

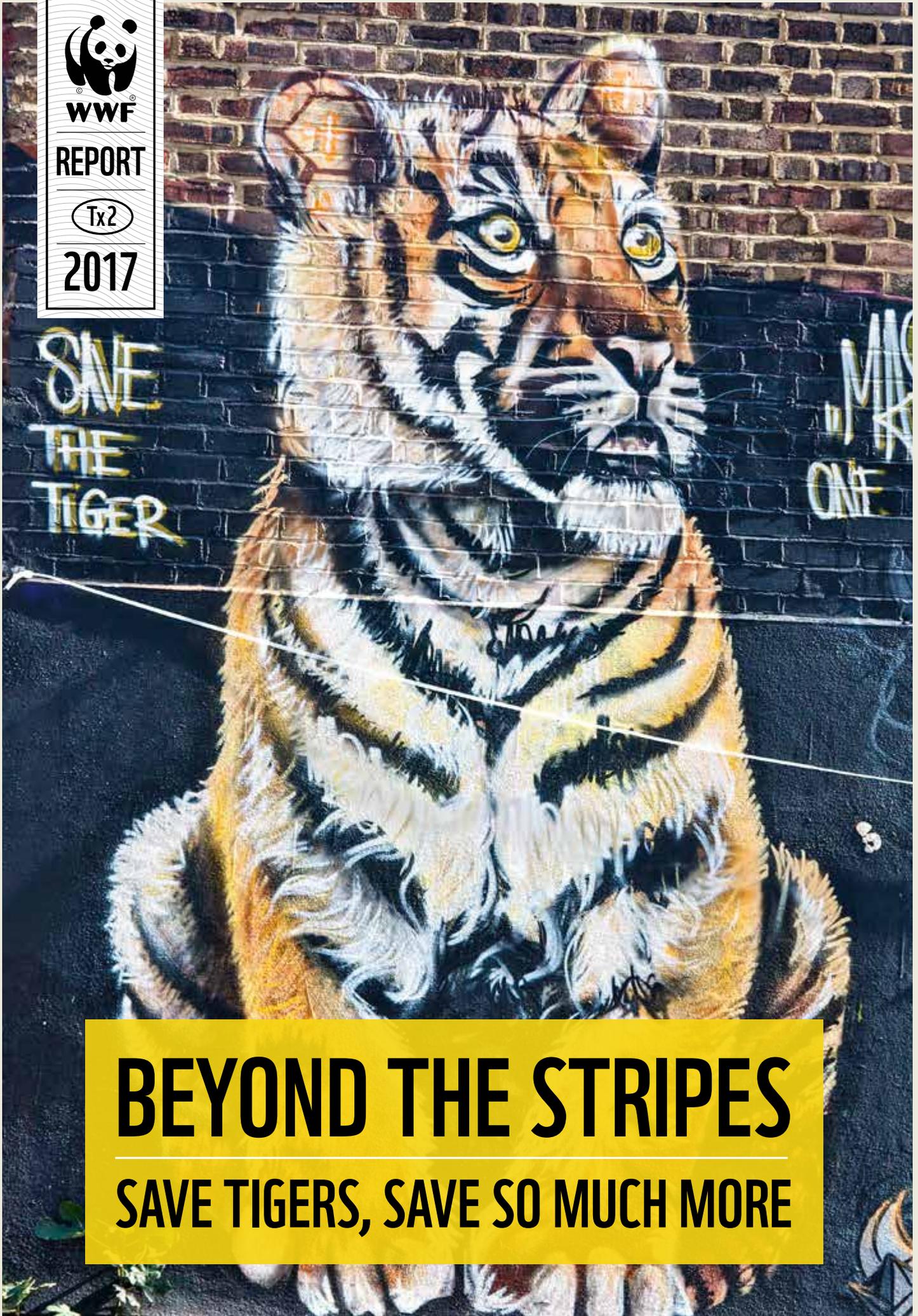


WWF®

REPORT

Tx2

2017



# BEYOND THE STRIPES

SAVE TIGERS, SAVE SO MUCH MORE

**Front cover**

A street art painting of a tiger along Brick Lane, London by artist Louis Masai.

© Stephanie Sadler

**WWF**

WWF is one of the world's largest and most experienced independent conservation organizations, with over 25 million followers and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which people live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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Equilibrium Research provides practical solutions to conservation challenges, from concept, to implementation, to evaluation of impact, by exploring and developing approaches to natural resource management that balance the needs of nature and people.

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# FOREWORD

## Seeing Beyond the Stripes

The magnificent tiger is truly an important champion for nature and the wild. Tigers inspire millions of people across the world everyday, from mountain temples in Bhutan to the catwalks of Milan. Tigers can inspire great action and bold commitments. In 2010, leaders of the 13 tiger range governments agreed to the St. Petersburg Declaration on Tiger Conservation, launching the TX2 Goal, to double the number of tigers in the wild. These leaders recognised that taking bold action for tigers will have a much wider impact than just for one species. A win for tigers can also be a win for other biodiversity and humans too.

Can the global investment and effort for tigers go beyond the stripes to benefit other global priorities? In recent years, our understanding of the multitude of values provided by healthy biodiversity and ecosystems (and tigers!) has increased dramatically. This is reflected in the hundreds of research papers and reports referenced in this publication. The preliminary evidence presented here shows that by protecting the wild places where tigers roam, we can save so much more.

As tigers are well-known as an umbrella species, it comes as no surprise that investments in securing tigers will also protect thousands of other threatened species in some of the most biodiverse areas on Earth. Tigers can even help in places where they themselves have gone extinct. In Cambodia and Kazakhstan, where wild tigers no longer roam, the respective governments are taking on efforts to rehabilitate entire landscapes, to provide a home for newly reintroduced tiger populations. This in turn supports efforts to conserve many other highly endangered species, improve ecosystem services and potentially provide new critical sources of income for local communities.

The report however goes deeper and begins to demonstrate that in fact tiger conservation is often helping to secure the natural capital and ecosystem services required to underpin economic expansion for the Asia region as a whole. This makes it of critical importance to millions of people reliant on the values they provide. If we fail to protect tigers, we will fail to protect so much more.

Perhaps the most important message of the report is that investments in tigers are by no means a diversion from other global development priorities. On the contrary, the evidence demonstrates that such investments are very significant contributions to the realization of many of the UN Sustainable Development Goals in Asia. This is also particularly relevant when it comes to safeguarding the interests and rights of millions of rural (and often marginalized) people who often depend very immediately upon the products of healthy and productive tiger landscapes.

Mike Baltzer  
Leader, WWF Tigers Alive Initiative



**Tigers today provide an opportunity to further herald a more inclusive, interconnected modern approach to conservation at the scale and intensity that the planet and people need.**

Camera trapping is identifying diverse wildlife populations, including the takin (*Budorcas taxicolor*), in wildlife corridors shared with tigers in Bhutan.

# EXECUTIVE SUMMARY

If tigers are to survive this century and beyond, their home range urgently needs to be protected and restored. This requires sustained support from governments, business and civil society at large, particularly from tiger range states. Tigers are apex predators and a classic landscape species. They need large numbers of prey; use many habitats across wide areas; play a key role in ecosystem function; have high socio-economic significance; and are vulnerable to human interference. If the landscape is not large, diverse and protected enough, tigers will not survive.

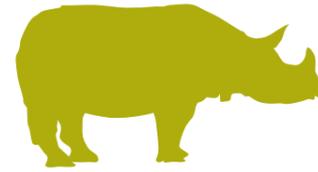
In the wild landscapes where tigers roam, including nature reserves, forest divisions and wildlife sanctuaries, an impressive range of ecosystem benefits are present. Yet, these could quickly be lost, if they are not effectively safeguarded. In this report, we explore some of the critical benefits from well-managed large-scale tiger habitats:

## 1. BIODIVERSITY

In conserving tigers we also conserve some of the world's richest ecosystems, including territories of other endangered flagship species. The large range needed by tigers mean that opportunities for landscape connectivity are being identified and managed for conservation, which also brings benefits for many other species and the provision of ecosystem services. In this politically diverse and often tense region, tiger conservation provides an incentive for cross-border collaboration on environmental issues, which has other positive outcomes.

## 2. ECOSYSTEM SERVICES

Tiger landscapes provide many ecosystem services that spill out beyond the range of the tiger. Hundreds of millions of people use high quality, regulated water from tiger reserves, which also provide disaster risk reduction against flooding, tidal surge and landslides. They conserve crop wild relatives and wild food sources. With stronger protection tiger landscapes store more carbon on the average than other forests in the region, helping to mitigate climate change.



**TIGER HABITAT OVERLAPS WITH 4 GLOBAL BIODIVERSITY HOTSPOTS, 332 KEY BIODIVERSITY AREAS AND 10 NATURAL WORLD HERITAGE SITES**

**IN SUMATRA, THE TIGER'S RANGE OVERLAPS WITH 100% OF THE RANGE OF ORANGUTANS AND RHINOS**



**FOREST LANDSCAPES PROTECTED FOR TIGERS STORE MORE CARBON THAN OTHER FORESTS IN THE REGION, HELPING TO MITIGATE CLIMATE CHANGE**

**TIGER HABITATS OVERLAP NINE GLOBALLY IMPORTANT WATERSHEDS, WHICH SUPPLY WATER TO AS MANY AS 830 MILLION PEOPLE**



**ECOSYSTEM SERVICES FROM TIGER RESERVES COULD BE WORTH BILLIONS OF DOLLARS**



**PRESERVING SACRED NATURAL SITES AND TRADITIONAL CULTURES WHERE MANY INDIGENOUS PEOPLES LIVE**

**THE SOCIAL SIGNIFICANCE OF TIGERS CAN BE SEEN IN COSMOLOGIES, FAITHS AND FOLKTALES OF ALMOST ALL CIVILIZATIONS IN TIGER RANGE COUNTRIES**

## 3. ECONOMIC BENEFITS

Well-managed tiger landscapes have concrete economic benefits. They are a vital safety net for local communities by providing access to sustainable natural resources for subsistence and sale. At a wider level, tiger landscapes contribute to national economic prosperity, both directly through ecotourism and jobs and indirectly by provision of ecosystem services; the loss of the latter costs money. These benefits are therefore increasingly recognized in national accounts and through direct payment for ecosystem services.

## 4. CULTURAL VALUES

Tigers have immense cultural value at global, national and local levels and to a variety of ethnic groups. Many indigenous peoples live in tiger habitat and preserving tigers can also preserve traditional cultures. Tiger landscapes protect sacred natural sites important to a range of faiths, and more generally, protection of the tiger plays a massively important cultural role around the world. These intangible values are the hardest to measure but may in reality provide the greatest incentive for long-term tiger conservation.

In 2016, the United Nations 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development came into force. Adopted by world leaders, the goals aim to end all forms of poverty, fight inequalities and tackle climate change – all through the lens of sustainable resource use. The tiger's future is tied to effective protection, enhanced habitat connectivity and habitat restoration. Without appropriate investment in tiger landscapes, the ecosystems that form the basis of sustainable management and use of resources across the tiger range are at risk of being further degraded. The benefits discussed throughout this report will be gone, and will need replacing at exorbitant cost. So by saving wild tigers, and securing their landscapes, we will secure so much more.

**Investing in tigers produce significant benefits and opportunities for thousands of species and millions of people**

**Tigers are a touchstone for many other benefits provided by the ecosystems in which they live, which have positive impacts on human well-being, economy and culture**



# INTRODUCTION

## Tigers can help save the planet!

The tiger (*Panthera tigris*) is one of the world's most iconic animals, an instantly recognizable symbol of strength, potency and untamed nature. But the wild tiger is in deep trouble; populations have collapsed due to habitat destruction and poaching and remaining tigers are squeezed by human priorities for land, resources and money.

Yet many governments see conservation as a luxury when people live in poverty and space for crops, building and energy generation is in short supply. It is often assumed that conservation limits development and is a net drain on national economies. But the evidence presented in this report suggests that the co-benefits of conservation have been massively undervalued. Tiger habitat supply many valuable ecosystem services, particularly carbon capture and water filtration,<sup>1</sup> as well as supporting other important and endangered species.<sup>2</sup>

The Millennium Ecosystem Assessment estimated that 60 per cent of global ecosystem services were degraded,<sup>3</sup> undermining food and water security and human health, and increasing climate-related disasters. The 2017 Global Land Outlook shows that the situation has deteriorated even more since.<sup>4</sup> Between 1997 and 2011, it is estimated that the world lost ecosystem services worth more than US\$20 trillion per year due to land degradation; tropical forests alone lost US\$3.5 trillion annually.<sup>5</sup> Although many tiger range countries have undergone rapid economic growth, they are also rapidly losing natural resources, which undermines their long-term stability.<sup>6</sup>

The balance sheet of short-term economic gain over ecosystem loss is already costing countries dear. Development cannot afford to be at the expense of long-term sustainability, and land use planning needs to recognize the trade-offs between different services from the natural environment. It is time for policymakers to abandon the false dichotomy between “conservation” and “development”. Even in a rapidly developing world, it is possible to ensure refuges for biodiversity that support ecological processes and assemblages of species.<sup>7</sup> As one of the most powerful icons of conservation, tigers attract large-scale support and funding. Fortunately, when you invest in tigers... you get so much more.



**“I would stop using the label ‘Project Tiger’ and call it ‘Project Eco-System’. We need to communicate effectively that saving the tiger is not some middle class obsession. It is an ecological imperative — by saving the tiger, you are saving the forests. The tiger is merely the symbol. By saving it, we ensure our water security.”**

Jairam Ramesh, former Minister of State for Environment and Forests, India<sup>8</sup>

The tigers' range has reduced by 95 per cent, leaving populations fragmented and isolated

“There is now a substantial body of research demonstrating that, alongside climate change, eliminating large carnivores is one of the most significant anthropogenic impacts on nature”<sup>10</sup>

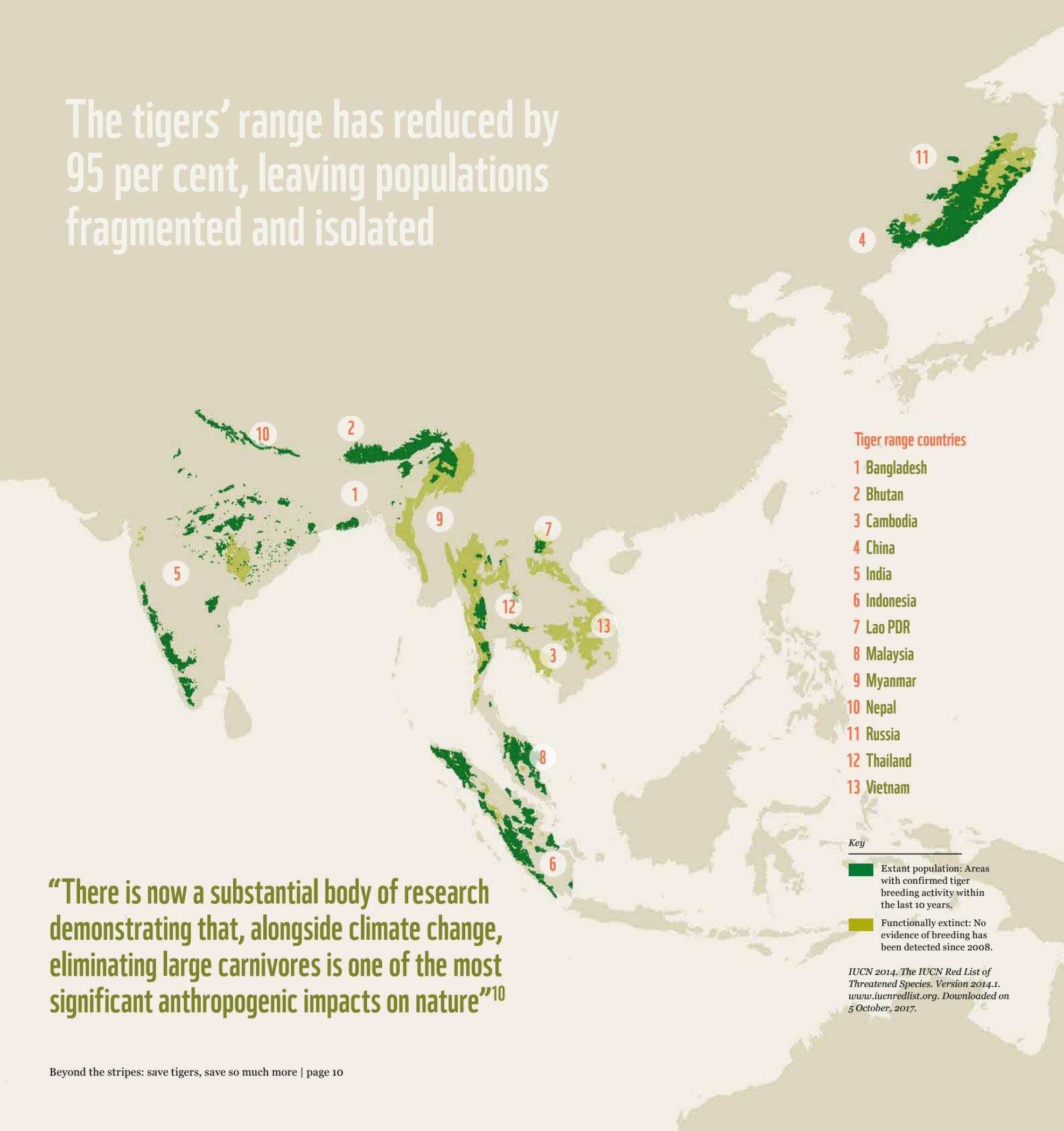
# 1: SAVING A BIODIVERSITY TREASURE TROVE

## A catalyst for biodiversity conservation cooperation across Asia

The tiger first stalks into history about two million years ago, the age of the earliest known fossils found in China,<sup>1</sup> although these ancestors were smaller than tigers today. “Our” tiger is much younger, with the modern species only finally emerging a hundred thousand years ago.<sup>2</sup>

Tigers, the largest living wild cats, were once common across Asia and spread as far west as Turkey, to the Korean Peninsula in the far east. Highly adaptable to a range of habitats from tropical forests to snow-covered mountains, and able to cover vast distances to find food and secure territories, they are the ultimate landscape species. But a mixture of persecution and loss of habitat and prey species has reduced their range by 95 per cent, leaving populations fragmented and isolated.<sup>3</sup> And even the remaining 5 per cent are threatened; with some scenarios predicting close to half (43 per cent) of the remaining suitable tiger habitat will soon be lost to agriculture expansion and urbanization.<sup>4,5</sup> Even countries that have invested significantly in tiger conservation, such as India, are still losing tiger habitat.<sup>6</sup>

Perhaps for tigers more than any other species, this decline has happened despite global public concern, innumerable conservation projects and, at least in some countries, strong government policies. But simply presenting the issue as a straight choice between tiger conservation and development also creates significant opposition to some conservation initiatives. There is a need for more inclusive arguments for conservation than those based on the survival of one species. In the following pages, we show that efforts to halt habitat loss and poaching of tigers will directly benefit thousands of other plant and animal species, many of which have high value to humans<sup>7</sup> and are also threatened by current development pathways,<sup>8</sup> and that tigers are a potent symbol of much wider biodiversity conservation concerns.



# TIGERS AND BIODIVERSITY

The high profile enjoyed by tiger conservation helps focus attention on the conservation of a variety of irreplaceable ecosystems.

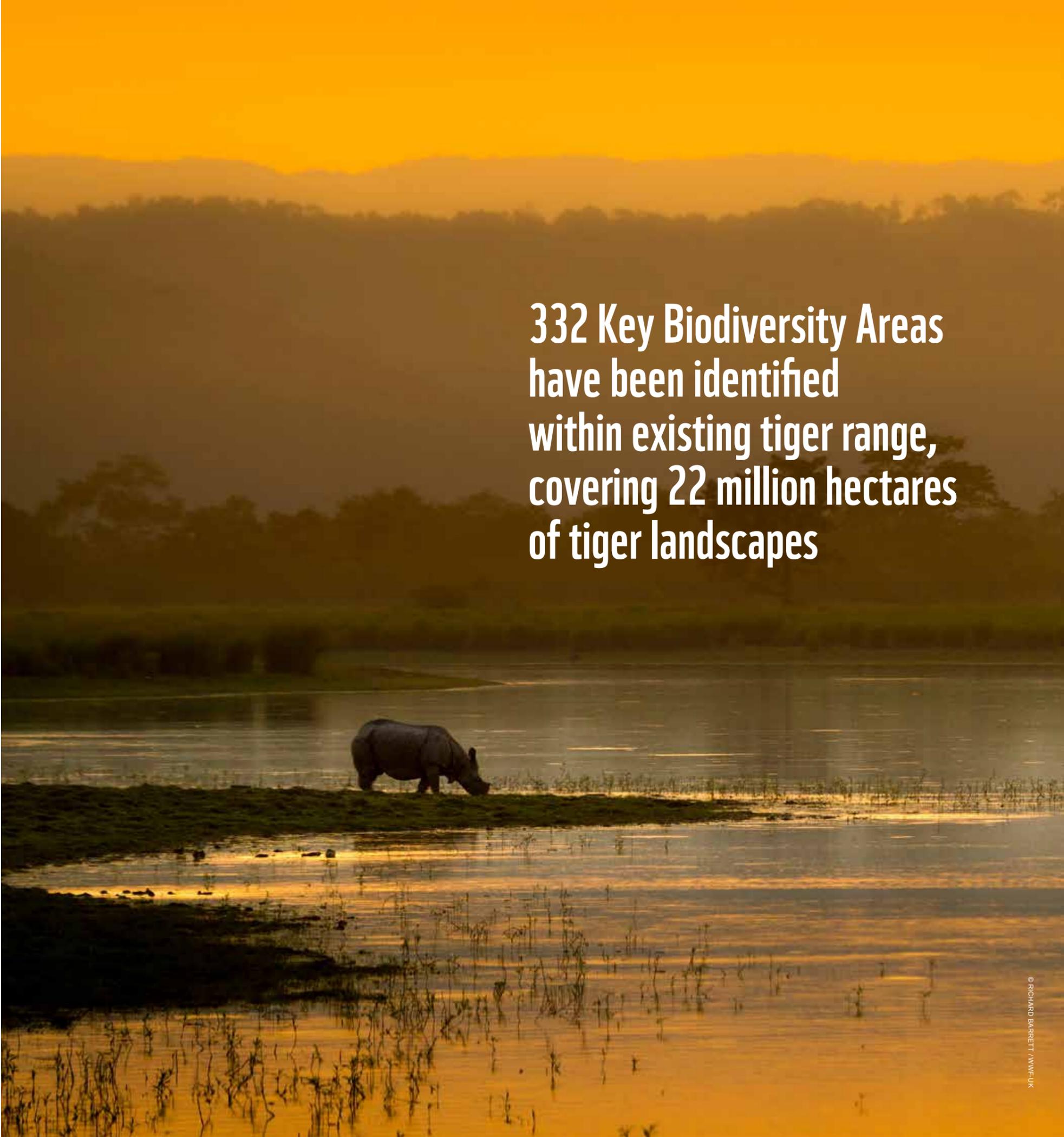
**Challenge:** Tigers range from the boreal forests of Russia to high Himalayan mountain habitat and the tropical and subtropical grasslands and forests of India and Southeast Asia. They live in some of the most important but also most highly threatened habitats on the planet.<sup>1,2</sup>

**Experiences:** Current remaining tiger range covers around 70 million hectares, the large majority of which is also in four biodiversity hotspots, the world's richest places in terms of plant and animal diversity: Eastern Himalayas, Indo-Burma, Western Ghats and Sundaland.<sup>3</sup> Twelve of these countries have tiger habitat entirely within one or more biodiversity hotspots, only the Russian Far East falling outside.<sup>4</sup>

The high biological value of tiger range is also borne out by comparison with Key Biodiversity Areas (KBAs); "sites contributing significantly to the global persistence of biodiversity".<sup>5</sup> To date, 332 KBAs have been identified within the existing tiger range, covering 22 million hectares of tiger landscapes.<sup>6</sup> In the future, further areas within the tiger range are likely to be identified as KBAs.

More evidence of the importance of tiger ecosystems comes from the number of protected areas with tigers that feature in the list of UNESCO natural World Heritage sites. World Heritage sites need to demonstrate "Outstanding Universal Value";<sup>7</sup> meaning each needs to be not only important but also demonstrate a level of uniqueness. Ten World Heritage sites, covering over 5.4 million hectares, support 30 per cent of the global wild tiger population. Several more sites used to contain tigers, such as Ujung Kulon in Indonesia<sup>8</sup> and Altai Mountains in the Russian Federation.<sup>9</sup>

**OPPORTUNITY:** Conserving tigers will also conserve a range of critically important habitats and ecosystems.

A large river landscape at sunset. The sky is a deep orange and yellow, reflecting on the water. In the middle ground, a rhinoceros stands on a grassy bank, looking towards the water. The background shows a line of trees and hills under the bright sky.

332 Key Biodiversity Areas  
have been identified  
within existing tiger range,  
covering 22 million hectares  
of tiger landscapes

# PROTECTING FLAGSHIP SPECIES

Tiger habitats harbour many of Asia's most exceptional species.

**Challenge:** Tiger habitats overlap with the range of many other threatened flagship or iconic species.<sup>1,2</sup>

**Experiences:** Tiger habitat, and the protected areas that provide the backbone of tiger conservation, harbour other flagship species needing conservation. This includes in particular:

**Asian elephant (*Elephas maximus*):** over 30 per cent of the population overlaps with the tiger's range,<sup>3</sup> including Bangladesh in the Chittagong Hill Tracts;<sup>4</sup> southern Bhutan;<sup>5</sup> India, particularly in the southwest;<sup>6</sup> on the island of Sumatra, Indonesia;<sup>7</sup> Peninsular Malaysia;<sup>8</sup> Myanmar;<sup>9</sup> Nepal, in the lowland Terai;<sup>10</sup> and Thailand.<sup>11</sup> Relic populations of elephants are also found in Cambodia,<sup>12</sup> where tiger reintroduction is planned, and in Vietnam<sup>13</sup> where the tiger may now be extinct.

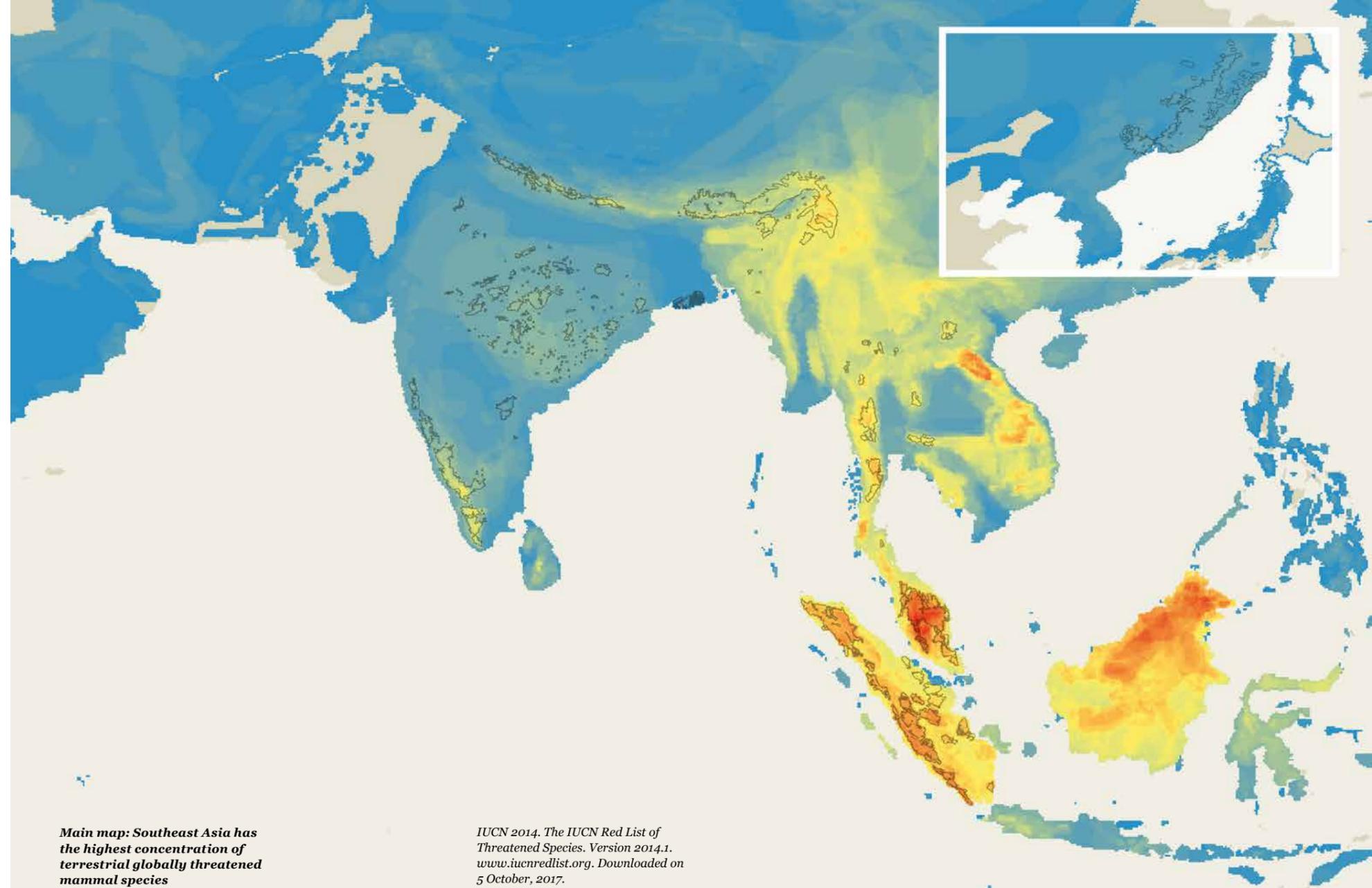
**Sumatran orangutan (*Pongo abelii*):** is critically endangered and confined to the same rainforests as the tiger in Sumatra, Indonesia.<sup>14</sup>

**Indian rhinoceros (*Rhinoceros unicornis*):** over three-quarters are now confined in or near a few protected areas in Nepal and India, with two-thirds of the world population in Kaziranga National Park in the Brahmaputra Valley, Assam,<sup>15</sup> which also protects tigers.

**Sumatran rhinoceros (*Dicerorhinus sumatrensis*):** is now critically endangered, and confined within the tiger range to three protected areas in Sumatra;<sup>16</sup> it is almost certainly extinct in Malaysia.<sup>17</sup> It is probably the most endangered rhinoceros species.

These species, and others flagships like the snow leopard (*Panthera uncia*), clouded leopard (*Neofelis nebulosa*) and brown bear (*Ursus arctos*) overlap range with the tiger. Investing in the tiger helps these species too, and vice versa. And for species like the pangolin (*Manis crassicaudata*, *M. pentadactyla* and *M. javanica*), which have received insufficient conservation attention but are threatened with extinction,<sup>18</sup> tiger reserves may well provide vital protection.

**OPPORTUNITY:** Conservation policies and investment spurred on by interest in tigers will also benefit thousands of other species, many of which are threatened.



**Main map: Southeast Asia has the highest concentration of terrestrial globally threatened mammal species**

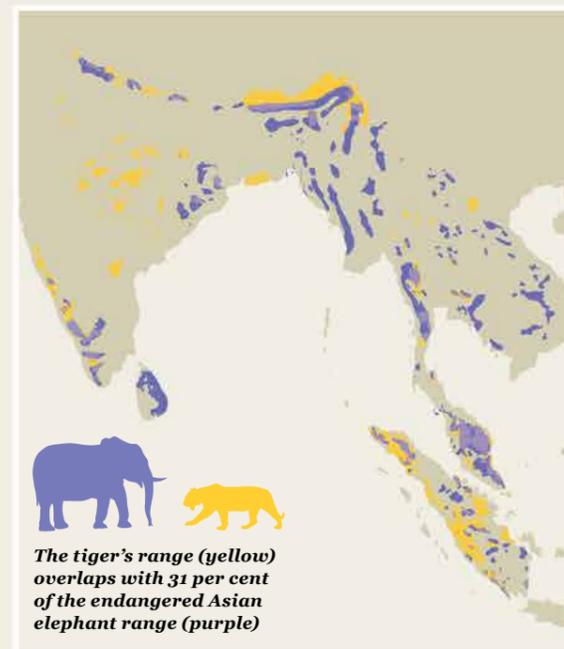
IUCN 2014. *The IUCN Red List of Threatened Species. Version 2014.1.* [www.iucnredlist.org](http://www.iucnredlist.org). Downloaded on 5 October, 2017.

**Key**

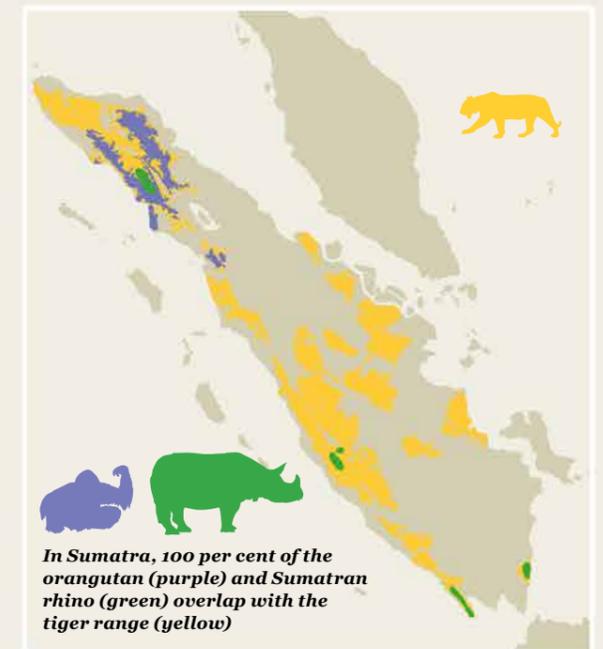
Heat map showing threatened mammalian species; from a low number, 0-30 species (blue) to high, over 30 species (red)

*Panthera tigris* range. Extant (resident)

Jenkins, C.N., Pimm, S.L. and Joppa, L.N. 2013. Global patterns of terrestrial vertebrate diversity and conservation. *Proceedings of the National Academy of Sciences* 110.28: E2602-E2610. Source (data layer): BiodiversityMapping.org and IUCN.



**The tiger's range (yellow) overlaps with 31 per cent of the endangered Asian elephant range (purple)**



**In Sumatra, 100 per cent of the orangutan (purple) and Sumatran rhino (green) overlap with the tiger range (yellow)**

# CONNECTING LANDSCAPES

Conservation networks ensure tigers and other wide-ranging species have enough space to thrive and interact across large areas.

**Challenge:** Tigers need to move between suitable habitats,<sup>1</sup> so although protected areas are fundamental to their survival connecting landscapes is also essential. These areas often have limited protection, and many development, mining and extraction projects are either proposed or in progress threatening the survival of many species.<sup>2,3</sup> In some parts of Central India, dispersal between source populations and other tiger reserves has reduced by up to 70 per cent over the last 25-35 years.<sup>4,5</sup> Other species face similar challenges.

**Experiences:** Recent efforts to protect habitat suitable for tigers<sup>6</sup> has resulted in 73-83 per cent of the wild population now being within protected areas,<sup>7</sup> although the percentage varies between countries. This means that large parts of the tiger range in many countries are not primarily managed for conservation. If carefully managed these areas can provide habitat not only for tigers but for a multitude of associated species of animals,<sup>8</sup> plants<sup>9</sup> and much more. In Peninsular Malaysia, where about 85 per cent of the tiger population is located in forest reserves,<sup>10</sup> forest corridors between Royal Belum State Park and Temengor Forest Reserve have been protected. Designed for tiger dispersal – the area is also home to indigenous people,<sup>11</sup> a host of species such as elephant and tapir (*Tapirus indicus*) and 10 species of hornbill.<sup>12</sup> The area's potential for carbon storage has been investigated through a Forest Carbon Offset Project, and could provide an income of US\$0.7 million per year.<sup>13</sup>

The Terai Arc is a vast landscape covering five million hectares along the base of the Himalayas. Home to three million people and 14 protected areas, conservation objectives have helped focus attention and funding on the region. Conservation corridors have been developed and tiger populations are increasing.<sup>14</sup> Vast carbon sources are conserved, particularly in protected forests,<sup>15</sup> and the development of community forestry has helped secure user rights and responsibilities, promoted forest restoration and provided additional income, capacity and infrastructure to local communities.<sup>16</sup>

**OPPORTUNITY:** Landscape-based approaches to tiger conservation emphasize habitat connectivity to enhance gene flow and provide opportunity for dispersal for multiple species.

## From tropical forests to snowy mountains

In Bhutan, tigers roam across diverse habitats – from sub-tropical forests to snowy mountains over 4000 m above sea level. Wildlife corridors provide vital lifelines for tigers, allowing movement across vast areas to hunt and reproduce. This tiger was recorded for the first time in May 2017 using a critical wildlife corridor that connects protected areas in central Bhutan.



## DRIVING POLITICAL MOMENTUM

Tigers have played a unique role in bringing countries, organizations and people to work together on a common conservation goal – and in doing so have ensured the future for habitats and species across the whole region.

**Challenge:** Tigers do not respect national boundaries,<sup>1</sup> and unfortunately neither do poachers; international criminal networks quickly shift between countries, exploiting weaknesses and loopholes.<sup>2</sup> Successful tiger conservation means international cooperation, between tiger range countries, other states (particularly recipients of illegal tiger trade), donors and NGOs.

**Experiences:** Over the last decade, the level of cooperation on tiger conservation has dramatically increased:

- **TX2:** the Global Tiger Initiative<sup>3</sup> was launched in 2008, led by the 13 tiger range countries and the World Bank, Global Environment Facility, Smithsonian Institution, Save the Tiger Fund and International Tiger Coalition (over 40 NGOs). The resulting Global Tiger Recovery Programme,<sup>4</sup> aims to double populations of wild tigers by 2022.
- **ITHCP:** Integrated Tiger Habitat Conservation Programme is an example of international development agencies using tiger conservation to boost human development. A five-year grant programme, ITHCP was set up in 2014 with €20 (US\$23) million funding from the German government through the German Development Bank (KfW), and is being implemented by IUCN. Each funded project has outcomes for tiger conservation and local livelihoods.<sup>5</sup>
- **CA|TS:** Conservation Assured Tiger Standards is a partnership between governments, donors and conservation organizations to guarantee effective and equitable tiger management<sup>6</sup> by accrediting sites against agreed standards of management. Sites can first register for CA|TS, then (if necessary) build capacity and become accredited at a later date. Under the umbrella of tiger conservation, CA|TS is aiming to improve all aspects of protected area management from conservation through to local community well-being and involvement.<sup>7</sup>
- **Rangers:** Numerous NGOs have made a raft of new investments in Asian rangers as a contribution to the goal of ending tiger poaching. This includes efforts to build capacity and seek further engagement and collaboration with government agencies responsible for this sector.<sup>8</sup>



### The Tiger Summit

in St Petersburg in 2010, brought together all tiger range countries and was attended by numerous heads of state and high level ministers and the President of the World Bank, launching a raft of initiatives to stabilize and reverse tiger decline and signalling huge political support.<sup>9</sup> Such a political agreement and process for the conservation of a single species are unprecedented.

**OPPORTUNITY:** Efforts to halt and reverse the tigers decline is encouraging countries to work together on conservation and development issues.

# RETURN OF THE KING

## Cambodia and Kazakhstan

Conservationists,<sup>1</sup> climate scientists<sup>2</sup> and those interested in development<sup>3</sup> agree that ecological restoration is now an urgent necessity in many parts of the world.<sup>4</sup> But despite fine words and paper commitments, large-scale investment in restoration remains limited. Tigers provide a much-needed boost to global restoration efforts and can provide the incentive and the backbone for activities that will benefit whole ecosystems. Tigers are ideal flagships for restoration; they are adaptable and breed quickly; given a fighting chance tigers recover from setbacks and rebuild populations; and considerable habitat remains within their historical range.<sup>5</sup> Successful examples include their reintroduction into Panna Tiger Reserve in India, following population collapse due to poaching and insurgency.<sup>6</sup>

Reintroducing tigers is likely to require restoration and protection of habitats and prey species; and by securing tigers, many more species of flora and fauna can also be protected.

Tigers disappeared from Cambodia over the last two decades due to hunting and a decline in prey species.<sup>7</sup> Current enforcement and capacity are weak.<sup>8</sup> Nonetheless, the Eastern Plains Landscape is identified as the most suitable restoration site, probably first in the Serepok Wildlife Sanctuary, with potential for a population of up to 180 tigers across the whole landscape and for tigers to spread into Lao PDR and Vietnam.<sup>9</sup> Restoration plans received government approval in 2017,<sup>10</sup> and will provide an incentive for conservation and restoration of the Eastern Great Plains, the last major undisturbed habitat area in Cambodia, dubbed the “Serengeti of Asia”, aiding a range of other endangered species.<sup>11</sup> Tigers could also provide a much needed boost to ecotourism and national tourism revenue.<sup>12,13</sup>

Tigers became extinct throughout Central Asia last century, but recently an official announcement outlined plans for the reintroduction of tigers in Kazakhstan.<sup>14</sup> Two potential sites have been identified: the Amu Darya Delta and the southern coast of Balkhash Lake.<sup>15</sup> However, successful restoration of tiger populations in the latter is contingent on consistent river flow of the Ili River, currently exploited for irrigation upstream in China, which may require a special agreement on future water consumption be reached between China and Kazakhstan.<sup>16</sup> Again, tiger reintroduction would also drive larger-scale conservation and restoration – as well as ecosystem services. Interest is also growing for reintroducing tigers in southern China, but this would require major habitat and prey restoration efforts.<sup>17</sup>

### Protecting and restoring landscapes

Reintroducing iconic top predator species such as tigers means protecting and restoring landscapes which support a whole host of other species. In Kazakhstan, for example, plans include the reestablishment of a number of locally extinct species, including thousands of kulans (*Equus hemionus*), the rare Bukhara deer (*Cervus hanglu bactrianus*) and the critically endangered Saiga antelope (*Saiga tatarica*). It would also aim to triple the existing Goitered gazelle (*Gazella subgutturosa*) population, and increase wild boar (*Sus scrofa*) numbers tenfold.





**Making ecosystem services a co-benefit of other important society priorities is one way of helping build support for achieving these goals, which is where tigers come in**

## 2. BENEFITING PEOPLE: CRITICAL ECOSYSTEM SERVICES

Protecting the tiger's range also protects critical ecosystem services

Ecosystem services are, literally, the benefits that people obtain from ecosystems. A decade ago, the *Millennium Ecosystem Assessment* popularized the term and identified four kinds of ecosystem service:

- **Supporting services:** basic ecosystem functions like primary productivity, nutrient recycling and soil formation, which are the basis of life and the powerhouses of agriculture, and allow other ecosystem services to be sustained;
- **Provisioning services:** provide the essential materials for sustaining life including food, water, genetic resources, medicines, energy, etc.;
- **Regulating services:** help to maintain a liveable planet, such as climate stabilization, water and air purification, soil maintenance in farming areas, disaster risk reduction, waste decomposition and pest and disease control;
- **Cultural services:** a broad category ranging from recreational and aesthetic values of nature, through spiritual values to those related to culture and history, science and education.<sup>1</sup>

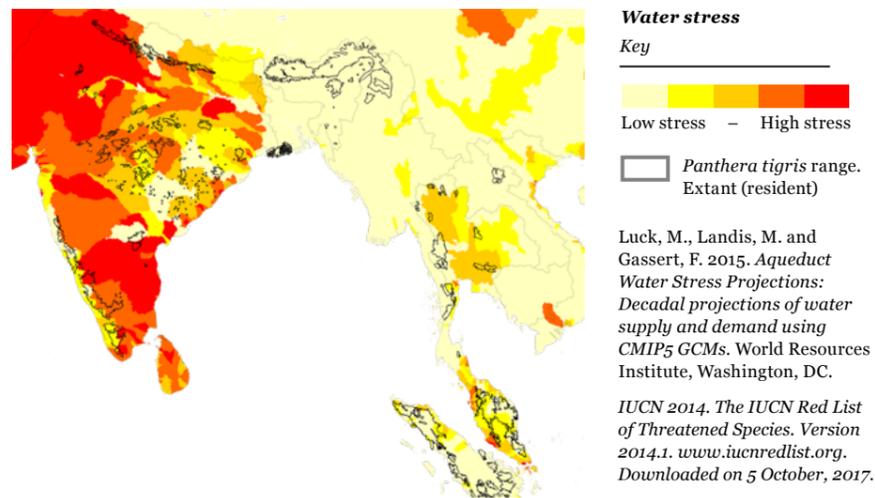
Such values are often unnoticed, undervalued,<sup>2</sup> ignored or treated by economists as “free goods”,<sup>3</sup> until they are degraded or disappear, whereupon it costs far greater investments of time and money to substitute or reinstate them.<sup>4</sup> Economists can show that the value of a natural ecosystem is far greater than its constituent parts; e.g. the value of a living forest is greater than the timber it contains.<sup>5</sup> However, these values are often widely dispersed, accruing in small amounts to many individuals.<sup>6</sup> For the person who owns or controls the ecosystem it is often more valuable in financial terms to cash in by extracting and selling natural resources, even if this destroys the value of a resource for future generations and to wider national, regional or global populations. However, despite an emerging middle class in much of Asia, the disadvantaged and marginalized remain poor,<sup>7</sup> and these services are vital for survival.

Finding ways to encourage long-term management of ecosystem services has been enshrined in the Sustainable Development Goals (SDGs),<sup>8</sup> which will be the driving force behind much of the global work on sustainable development and conservation for the next decade.

# SAFEGUARDING WATERSHEDS AND WATER SECURITY

Millions of people depend on water from places where wild tigers roam.

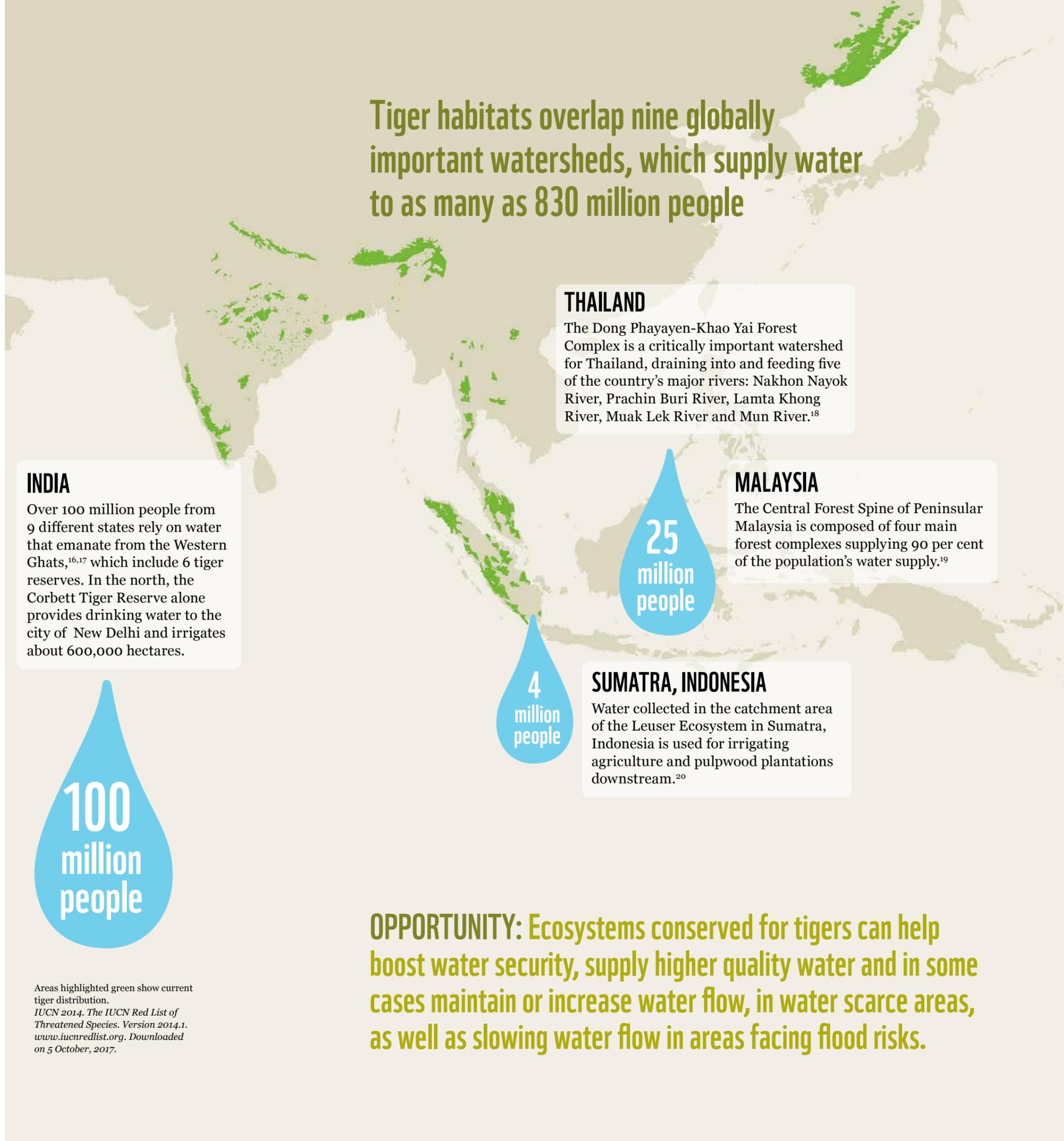
**Challenge:** Much of South Asia suffer from water stress<sup>1</sup> which is projected to become critical in many areas by 2040,<sup>2</sup> leading to local<sup>3</sup> and international<sup>4</sup> conflict, including political tensions. In addition, land use change, combined with agricultural intensification, has reduced water quality throughout many tiger-range countries.<sup>5</sup>



**Experiences:** Tiger conservation landscapes overlap with nine globally important watersheds, covering 5.8 million km<sup>2</sup>, which serve as water sources for agriculture, energy generation, industry and domestic use for up to 830 million people.<sup>6</sup> Intact ecosystems, particularly natural forests, play a critical role in maintaining water security.<sup>7</sup>

- **Water quality:** Natural forests discharge purer water,<sup>8</sup> and reduce sediment reaching rivers, streams and reservoirs,<sup>9</sup> with direct social and economic benefits. For example, the Ramganga River watershed is largely inside Corbett National Park in India, a tiger stronghold. From 1974 to 2010, a downstream dam has generated electricity worth US\$41 million along with 88,000 million m<sup>3</sup> of irrigation water, without direct investment in catchment treatment or significant siltation.<sup>10</sup> Similarly the Similpal Tiger Reserve in Orissa maintains forest in an otherwise deforested landscape and is the source of at least 11 rivers.<sup>11</sup>
- **Water flow:** Forested catchments also play an important role in regulating water flow. Some forest types such as cloud forests increase net flow,<sup>12</sup> while many humid forests reduce net flow through evapotranspiration.<sup>13</sup> Most forests also help to “smooth out” flow during times of drought or heavy rains, thereby helping to mitigate flood risks to downstream communities.<sup>14</sup> In Bhutan, Myanmar and Nepal, where hydropower supplies 74-100 per cent of electricity, tiger ranges overlap with the headwaters the maintain flows to the dams.<sup>15</sup>

Tiger habitats overlap nine globally important watersheds, which supply water to as many as 830 million people



## THAILAND

The Dong Phrayayen-Khao Yai Forest Complex is a critically important watershed for Thailand, draining into and feeding five of the country’s major rivers: Nakhon Nayok River, Prachin Buri River, Lamta Khong River, Muak Lek River and Mun River.<sup>18</sup>

## MALAYSIA

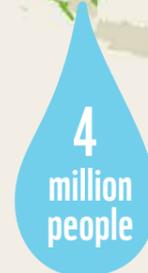
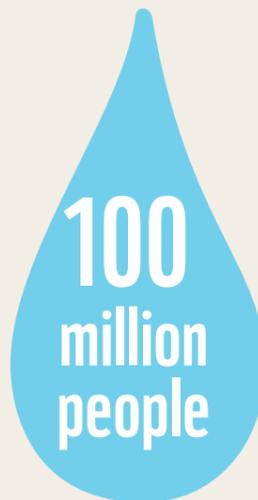
The Central Forest Spine of Peninsular Malaysia is composed of four main forest complexes supplying 90 per cent of the population’s water supply.<sup>19</sup>

## SUMATRA, INDONESIA

Water collected in the catchment area of the Leuser Ecosystem in Sumatra, Indonesia is used for irrigating agriculture and pulpwood plantations downstream.<sup>20</sup>

## INDIA

Over 100 million people from 9 different states rely on water that emanate from the Western Ghats,<sup>16,17</sup> which include 6 tiger reserves. In the north, the Corbett Tiger Reserve alone provides drinking water to the city of New Delhi and irrigates about 600,000 hectares.



Areas highlighted green show current tiger distribution.  
IUCN 2014. *The IUCN Red List of Threatened Species. Version 2014.1.* www.iucnredlist.org. Downloaded on 5 October, 2017.

**OPPORTUNITY:** Ecosystems conserved for tigers can help boost water security, supply higher quality water and in some cases maintain or increase water flow, in water scarce areas, as well as slowing water flow in areas facing flood risks.

# TIGERS AND CLEAN WATER

## India

The southern state of Karnataka has recently seen the largest expansion of protected areas in India since the 1970s through increasing forest protection levels, from Reserved Forests to Wildlife Sanctuaries. The stimulus was to protect tigers;<sup>1</sup> but one important additional benefit was in securing water resources for millions of people. The decision to expand protected areas was reached through collaboration between government agencies, civil society and individuals to build the political momentum necessary for conservation.<sup>2</sup>

Karnataka in the Western Ghats has around 400 tigers,<sup>3</sup> one of the largest contiguous tiger populations in India. By identifying the integrity and connectivity of reserved, state and other forests in the region that were suitable both ecologically and politically for designation as protected areas, the protected area network has increased by 2,385km<sup>2</sup>, including connecting 23 protected areas and the creation of three complexes of protected areas, increasing the protected area network in Karnataka from 3.8 to 5.2 per cent of the state's land area.<sup>4</sup>

These protected areas not only support a large variety of wildlife, including elephants, lion-tailed macaque (*Macaca silenus*) and other threatened species that are wide-ranging or endemic, but also conserve watersheds, including 16 rivers, such as the Cauvery, Nethravathi, Paalar, Bhadra, Varahi, Gundia, Kumaradhara, Seetha and Kaali Rivers, which play important local and regional roles in water security. These watersheds sustain the farming and drinking water needs of 80 million people in southern India, and water was an important negotiating point during discussions about the expansion of the protected area network with the elected representatives of the local constituencies.<sup>5</sup>

The increased level of protection was coupled with the acknowledgement that the existing rights of traditional indigenous communities will continue as designated under The Scheduled Tribes and Other Traditional Forest Dwellers.<sup>6</sup>



# MITIGATING CLIMATE CHANGE

Tiger habitats play a significant role in efforts to contain greenhouse gas emissions

**Challenge:** Ecosystem loss and degradation are major causes of climate change.<sup>1</sup> Some tiger habitats are already switching from being carbon sinks to carbon emitters.<sup>2</sup> Tropical forests are the largest terrestrial carbon store,<sup>3</sup> but this service is now threatened as natural habitats degrade or disappear.

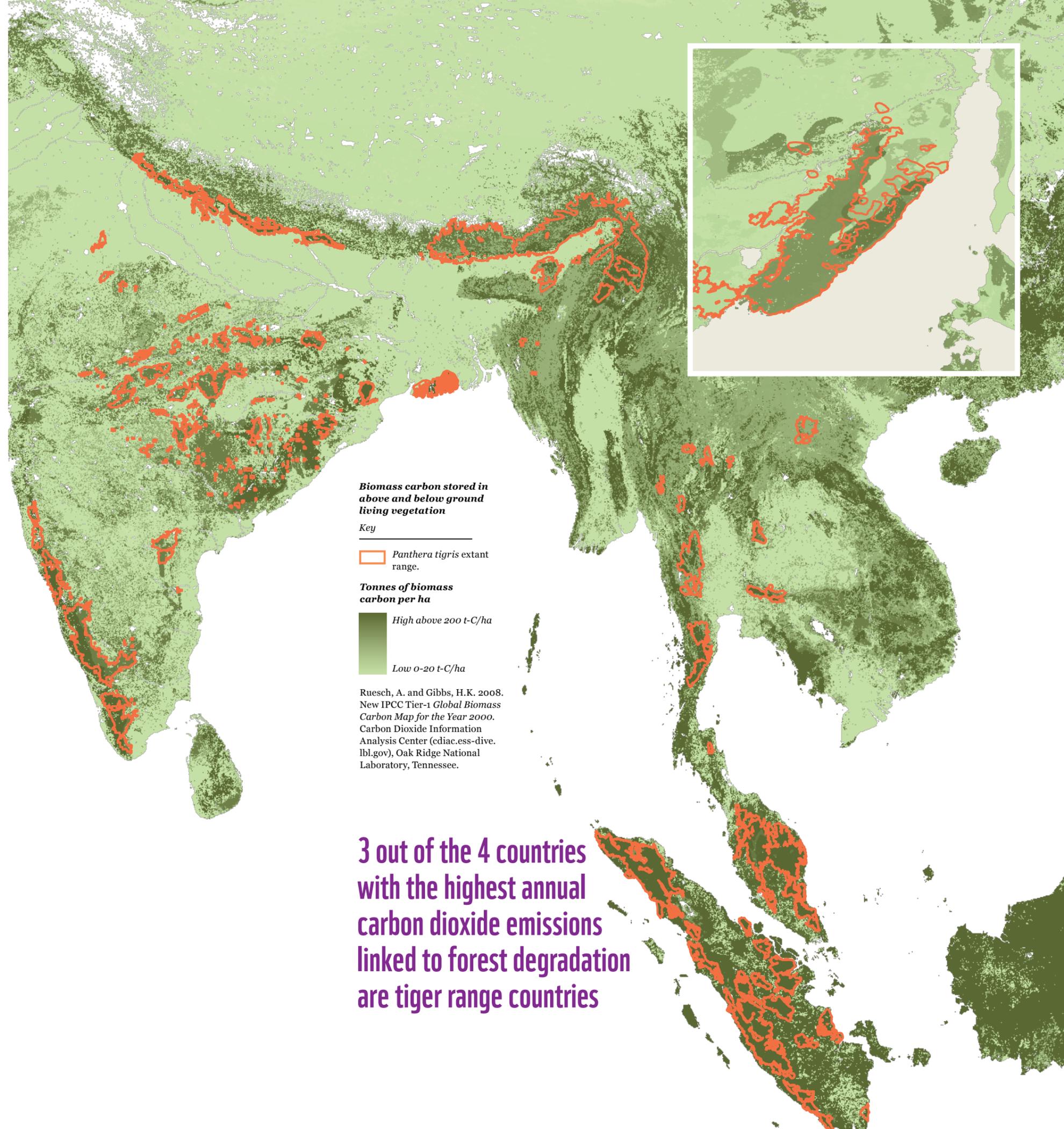
**Experiences:** Carbon sequestration and storage is one of the few ecosystem services that can be mapped and clearly communicated to policymakers.<sup>4</sup> The remaining forest habitats where tigers live are also forests that have a significant role in carbon sequestration.

The presence of tigers strengthens the motivation for governments to protect forests from illegal timber harvesting.<sup>5</sup> In some cases, tigers have been the key motivation for protecting forests with high carbon densities. Habitat conversion in tiger habitats across the range in the period 2001 to 2014 stood at 7.7 per cent;<sup>6</sup> however, losses were significant in Sumatra, Indonesia, which ranks as the world's leading producer of carbon emissions linked to forest degradation, followed closely by Malaysia and India.<sup>7,8</sup>

Most studies related to carbon and climate change mitigation focus on identifying areas at risk of deforestation and assessing their carbon storage and potential future sequestration. However, the research above suggests that species loss in forest ecosystems can also lead indirectly to carbon loss, due to reduced management attention and thus greater illegal use and resultant degradation.<sup>9</sup>

One global study comparing conservation strategies found that protecting species-rich habitat would result in 30 per cent more stored carbon being conserved by protected areas.<sup>10</sup> As an umbrella species, tiger conservation offers an opportunity to conserve forests that act as high-value carbon sinks.

**OPPORTUNITY:** Protecting forest landscapes for tigers will help protect the last remaining forests critical for carbon sequestration, helping to mitigate climate change.



**Biomass carbon stored in above and below ground living vegetation**

Key

 Panthera tigris extant range.

**Tonnes of biomass carbon per ha**

 High above 200 t-C/ha

 Low 0-20 t-C/ha

Ruesch, A. and Gibbs, H.K. 2008. New IPCC Tier-1 Global Biomass Carbon Map for the Year 2000. Carbon Dioxide Information Analysis Center (cdiac.ess-dive.lbl.gov), Oak Ridge National Laboratory, Tennessee.

3 out of the 4 countries with the highest annual carbon dioxide emissions linked to forest degradation are tiger range countries

# TIGERS, CARBON AND LIVELIHOODS

## Russian Far East

The Korean pine forests of the Russian Far East are unique, but have been reduced due to legal and illegal logging. Pine nuts are economically important for local indigenous communities and are also the main food of the wild boar the main prey of the tiger in the region.

To reverse forest loss, the Bikin, and associated Cedar, project conserved 3 million hectares of temperate forest, including through the designation of three protected areas (Land of the Leopard, Bikin National Park and Sredneussuriisky Wildlife Refuge) and three ecological corridors in Khabarovsk Province.<sup>1</sup>

Saving these forests attracted high-level support and collaboration including: international cooperation between Russia and Germany for a four-year conservation project launched at the Global Tiger Forum in St Petersburg;<sup>2</sup> a Presidential Order banning logging of Korean pine in Russia;<sup>3</sup> JSC Terneyles, a large FSC certified logging company, agreeing to stop logging in over 200,000ha of forest and restricting logging in another 400,000ha of Korean pine forest;<sup>4</sup> listing of Korean Pine in Appendix III of the Convention on International Trade in Endangered Species;<sup>5</sup> the proposal to include the Bikin River Valley in an extension of the Central Sikhote-Alin World Heritage site.<sup>6</sup>

This protection and support is ensuring all four ecosystem service types as defined by the *Millennium Ecosystem Assessment*,<sup>7</sup> for example:

- **Supporting:** water services from the headwaters of the Samarga River.<sup>8</sup>
- **Provisioning:** pine nuts, one of the few cash crops in the area.<sup>9</sup> In 2014, the harvest earned villagers around US\$60 million. Existing nut harvesting zones (NHZ) have been enhanced through combating illegal logging, increasing protection and developing facilities for forest product processing, storage and marketing.<sup>10</sup>
- **Regulating:** in particular carbon storage. Forest protection prevents emissions of an estimated 130,000 tonnes of CO<sub>2</sub> annually.<sup>11</sup> Income is generated through carbon credits under the Verified Carbon Standard,<sup>12</sup> for example, funds to compensate for the Sochi Olympics' emissions earned the local community more than US\$550,000, which paid for the NHZ leases and various community projects.<sup>13</sup>
- **Cultural:** securing traditional resources use, e.g. hunting, fishing and NTFP harvest, which are being co-managed by the government and indigenous Udege and Nanai people, in the new protected area.<sup>14</sup>

By protecting 10 per cent of the Amur tiger population in Russia, the Bikin Project has provided a wealth of benefits. Thanks to its success, it is being expanded to other NHZs.<sup>15</sup>

Forest protection prevents emissions of an estimated 130,000 tonnes of CO<sub>2</sub> annually

In 2014, the pine nut harvest earned villagers around US\$60 million



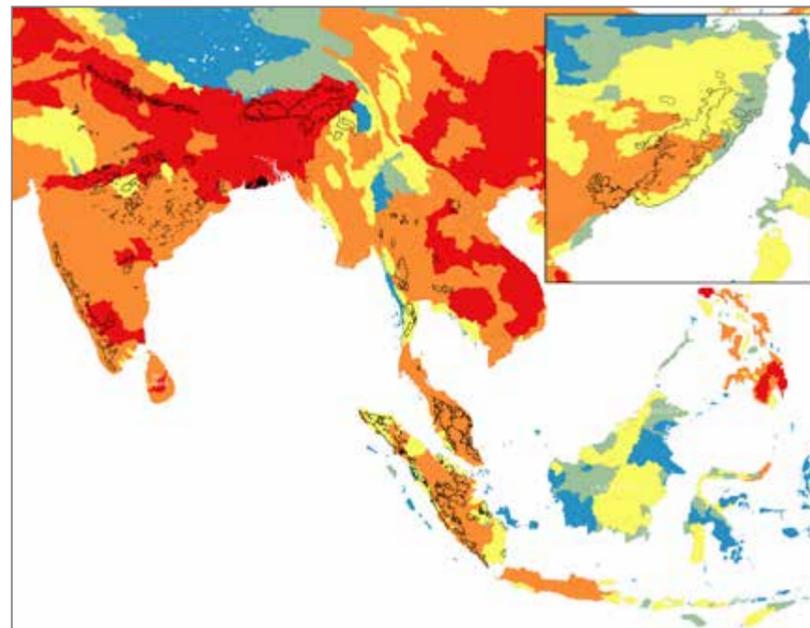
# REDUCING DISASTER RISK

Tiger habitats should be seen as vital elements in disaster risk reduction strategies

**Challenge:** Land degradation, population change and poor infrastructure all increase risks of harsh weather triggering disasters, which have severe social and economic impacts. For example, monsoon rains combined with degraded landscapes increase the frequency and severity of flooding, with rivers like the Ganges–Brahmaputra and Mekong at particular risk.<sup>1</sup> Climate change is increasing the number and severity of extreme weather events, with models predicting increasing flood hazards in parts of South Asia and Southeast Asia.<sup>2</sup> 75 per cent of tiger landscapes have been categorized as having high or extremely high flood risk.<sup>3</sup>

**Experiences:** Healthy natural ecosystems help mitigate all but the largest disasters<sup>4</sup> by buffering floodwaters;<sup>5</sup> stabilizing soil and snow;<sup>6</sup> blocking tidal surges and storms;<sup>7</sup> resisting desertification;<sup>8</sup> and fire;<sup>9</sup> and mitigating landslides and rock fall after earthquakes.<sup>10</sup> Areas conserved for tigers also help to buffer against the impact of natural disasters.

For example, the storm protection value of mangroves is recognized in Thailand,<sup>11</sup> Bangladesh<sup>12</sup> and India; in the latter two countries, coastal mangroves in protected areas in the Sundarbans help to buffer communities against storm surge<sup>13</sup> including the 2007 Cyclone Sidr and 2009 Cyclone Aila.<sup>14</sup> Forests in tiger reserves in mountainous areas such as Bhutan help to prevent soil erosion<sup>15</sup> and landslides, while forests within the region have also been shown to buffer against landslides following earthquakes.<sup>16</sup> In China, where decades of habitat loss have led to severe flooding and a massive contraction of the tiger's range, policies of forest protection and restoration have decreased flooding and recreated tiger habitat.<sup>17</sup>



According to the World Bank, every US\$1 invested in effective disaster reduction saves US\$7 in disaster losses.<sup>180</sup>

*Flood occurrence (floods recorded from 1985 to 2011) is high or extremely high across 75 per cent of the tiger range*

Gassert, F., Landis, M., Luck, M., Reig, P. and T. Shiao. 2014. *Aqueduct Global Maps 2.1*. World Resources Institute, Washington, DC.

## Role of natural ecosystems in tiger reserves in combating disasters



### Flooding

Providing space for floodwaters to dissipate; absorbing impacts



### Landslide

Stabilizing soil, packing snow and slowing earth, rock and snow movement.



### Storm surge, tsunamis, erosion

Mangroves creating a barrier, roots stabilizing wetlands



### Fires

Protecting fire-resistant natural ecosystems, limiting encroachment into fire-prone areas and maintaining traditional management to control fire



### Hurricanes and typhoons

Mitigating floods and landslides, buffering communities



### Earthquakes

Preventing or mitigating hazards such as landslides and rock falls

**OPPORTUNITY:** Natural ecosystems, such as those protecting tigers, are recognized for their disaster risk reduction role, and their conservation and restoration are included in disaster risk reduction strategies.

# LUCID WATERS AND LUSH MOUNTAINS

## China

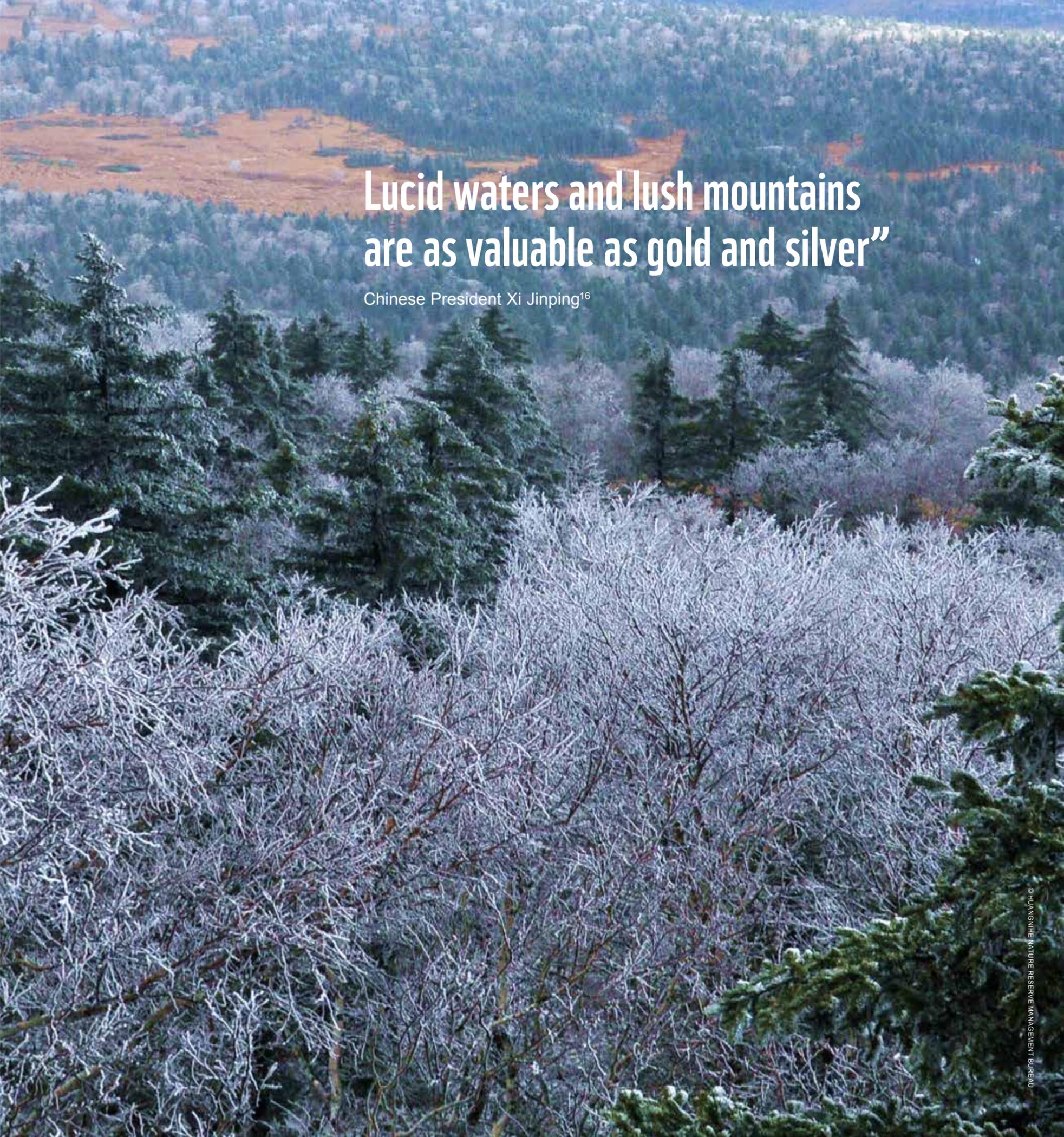
China has a long-term ambition to re-establish viable Amur tiger and leopard (*Panthera pardus orientalis*) populations.<sup>1</sup> However, the large-scale habitat required for these species has been restored largely as a response to a dramatic loss of ecosystem services.

Once found across the whole of China, tigers and their prey have disappeared from their forest habitats over the past 100 years<sup>2,3</sup> – not surprising, considering that by the mid-20th century China's forest cover had reduced by over 90 per cent.<sup>4</sup>

The last stronghold of the tiger in China is in the far northeast (Liaoning, Jilin and Heilongjiang provinces).<sup>5</sup> But even here, fifty years of large-scale logging have led to the loss of tiger habitat and the collapse of ecosystem services provided by the forest, leading to severe drought<sup>6</sup> and massive flooding.<sup>7</sup> As a response, the National Forest Protection Program was initiated in 1998, leading to a major reduction in forestry operations in the region and substantial improvements in the quantity and quality of forests,<sup>8</sup> including effective protection within national-level nature reserves.<sup>9</sup> By 2016, for example, Jilin province's forests covered almost 44 per cent of the territory, and were further secured by a complete ban on commercial logging.<sup>10</sup>

Restoring the forests has led to a greatly expanded tiger range and a slowly recovering tiger population. And now, China is protecting these habitats to secure their future. The Chinese central government has announced nine national parks with a combined area of nearly 170,000km<sup>2</sup> being planned across the country to protect endangered species and the sources of major watersheds.<sup>11</sup> One of these will protect Jilin's forest. This new park, provisionally known as the Amur Tiger and Leopard National Park, will be 60 per cent larger than Yellowstone, covering 14,600km<sup>2</sup> in Jilin and Heilongjiang and bordering Russia's Primorsky.<sup>12,13</sup> The plan is to draw national support, both financial and technical, for the protection of the big cats and through this process protect many other species.

The viability of increasing the Chinese population of tigers suggests that an ecosystem services-centred economic development model, which also promotes ecological tourism and conservation-related enterprises that directly benefit local people, is an important requirement for success in many tiger conservation projects.<sup>14,15</sup>



Lucid waters and lush mountains  
are as valuable as gold and silver”

Chinese President Xi Jinping<sup>16</sup>

# HEALTHY PEOPLE

Overlooked until recently, natural environments provide health benefits for many rural communities

**Challenge:** The destruction and degradation of the natural environment is having an impact on the spread of diseases and the availability of resources for medicinal use and research.<sup>1</sup>

**Experiences:** Protected areas provide four primary benefits to health: reducing the risk of disease; as sources of local medicines; sources of global medicines including components of pharmaceuticals; and direct health benefits such as physical exercise.<sup>2</sup>

The World Health Organization links the increase in many infectious diseases to environmental threats.<sup>3</sup> For example, although deforestation may initially reduce the carriers of malaria, these areas are then opened up to other carriers increasing transmission of the disease.<sup>4</sup> There has been a steep rise in human malaria cases in areas undergoing rapid deforestation in Sabah, Malaysia.<sup>5</sup> In Cambodia, the positive links between conservation and health have been assessed; research found decreased incidences of diarrhoea and respiratory infection in children living close to protected areas.<sup>6</sup>

Tiger reserves provide direct medicinal benefits to many local people. For example, the Kani tribes in Kalakkad Mundanthurai Tiger Reserve, India, collect medicinal plants in the reserve<sup>7</sup> and rear the bee *Trigona irredipensis* for honey used to treat infections.<sup>8</sup> Three-quarters of Soliga people in India's Biligiri Rangaswamy Temple Reserve use traditional local medicines from over 100 plant species for curing minor ailments<sup>9</sup>

Over 50,000 higher plant species are used worldwide for medicinal purposes,<sup>10</sup> many of which are collected from the wild: over 80 per cent of medicinal plants collected in India and China are from uncultivated sources.<sup>11</sup> The value of medicinal plants in the international marketplace is estimated at more than US\$50 billion annually.<sup>12</sup> Guidelines for the conservation of medicinal plants exist<sup>13,14,15</sup> and many countries have developed national regulations.<sup>16</sup> Careful management of commercial resource use in tiger reserves can be the key to sustainable trade and equitable benefit sharing. In Bhutan, the protection and sustainable management of *Cordyceps sinensis*, Chinese caterpillar fungus, and other medicinal herbs ensure a positive relationship between communities and protected area staff.<sup>17,18,19</sup>

**OPPORTUNITY:** Protecting forests and other natural habitats across the tiger range will secure a wide range of human health benefits.



# FORESTS, MEDICINE, LIVELIHOODS

## Nepal

Protected areas and their buffer zones are often established to protect high profile species, such as tigers, but they are also becoming vital laboratories for recording ethnobotanical knowledge.<sup>1</sup> In China, around 5,000 plant species have medicinal and aromatic values, in India about 2,500 and Nepal about 1,500.<sup>2</sup>

In Nepal, tigers have maintained high densities in national parks despite an increase in surrounding human density. Participatory forest management and restoration provide essential resources and improved wild ungulate habitat, thus providing tigers with prey and reducing conflict through livestock attacks.<sup>3</sup>



© SIMON DE TREV-WHITE / WWF-UK

In Chitwan National Park, people rely on a wide range of plant and animal resources from forest, wetlands, cultivated lands and communal lands for their subsistence.<sup>4</sup>

### Food plants

Grains used during scarcity and seeds are used to prepare dal



### Wild edible fruits

26 edible wild fruits



### Wild vegetables

26 wild species used as vegetables mostly in times of scarcity, although some are also sold in local markets



### Pickles, spices and condiments

Several fruits are pickled and seeds and leaves used as spices



### Marcha

A fermenting substrate used for preparing beverages such as “raksi” (local whisky) and “moat” (beer), is made from a number of wild plants

### Medicines

Several medicinal plant resources are used for combating different health problems of humans and livestock



### Fodder and forage

23 species of legumes, 19 species of grasses and 59 other plants are used for fodder and forage; the forests are most frequently used for grazing animals, cutting grasses for stall feeding and other purposes



### Farming and crop management

Leaves are used as botanical insecticide and insect repellents; dried stems are used as fences to protect gardens from chickens; plants are also used as green manure to increase soil fertility

### Fishing

Plants prepared in a variety of ways are used in piscicide (i.e. stunning or paralysing fish to aid capture)



### Timber and fuelwood

Many timber trees are used for building and heating



### Religious plants

Several plants are used in the worship of the Gods Ganesh and Bikram Baba, while others are necessary for religious ceremonies

### Gums and resin

Are extracted from the stem barks of plants

### Oils

are extracted from plants for use in making candles or for cooking

### Tannin

Is obtained from bark, leaves, galls and nuts for use in the leather industry

### Fibres

Either from whole plant, stem barks or from flowers or seeds, are used for making ropes or cordage or for stuffing pillows and cushions



### Paper and pulp

At least 15 plants are used for making paper and pulp

### Construction and household implement materials

Many plants are used for thatching and to make brooms and baskets; leaves are used for making plates and cups, wood for frames, toys and pencils

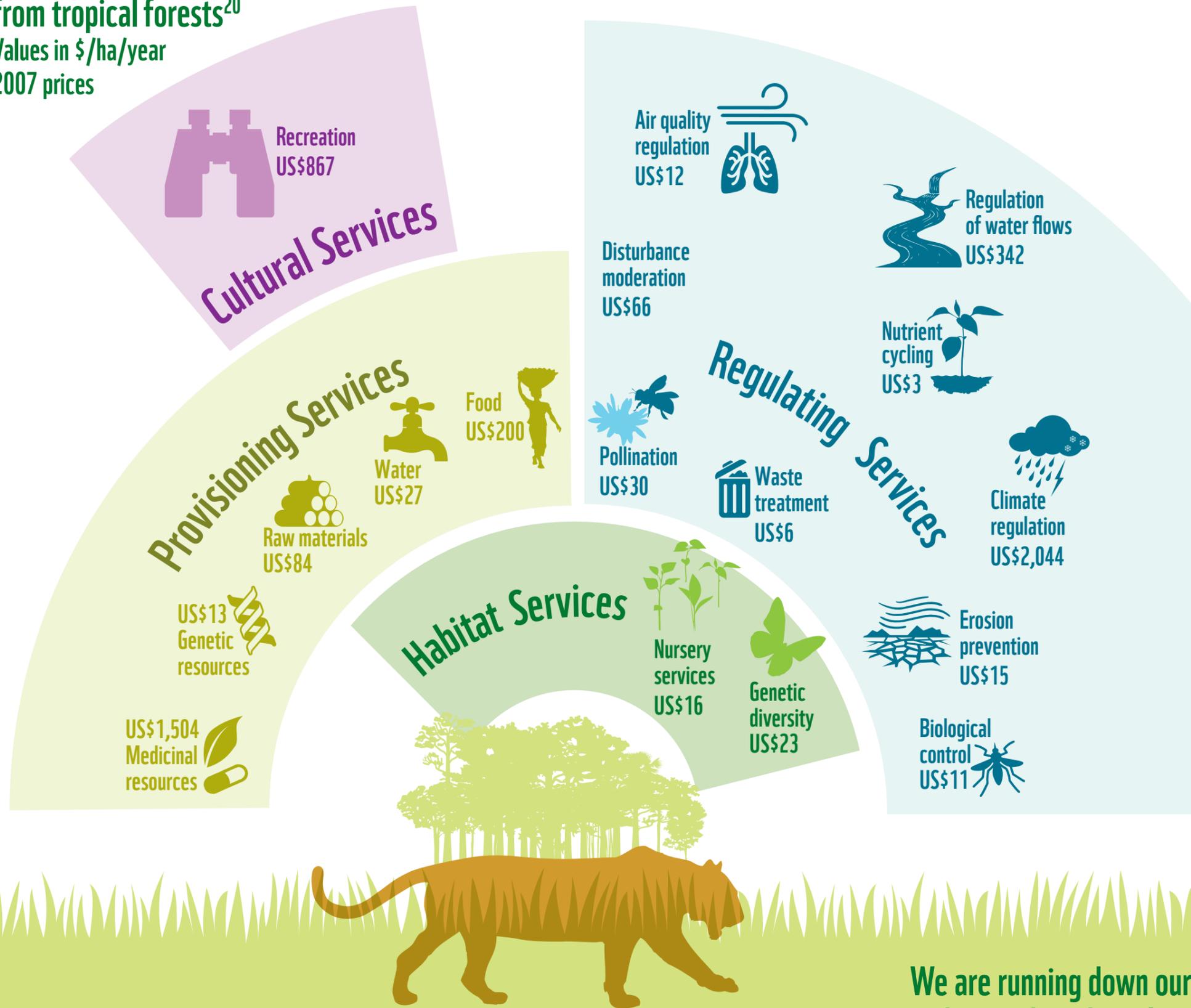
### Dyes

Bark, flowers, fruit pulp and whole plants from at least 19 species are used to make different coloured dyes



## Indicative monetary values for services from tropical forests<sup>20</sup>

Values in \$/ha/year  
2007 prices



## 3. PAYING THEIR WAY: A DIFFERENT TIGER ECONOMY

Ecosystem services from tiger reserves could be worth billions of dollars

Tigers are priceless, but understanding the value of their habitat when taking development decisions<sup>1,2</sup> and in securing conservation funds could provide the impetus needed for their protection. Current economic models only tell one part of the story of a country's wealth and stability.<sup>3</sup> The ecosystems, biodiversity and natural resources (sometimes called the natural capital) that underpin economies, societies and individual well-being are of equal if not greater importance.<sup>4</sup>

One of the goals of the Global Tiger Recovery Programme is to shift from donor support to sustainable forms of financing; i.e. nature-based tourism, international or domestic payment for ecosystem services schemes, offsets from infrastructure development and carbon credits, etc.<sup>5</sup> International multilateral initiatives to help countries understand and calculate their natural capital began with the Millennium Ecosystem Assessment,<sup>6</sup> followed by The Economics of Ecosystems and Biodiversity (TEEB),<sup>7</sup> the World Bank's Wealth Accounting and the Valuation of Ecosystem Services partnership (WAVES)<sup>8</sup> and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).<sup>9,10</sup> Funding mechanisms are being developed through policies linked to Reducing Emissions from Deforestation and Forest Degradation (REDD+),<sup>11</sup> and private sector efforts are also mainstreaming concepts around natural capital, including 42 global financial institutions<sup>12</sup> through the Natural Capital Declaration<sup>13</sup> and over 200 global businesses working together in the World Business Council for Sustainable Development.<sup>14</sup>

Although there are considerable challenges to understand fully the contribution of ecosystem services in tiger range countries,<sup>15,16,17</sup> understanding, assessing and valuing ecosystem services<sup>18</sup> needs to be linked to reporting national economic output and used in decision-making and in identifying new funding mechanisms.

**We are running down our natural capital stock without understanding the value of what we are losing.”** TEEB<sup>19</sup>

# REALISING THE TIGER'S SHARE

Every hectare protected as tiger habitat has multiple values; when these economic values are calculated these can add up to several thousand dollars per year

**Challenge:** Multiple studies<sup>1</sup> have assessed the value of biodiversity, from large-scale regional valuations to specific studies in protected areas with tigers.<sup>2</sup> Estimates vary depending on habitat and management regime, but all indicate the high value of natural ecosystems.

**Experiences:** The total value of tropical forest and mangrove ecosystems per hectare per year have been estimated at around US\$5,500<sup>3,4</sup> and US\$4,000<sup>5</sup> respectively; a value rarely accounted for by governments or fed back into conservation funding. These values are made up of a range of benefits including:

**Carbon:** Protected forests in tiger reserves in Asia are more effective carbon stores than any other type of land management.<sup>6</sup> The carbon storage capacity of every hectare protected in Corbett National Park in India is worth about US\$220 annually.<sup>7</sup>

**Tourism:** It has been estimated that globally protected areas generate over US\$600 billion per annum in revenue from visitors.<sup>8</sup> The role of tigers in tourism is important across the tiger range,<sup>9</sup> although benefits are unevenly distributed.<sup>10</sup> Ranthambore National Park was the first designated tiger reserve in India, the surrounding area supports 3,000 tourist beds and tourism revenues of over US\$0.5 million per year.<sup>11</sup>

**Water:** Forests protect soil and reduce erosion rates, avoiding expensive water purification costs.<sup>12</sup> Water regulation and purification values for every hectare of forest protected in Bhutan have been estimated at over US\$6,000 per year.<sup>13</sup>

**Genetic resources:** Estimates of the global value associated with the use of plant genetic resources in food and agriculture vary from hundreds of millions to tens of billions of dollars per year.<sup>14</sup> Many protected areas conserve the ancestors of the crops we use today, providing vital resources for research and future crop breeding. Thung Yai and Huai Kha Khaeng Wildlife Sanctuaries, in Thailand, are important sites for the conservation of genetic resources, including mango, rambutan, *Amorphophallus* spp. and longan (*Dimocarpus* spp.).<sup>15</sup>

Translating these values into contributions for conservation is still in its infancy, with most payments for ecosystem services in Asia focusing on watershed services or carbon markets.<sup>16</sup>

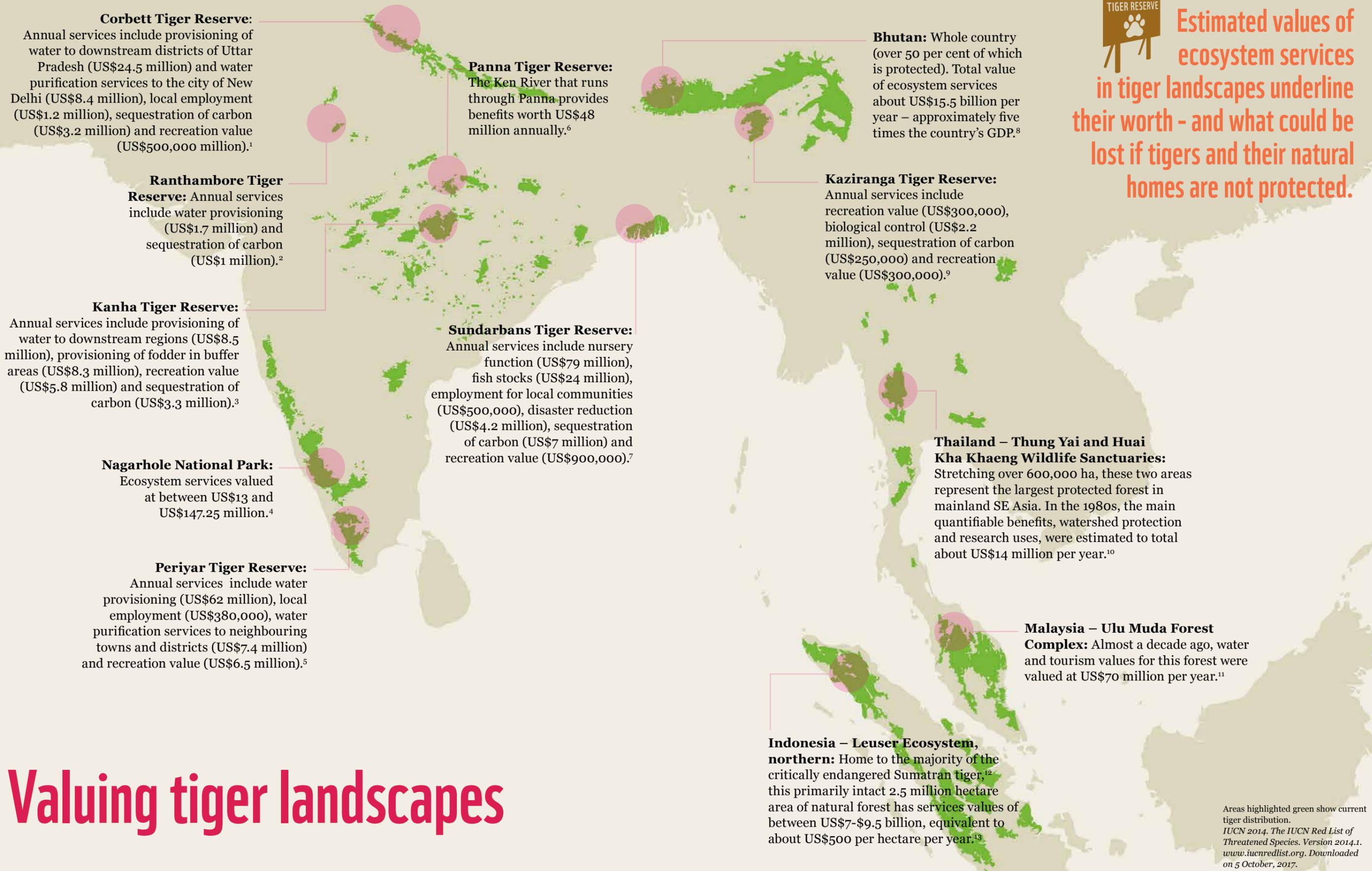
**OPPORTUNITY:** Accounting for ecosystem service values in decision-making will strengthen the economic case for conserving habitats under pressure from development. Understanding these values also helps to identify sustainable funding streams for future conservation needs.



**A single well known tigress in Ranthambore Tiger Reserve, India, was responsible for revenues of over US\$103 million in the first decade of her life, through park fees, lodging, taxes and services fees**

**She also effectively employed over 3,000 local people according to Travel Operators for Tigers.<sup>1</sup> And her offspring continue her legacy**





# Valuing tiger landscapes

# WHAT WOULD PEOPLE GIVE?

## Malaysia

Economic development over much of Asia has been at the expense of natural habitat, but the rapidly growing middle-income population is willing to pay for the many benefits that tiger conservation is bringing.

At the end of the last century, the number of people in absolute poverty in East Asia fell faster than anywhere worldwide; from 55 per cent in 1990 to 17 per cent in 2005.<sup>1</sup>

Malaysia reached the World Bank upper-middle income level in 1992 (the third of four country-income levels from low to high<sup>2</sup>). Much of this growth was fuelled by conversion of lowland rainforests to rubber and oil palm plantations.

The Belum–Temengor area has remained relatively untouched by these developments, and retains populations of elephant, tiger, rhinoceros and other large mammals. Protecting Belum–Temengor against logging and poaching has been a priority for the Malaysian Nature Society (MNS) and WWF-Malaysia since the early 1990s. In 2007, about one-third of the area was protected as the Royal Belum State Park, however the rest remained open to logging and even in the park the government retained authority to reopen it for logging.<sup>3</sup>

A willingness-to-pay survey of over 1,000 households in Malaysia concluded that nationally the public would be willing to contribute to additional government allocations to effectively protect Belum-Temengor (US\$437 per hectare per annum, prices as of 2010); a much larger sum than the annual operating budgets of protected areas in Peninsular Malaysia, which range from under a dollar to just over US\$12 per hectare.<sup>4</sup>

Providing policymakers with better information on public preferences is an important potential contribution of environmental valuation surveys. It provides guidance on the possibility of increased domestic funding such as payments for ecosystem services as well as indicating public awareness and interest in conservation.<sup>5</sup>

Image: Miniature of 29th Southeast Asian Games mascot for Malaysia; 'Rimau' the Tiger.





## 4. BURNING BRIGHT: INSPIRING CULTURE

The tiger as icon in Asia's religious and cultural life

The social significance of tigers can be seen in cosmologies, faiths and folktales of almost all civilizations in tiger range countries. As the tiger range has disappeared, however, so have many of the ethnic groups who created these cultural ties.

The tiger is revered by faiths across its historic range. For the Chinese, the tiger has many symbolic attributes; it is one of the 12 zodiac signs and king of all the animals, commonly depicted with four stripes on the forehead that form the character Wang or Prince.<sup>1</sup> Tigers were thus linked with Taoism, one of the earliest major religions in the region, and in turn incorporated into other faiths as these emerged. Further to the west, in the Hindu traditions, the ten-armed warrior goddess Durga (Shakti or Kali) rides the tiger, which represents power and immortality.<sup>2</sup> Tigers were incorporated into Buddhist traditions; for example, many Korean Buddhist temples contain shrines to the San Shin mountain spirits and the tiger.<sup>3</sup> Tigers are often referred to in Buddhism as one of the Three Senseless Creatures, symbolizing anger,<sup>4</sup> and appear on temples in Thailand, Bhutan and China. Guru Rinpoche is said to have flown from Tibet to Bhutan on the back of the tiger, in order to establish the Tantric school of Buddhism still practised in the country today.<sup>5</sup>

Inside and outside the region, tigers feature prominently in poetry, novels and paintings. Early writers in the West tended to use the tiger as a personification of remorseless cruelty,<sup>6</sup> while the visionary English poet William Blake wrote his famous poem that begins "Tyger tyger, burning bright / In the forests of the night ..." after seeing a tiger for himself at the zoo in the Tower of London by the River Thames; his deliberately archaic spelling emphasized the power and mystery of the beast.

Meanwhile in popular works for children, tigers became transformed into altogether less frightening creatures, such as Tiger in Winnie the Pooh and Calvin and Hobbes. Painters and visual artists continue to employ the tiger as a symbol of power and eroticism, from Rousseau's naïve jungle scenes to the endless depictions of tigers in Indian art, seen across the country in art galleries and sold in vast numbers to tourists.

# TRADITIONAL AND INDIGENOUS CULTURES

Tiger habitat is helping secure the territories of traditional and indigenous peoples

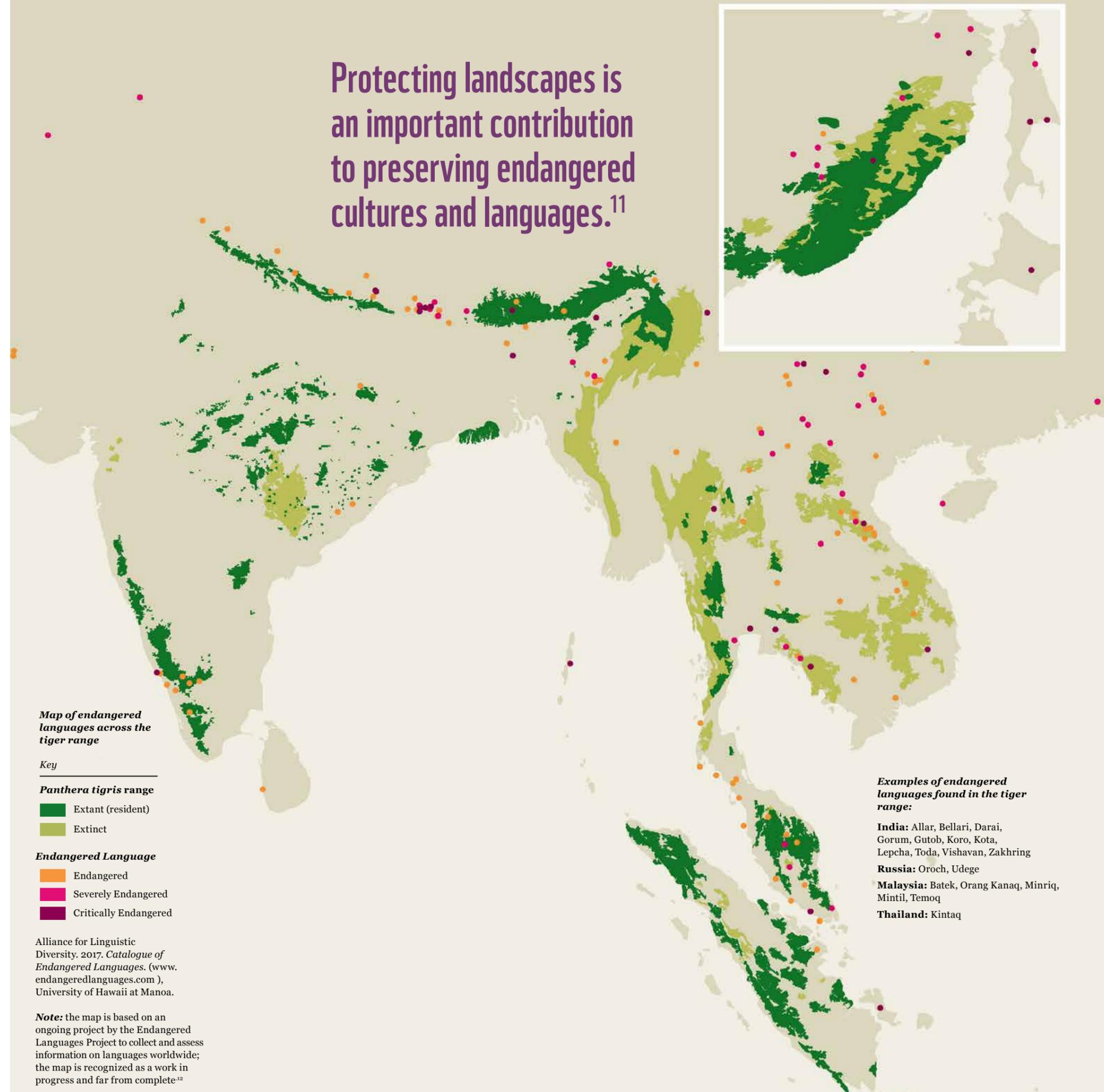
**Challenge:** Our “biocultural diversity”, the diversity of society, culture and language, is disappearing as fast as biodiversity; linguists predict that between 50 and 90 per cent of the world’s languages will disappear by the end of this century.<sup>1</sup> Conflict and development has led to large-scale displacements of traditional and indigenous communities across Asia,<sup>2</sup> with resulting impacts on biocultural diversity.

**Experiences:** There is a high geographical correlation between linguistic diversity and biodiversity,<sup>3</sup> which can be used as a proxy for understanding the link between tiger conservation and bioculture. Almost one-quarter of the endangered languages assessed to date across the tiger range are spoken by people living with tigers as close neighbours,<sup>4</sup> illustrating the importance of just over 700 million hectares of land for cultural survival.

Many communities live alongside and support the existence of tigers, despite the dangers, in part because they recognize links between tiger conservation and their own livelihood security.<sup>5</sup> For example, Bikin National Park in the Russian Far East<sup>6</sup> protects Amur tigers and is home to the Udege and Nanai people, who previously battled against logging companies.<sup>7</sup> Similarly, the Soliga tribe residing in India’s Biligiri Rangaswamy Temple Sanctuary provide an exemplary case of successful tiger conservation and maintenance of traditional livelihoods.<sup>8</sup> The Belum-Temengor Forest Complex in Peninsular Malaysia is important tiger habitat and home to over 5,000 Orang Asli indigenous people, who extract non-timber forest products, fish and hunt using blowpipes.<sup>9</sup> This reliance on natural resources and the natural habitat protected through tiger conservation is vital to the survival of these, and many other peoples, across Asia. A reliance that increases in poorer and/or more remote communities.<sup>10</sup>

**OPPORTUNITY: Conserving tiger landscapes, if done with sensitivity to human needs, helps protect cultures.**

Protecting landscapes is an important contribution to preserving endangered cultures and languages.<sup>11</sup>



## SYMBOLS OF FAITH AND TRADITION

Developing the religious power of the tiger into an effective conservation movement is an important opportunity for any tiger protection strategy.

**Challenge:** Many faiths across Asia recognize the central importance of the tiger. However, as the wild tiger becomes extinct in some countries, the links are becoming purely symbolic.

**Experiences:** The religious importance of tigers is clear across Asia. Many tiger reserves contain important religious buildings; one of the largest annual pilgrimages in the world takes place in the Periyar Tiger Reserve in India where two Hindu shrines are visited by 10 million devotees each year.<sup>1</sup>

The traditional Tungusic, Udege and Nanai peoples of Siberia consider the tiger a near-deity and often refer to it using a title of respect.<sup>2</sup> The recent protection of 1.16 million hectares of forest in the Bikin National Park will protect their land and provide habitat for the Amur tiger.<sup>3</sup> Similarly, Buddhist traditions have close links with conservation,<sup>4</sup> and in countries like Bhutan, conservation success is in part attributed to people's religious beliefs.<sup>5</sup> A fatwa (a religious edict) issued by Indonesia's top Muslim Clerical Body pronounced the poaching and trading of tigers and other endangered wildlife to be haram (forbidden), and urged its government and citizens to protect these wildlife and their habitats.<sup>6</sup>

In Korea, the tiger is seen as a protective and benevolent spirit and features centrally in shamanistic creation stories; it was also considered to be the messenger of San Shin, the spirit of the mountain.<sup>7</sup> The tiger is still the national animal of South Korea despite being extirpated throughout the country and there are no plans for re-introduction.

**OPPORTUNITY:** Local communities are helping to ensure the survival of the tiger, in part due to its spiritual importance, and thus ensuring their own cultural and spiritual survival.



## PROTECTING A WAY OF LIFE

### India

The Bor Tiger Reserve in Maharashtra State, India extends over 61km<sup>2</sup> plus a buffer zone of 159km<sup>2</sup>, where villagers from 18 villages access the reserve for grazing livestock and gathering firewood.

Interviews with villagers found that most (96 per cent) considered tigers beneficial to their livelihood, stressing the necessity to conserve tigers in order to ensure their own continued survival. The tiger's significance as the animal of transport of the Goddess Durga was also noted. Some respondents believed that the loss of tigers would lead to reduced conservation in their region, which would in turn lead to increased timber removal and fodder gathering, more soil run-off during the monsoon rains, resulting in reduced crops, which would eventually have a negative effect on their financial well-being.

Farmers noted the presence of the tiger also kept marauding troops of Hanuman langur monkeys (*Semnopithecus dussumieri*) and herds of herbivores such as chital deer (*Axis axis*), nilgai (*Boselaphus tragocamelus*) and wild boar (*Sus scrofa*) away from their plots, subsequently allowing for better harvests. Tigers were also appreciated by dairy farmers. Milking is done at night and in the early morning; when still dark, villagers cycle between villages to sell their milk. During this time, they are prone to attacks by bandits. The only areas not frequented by thieves are the trails in tiger territory.

Not all responses were positive; a minority of villagers complained about damage incurred by the tigers, but discontent was based on inept handling of property losses by the authorities, who did not provide compensation on time or paid only a small part of the original value of the loss, highlighting the importance of effective management in tiger reserves to ensure the support of local people.<sup>1</sup>

**Tigers are appreciated by dairy farmers in Bor Tiger Reserve; villagers cycling between villages to sell their milk are subject to attacks by bandits, apart from the trails in tiger territory**



## A BREATHING, LIVING ICON

Ultimately, it is the wider cultural significance of tigers that may well be the most powerful incentive for their conservation.

**Challenge:** There are plenty of examples of mythical animals, such as the unicorn, and extinct creatures, like the dodo, remaining part of the international consciousness. Tigers are a global phenomenon, but unless conservation is successful, they will only be known in zoos or in cultural media.

**Experiences:** The link between humans and tigers retains a powerful appeal throughout the world.<sup>1</sup> Throughout history, rulers made use of the high regard that people held for tigers and incorporated them into their own propaganda, so for instance in Imperial China a tiger was the personification of war and often represented a high army official.<sup>2</sup> Within tiger range countries, the image of the tiger remains one of power.<sup>3</sup> Tigers are the national animal of Bangladesh, India, Malaysia, South Korea and Vietnam, and South Korea chose a tiger for the symbol of the 1988 Olympic Games in Seoul, as did India for the 2010 Commonwealth Games in Delhi.

The tiger's current imperilled status has if anything added to its mystique. The emerging middle classes of the tiger range countries are flocking to national parks in the hopes of glimpsing one of the few remaining wild animals. Countries with ambitions to increase or restore tigers in the wild, hope to build on the role of tigers in national cultures to elicit public support for conservation.<sup>4</sup>

**OPPORTUNITY:** The international appeal of tigers can be harnessed to protect them and help countries in the tiger range to protect a wide range of habitats and associated ecosystem services.

Image: Hua Tunan, an artist based in China, uses tiger as an inspiration for his artwork



## 5. AND SO MUCH MORE

### If we save tigers, we save so much more

The Asia region is going through a period of unprecedented change – similarly, traditional methods of tiger conservation are evolving. A new model is emerging where investments in tigers also produce significant co-benefits and economic opportunities for people and other species that live in the tiger range. As such, this new approach is well aligned with the eventual realization of the Sustainable Development Goals.

This shift is occurring at a time when many other international priorities are being directly linked to tiger landscapes; from the mitigation of climate change and its impacts through to the protection of carbon rich forests, the safeguarding of critical clean water sources or the preservation of other ecosystem services. Furthermore, policies are moving, albeit far too slowly, to try to understand the complexity of economic, cultural and social values in decision-making.<sup>1</sup>

Securing the future of wild tigers does not mean huge parts of Asia need to become nature reserves. The global cooperative goal of doubling wild tiger numbers embodies the larger goal of conserving and managing sustainably up to 1.2 million km<sup>2</sup> of forest habitat suitable for tiger across the 13 tiger range countries in Asia.<sup>2</sup> Protected areas are vital, and more are needed, but they are only one of many land uses that can help secure wild tiger populations.

The evidence provided in this report suggests that we need a “tiger filter” on development so a new type of “tiger economy” can be developed, which sees the rapid economic growth synonymous with this term coupled with securing vital ecosystem services which underpin the survival of us all.

**The “tiger economies” of Asia have so far grown partly at the expense of the animals whose name they adopt: it is time that tiger economics means growth that supports rather than undermines the natural world. That way we can save tigers – and so much more ...**



## VISION FOR THE FUTURE

### Indonesia

An understanding of ecosystem services is informing environmental governance in Indonesia and valuation is being institutionalized in state policy, as evidenced in budget allocations, strategic priorities, public statements, the perceptions of staff and management and on-the-ground actions.<sup>1</sup>

Central Sumatra contains some of the last remaining forest habitat of the critically endangered Sumatran tiger. But it has experienced some of the highest deforestation rates in the world, with associated losses of carbon and impacts on water, driven primarily by forest conversion to oil palm<sup>2</sup> and Acacia plantations, along with illegal logging<sup>3</sup> and use of fire.<sup>4</sup> From 1985 to 2007, 12 million ha, 48 per cent of forest was converted in Sumatra;<sup>5</sup> losses of over half a million hectares a year occurred between 2000 and 2010.<sup>6</sup>

A study<sup>7</sup> compared how five ecosystem services interacted with tiger habitat under two future scenarios: 1) a conservation-friendly Green Vision and 2) a Spatial Plan developed by the Indonesian government to help inform decision-making in Sumatra.

The results indicated that sub-watersheds with high levels of ecosystem services contained substantially more tiger habitat than a random subset of sub-watersheds, suggesting that prioritizing ecosystem services could benefit tiger conservation, and vice versa. The analysis provided WWF-Indonesia with visual and technical input to government-led spatial planning and strategic environmental assessments. Although government stakeholders were aware of ecosystem services, they had not considered them in a spatial context before.

The analysis helped strengthen government understanding of the spatial dimensions of ecosystem services and therefore the need to include them in spatial plans. This method can be replicated for valuing the quality of habitat while implementing the presidential decree of Sumatra Island Spatial Planning.<sup>8</sup> The study resulted in the incorporation of ecosystem services in strategic environmental assessments of Jambi province and one district in each of Riau and West Sumatra provinces. The Indonesian government has designated part of the study area as an “ecosystem corridor” under a presidential decree, thereby establishing a legal framework for conservation and sustainable land use in the area.<sup>9</sup>



“All ten Governors will begin work to develop ecosystem-based spatial plans that will serve as the basis for all future development on Sumatra Island [taking into] consideration conservation of ecosystem goods and services such as watershed protection and carbon storage, and food security, as well as wildlife habitat protection and restoration.”<sup>10</sup>

**“We need to define conservation as a means to achieve development rather than considering it to be anti-growth. I strongly believe that tiger conservation or conservation of nature is not a drag on development”**

Prime Minister Narendra Modi, India<sup>1</sup>



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