue repair to development and cancer. After centuries of inbreeding, captive populations are at risk and scientists could lose the opportunity to learn vital information about the animal's biology that could have significant benefits for human health.<sup>1</sup>

## On the loss of species

All species, including humans, depend for their survival on the delicate balance of life in nature.<sup>2</sup> Yet biodiversity—the diversity within species, between species, and within ecosystems—is declining faster than it has at any other time in human history.<sup>3</sup> The current rate of extinction is tens to hundreds of times higher than the average over the past 10 million years—and it is accelerating.<sup>4</sup> Although the world's 7.6 billion people represent just 0.01% of all living creatures, humanity has already caused the loss of 83% of all wild mammals and half of plants.<sup>5</sup> If low estimates of the number of species are accurate—around 2 million—between 200 and 2,000 extinctions are occurring every year. At the upper end of the estimate, between 10,000 and 100,000 species are going extinct each year.<sup>6</sup> How we grow

food, produce energy, dispose of waste and consume resources is destroying nature's delicate balance of clean air, water and life that all species—including humans—depend on for survival.<sup>7</sup>

Human activity endangers biodiversity in at least five main ways.<sup>8</sup> First, agricultural and industrial expansion has led to the loss of over 85% of wetlands, altered 75% of land surface, and impacted 66% of ocean area. A second powerful threat is in the exploitation of plants and animals through harvesting, logging, hunting and fishing. Third, pollution: habitats are being destroyed by untreated waste; by pollutants from industrial, mining and agricultural activities; and by oil spills and toxic dumping. Marine plastic pollution alone has increased tenfold since 1980. A fourth critical driver of biodiversity loss is the introduction of

# Biodiversity is declining faster than it has at any other time in human history

non-indigenous species that edge out native ones; this has increased by 40% globally over the same period. Fifth, climate change exacerbates nature loss, which in turn reduces nature's resilience to climate change—a vicious circle.<sup>9</sup>

Less directly, losses of biodiversity are driven by population growth, trade, consumption patterns and urbanization.<sup>10</sup> By 2030, cities are expected to cover three times as much land as they did in 2000, with many of the expansions occurring in key biodiversity hotspots.<sup>11</sup> Inadequate export controls have facilitated the spread of invasive species, pests and diseases, which aggravate a quarter of plant extinctions and a third of animal ones.<sup>12</sup> Demand for food will more than double by 2050; meeting this demand will require an additional billion hectares of land—an area the size of Canada<sup>13</sup>—or increasing yields on existing land through the use of fertilizers and pesticides, which also contribute to biodiversity loss.

## Implications for humanity

The dramatic loss of biodiversity brings serious risks for societies, economies and the health of the planet. Sir Robert Watson, chair of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES),<sup>14</sup> observes: “Biodiversity and nature’s contributions to people sound, to many people, academic and far removed from our daily lives. . . . Nothing could be further from the truth—they are the bedrock of our food, clean water and energy.”<sup>15</sup> Humans rely on biodiversity in fundamental ways, from pollinating crops to curing diseases. Biodiversity loss has also come to threaten the foundations of our economy: one attempt to put a monetary value on goods and services provided by ecosystems estimates the worth of biodiversity at US\$33 trillion per year—close to the GDP of the United States and China combined.<sup>16</sup> Risks arising from biodiversity loss include:

### Food insecurity

Biodiversity underpins the world’s food system.<sup>17</sup> It creates and maintains healthy soils, pollinates plants, purifies water and protects against extreme weather events, among other vital services.<sup>18</sup> The ongoing loss of diversity in indigenous domesticated plants and animals is undermining the resilience of agricultural systems against pests, pathogens and climate change.<sup>19</sup> Declining diversity of fish species is correlated with lower catches and higher incidence of stock collapse.<sup>20</sup> A new report from the United Nations’ Intergovernmental Panel on Climate Change (IPCC) identifies another risk: increased carbon-dioxide levels are lowering the nutritional value of food staples such as rice and wheat.<sup>21</sup>

# 83%

**wild mammal species loss caused by humanity**

### Health risks

Well-functioning ecosystems support human health by providing clean air and water and a source of medicines.<sup>22</sup> An estimated 50,000–70,000 plant species are harvested for traditional or modern medicine,<sup>23</sup> and around 50% of modern drugs were developed from natural products. Researchers are increasingly “reverting to nature” to look for new therapeutic options, efforts that are threatened by biodiversity loss.<sup>24</sup> Species currently endangered by biodiversity loss include the South American cinchona tree, the source of the malaria drug quinine.<sup>25</sup> In many cases, natural molecules for medical treatments are so complex that scientists are not yet able to chemically synthesize them, so they must harvest and store plants and seeds.<sup>26</sup> Some threatened organisms are critical for medical research: the Mexican axolotl (described above), for example, has unique characteristics that enable instructive comparisons with the human genome.<sup>27</sup>

# 50% modern drugs developed from natural products

crisis: these microscopic plants that drift at the sea surface absorb carbon dioxide on a scale comparable to the world's forests,<sup>29</sup> and they are threatened by warming oceans.<sup>30</sup>

## Exacerbation of climate change

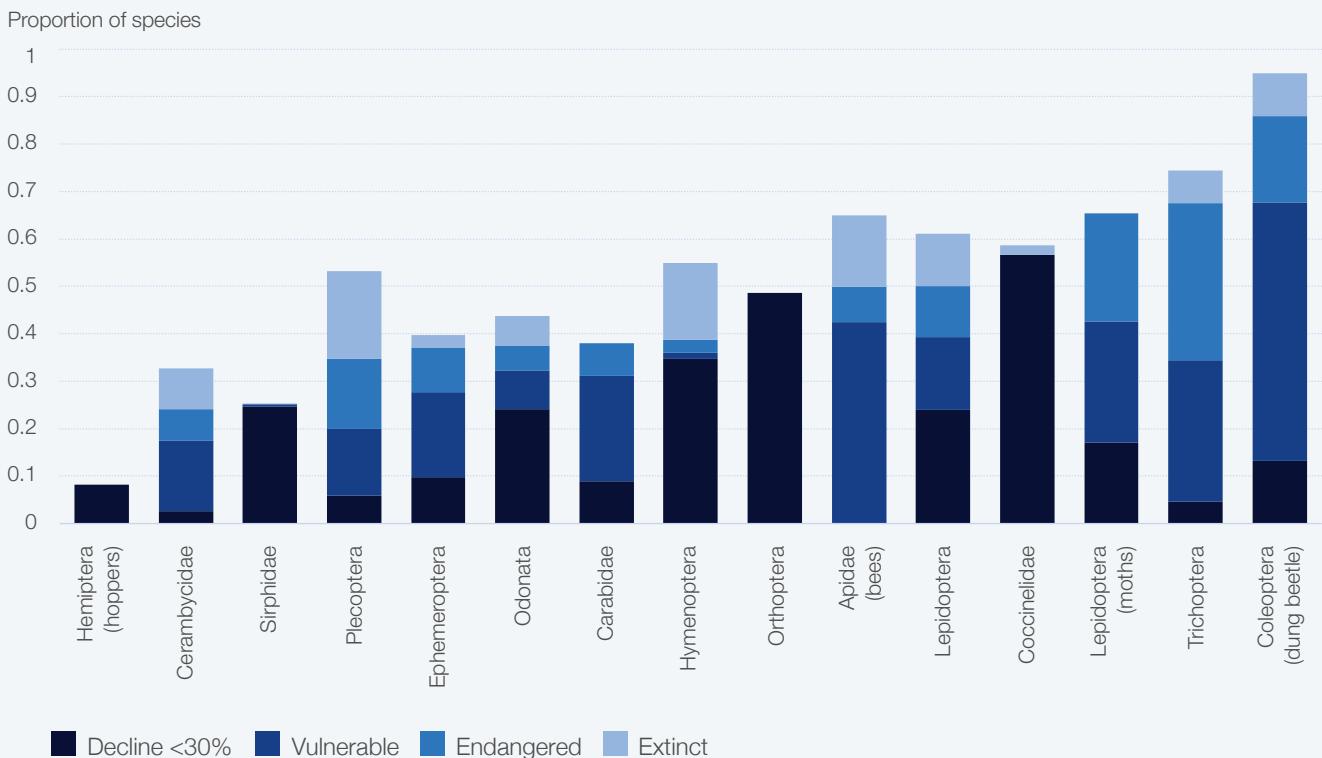
Terrestrial and marine biodiversity together support the reduction of greenhouse gas emissions and the conservation of carbon sinks, sequestering 5.6 gigatonnes of carbon per year—the equivalent of 60% of global human-driven emissions. The health of ecosystems that sequester carbon can depend on individual species: for example, endangered forest elephants are vital to the health of Central Africa's rainforests. Collapse of this ecosystem could release 3 billion tons of carbon, the equivalent of France's emissions for 27 years.<sup>28</sup> Phytoplankton provide another example of how depletion of species and ecosystems could exponentially worsen the climate

## Business risk

The destruction of nature will inevitably impact bottom lines—for example, through reduced fish stocks disrupting commodity supply chains, economic losses from disasters such as flooding, and the loss of potential new sources of medicine. Extractives, construction, energy, fashion and textiles are among the sectors especially vulnerable to ecological destruction.<sup>31</sup> All businesses should account for ecological risks to their operations and reputations, yet few do: a recent study of Fortune 500 companies found that nearly half mentioned biodiversity in their sustainability reports, but only five set specific, measurable and timebound targets.<sup>32</sup> Nature-related risks are undervalued in business decision-making.

FIGURE 4.1

## Species Decline: Insects



Data source: Sánchez-Bayo, F. and K. A. G. Wyckhuys. 2019. "Worldwide Decline of the Entomofauna: A Review of its Drivers". *Biological Conservation* 232 (April 2019): 8–27. <https://www.sciencedirect.com/science/article/pii/S0006320718313636>

## Indigenous community livelihood and culture risks

Indigenous communities often rely on their diverse local ecosystems for food and other resources: for example, 60% of the world's indigenous population uses largely plant-based traditional medicines.<sup>33</sup> And the rest of humanity relies on indigenous communities to be stewards of ecosystems, protecting and preserving environmental resources. Indigenous peoples comprise less than 5% of the world's population but protect 80% of its biodiversity.<sup>34</sup>

Beyond these known risks are unknowable losses—the risk of losing species we have not yet discovered that could have been domesticated for crops or given rise to new medicinal breakthroughs. For example, the ocean represents a “virtually untapped resource for discovery of novel chemicals with pharmaceutical potential,”<sup>35</sup> and recent bacterial samples from coastal sediments grown under saline conditions have yielded new antibiotic, antitumor and anti-inflammatory compounds.<sup>36</sup> Another recently discovered ocean organism, a rare genus of marine bacteria called *Serinicoccus*, was shown to selectively destroy melanoma cancer cells.<sup>37</sup> With continued loss of biodiversity, we may never know what we have missed out on.

## Imagine if ...

Many and varied ecosystems are in decline or at risk of destruction from human activity. While their complexity makes it very hard to predict which losses would be most consequential, it is clear the stakes are high. Here we consider three potential ecosystem collapses or extinctions that could have profound impacts for humanity and the Earth.

### Insect decline

A world without insects, according to one entomologist, would be a “flowerless world with silent forests, a world of dung and old leaves and rotting carcasses accumulating in cities and roadsides.”<sup>38</sup> One recent study estimates that insects have declined by 40% in recent decades (see Figure 4.1), and a third are endangered.<sup>39</sup> It identifies deforestation, urbanization, pollution and the widespread use of pesticides in commercial agriculture as the principal



REUTERS/ARND WIEGMANN

causes. Insects are the main food source for many species higher in the food chain, such as birds, reptiles, amphibians and fish. As the author of the study points out, “[if] this food source is taken away, all these animals starve to death.”<sup>40</sup>

Insects are also the world's top pollinators: 75% of the 115 top food crops rely on animal pollination, including nutrient-rich foods like fruit, vegetables, nuts and seeds, as well as cash crops such as coffee and cocoa.<sup>41</sup> Dwindling insect populations will force farmers to seek alternative means of pollination,<sup>42</sup> or shift to staple crops that do not rely on pollinators. However, these crops—such as rice, corn, wheat, soybeans and potatoes—are often energy-dense, nutrient-poor and already over-consumed globally, contributing to an epidemic of obesity and diet-related disease.<sup>43</sup> Increasing their prevalence in the food supply at the expense of fruits, nuts, vegetables and seeds could exacerbate this global health crisis (see Chapter 6, False Positive).

Approximately 1 million insect species have been documented, but “untold millions await discovery.”<sup>44</sup> As with the broader community of species discussed above, it is impossible to know what humanity could lose from the extinction of insect species that are not yet known to science.



# Nature-related risks are undervalued in business decision-making



REUTERS/ANDY CLARK

## Coral reef collapse

Coral reefs are home to some of the planet's most biodiverse ecosystems. They are critical to ocean health: although they make up less than 1% of the ocean floor, 25% of fish species rely on reefs for at least part of their life cycle.<sup>45</sup> Ocean reefs contribute to the livelihoods of at least 500 million people worldwide, mostly in less-developed economies.<sup>46</sup> Coral reefs generate US\$36 billion per year for the global tourism industry, with the Great Barrier Reef in Australia accounting for more than 15% of that total (US\$5.7 billion).<sup>47</sup> They provide vital protection from coastal flooding and storm surges: one recent study found that losing just the top layer of coral could result in US\$4 billion more in flood damages per year.<sup>48</sup>

Coral reefs are threatened partly by overfishing, industrial activity and pollution, but even more by the planet's rapid warming. When the water surrounding them becomes too warm, corals expel the algae living within the tissue of the reef, turning the corals white—also known as “coral bleaching”. If corals are bleached for prolonged periods, they will die. A recent study found that severe marine heatwaves can lead not just to bleaching, but also to the immediate death of reefs.<sup>49</sup> If global temperatures stabilize at an increased 1.5°C, coral reefs could decline by 70% to 90%; with higher rises, they would disappear.<sup>50</sup>

The disappearance of coral reefs could have dire consequences for life on land

as well as in the ocean. Up to 80% of the oxygen humans breathe comes from the ocean.<sup>51</sup> Without reefs, coastal communities would be more vulnerable to storms, and migration away from low-lying population centres and islands could increase. As the oceans “become largely lifeless or at least extremely transformed”,<sup>52</sup> the fishing and tourism industries could be wiped out. In some regions, collapsing fish stocks could increase security risks, such as piracy and terrorism.<sup>53</sup>

### Disappearance of the Amazon

Around 12 million hectares of tropical forest worldwide were lost in 2018, equivalent to 30 football fields per minute.<sup>54</sup> The Amazon alone has lost approximately 17% of its size over the last 50 years, and rates of deforestation have been rising since 2012.<sup>55</sup> The Amazon now absorbs around a third less carbon than it did a decade ago,<sup>56</sup> and a recent study found that increasing dryness in the atmosphere is leaving ecosystems even more vulnerable to fire and drought.<sup>57</sup> The rapid disappearance of more of the rainforest could exacerbate the effects of climate change: if 20% to 25% of the forest is lost, scientists warn that the Amazon could pass a tipping point where a vicious cycle of drought, fire and canopy loss takes hold that cannot be stopped. This tipping point could be reached within decades.<sup>58</sup> The destruction of the forests of Borneo offer an ominous precedent: mass deforestation and fires there have led to the loss of over 50% of lowland tropical rainforest.<sup>59</sup>

Because the Amazon is the world’s most diverse ecosystem and home to about 10% of terrestrial species,<sup>60</sup> its destruction means potentially undiscovered cures for disease would be lost forever. More intense fires and flooding in the region, as well as more unpredictable rainfall patterns and droughts, could also ensue. This would undermine food production, increase water scarcity and reduce hydropower generation, with economic costs exceeding US\$3 trillion.<sup>61</sup> Global agricultural markets might suffer as well,<sup>62</sup> since Brazil is one of the world’s largest agricultural exporters of products including soybeans, maize and meat. A significant decline in Brazil’s agricultural output could increase volatility of food prices, which history shows can trigger instability and contribute to long-term

deteriorations in security. Indigenous communities who rely on the rainforest would struggle and possibly disappear. The tourism industry, critical for South American economies, could be badly affected.

### No silver bullet

The UN declared 2010 to be the International Year of Biodiversity. Notwithstanding the appearance of biodiversity as a top risk by both likelihood and impact on the GRPS (see Figure II, The Global Risks Landscape 2020), 10 years later, general confusion persists about what precisely biodiversity is, why it relates to human prosperity and how to confront its loss. Achievement of the Aichi Biodiversity Targets for 2020 has lagged.<sup>63</sup> Since the targets were set in 2011, global production of metals, minerals, fossil fuels and biomass has increased by more than 20%, while an area larger than Mexico has been deforested.

**80%** oxygen that humans breathe comes from the ocean

Solutions to stemming biodiversity loss will be as complex as the problem itself. No longer can nature be protected by either “sparing” (preserving areas of land where species can thrive away from production) or “sharing” (integrating processes where nature and food production coexist).<sup>64</sup> Both approaches are required and both will involve trade-offs: how should biodiversity be weighed against social and economic imperatives such as food production and economic development? For example, organic agriculture avoids the use of harmful chemicals but might require more land for comparable yields.<sup>65</sup> Similarly, the production of biofuels and bioenergy with carbon capture and storage (BECCS) is a potential game-changer for negative carbon emissions.<sup>66</sup> However, BECCS also uses large swaths of agricultural land, with implications for future socio-economic developments, food security and biodiversity management.

Bio-economic transitions would create feedback loops that must also be considered. For example, developing climate-resistant crop varieties could help farming systems adapt to a warming planet—but deepening our reliance on a handful of staple crops grown in large-scale, intensive monoculture farming systems could ultimately undermine the resilience of the food system by reducing genetic diversity and increasing vulnerability to pests and disease.<sup>67</sup> On a smaller scale, urban tree-planting might actually result in a net loss of street-tree carbon storage over time because of the “unique demographics of urban ecosystems”.<sup>68</sup>

Inequities in development trajectories that characterize the climate debate are also inherent in any coordinated response to

biodiversity loss. Certain countries, for example, may incur a stiffer penalty for the protection of the planet by virtue of their geography and natural resources. However, conservation efforts do not necessarily require trade-offs in development priorities or human rights.<sup>69</sup> In fact, efforts to address declining biodiversity ought to be inextricably linked to other social agendas, such as poverty alleviation,

healthcare, disaster relief and protection of human rights.<sup>70</sup> It is vital to expand discussion around biodiversity loss to include researchers from non-empirical disciplines as well as farmers, indigenous communities, businesses and other stakeholders.

## The new nature economy

While trade-offs may be unavoidable, there are also potential “win-wins”. Consider diets. The livestock sector accounts for 70% of agricultural land use;<sup>71</sup> it is also responsible for about 14% of global greenhouse gas emissions.<sup>72</sup> Reducing meat consumption would be good for nature and the climate. In a growing number of countries it would be good for people as well, as overconsumption of meat could be leading to worse health outcomes.<sup>73</sup> Another win-win example is the

circular economy, in which waste is designed out and materials are kept in use for as long as possible: besides helping to decouple resource demand from economic growth, this can contribute to lower emissions and less habitat loss.

There is also a business rationale for preserving or restoring natural ecosystems.<sup>74</sup> On average, the costs of restoration are outweighed tenfold by its benefits to communities.<sup>75</sup> Restoring coastal mangroves, for example, can protect land from storm surges and coastal erosion, develop fisheries and support ecotourism. Investing in the restoration of wetlands, mangroves and coral reefs could reduce insurance costs for businesses in coastal areas vulnerable to flooding. Likewise, financing ecological forestry practices could reduce insurance costs for businesses, such as power and water utilities, that are exposed to wildfire risks.<sup>76</sup> According to the Organisation for Economic Co-operation and Development (OECD), restoring 46% of the world’s degraded forests could provide up to US\$30 in benefits for every dollar spent, boosting local employment and increasing community awareness of biodiversity’s importance.<sup>77</sup>

A critical challenge for the biodiversity agenda will be finding investment models that mobilize private finance to capture a share of this opportunity. New approaches are emerging, such as resilience-financing structures through which businesses can invest in the restoration of ecosystems in return for a reduction in insurance premiums or risk-financing costs. Better data to track the effectiveness of investments will be critical. However, given the sums involved—one estimate puts the current cost of protecting biodiversity at US\$100 billion per year<sup>78</sup>—public funding will also be needed. Habitat protection and restoration are highly beneficial public goods for which government investment is more than justified. The People’s Bank of China, for instance, now offers capital relief for banks that make green loans.<sup>79</sup> The International Union for Conservation of Nature is developing a species conservation metric that will help companies, banks and governments to quantify their contribution.<sup>80</sup> A renewed interest in nature-based solutions can help combat climate change as well as mitigate the exacerbating effects of nature loss on the climate.

**70%**  
**agricultural land  
use accounted  
for by livestock  
sector**



Beyond policy interventions, stemming the impacts of biodiversity loss may require a fundamental shift in thinking about the economic value of nature. Gross domestic product (GDP), the primary performance indicator for economies, fails to account for “natural capital”—the stock of a country’s ecosystems, natural resources and human capital.<sup>81</sup> Businesses, governments and individuals would be better served by another metric—or series of metrics—that more accurately describes an economy’s overall health, thus incorporating the costs of ecosystem degradation. The Gaborone Declaration for Sustainability in Africa, for example, is encouraging member countries to use metrics such as “ecosystem valuation” and “natural capital accounting” in measuring economic activity and decision-making.<sup>82</sup>

The most effective solutions may imply significant disruption or shifts to existing business models. For example, the fashion industry could reduce its impacts on biodiversity by shifting towards transforming old clothes into new ones and creating garments that are durable rather than disposable—an opportunity worth US\$560 billion.<sup>83</sup> Extractive industries’ negative impacts on biodiversity could be mitigated if mining companies were to move to a resource services model,<sup>84</sup> in which the companies retain ownership of metals over their lifecycle and keep them in use for as long as possible.

Later in 2020, governments will gather in Kunming, China, to revisit global targets on protecting ecosystems and halting species loss. This is a critical moment: as climate change exacerbates ecosystem collapse, we could be causing irreversible ecosystem damage with serious economic and social consequences.<sup>85</sup> Some of the most serious impacts will not occur gradually, but rather suddenly and violently, as critical thresholds are breached. Messaging around biodiversity loss and its impacts is key to underscoring the meaning and impact of biodiversity loss for societies. Consumers also have a role to play in demanding sustainable policy-making and products.

The rapid degradation of our life support system means a lot more is needed. As we find ourselves at the doorstep of the “sixth mass extinction”, both businesses and regulators have a huge role to play in shifting paradigms about who pays for the externalities created by business-as-usual. The World Economic Forum will be publishing the *New Nature Economy Report*—to be released in three parts during 2020—setting out risks, key transformation pathways and financing for a nature-positive economy. We have the science and evidence required to pivot in this direction, but there is an acute need for champions who can shift systems and prioritize investment for safeguarding nature.

# Notes

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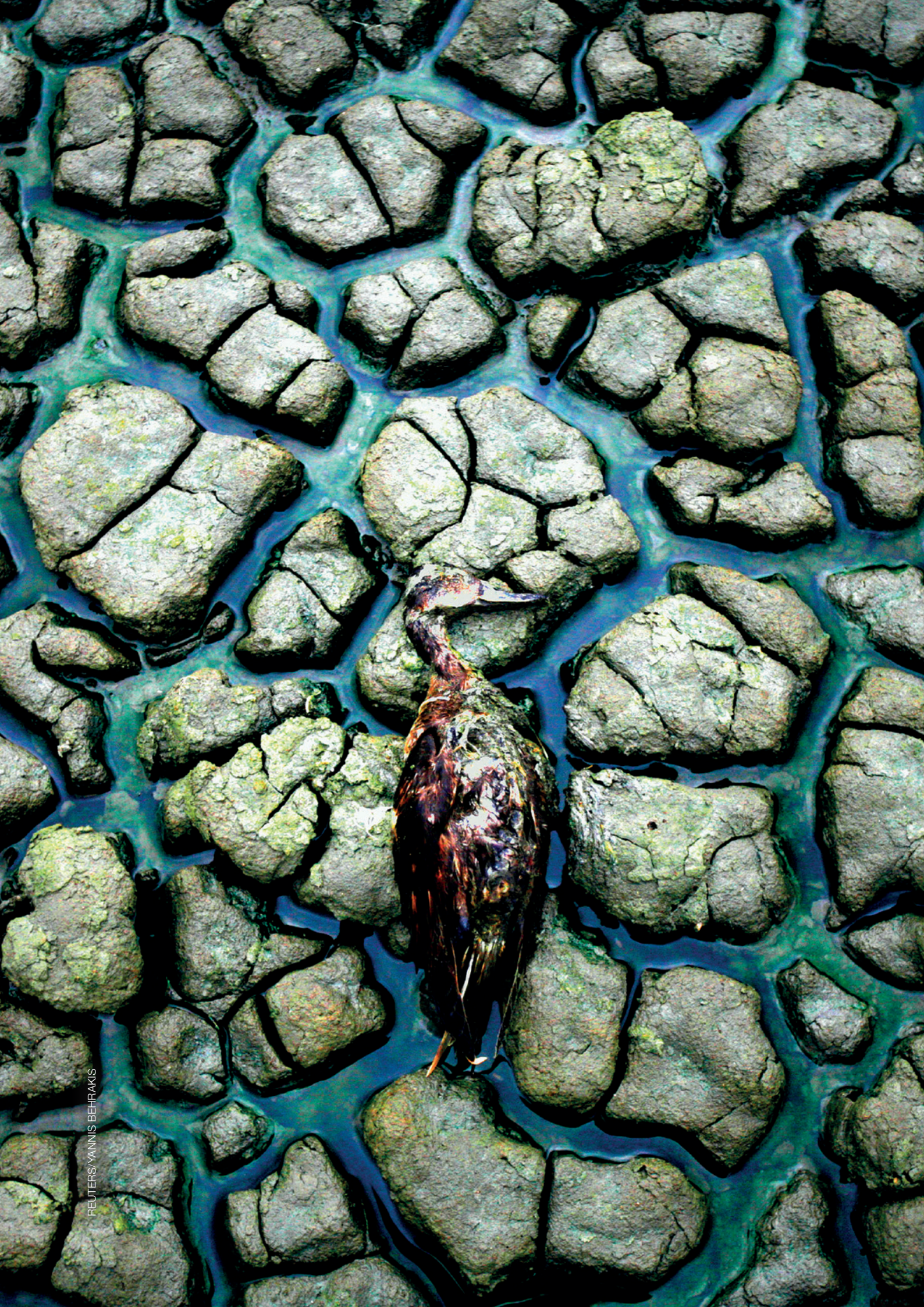
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