2019 UNITED NATIONS GENERAL ASSEMBLY:

WORLD LEADERS MUST ACT NOW TO RESTORE NATURE FOR A SECURE ECONOMIC FUTURE

WORLD'S ECONOMIES, TRADE AND INDUSTRY SEVERELY THREATENED BY ESCALATING ENVIRONMENTAL DAMAGE, NEW GLOBAL RESEARCH SHOWS.

WWF

IN PARTNERSHIP WITH

GTAP Global Trade Analysis Project

natural capital PROJECT

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SUMMARY

As world leaders take their seats at the 74th UN General Assembly in New York in September 2019, the fate of current and future generations will be in their hands. The world's economies, businesses and our own well-being all depend on nature. But from climate change, extreme weather and flooding, to water shortages, soil erosion and species extinctions, evidence shows that our planet is changing faster than at any other time in history. The way we feed, fuel and finance ourselves is destroying the life-support systems on which we depend, risking global economic devastation.

Ground-breaking new research is revealing the risks that accelerating environmental degradation poses to the world's economies, trade and industries. Global Futures is an innovative new economic modelling approach that combines for the first time a global economic model with high-resolution land-use and ecosystem services models. This powerful analytical tool, covering 140 countries/regions and all key economic sectors, is yielding alarming new insights into the economic implications of nature's decline and the distribution of risks around the globe.

The research is looking at the critical contributions that nature makes to the world's economies through the provision of ecosystem services (such as coastal protection, pollination, provision of water and timber, commercial fisheries, and carbon storage), and is assessing how future changes in the stocks of the natural assets that provide these services would affect macro-economic outcomes (such as GDP, sector output, trade, prices, and employment).

The full report will be published soon, but looking at the results from just one of the ecosystem service models illustrates the sheer scale of these effects. The model shows that a reduction in coastal protection services alone — as would occur if we continue to lose coral reefs, mangroves, seagrasses and saltmarshes at present rates — could wipe over US$330 billion (0.47%) off global GDP every year by 2050 (through infrastructure damage and loss of productive coastal agricultural land due to climate change induced sea-level rise and extreme weather).

In contrast, under a scenario in which the world adopts a more sustainable development pathway — and enhances coastal protection services through improved protection of these valuable natural assets — coastal risk exposure would be greatly reduced, potentially avoiding around US$200 billion of those losses annually even in a relatively low-ambition scenario.

>$330bn

COULD BE WIPED OFF GLOBAL GDP EVERY YEAR BY 2050 DUE TO THE LOSS OF COASTAL PROTECTION SERVICES ALONE

Countries that are highly reliant on coastal agriculture or have significant built infrastructure along coastlines are likely to face the greatest challenges (e.g. Brunei, Uruguay, Singapore, New Zealand and Oman stand to lose between 2.1% and 4.7% of GDP every year by 2050 in a business as usual scenario). The risks also vary between economic sectors and commodities, with food production sectors experiencing the greatest percentage reduction in the value of supply globally and, consequently, the largest price hikes (e.g. a 0.75% increase in global livestock, wheat and maize prices). These are not trivial impacts, and constitute a severe threat to national and global economic prosperity.

And this is just one part of the picture. If we also take into account the multiple other services provided by these assets (e.g. fishery production, access to food and raw materials, water quality, tourism and carbon sequestration) a business as usual scenario would further compound the adverse effects on coastal economies around the world, jeopardising the lives of billions of people. Add in the effects of losing other economically important natural assets — such as forests, rivers and wetlands — and it's clear that we're not just in an environmental crisis, we're in an economic crisis too.

The forthcoming Global Futures report will present modelling results for a wider set of these issues, and calculate the aggregate impact of them all combined. It is crucial that economic decision-makers understand the risks and costs associated with nature's decline, to better inform decision-making. This will feed into deliberations around a set of new international agreements taking place in 2020, with the potential to have a significant impact on global environmental, as well as economic and social, outcomes going forward.

If future generations are to enjoy a secure and prosperous future, world leaders must take decisive action in New York to reverse nature's loss — committing to launch an Emergency Declaration that will pave the way for a new deal for nature and people.

-$77.7bn

POTENTIAL ANNUAL GDP REDUCTION IN THE USA BY 2050 DUE TO LOSS OF COASTAL PROTECTION SERVICES

COUNTRIES WHOSE ECONOMIES DEPEND ON COASTAL AGRICULTURE AND INDUSTRY ARE AT THE GREATEST RISK FROM THE LOSS OF COASTAL PROTECTION SERVICES.

WELCOME TO THE ANTHROPOCENE

Humans have dramatically changed the world within a single human lifetime — for both good and ill. Since 1960, the human population has more than doubled, from 3 to 7.7 billion. The growth of economic activity has been even more dramatic, increasing more than sevenfold in real terms. This rapid increase in economic activity has reduced poverty rates and raised material standards of living — but there's a downside.

Unsustainable economic growth has caused environmental degradation from local to global scales, leading to climate change, ocean acidification, changes in water and nutrient cycles, loss of forests, grasslands, wetlands, coral reefs, and other habitats, and dramatic declines in biodiversity. Continuing current trends will intensify this environmental harm, posing an existential threat to future generations.

The recently released Global Assessment from the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) paints a stark picture of the state of nature and the services it provides.[1] People, businesses and economies all depend on these 'ecosystem services' — to pollinate our crops, maintain our soil quality, provide nursery, breeding and feeding habitats for commercial fisheries, remove pollutants from the air and water, regulate climate conditions, provide opportunities for outdoor recreation or cultural and spiritual meaning, and more.

Yet the report found that 14 of 18 categories of these benefits have declined over the past 50 years. We are now firmly in the Anthropocene — a new geological era where humans have become the dominant force over the Earth's environment and climate. The conclusion is clear: that unless we change course, the negative implications for humanity's future will be profound.

CONTINUING CURRENT TRENDS WILL INTENSIFY THIS ENVIRONMENTAL HARM, POSING AN EXISTENTIAL THREAT TO FUTURE GENERATIONS.

1 https://www.ipbes.net/global-assessment-report-biodiversity-ecosystem-services

7.7bn

HUMAN POPULATION HAS MORE THAN DOUBLED SINCE 1960

CREATING A SUSTAINABLE FUTURE: TRANSFORMING OUR ECONOMIC AND FINANCIAL SYSTEMS

Thankfully the world is waking up to the need to reverse nature's decline if we are to have a sustainable future. Yet current levels of ambition fall far short of what's needed to achieve this, and current trends in terms of economic and population growth and consumption are putting ever increasing pressures on our natural environment. Even in what IPBES calls a 'Sustainable Development' scenario, it warns that biodiversity and many of the economically important 'regulating' services that nature provides (like coastal protection, crop pollination, soil protection, nitrogen retention, pest control, and carbon storage) will continue to decline.

Small improvements aren't enough: IPBES concludes that transformative change is necessary. This includes reforming economic and financial systems in order to systematically take account of the contribution that nature makes, and align economic incentives to maintain or enhance nature and the benefits it provides. IPBES outlines how such reforms could remake the market economic system so that producers and consumers treat nature as vital infrastructure that underpins economic activity and human well-being — rather than it being ignored or treated as an afterthought.

GLOBAL FUTURES: MODELLING THE ECONOMIC IMPACTS OF OUR CHANGING ENVIRONMENT TO SUPPORT DECISION-MAKING

Despite IPBES' clear message — endorsed by 132 member governments — and increasing concern among global companies, investors and the general public — substantial barriers to achieving transformative change exist. One key barrier is that political and business decision-makers don't have the kinds of information they need to prioritise and justify policy action at the scale and pace required. We still know relatively little about how and under what circumstances environmental changes affect economies, trade and businesses, and how that will affect different countries and economic sectors. How best to accomplish the transformation required, and what impacts particular policies or market interventions are likely to have, also remain open questions.

The Global Futures project — a partnership between WWF, University of Minnesota and Purdue University — is addressing these urgent questions. By developing and applying new, cutting-edge modelling approaches, the project, initiated in 2017, aims to help global political and business leaders better understand how changes in the world's natural systems affect economic outcomes. The approach links — for the first time — the world's leading economic-trade and ecosystem services models: the Computable General Equilibrium model from Global Trade & Analysis Project (GTAP), and InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) developed by the Natural Capital Project.

The linked GTAP-InVEST model enables quantitative analysis of the potential economic impacts of environmental change under different future scenarios. In other words, it calculates how environmental changes would affect current GDP, sector output, trade, income, jobs and so on. Covering 140 countries/regions and key economic sectors[2], the GTAP platform provides a detailed picture of the global distribution of impacts per country and sector. The rich data it contains can also help understand the implications for wider global goals such as economic growth, security, conflict, migration, health and human development.

As shown in Figure 1, the modelling approach has four stages. Step 1 creates spatially-explicit land use scenarios describing what the world could look like in 2050 based on a combination of assumptions regarding socio-economic drivers, climate change emissions, and land use change.[3] These scenarios form the basis for step 2, which uses InVEST to model how various ecosystem services change between present day and future land use scenarios.

In step 3, the outputs from InVEST are fed into the GTAP model to assess how future changes in ecosystem services affect the current economy, including GDP, including GDP, prices, trade, employment, and production statistics at the national and sectoral level. Finally, in step 4, the modelling outputs are aggregated, interpreted and presented to show the economic impacts of environmental change.

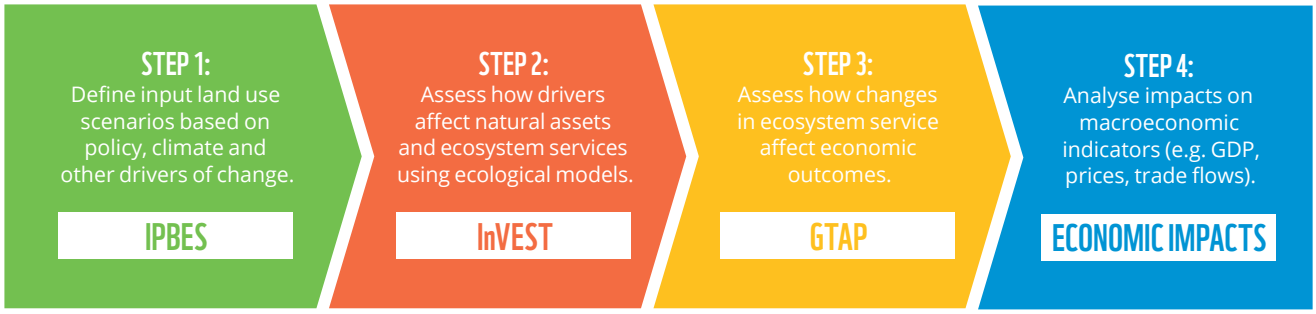

FIGURE 1:
STEPS IN THE GLOBAL FUTURES MODELLING FRAMEWORK

2 In this study, GTAP database version 9 is used which represents the world economy in year 2011

3 Three future scenarios were initially developed, drawing on existing frameworks (e.g. IPBES): (1) climate change intensive business-as-usual, based on extensive climate and land use change (but emphasis on the former) and continued loss of biodiversity; (2) land use intensive business-as-usual, based on extensive climate and land use change (but emphasis on the latter) and continued loss of biodiversity; and (3) current sustainability ambitions, based on stabilisation of climate change, a shift towards more sustainable consumption/production and improved protection of biodiversity. Others scenarios are also being developed, and will be covered in the final report.

PRELIMINARY RESULTS:

Modelling analyses so far have already revealed a rich set of results, presenting some important insights for policy, and illustrating the significant potential for this modelling approach to support decision-making.

Coastal protection — one of six critical ecosystem services modelled to date — provides a strong example. Natural assets such as coral reefs, mangroves, seagrass beds and saltmarshes help to protect coastal communities and infrastructure from storms, erosion, flooding and saltwater contamination of water supplies. Yet, as IPBES has highlighted, these assets are also among the most threatened due to human pressures such as clearance for development, over-harvesting of fish, pollution, and ocean acidification and warming. Around half of the world's corals have already been lost in the last 30 years and up to 50% of the world's mangroves in the last 50.[4,5]

With some 40% of the world's population living on the coast, and billions of dollars worth of infrastructure situated in coastal cities, loss of these assets is already having an economic impact in many regions of the world, particularly low-lying areas and islands. Given future predictions for climate change-induced sea-level rise, combined with hurricanes and other extreme weather events, the ingredients are in place for greatly elevated coastal damages.

Global Futures was set up to explore exactly this kind of issue. How would coastal economies be affected by further loss of these natural assets in the context of unabated climate change and sea-level rise? How would investing in widespread restoration of these natural assets affect economic growth?

Modelling results so far reveal the significant contributions that these habitats make to economic activity through coastal protection services, and that economic outcomes vary dramatically in different scenarios (see graphic on next page). Results suggest that more than US$330 billion could be wiped off global annual GDP in today's economy through infrastructure damage and loss of agricultural land on the coast under a 'climate change intensive business-as-usual' scenario by 2050 (characterised by further loss of natural habitats and climate change induced sea-level rise and extreme weather).

In contrast, under a 'current sustainability ambitions' scenario — in which coastal protection services are enhanced through improved protection of these natural assets — coastal risk exposure would be greatly reduced, potentially avoiding around US$200 billion of those losses annually.

To put this in context, this benefit can be compared to those from other global policy interventions. For example, promoting trade liberalisation is a major policy priority for many countries. The same economic framework (GTAP) estimates that removing all import tariffs in all regions of the world in today's economy would yield an increase in global GDP of US$215 billion — comparable in magnitude to the US$200 billion gains from enhanced coastal protection services alone under the 'current sustainable ambitions' scenario.

40%

OF THE WORLD'S POPULATION LIVE ON THE COAST

4 Van Hooidonk, R., Maynard, J. A., Manzello, D. & Planes, S. Opposite latitudinal gradients in projected ocean acidification and bleaching impacts on coral reefs. Global Change Biology 20: 103-112, doi:10.1111/gcb.12394 (2013)

5 Donato, D. C. et al. Mangroves among the most carbon-rich forests in the tropics. Nature Geoscience 4: 293, doi:10.1038/ngeo1123 (2011)

POTENTIAL IMPACTS IN THE CURRENT ECONOMY OF FUTURE CHANGES IN COASTAL PROTECTION SERVICES BY 2050

SELECTED PRELIMINARY MODELLING RESULTS

SCENARIOS:

BUSINESS AS USUAL (CLIMATE CHANGE INTENSIVE)

ENERGY/MATERIAL INTENSIVE CONSUMPTION

NO CONSERVATION (FURTHER LOSS OF BIODIVERSITY)

CONSIDERABLE LAND-USE CHANGE

GHG EMISSIONS CONTINUE TO RISE

CURRENT SUSTAINABILITY AMBITIONS

SUSTAINABLE CONSUMPTION / PRODUCTION

LIMITED CONSERVATION (REDUCED IMPACTS ON BIODIVERSITY)

STABILIZATION OF LAND-USE CHANGE

GHG EMISSIONS PEAK BETWEEN 2010 AND 2020

ECONOMIC OUTCOMES:

BUSINESS AS USUAL (CLIMATE CHANGE INTENSIVE)		CURRENT SUSTAINABILITY AMBITIONS
-$334.2bn	GLOBAL GDP (actual change, in Billion USD / year)	-$136.5bn
-$77.7bn	NATIONAL GDP - USA (actual change, in Billion USD / year)	-$46.6bn
-4.7%	NATIONAL GDP - BRUNEI (% change)	-4.3%
BRUNEI, URAGUAY, SINGAPORE, NEW ZEALAND, OMAN	NATIONAL GDP - TOP 5 COUNTRIES (greatest % loss)	BRUNEI, OMAN, AUSTRALIA, MORROCCO, VIETNAM
-0.29%	VALUE OF WORLD SUPPLY - OTHER FOOD SECTOR* (% change)	-0.17%
-$183.9bn	VALUE OF WORLD SUPPLY - SERVICES SECTOR† (actual change, in Billion USD / year)	-$145.1bn
+0.78%	GLOBAL WHEAT PRICES (% change)	+0.27%
-$26.4bn	TRADE BALANCE - CHINA∞ (actual change, in Billion USD / year)	-$7.8bn

* Includes: prepared and preserved fish or vegetables, fruit juices and vegetable juices, prepared and preserved fruit and nuts, all cereal flours, groats, meal and pellets of wheat, cereal groats, meal and pellets n.e.c., other cereal grain products (including corn flakes), other vegetable flours and meals, mixes and doughs for the preparation of bakers' wares, starches and starch products; sugars and sugar syrups n.e.c., preparations used in animal feeding, bakery products, cocoa, chocolate and sugar confectionery, macaroni, noodles, couscous and similar farinaceous products, food products n.e.c.

† Includes: Electricity; gas; water; sewage and refuse disposal; construction; trade/retail; transport; communications; finance, pensions and insurance; business services; recreation; public administration and defense; education; health and social work; sanitation; housing/dwellings.

∞ Calculated from the difference in the value of exports at FOB (Free on board) prices and the value of imports at CIF prices (Cost, Insurance and Freight).

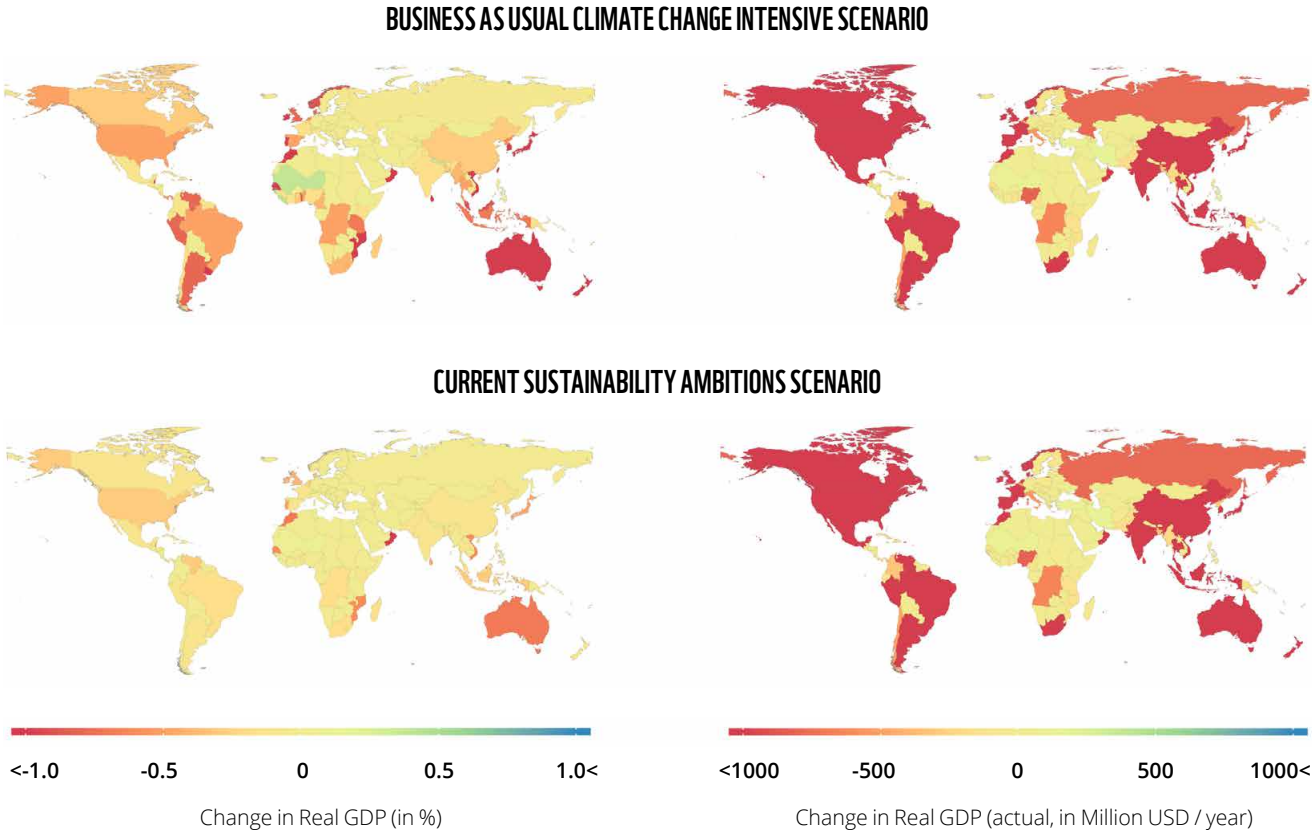

FIGURE 2:

POTENTIAL IMPACTS TO REAL GDP IN THE CURRENT ECONOMY DUE TO FUTURE CHANGES IN COASTAL PROTECTION SERVICES BY 2050

It's important to note that the 'current sustainability ambitions' scenario modelled so far assumes a relatively low level of ambition in terms of nature conservation (it is based on the 'sustainable development' scenario used in the IPBES Global Assessment which, as noted previously, would still see continued loss of biodiversity and ecosystem services). In an even more ambitious scenario – with a concerted global effort to protect and restore the world's oceans, forests, wetlands, rivers and fisheries – as will be explored in the full report, the economic gains could be significantly higher.

Beneath this global picture, the results so far also show some important patterns among locations and across scenarios. Figure 2 highlights how countries around the world would be affected due to future changes in coastal protection services. Countries that are highly reliant on coastal agriculture or have significant built infrastructure along coastlines are likely to face the greatest challenges. Table 1 shows the 10 countries that stand to lose most in a business as usual scenario (in comparison to a current sustainability ambitions scenario) – including Uruguay, Singapore, New Zealand, Portugal and Vietnam, among others.

The risks also vary between economic sectors and commodities. Under a business as usual scenario, food production sectors (e.g. cereals, fish, fruit, vegetables and livestock) would experience the greatest percentage reduction in the value of supply globally and, consequently, the largest price hikes (e.g. ~ 0.75% increase in global livestock, wheat and maize prices). Considering that these results do not include changes in other ecosystem services essential to agriculture, such as pollination and water supply, these numbers should be treated as minimum estimates and clearly demonstrate the stark risks facing farmers and the global food supply under a business as usual scenario.

It's worth noting that these coastal and marine habitats provide other important economic contributions, for example supporting fishery production through their provision of breeding, nursery and feeding grounds, and tourism. In fact, coral reefs alone are home to a quarter of the world's fish species. If these other ecosystem services were also considered (as they will be in the full report) the impacts would be larger still.

COASTAL AGRICULTURE IS PARTICULARLY AT RISK UNDER THE CLIMATE CHANGE INTENSIVE SCENARIO, WITH FOOD PRODUCTION SECTORS EXPERIENCING THE LARGEST REDUCTION IN SUPPLY AND, CONSEQUENTLY, THE LARGEST PRICE HIKES.

	Percentage change in Real GDP in the current economy due to changes in coastal protection services by 2050		
Country	Business as usual climate change intensive (BAUCC)	Current sustainability ambitions (CSA)	Difference between % changes in BAUCC and CSA scenarios
Uruguay	-2.60	-0.10	2.50
Singapore	-2.30	0.00	2.30
New Zealand	-2.30	-0.10	2.20
Portugal	-1.80	-0.50	1.30
Vietnam	-1.90	-0.60	1.30
Taiwan	-1.30	-0.20	1.10
Ireland	-1.50	-0.40	1.10
Oman	-2.10	-1.00	1.10
Sri Lanka	-1.60	-0.50	1.10
Togo	-0.90	0.03	0.93

TABLE 1:
TOP 10 COUNTRIES IN TERMS OF POTENTIAL ANNUAL GDP BENEFITS FROM ENHANCEMENT OF COASTAL PROTECTION SERVICES BY 2050
(ranked by difference between % changes to GDP in the current economy under 'business as usual ' and 'current sustainability ambitions' scenarios)

WHY 2020 IS A CRITICAL YEAR

The results highlighted here are only an illustration of what's to come. The first Global Futures report will be published soon, providing the first full set of results from this phase of work and analysis of the implications for policy-making.

The report will come at a critical time, marking the start of a landmark year for the future of our planet. During 2020, political leaders and negotiators will be working on a series of important global policy processes on nature, climate and development. As IPBES has warned, current levels of ambition are not enough. To reverse nature's decline, and for humanity to enjoy a sustainable and prosperous future, we urgently need transformational change across our economic and financial systems so they are geared towards protecting and restoring nature. Our ambition is that this report, alongside other evidence, will encourage world leaders to take decisive action before it is too late.

CALLING UNGA 2019: THE TIME TO ACT IS NOW

The economic imperative for action is already clear, and we must lay the foundations for 2020 now. World leaders in New York at UNGA74 in September 2019 must take decisive action to reverse nature's loss, committing to launching an Emergency Declaration to be signed by all Member States at UNGA75 in 2020.

By backing this critically important declaration, world leaders can give a clear signal and mandate to all actors to take an ambitious, global stand in the 2020 policy discussions, inspiring others to follow. It would pave the way for a 'New Deal for Nature and People' — a global collective effort based on the decisions and actions that come out of the 2020 processes to protect and restore nature by 2030. This deal will support the Paris Agreement and the Sustainable Development Goals, while at the same time signalling the start of a new economic era that enables nature and people to thrive, creating economic opportunities for all from the transition to a new, sustainable future.

BY BACKING THIS CRITICALLY IMPORTANT DECLARATION, WORLD LEADERS CAN GIVE A CLEAR SIGNAL AND MANDATE TO ALL ACTORS TO TAKE AN AMBITIOUS, GLOBAL STAND IN THE 2020 POLICY DISCUSSIONS, INSPIRING OTHERS TO FOLLOW.

NOTES

- **WWF is one of the world's largest independent conservation organisations, active in nearly 100 countries. Our supporters – more than five million of them – are helping us to tackle the main causes of nature's decline and to drive a transition to a world that is low-carbon, resource efficient and restores the Earth's natural systems on which we all depend. We're fighting for a world with thriving habitats and species, and that meets humanity's needs within the limits of our one planet.**

- WWF initiated a partnership with the University of Minnesota and Purdue University to strengthen the evidence base for how natural capital and ecosystem services generate economic value, and how policies aimed at conserving or enhancing natural capital contribute to economic activity, income, trade and employment. This partnership combines the expertise of researchers in the Global Trade Analysis Project (GTAP), based at Purdue University, and the Natural Capital Project (NatCap) based at the University of Minnesota.

- **GTAP has pioneered global economic production and trade modelling. Since its beginning in 1992, GTAP has grown into a global network of over 18,000 individuals in over 175 countries. GTAP has built a common database and modelling framework to assess the economy-wide impacts of trade, agricultural and environmental policies. More recently, GTAP has become a focal point for research into issues bearing on the world's land and water resources, including the assessment of climate impacts and mitigation activities, including biofuel production, on food security, incomes and poverty.**

- NatCap has pioneered biodiversity and ecosystem service modelling linked to economic valuation. The goal of NatCap is to integrate the value that nature provides to society into all major decisions, with the ultimate objective of improving well-being of people and nature by motivating greater and more targeted investments in natural capital. NatCap has developed the InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) suite of ecosystem service assessment tools, comprising more than 20 models that estimate how land use and other forms of ecosystem management and change impact the provision of a broad range of ecosystem services. InVEST has been applied in 185 countries to date.

- **Members of the research team have a wealth of experience integrating natural capital and ecosystem services with economic and financial modelling and accounting. The team includes the coordinating lead author and contributing authors for the IPBES Global Assessment, and has worked with colleagues at the Chinese Academy of Sciences on Gross Ecosystem Product (GEP); at the World Bank on a Natural Capital Index and the Wealth Accounting and the Valuation of Ecosystem Services (WAVES) programme; and at the UN Statistics Division on the System of Environmental-Economic Accounts. This project will share advances with these other projects to enhance the faster spread of ideas and quicker uptake into practices, as well as leverage advances in knowledge from other on-going projects. There is significant potential to further strengthen linkages between research efforts like this and the broader global modelling and policy-making communities, promoting knowledge exchange and learning through networks of networks.**

- The upcoming Global Futures report, due for launch in early 2020, will be just one step in a broader and longer-term research programme to help promote more sustainable policy-making. Working with a growing partnership of organisations, we plan to further improve the modelling framework to help improve its usefulness for policy-making, for example, to enable it to better consider socio-economic drivers (including potential economic and fiscal reforms and policy interventions), feedbacks, thresholds and uncertainties. We also intend to apply it to a broader range of policy-related analyses, for example, exploring the impacts of specific policy reforms and interventions (to help identify priorities and trade-offs), and implications for specific actors (e.g. businesses, investors and banks). We also aim to develop a series of 'deep dive' case studies, to explore how economic impacts might play out in different regions/countries, and to provide robustness checks and validation of results.

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