



WAKE UP AND SMELL THE COFFEE

WHY BIODIVERSITY
IS ESSENTIAL TO
SUPPLY CHAINS

White Paper
September 2021

 **FII INSTITUTE**
Future Investment Initiative Institute

Impact
on Humanity

FACTS AND FIGURES

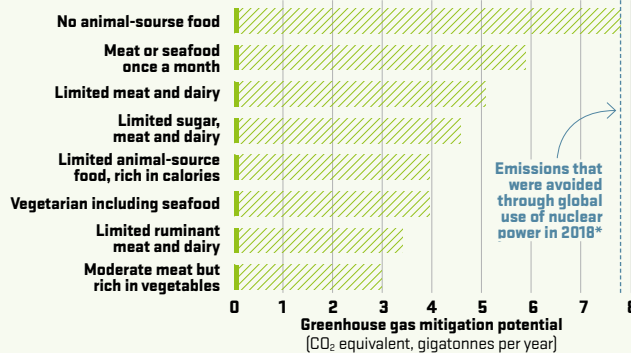
ECOSYSTEMS AND SPECIES IN JEOPARDY

Deforestation is the greatest threat to biodiversity worldwide and the rate of species extinction is accelerating. But changes to our diet can help to save the planet.

WHAT IF PEOPLE ATE LESS MEAT?

Examination of estimated impact on greenhouse gas emissions of the world's population adopting a variety of diets.

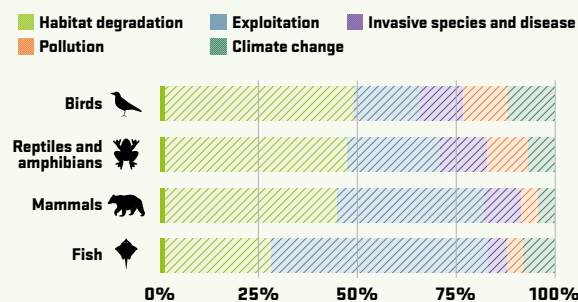
*Assumes nuclear power plants replaced fossil fuels;



SOURCE: INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

HABITAT LOSS IS A MAJOR THREAT TO BIODIVERSITY

The Living Planet Report assesses key drivers of species decline.



SOURCE: LIVING PLANET REPORT, WWF

ONE IN FOUR SPECIES ARE AT RISK OF EXTINCTION

Species assessed by the IUCN Red List



Amphibians
40%



Conifers
34%



Reef corals
33%



Sharks/rays
31%



Selected crustaceans
27%



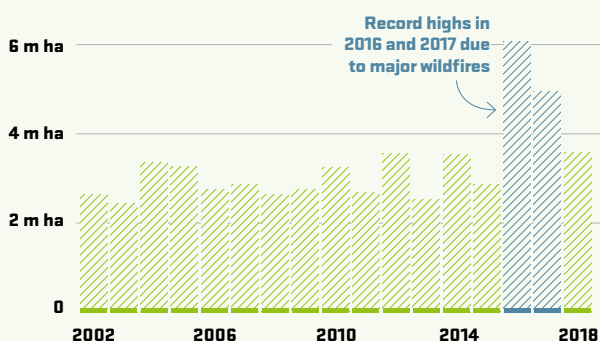
Mammals
25%



Birds
14%

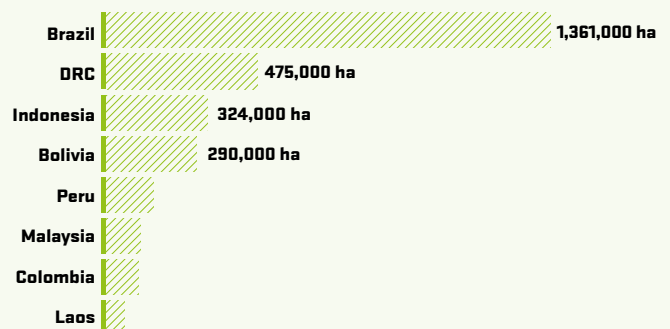
SOURCE: IUCN RED LIST

BELGIUM-SIZED AREA OF FOREST DESTROYED IN 2018



SOURCE: GLOBAL FOREST WATCH, UNIVERSITY OF MARYLAND

TROPICAL COUNTRIES THAT LOST THE MOST PRIMARY FOREST IN 2019



SOURCE: WORLD RESOURCES INSTITUTE

EXECUTIVE SUMMARY

WARNING SIGNS ARE FLASHING

The planet is dying. One million of the estimated eight million animal and plant species on earth are now threatened with extinction. To put matters right, we need to adjust what we consume and where it comes from.



A SHOCKING RECORDER of species extinction, the IUCN Red List,¹ gives us a stark warning. The rate of species extinction, on land and sea, is higher than at any time during the last ten million years – and it is accelerating.

The United Nations Sustainable Development Goals (SDGs), drawn up in 2015,² provide a practical roadmap to recovery. They have been widely adopted by countries, investors and companies. Yet of the 17 SDGs, only one – SDG15, Life on Land – refers specifically to land use.

The FII Institute has been highlighting sustainability issues in its conferences and reports. We believe that, in our globalised world, supply chain management and verification have been dangerously overlooked. The Covid-19 pandemic has made this even more apparent.

GLOBAL TRANSITION

In the last three decades, the attention of policymakers and the public has primarily been fixed on reducing carbon as the main element in achieving global transition, often as a quick technological fix. Yes, the climate emergency is urgent. Wind turbines and solar panels can be built and trees planted quickly. But what if these actions promote monoculture and, as some experts believe, sometimes reduce biodiversity?³ They could be making matters worse.

The FII Institute is calling for a longer-term and more focused and holistic set of solutions that will be fair to both developed and less-developed countries. Supply chains – a complicated and unglamorous topic – need to be



The rate of species extinction, on land and sea, is higher than at any time during the last ten million years – and it is accelerating.

fixed. Consumers in the wealthiest countries need to know that it is only by addressing what they wear and eat and drink (even coffee), where it comes from and how it is transported, that the linked crises of climate change and biodiversity loss can be tackled.

This is a huge issue, requiring both lifestyle changes and a reassessment of how we measure and record ecosystem damage. Supply chains are complex and multifaceted. But focusing on them will be imperative, both for reducing greenhouse gases and for protecting the beautiful planet that we live on. This is a task that requires urgent action – that's why we are publishing this white paper. ■

SUPPLY CHAINS

WE HAVE THE TOOLS, LET'S USE THEM

Large companies are racing to reduce their carbon emissions, but systems monitoring supply chains for their biodiversity impact are not in widespread use and there is almost no legislation to require it.

➔ **ON TOP** of environmental ecology is an overlay of a human one – millions of human interactions that we call a supply chain. A supply chain is a network⁴ between a company and its suppliers, designed to produce and distribute a specific product.

From the 1970s, the use of barcodes⁵ revolutionized supply chain management – a business discipline which did not yet have a name.⁶ In the 1990s, more data-rich QR codes⁷ became available. More recently, there have been rapid advances in the cloud, blockchain, the Internet of Things and DNA typing.⁸ These technologies can source stock items and track their movements with great accuracy. Data analysis allows us to capture the environmental and ethical footprints of products and their components.

Many companies are now anxious to display their commitment to carbon reduction, since supply chains account for more than 80 percent of greenhouse gas emissions.⁹ However, most have proved less keen to delve deeply into how sourcing and transporting their raw material adversely affects ecosystems. Subcontracting and supply chain brokerage makes many product journeys extremely complex. Limited laws imposing environmental and or labor

standards on supply chains have been passed by the UK, Holland, France, Germany and Australia,¹⁰ but globally they are uncommon.

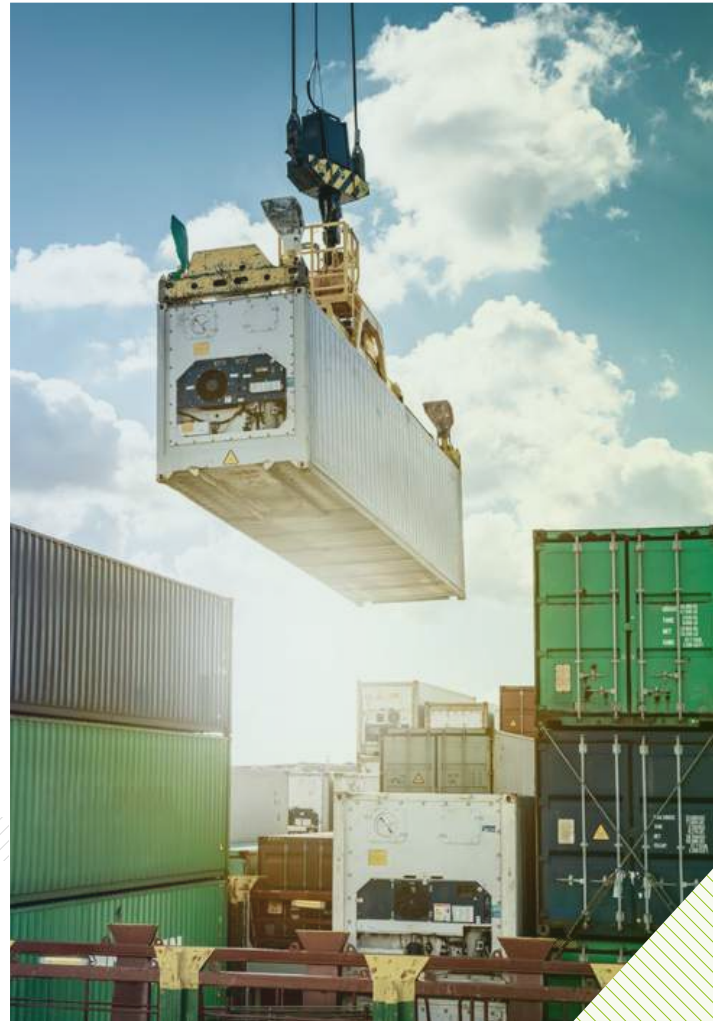
Planet-spanning and often “just in time” supply chains remain largely invisible to external scrutiny. Sophisticated tools are available to audit them but they are not generally used.

INTENSIVE AGRICULTURE

In terms of food, focusing on just a few commodities could make a huge difference. Today's monocultural, intensive agriculture means that 75 percent of the world's food comes from just a dozen crops and only five animal species.¹¹

According to experts, the majority of global biodiversity loss is tied to just four staples – palm oil, beef, soy and wood products¹² destined for the world's wealthiest economies. These commodities alone are responsible for 70–80 percent of the 10 million hectares of natural habitat annually lost to deforestation.¹³

The conclusion? The world needs changes to consumption, more sustainable and locally focused agriculture, and legally enforced standards for



80%

of greenhouse gas emissions are due to supply chains.

10

MILLION HECTARES

of natural habitat are lost to deforestation every year.

biodiversity in supply chains. We have the technology. Covid-19 has shown us that opaque trade exposes humans to deadly viruses, and we know that pests and invasive species¹⁴ are crossing the world unchecked. Fixing supply chains has to be an urgent priority. ■

BIODIVERSITY

VARIETY IS THE SPICE OF LIFE

We need nature. It protects us, feeds us and nurtures life. It's now clear that species threatened with extinction could be vital to protecting a world that is being devastated by man-made climate change.

➔ **SCIENTISTS** have proved what we always suspected – that nature is good for us. The reason is simple: The more species that are supported by an ecosystem,¹⁵ the higher the rate of survival for every organism inside it, including humans. A rich biodiversity of genes,¹⁶ species and ecosystem will speed the recovery of the environment after a natural disaster, such as fire or flooding. Biodiversity improves soil fertility and breaks down toxins and pollutants.¹⁷

And yet we are destroying it at an unprecedented rate. On land, the largest destroyer of biodiversity is agriculture,¹⁸ leaving impoverished and unproductive soil that simply blows away. At sea, overfishing is stripping the oceans of aquatic life,¹⁹ while human

encroachment on coastal plains is causing a devastating loss of wetlands.

Coral reefs and mangrove swamps, known as “blue forests,” help to shield more than 31 million people in regions that are vulnerable to sea-level rise and hurricanes or tropical cyclones.²⁰

Eighty percent of the world's estimated 8 million species are insects,²¹ and the fact that 40 percent of insect species are declining is of particular concern.²² Three-quarters of global food crops rely on insects for pollination,²³ meaning that such a colossal collapse could lead to global food shortages.

Forests, covering almost one-third of the world's surface, provide shade and absorb pollutants and carbon on a huge scale.²⁴ They are the planet's most diverse ecosystems, holding the

majority of terrestrial species. Just five hectares of forest in Borneo contains 700 tree species, the same number as the whole of North America.²⁵

It's certain that millions of species²⁶ will become extinct before they are recorded, which is a tragedy. Genetic material²⁷ in nature annually contributes billions of dollars to the global economy in new drugs and is helping us develop crop varieties that can survive in salty or drought-affected soils.

This October, experts and global leaders²⁸ meet at Kunming in China for the UN Biodiversity Conference, COP 15. If they are serious, they will need to come up with targets and programs for protecting biodiversity that are just as comprehensive as those for reducing carbon emissions. ■

PHOTO: GETTYIMAGES / ANDREA PISTOLESI



Proboscis monkeys in the primary rainforest of the Malaysian state of Sabah, Borneo

Forests, covering almost one-third of the world's surface, are the planet's most diverse ecosystems.

THINK BEFORE YOU DRINK

Only action to incentivize sustainable production and manage supply chains will make a global impact on the damage that coffee is doing to the planet. But NGOs, local good practice and consumer behavior can make a huge difference.



→ **COFFEE** is the second-most valuable traded commodity in the world.²⁹ Production volume for 2020/21 is forecast to reach more than a trillion tonnes.³⁰ South America³¹ contributes half the world's production followed by the Asia Pacific region, Mexico and Central America and Africa. Cultivated in some of the most biodiverse tropical and subtropical regions of the planet and shipped around the globe, its impact on biodiversity is significant.

Deforestation³² in coffee-producing countries has a huge negative impact. It is the primary source of new coffee lands in nearly all producing countries, with an annual increase that is likely to reach 100,000 hectares.³³ Loss of carbon absorption aside, reducing forest habitats is directly linked to species decline. Without the protective cover of the forest, exposed soil retains less water and nutrients and quickly erodes. As soil degrades, coffee growers increase the use of harmful chemicals in a destructive cycle.

BIRD POPULATIONS

However, not all coffees are alike. Rustic and shade-grown coffees have the least impact on biodiversity.³⁴ Even small increases in tree cover have a positive effect on bird populations.³⁵ As the bulk of coffee is exported to the largest coffee-consuming markets in North America, Europe and Asia, shipping poses a threat to maritime biodiversity.³⁶

Carbon emissions, discharge of ballast water, the use of antifouling paint and waste disposal take their toll. Alien and invasive species are also moved around the world and can damage new places.

So, what can be done? Training smallholder farmers in sustainable and organic methods is helpful.³⁷ But political and regulatory action is needed globally. That will mean rigorously monitoring supply chains, legal sanctions against counterfeited products, better on-pack labeling and trustworthy certification of sustainability. Non-profits, such as the Rainforest Alliance,³⁸ are playing a growing role. Based near Hyderabad in

Central India, the Naandi Foundation³⁹ provides an excellent example of local good practice. "Arakunomics," the foundation's sustainable, community-centric coffee production model, helps farmers to overcome poverty and sustains millions of trees.

Smarter supply chains, managed by modern digital methods (see page 8), will make the greatest global impact. But consumer behavior is important. Look for brands that are certified by organizations such as the Rainforest Alliance. Or simply ask your local roaster for the best sustainable brew. Remember, every sip can make a difference. ■

EU Coffee imports 2018

The EU's coffee comes from:



BRAZIL

29%
901,000 tonnes

VIETNAM

25%
770,000 tonnes

Total exported to EU:



3.1
million tonnes

Top importing member states:



GERMANY

36%
1.1 million tonnes
followed by Italy with 19%
(587 000 tonnes)

SOURCE: EC.EUROPA.EU/EUROSTAT

COMMODITIES

THE RISE, FALL AND RISE OF A SUPERFOOD

Quinoa (pronounced keen-wah) is a popular food for health-conscious consumers. In the 2000s, it was denounced as bad for the environment. But, spurred by more sustainable production, it's now seen as important to ensuring global food security.

➔ **CLOSELY** related to spinach and rich in protein, fibre and bio-actives, quinoa is a gluten-free alternative to more commonly eaten cereals.⁴⁰ It was first exported⁴¹ from South America to North America in the 1980s, where it became highly valued in health-food shops.

Global demand boomed worldwide. Today, quinoa has been introduced to 70 countries,⁴² including the US, India and Poland. But the crop⁴³ is almost exclusively grown commercially in the Andean highlands of South America.

STRATEGICALLY IMPORTANT

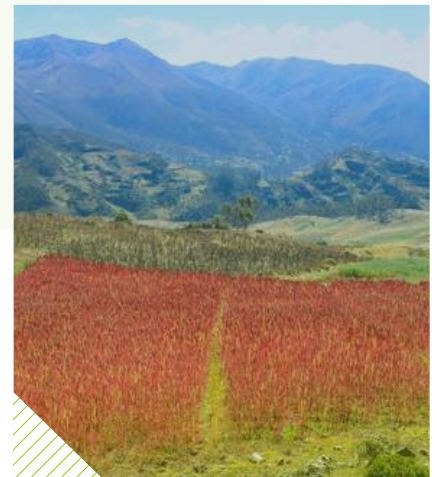
In the early 2000s, media coverage of negative environmental impacts led to a quinoa backlash⁴⁴ that adversely affected the market. More recently, quinoa's public image has improved. The crop is regarded by the United Nations⁴⁵ as strategically important to global food security and as an essential export from the poorest countries of South America.

Is quinoa's sometimes negative image actually justified? It's a complex debate. Increased production has undeniably had a negative effect on some ecosystems. But there is also evidence⁴⁶ that growing quinoa has lifted many communities out of poverty.

One of the main problems is that extensive monoculture⁴⁷ was introduced in areas where crop rotation, including llama grazing, had been practiced for centuries. Chemical pesticides and fungicides were used to maximize yields. Intensive farming methods led to soil degradation and the loss of biodiversity.

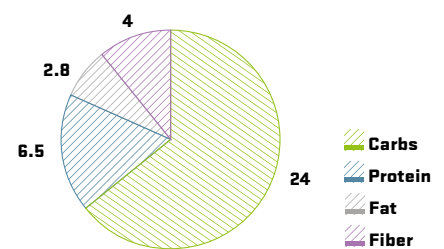
Before quinoa reaches North America and Europe, it is transported from the Andean highlands through the Panama Canal and across the Atlantic. The crop's carbon footprint is immense. So what can be said in its favor? Well, experts believe⁴⁸ that quinoa can help to feed an ever-growing world population healthily. Its hardiness⁴⁹ and adaptability make it an ideal replacement for less resilient crops, such as rice.

There are some impressive examples of good practice. Olam Superfoods,⁵⁰ a leading supplier, shows how data-driven supply chains can ensure an environmentally friendly product. The company's 3,000 farmers use organic methods. Consumers can enjoy quinoa's health benefits with a clear conscience by sourcing organic and direct-trade products. However, not all labels keep their promise. The discerning shopper will need to invest a little time to find the best green deal. ■



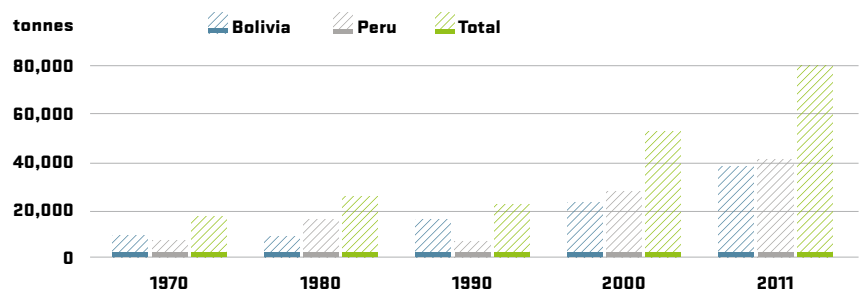
One cup of cooked quinoa

Grams of carb (starch and sugar), protein, fat and fiber



SOURCE: CANADIAN NUTRIENT DATABASE

Quinoa production



SOURCE: FAO

SUPPLY CHAINS

THE FUTURE: HYDROGEN AND BLOCKCHAIN

Digital technologies and non-hydrocarbon fuels will reduce the environmental impact of supply chains. How quickly they are adopted will depend on regulation, the need for due diligence and technology.

➔ **MANY** large companies publish an anti-modern slavery statement, even if they are not legally required to do so. But what of biodiversity? A recent study found that 90 percent of the environmental impacts of a company are created by its supply chains.⁵¹ So why is this topic not spoken about more often?

We have looked at the direct effects of planting and harvesting for agriproducts (see pages 6 and 7). Another massive and generally neglected impact comes from transport. Cargo ships,⁵² which account for 90% of world trade, cause huge environmental damage.⁵³ Their low-grade bunker fuel⁵⁴ emits high levels of CO₂ and pollutants. Candidates for deep-sea zero-emission vessels include ships powered by ammonia and hydrogen.⁵⁵

MONITORING SOFTWARE

Technical options for low-carbon shipping are limited, but those available for supply chains management are sophisticated. Companies such as Anthesis⁵⁶ and Source Intelligence,⁵⁷ for example, provide supply chain monitoring software to the world's leading brands. A management system, ISO 14001,⁵⁸ offers accreditation that suppliers have been checked for environmental impact, including biodiversity.

Unilever⁵⁹ has developed software to ensure that its foods are sustainably sourced and the e-commerce site of Walmart⁶⁰ tags qualifying businesses as “sustainability leaders.” US food

Supply chain impact vs. direct impact

Breakdown by source

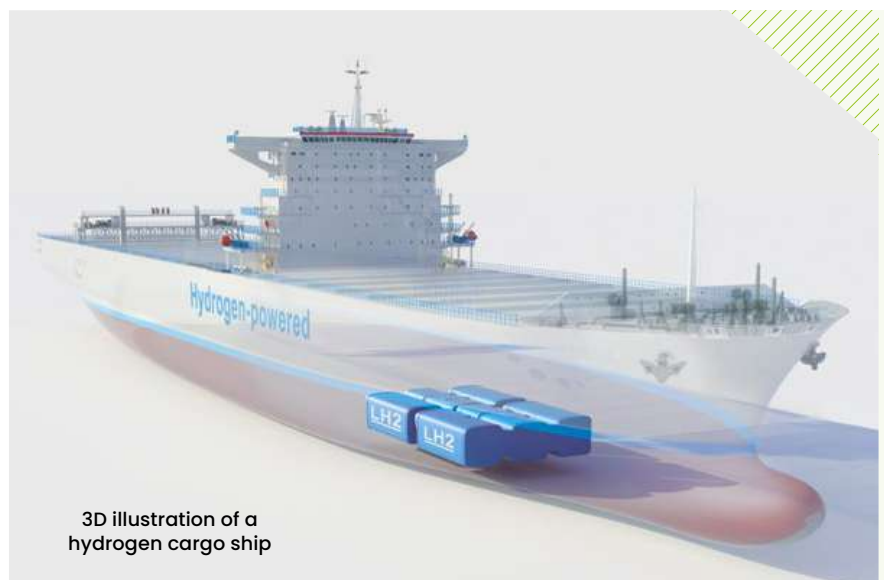


SOURCE: MCKINSEY

giant Cargil⁶¹ is committed to creating a transparent supply chain for palm oil. An important health warning should be attached to all such claims of “sustainability.” Do they actually mean that biodiversity is not being harmed? This should always be checked.

The largest companies have turned to blockchain. Walmart, the world's largest retailer, is using a blockchain-based product, Fabric by Hyperledger,⁶² which was developed with IBM, to track the origins of more than 25 products from five different suppliers. The system was piloted with mangos sold in the US and pork in China. An excellent example of continent-wide verification for supply chain authenticity is provided by OriginAll. In a partnership between the FII Institute⁶³ and the African Continental Free Trade Area, OriginAll's blockchain technology will support an online product verification system to protect up to 1.2 billion people in Africa from counterfeit and illegally traded products.

A handful of countries (see page 4) have introduced laws that require supply chain scrutiny. Now measures in the UK⁶⁴ would go further. Proposed legislation would require companies to publish information on their sourcing of “forest-risk” commodities such as cocoa, rubber, soy and palm oil to confirm that it did not damage ecosystems. ■

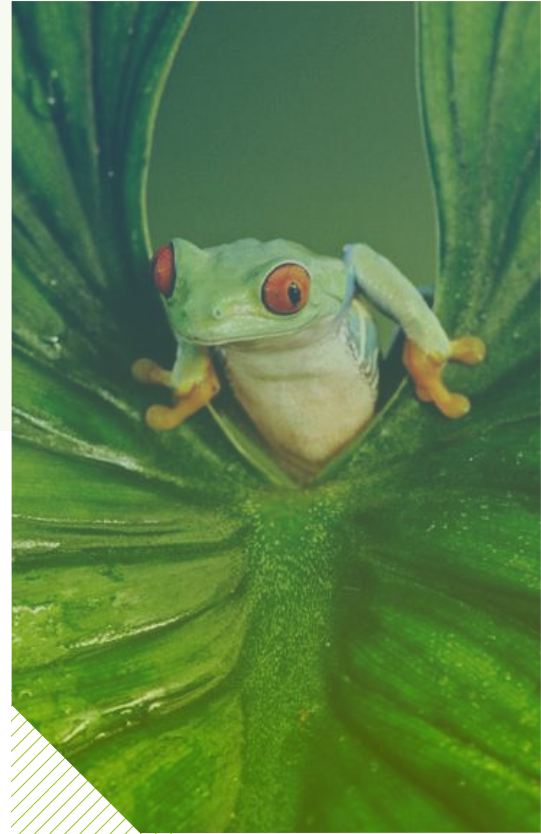


3D illustration of a hydrogen cargo ship

WHAT CAN WE DO?

FIVE WAYS TO HEAL THE PLANET

Food demand is driving large-scale deforestation, which is the world's biggest single threat to biodiversity. Investors and legislators are beginning to require change, but only a revolution in consumer behavior will swing the balance back to nature.



**It's obvious
but true.
We should eat
locally sourced,
in-season
fresh produce,
including
organic meat.**

1 National regulation must become more common. As we have seen (see page 4) only a handful of countries have passed laws making larger companies accountable for the environmental damage caused by their supply chains. India and Indonesia are highly unusual in the Asia Pacific region⁶⁵ in having introduced limited environmental and social reporting. The world may be facing a sixth mass extinction⁶⁶ but the issue of biodiversity preservation is still not regarded as mainstream.

2 Measuring environmental impact should always include biodiversity.⁶⁷ Often it doesn't. Present measurement systems, such as ESG and task force on carbon-related financial disclosure (TCFD) metrics tend to focus on greenhouse gas reduction. Experts have warned that measures such as devoting large areas to cultivate biofuels, inappropriate planting to offset carbon emissions and creating land and sea-hungry solar arrays and wind farms can harm biodiversity.

3 Consumer demand is key. It's obvious but true. We should eat locally sourced, in-season fresh produce, including organic meat.⁶⁸ We should avoid overpackaged, processed foods and ready meals with multiple, separately sourced ingredients. For coffee, direct trade⁶⁹ or Rainforest Alliance-certified products are best. The global adoption of a more plant-based diet would help to slow down tree loss and climate change. Cattle rearing in Brazil,⁷⁰ the world's largest beef producer, is causing extensive deforestation.

4 Better certification is needed for green claims to prevent "greenwashing." Labels are often highly selective. Is a product being grown on reclaimed land? What chemical fertilizers and pesticides are used? How much carbon is emitted during its transportation? Only independent certification can guarantee traceability and authenticity. An accepted methodology for measuring biodiversity impact could benchmark a biodiversity impact rating system, applicable to products.

5 New fuel development and electrification must be speeded up. Highly polluting, diesel-powered ships carry the majority of the world's goods around the planet. Liquefied natural gas (LNG) is making inroads, but green hydrogen,⁷¹ generated by electrolysis from renewable energy, is likely to be the maritime fuel of the future. It's estimated that the size of the hydrogen generation⁷² market will reach \$201 billion by 2025, with Asia Pacific emerging as the leader.

ABOUT THE FII INSTITUTE



FII INSTITUTE is a new global nonprofit foundation that has an investment arm and one agenda: **Impact on Humanity**. Global, inclusive and committed to Environmental, Social and Governance (ESG) principles, we foster great minds from around the world and turn ideas into real-world solutions in five critical areas: Artificial Intelligence (AI) and Robotics, Education, Healthcare and Sustainability. We are in the right place at the right time: when decision makers, investors and an engaged generation of youth come together in aspiration, energized and ready for change. We harness that energy into three pillars: **THINK**, **XCHANGE**, **ACT**. Our **THINK** pillar empowers the world's brightest minds to identify technological solutions to the most pressing issues facing humanity. Our **XCHANGE** pillar builds inclusive platforms for international dialogue, knowledge sharing and partnership. Our **ACT** pillar curates and invest directly in the technologies of the future to secure sustainable real-world solutions. Join us to own, co-create and actualize a brighter, more sustainable future for humanity.

This paper is part of our Sustainability Series, where the Institute's approach to addressing issues within this field emanates from our focus on SDG 13, SDG 14 and SDG 15. To drive results, the FII Institute's attention will initially focus on ecosystem preservation in both land and sea capacities, before moving onto sustainable marine and land exploitation and carbon-capture solutions in 2022. We will tackle this in a sequential manner, in which inhibitors to progress are identified, potential solutions are mapped out, and organizations and individuals to partner with are approached. ←



We are in the right place at the right time: when decision makers, investors and an engaged generation of youth come together in aspiration, energized and ready for change.



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Visit our website: [FII-INSTITUTE.ORG](https://www.fii-institute.org)

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