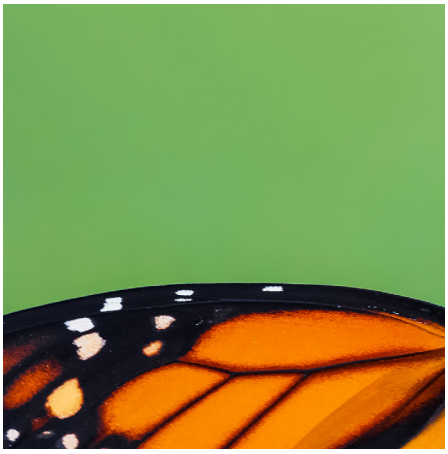
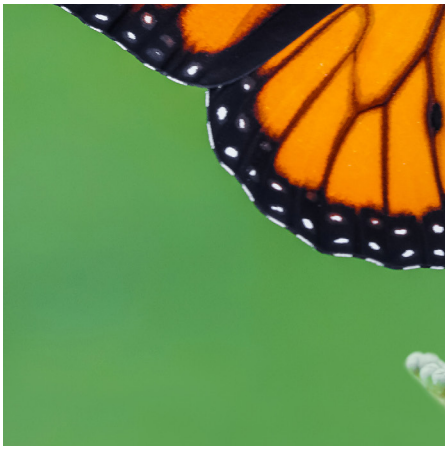
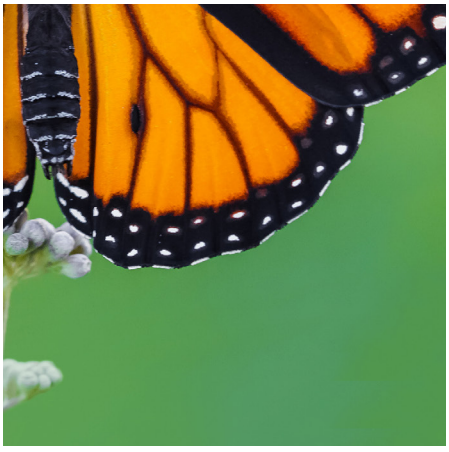
LOMBARD ODIER
INVESTMENT MANAGERS

Investing in Nature: the true engine of our economy – a synthesis

January 2021







Natural capital as the basis of value addition, wealth and prosperity

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Please read important information at the end of this document.

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Content

Nature is both overexploited, and underutilised. Our failure to value natural capital has led us to turn a blind eye to its decline, and kept us from grasping its economic potential.

The transition to the butterfly economy[1]

Our present economic system depletes the very resources it relies on through excessive material extraction and adverse impact on nature. We call this the take-make-waste economy; taking more than is sustainable, making more than we need, and wasting most of what we produce.

As our impact has grown, this model can no longer be sustained. Regulatory, consumer and market forces are forcing our economy to transition to a model that not only harnesses nature-based solutions through the circular bio-economy but also preserves nature through resource efficiency and outcome-oriented business models, closing the loop towards zero-waste. We call this new economic model the butterfly economy.

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LINEAR ECONOMY

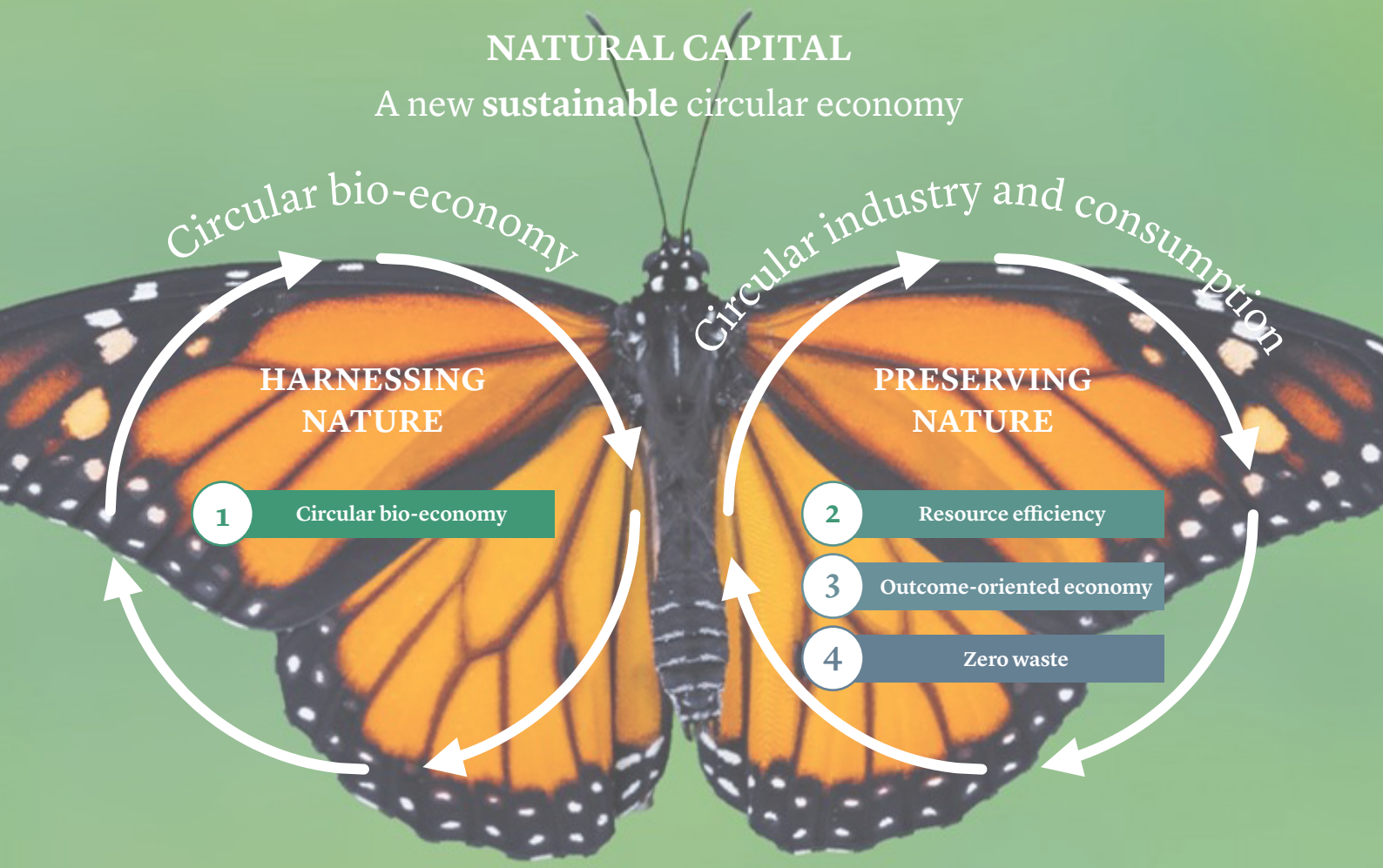
An outdated and **unsustainable** model

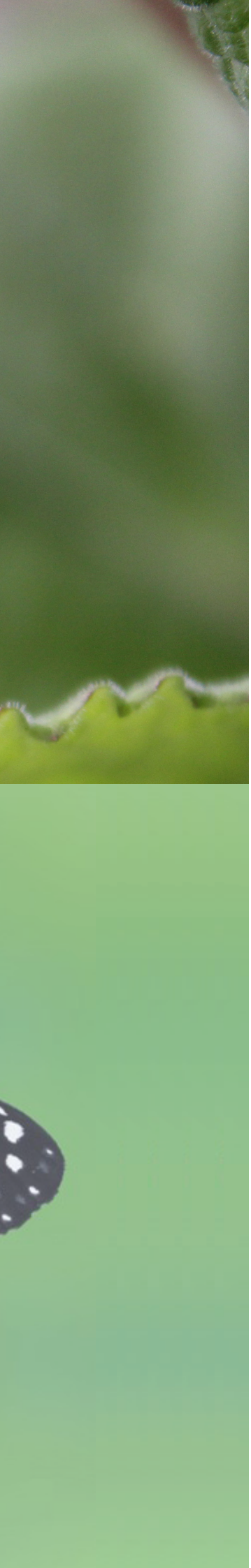
TAKE - MAKE - WASTE

Policy, market and technological forces

NATURAL CAPITAL

A new **sustainable** circular economy





Foreword

Nature is among the most productive assets of our economy. Yet our prevailing linear, take-make-waste model is depleting our natural wealth faster than it regenerates, posing a risk for global economic activity. Climate change, biodiversity loss, land degradation and more frequent pandemics are all symptomatic of an economic system that sits ill at ease with the natural environment. But although nature is overexploited, it is also underutilised. Our failure to value natural capital has led us to turn a blind eye to its decline, and kept us from grasping its economic potential.

However, powerful forces, enabled by technology and innovation, are now pushing our economy to evolve into a new circular and bio-aligned model that both harnesses and preserves nature. Harnessing nature, on the one hand, means advancing the development of bio-based materials and increasing the uptake of nature-based solutions across all industries. Preserving nature, on the other hand, means shifting towards greater circularity in production and consumption, closing the loop on our ecological footprint and leveraging a leaner form of industry.

In November, His Royal Highness The Prince of Wales launched the Circular Bioeconomy Alliance within the framework of the Sustainable Markets Initiative. Recognising the need to mobilise investment in a nature-based economy, the Prince said, "We need to accelerate our efforts and set the course for a sustainable future rooted in a new economic model – in other words, a circular bioeconomy that puts Nature and the restoration of Natural Capital at the centre of the entire process. Building a sustainable future is, in fact, the growth story of our time. If we are to drive global economic growth, it is imperative that we value and invest in our natural capital."[2]

At Lombard Odier, we agree, and we believe this profound metamorphosis of our linear economic framework into a new circular model will ensure a sustainable economy within a healthy society and environment. And as we outline in this paper, this transition is already underway and set to accelerate, driven first and foremost by value creation and superior economics.

Having worked in partnership with the Alliance, we have therefore launched a new Natural Capital strategy which recognises that the ongoing transition will reshape economic landscapes and unlock new investable opportunities. For the first time, this strategy allows investors to invest in companies that leverage the regenerative power of nature. We believe these companies will deliver strong growth and become the winners of the future.

As a founding member of the Circular Bioeconomy Alliance, we recognise that opportunities linked to the unrealised potential of natural capital create a reciprocal relationship between nature and investment and act as an engine for growth. Through our Natural Capital strategy, we invite investors both to rethink investment and contribute to a new and superior economic model.

Hubert Keller
Managing Partner, Lombard Odier

> *"We need to accelerate our efforts and set the course for a sustainable future rooted in a new economic model – in other words, a circular bioeconomy that puts Nature and the restoration of Natural Capital at the centre of the entire process. Building a sustainable future is, in fact, the growth story of our time. If we are to drive global economic growth, it is imperative that we value and invest in our natural capital."*
>
> **HRH The Prince of Wales**

[2] His Royal Highness The Prince of Wales as cited by Lombard Odier (2020).

Key takeaways

Nature is in decline. With it, we are losing one of our most productive forms of capital and ultimately putting at risk our society, economy, health and way of life. Underinvestment and the destruction of nature threatens the foundations of our wealth and prosperity in the same way that the loss of a factory, underinvestment in infrastructure, or lack of access to education does. Nature's role is undervalued and, as a result, poorly managed.

1. Nature is the bedrock of our economy

Our economy is not a system external to nature, but wholly encompassed by it. Nature and its processes provide the basis of our primary industries and have provided the stable conditions that have allowed civilisations to thrive. Its capacity is finite, however, and our failure to appreciate the value and limits of nature has blinded us to the need to manage and reinvest in natural forms of capital:

- **Natural capital is a productive asset:** Natural capital includes all the renewable and non-renewable resources in our biosphere, including clean air and water, fertile soils and sediments, biodiversity, and finite mineral and fossil resources. Biomass, a renewable form of natural capital, regenerates at an average rate of 19% per year and supports flows of agricultural, marine and forestry products.[3] But nature also provides enabling and protective services (like pollination and air filtration) that support economic processes and prevent disruption from climate change, storms, erosion, and disease.
- **Our economy depends on natural capital:** At least USD 44 trillion worth of GDP is moderately or highly dependent on nature.[4] The USD 5 trillion agricultural industry depends as much on rapidly-degrading soils as the forestry industry depends on forests, which are shrinking.[5] Food processing, apparel, and other manufacturing industries all depend on nature-based supply chains. Within the pharmaceutical industry, two-thirds of newly-developed drugs are based on or inspired by natural products.[6] Meanwhile, the non-material value of nature supports much of the USD 9 trillion tourism industry and can account for as much as 20% of local property prices.[7]
- **We fail to account for the value of nature:** Measurements of GDP take an incomplete account of the contribution of nature. After all, bees do not send invoices, despite supporting the pollination of crops worth up to USD 577 billion per year.[8] Similarly, we do not value the clean air supported by our soils and forests, despite air pollution generating USD 3.5 trillion in annual health costs.[9] And we rarely put a price on the value of carbon sequestration provided by our forests, even though this helps us to mitigate an expected escalation in climate-related damage linked to global warming.[10]
- **The value of nature is quantifiable, even if ultimately irreplaceable:** The value of nature can be quantified but is irreplaceable: the examples above illustrate the importance of natural capital to our society. But this form of a capital is a fragile asset, easily lost, and not so easily replaced. It takes 200-400 years to form a single centimeter of the soils that today are lost carelessly to erosion, pollution or mismanagement.[11] Similarly, it may take us at least three million years to recover the biodiversity lost from species expected to be pushed to extinction in the near future.[12] This destruction of natural capital reduce the flows of ecosystem services and the benefits our economy derives from it.

[3] Dasgupta, 2020.

[4] World Economic Forum, 2020.

[5] World Bank, 2019.

[6] Schmidt, Ribnicky, Lopsky, & Raskin, 2007.

[7] Bockarjova, Botzen, van Schie, & Koetse, 2020.

[8] United Nations Development Programme, 2017.

[9] OECD, 2014.

[10] According to the IPCC "the mean net present value of the costs of damages from warming in 2100 for 1.5°C and. 2°C (including costs associated with climate change-induced market and non-market impacts, impacts due to sea level rise, and impacts associated with large-scale discontinuities) are USD 54 and USD 69 trillion, respectively, relative to 1961–1990" (IPCC, 2018).

[11] John Innes Centre (2020).

[12] World Economic Forum (2018) citing David, Faurby and Svenning (2018).

FIG. 1 NATURAL CAPITAL PRODUCES ANNUAL RETURNS IN THE FORM OF ECOSYSTEM SERVICES[13]

NATURE PROVIDES MANY OF THE DIRECT INPUTS THAT SUPPORT OUR PRIMARY INDUSTRIES, BUT ALSO PROVIDES THE ENABLING AND PROTECTIVE SERVICES THAT DRIVE OUR ECONOMY, AND ITSELF REPRESENTS AN INTANGIBLE FORM OF WEALTH. DEPENDENCE ON NON-RENEWABLE FORMS OF NATURAL CAPITAL LIKE FOSSIL FUELS AND ORES AND MINERALS MUST BE PHASED OUT, BUT INVESTMENT IN ECOSYSTEMS SUCH AS OUR FORESTS AND OCEANS CAN INCREASE THE FLOW OF RENEWABLE MATERIALS AND SERVICES SOURCED FROM NATURE.

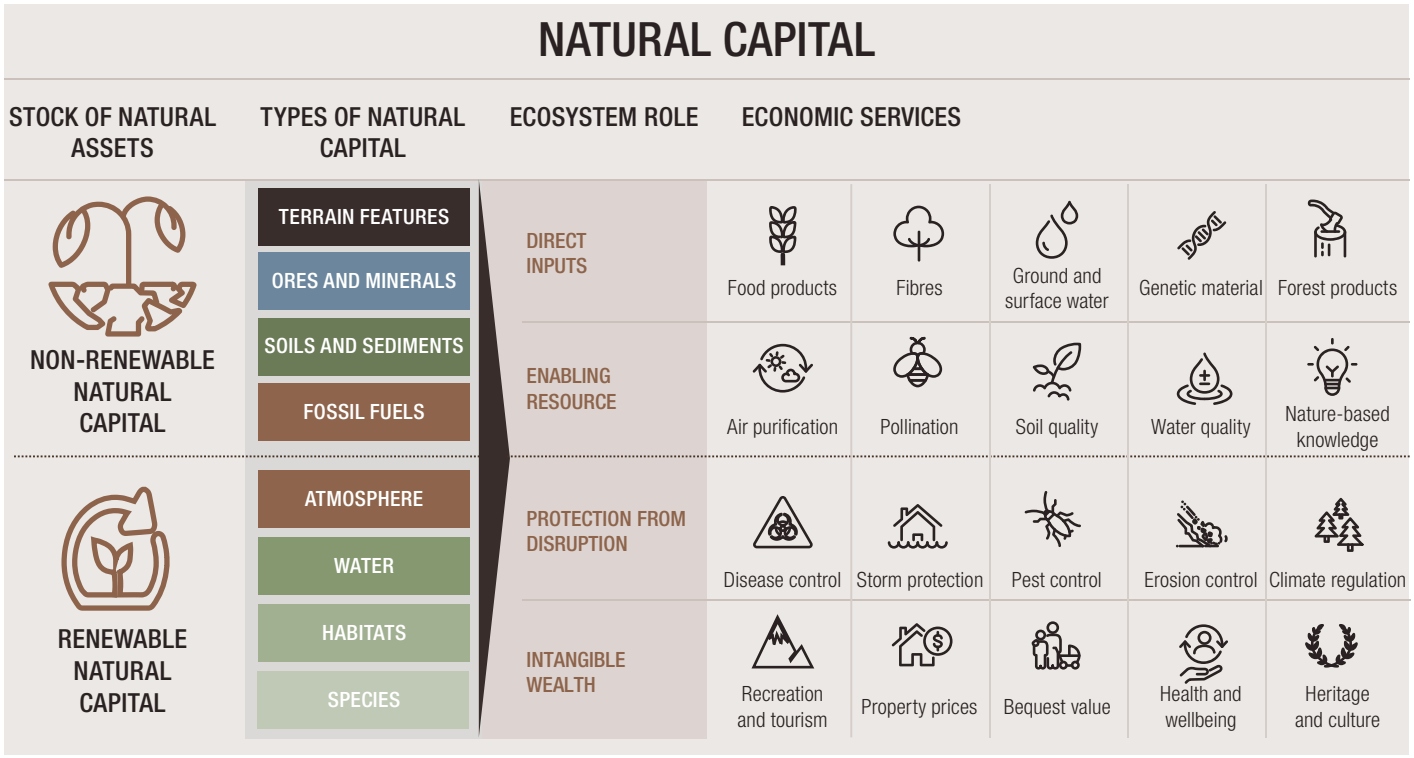
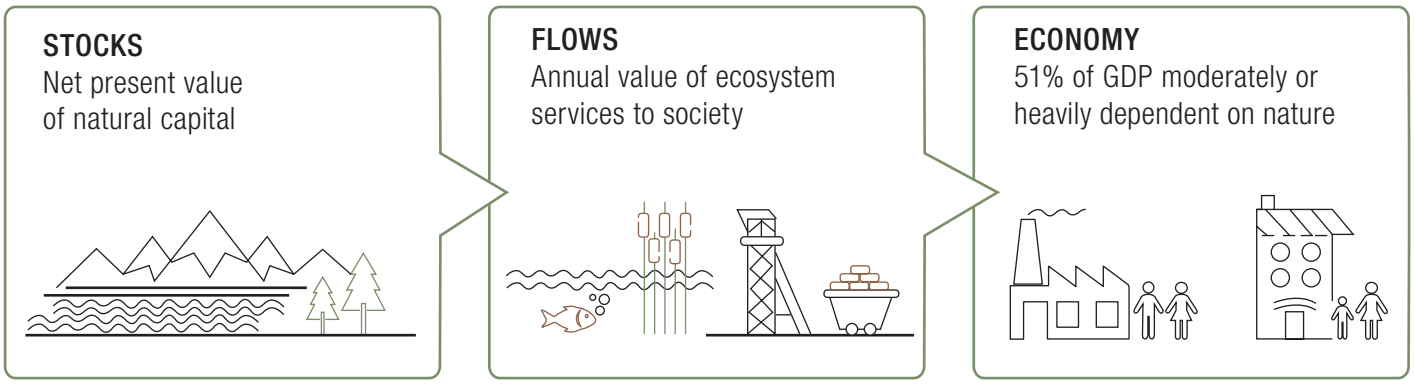


FIG. 2 THE ROLE OF NATURE IN OUR ECONOMY[14]

NATURE REPRESENTS A STOCK OF NATURAL CAPITAL THAT CAN BE EXPANDED THROUGH GOOD MANAGEMENT OR LOST THROUGH NEGLECT. THIS STOCK OF NATURAL CAPITAL GENERATES ONGOING BENEFITS AND SERVICES TO SOCIETY, AS DESCRIBED IN FIGURE 2. AT LEAST 51% (OR USD 44 TRILLION) OF GDP IS MODERATELY OR HEAVILY DEPENDENT ON NATURE, BUT EVEN THIS FIGURE CAPTURES ONLY A PORTION OF THE TRUE CONTRIBUTION OF NATURE IN SUPPORTING OUR MOST BASIC REQUIREMENTS.



[13] Lombard Odier. All rights reserved.

[14] Sources as cited in text. For illustrative purposes only.

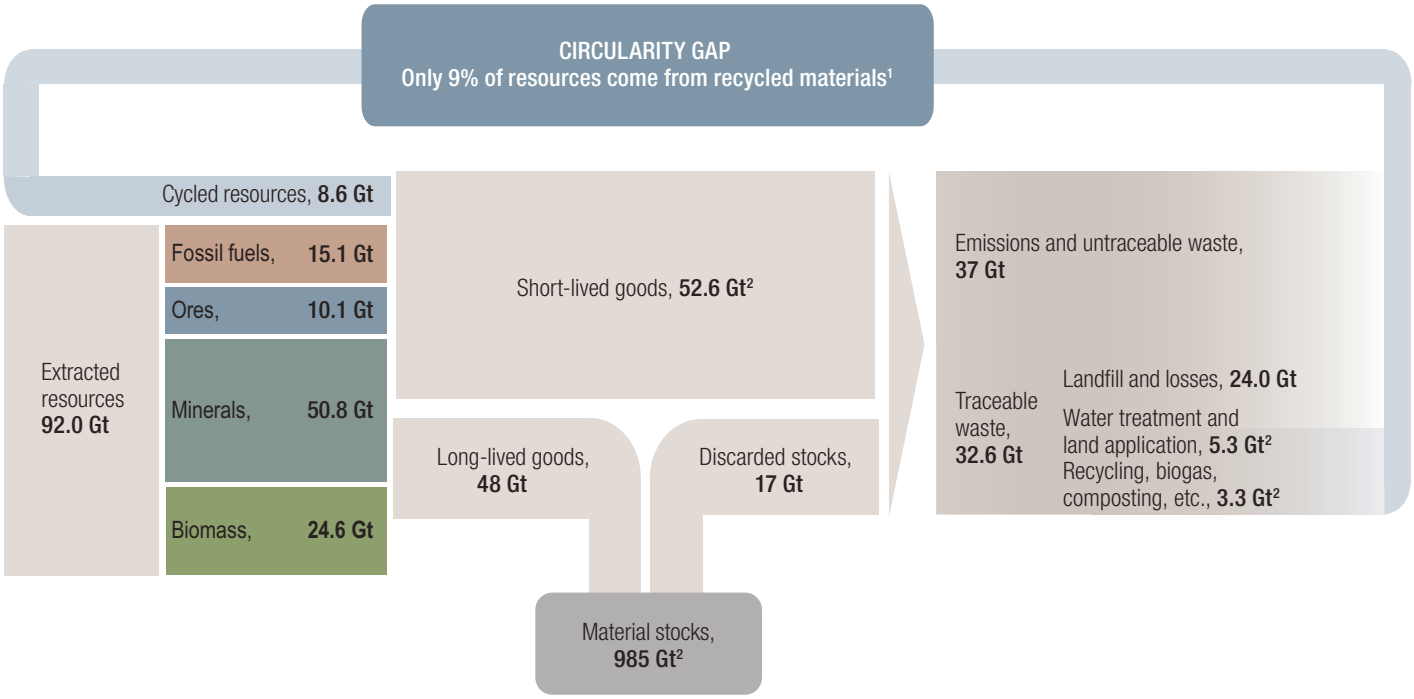
2. Our impact on nature has pushed us past the point of stability

Our present, wasteful economic model has never been sustainable, but in past centuries the impact might have been deemed comparatively harmless. As our population and economy have grown, however, so too has our economic impact.[15] The depletion, destruction and disruption of nature that has become inherent to our economic model has now led us to exceed manageable limits, elevating the risk of a collapse of natural systems and, hence, economic ones.

- **Our take-make-waste economy is value-destroying:** The wasteful nature of our economic model is the root cause of the degradation of nature and biodiversity. We extract 92 billion tonnes of resources per year (over half the weight of Mount Everest),[16] depleting finite resources through a dependence on mining activities with a high risk of adverse environmental impact.[17] Process losses contribute to this excess footprint, with large quantities of material never making it into a final product.[18] Once produced, products often sit idle – with 80% of global belongings used only once a month.[19] And at the end of product lives, most of this material is wasted, with only 9% of our resources sourced from recycled materials.[20]
- **We are crossing the boundaries of our planet's resilience:** Nature is being destroyed at an accelerating rate. Scientists have defined nine key planetary boundaries that define the safe limits within which geological and planetary conditions favourable to human development can persist. Climate change, species extinction, deforestation and agrochemical pollution have reached such extents that four of these boundaries have now been crossed.[21] This disruption of natural systems and processes creates the further risk of tipping points and spillover effects, threatening the integrity of the Earth system as a whole.

FIG. 3 A BIRDS-EYE OVERVIEW OF OUR TAKE-MAKE-WASTE ECONOMY

OUR TAKE-MAKE-WASTE ECONOMY IS BASED ON THE EXTRACTION OF VAST AMOUNTS OF RESOURCES. WE EXTRACT OVER HALF THE WEIGHT OF MOUNT EVEREST PER YEAR, IN THE FORM OF FOSSIL FUELS, ORES, MINERALS AND BIOMASS. SOME OF THIS MATERIAL LEADS TO THE ACCUMULATION OF GOODS – MANY OF WHICH ARE RARELY USED – BUT MUCH OF THE MATERIAL IS LOST, WASTED OR EMITTED INTO THE ENVIRONMENT, LEADING TO DEPLETION, DESTRUCTION AND DISRUPTION OF NATURAL CAPITAL.



Source: Adapted by Lombard Odier from Circle Economy (2020). Source: Lombard Odier analysis; [1] Original data based on the Circle Economy 2020 Circularity Gap Report; [2] Figure estimated by Lombard Odier; [3] Credit Suisse Global Wealth Report; Note: 1 gigatonne (Gt) is roughly equivalent to 2,740 times the weight of the Empire State Building or 100,000,000 African elephants.

[15] Dasgupta, 2020.
[16] Circle Economy, 2020.
[17] Manhart, Vogt, & Priester, 2019.
[18] Milford, Allwood, & Cullen, 2011.
[19] Bank of America, 2017.
[20] Circle Economy, 2020.
[21] Steffen & al, 2015; PIK, 2015.

- **We are depleting our ecological reserves:** One-third of our land is already degraded,[22] putting our food system at risk. We would need the equivalent of 1.6 Earths just to supply the biological products and processes that our ecological footprint requires at our current population size.[23] Populations of species have declined by an average of 68% since 1970, with losses as high as 94% in some areas.[24] As a result, out of 18 key ecosystem services surveyed, 14 are suffering from a long-term decline. Among others, this includes declines in pollination, the abundance of fish stocks, new soil formation, the maintenance of genetic diversity, freshwater quality, and natural hazard protection – each examples of services essential to our economy and to sectors as diverse as our food industry, pharmaceuticals and real estate.[25]

3. To preserve economic growth we must put nature at the heart of our economy

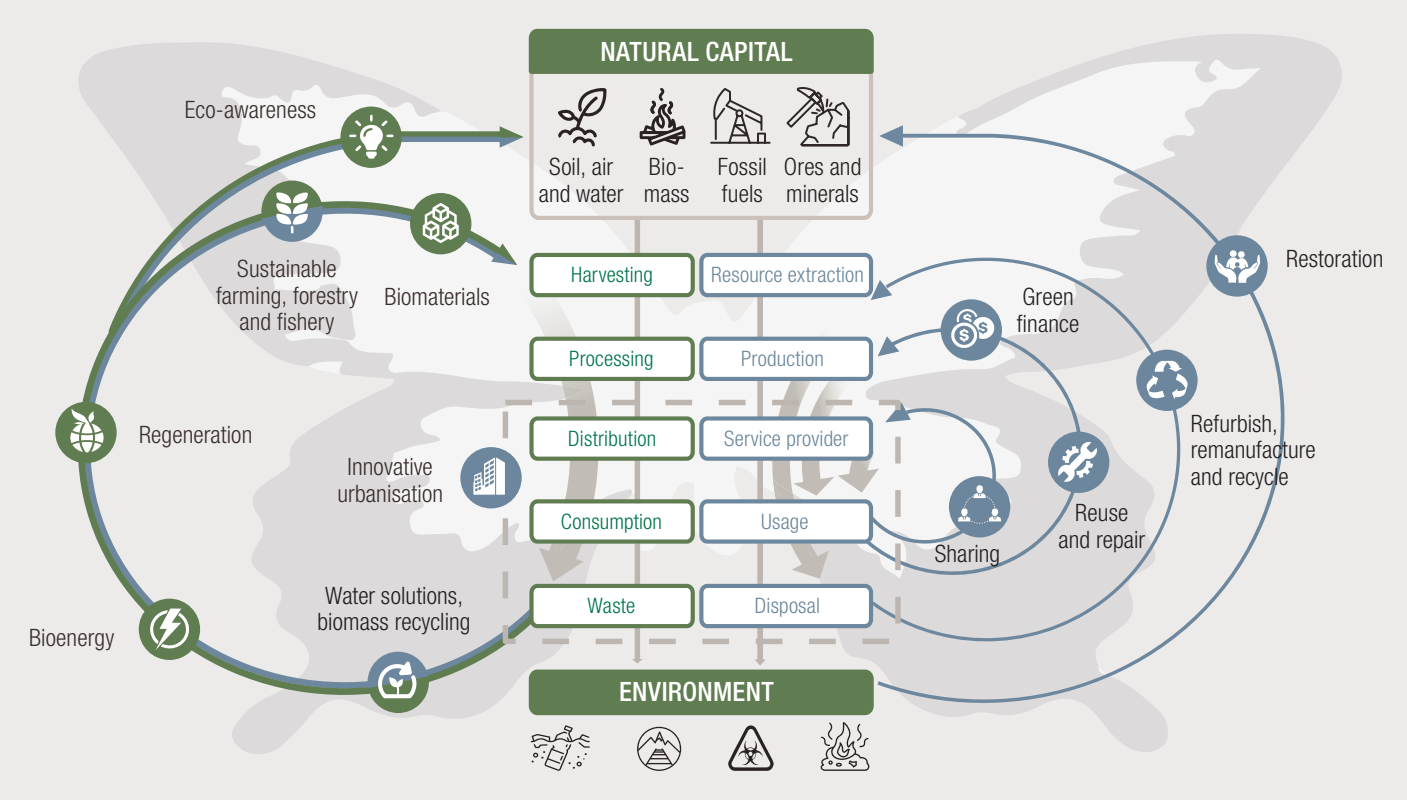
As human impact has become the driving force of environmental change, business models that worked in the past are no longer suitable for the future. Our economy is built on excess reliance on extractive industries depleting and degrading the very natural capital that it relies on. A transformation is required to a nature-positive economy that closes the loop on our ecological footprint, maximising the value addition of the resources we rely on nature for and minimising our adverse impact on the natural capital that sustains our society and economy.

- **The transition ahead leads us to a butterfly economy:** Whereas the take-make-waste, linear economy is one that underutilises and overexploits natural capital, the butterfly economy is characterised by its two circular wings, comprised of a regenerative bioeconomy on the one hand and a leaner form of industry on the other. These two wings, respectively, aim to *harness* natural capital and the diverse inputs it can provide and *preserve* nature by avoiding the excess impact associated with our excess ecological and material footprints. In the butterfly economy, resources generate value with every cycle they make through a closed system. This is infinitely preferable to a linear economy focused on one-off use, where most of the products end as unrecycled waste.
- **Harnessing nature through the circular bio-economy:** As much as 60% of our economy's inputs can be derived from biological processes through greater investment in the circular bio-economy.[26] Existing nature-based products may replace less sustainable industrial alternatives, with timber, for instance, capable of substituting as much as 20% of steel and concrete in construction in the EU.[27] Biorefineries may also process organic raw materials such as lignin and cellulose to produce bioplastics, biochemical, biomedicals, and other bio-based materials such as textiles. At least 400 new applications are under development that may contribute USD 4 trillion over the next ten to twenty years.[28]
- **Preserving nature through a leaner form of industry:** Present levels of raw material are unsustainable and contribute to ecosystem damage, removal of soils, water stress, avoidable energy use and chemical pollution.[29] *Resource efficiency* can lead to more efficient production processes, avoiding at least 17% in baseline requirements.[30] Demand-side changes are also necessary, transitioning to an *outcome-oriented economy*, characterised by sharing, re-use and repair and monetising over USD 4.5 trillion in assets that sit idle today.[31] Finally, closing the loop on our ecological footprint requires a transition to *zero-waste*, made possible by better recycling technologies and offering energy savings ranging between 60-75% and 90-97% for materials such as steel and aluminium.[32]
- **The failure to price natural assets leads to poor decisions:** Each year we provide agricultural subsidies of USD 600 billion, yet fail to discourage agrochemical pollution or incentivise practices to restore depleted soils.[33] Similarly, rather than encouraging a transition to reliance on renewable forms of energy, we provide up to USD 400 billion per year worth of subsidies to fossil fuels, burning carbon stores millions of years old, depleting carbon budgets and hastening the climate crisis.[34] As regulators revise old incentive structures, bound by targets on carbon reductions and biodiversity preservation, these old business models cease to be viable.

[22] FAO, 2011.
[23] Global Footprint Network , 2019.
[24] WWF, 2020.
[25] IPBES, 2019.
[26] McKinsey Global Institute, 2020.
[27] Maximum ambition assumptions for a net zero transition within the EU as per (ClimateWorks/CTI, 2018).
[28] McKinsey Global Institute, 2020.
[29] Manhart, Vogt, & Priester, 2019.
[30] UNEP, 2016.
[31] Bank of America, 2017.
[32] UNEP, 2016.
[33] Searchinger et al. (World Bank, 2020).
[34] IEA, 2020; IEA, 2019.

FIG. 4 THE BUTTERFLY ECONOMY FEATURES TWO CIRCULAR WINGS[35]

THE LEFT WING COMPRISES THE CIRCULAR BIO-ECONOMY, BASED ON REINVESTMENT IN NATURAL CAPITAL TO PROVIDE A SUSTAINABLE FLOW OF NATURE-BASED PRODUCTS. THE RIGHT WING COMPRISES THE INDUSTRIAL ECONOMY, LEVERAGING RESOURCE EFFICIENCY, BUSINESS MODELS BUILT AROUND SHARING, RE-USE AND REPAIR (THE OUTCOME-ORIENTED ECONOMY) AND IMPROVED WASTE MANAGEMENT TO CLOSE THE LOOP ON OUR ECOLOGICAL FOOTPRINT AND RELIANCE ON NON-RENEWABLE RESOURCES.



4. The time is ripe to reallocate capital to nature

Albeit much delayed, the transition to a bio-aligned, butterfly economy is in motion. Policymakers are coming to terms with the necessity of a green economy and are committing to "build back better" after the pandemic.[36] Recognition that climate change is but a window into the wider risk of nature collapse is growing. As policy, technological and consumer forces align, transitional risks are multiplying but so too are the opportunities for circular, bio-based, disruptive business models.

- **Powerful forces are accelerating the transition:** In 2021, new targets for the preservation of biodiversity are likely to be agreed at a biodiversity conference in Kunming, China. A new Taskforce on Nature-related Financial Disclosures (TNFD) and regional initiatives will accelerate the transition. Payment structures for ecosystem services – incentives offered to farmers to manage their land in support of nature-related objectives – may increase as part of new policy objectives. Meanwhile, costs of bio-technologies are falling. For instance, in 2013 the first burger using lab-grown beef cost over USD 300,000 to make, but within two years this cost had fallen to USD 11.[37] Plant-based alternatives have now already hit the market, while new techniques in precision biology may soon allow us to produce protein at a cost comparable to the cost of sugar.[38] Consumer sentiment is shifting to greater eco-awareness,[39] driving investment in these new technologies, supporting their economies of scale, and further driving down costs.
- **The transition to the butterfly and net zero economy are mutually reinforcing:** Net zero strategies will depend critically on substitution of industrial products with nature-based and circular strategies inherent in the butterfly economy.[40]

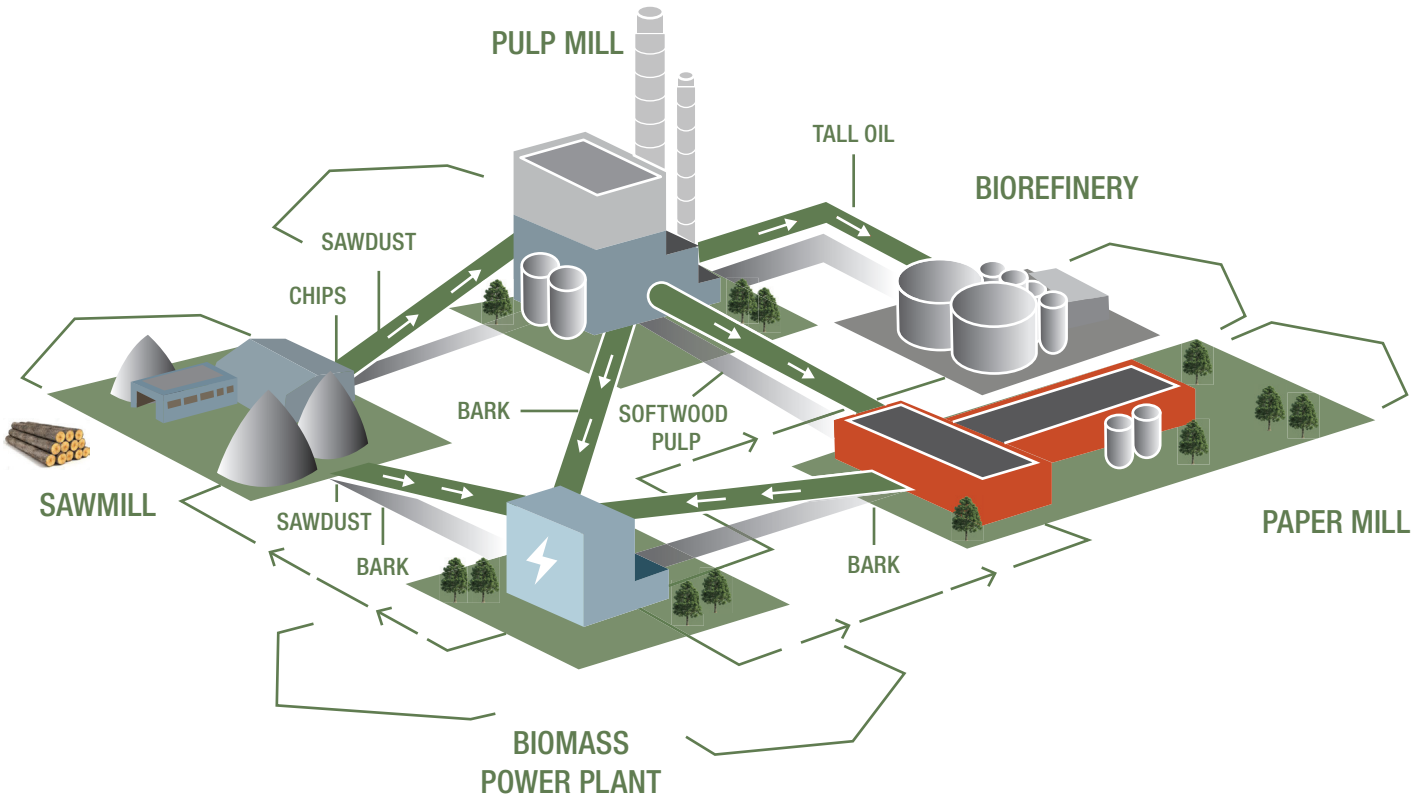
[35] Lombard Odier. All rights reserved.
[36] UN, 2020); Biden, 2020; von der Leyen, 2020.
[37] McKinsey Global Institute (2020).
[38] RethinkX (2019).
[39] Among consumers, self-reported veganism is up 600% in the US over just three years (GlobalData, 2017); 86% of UK consumers express concern over plastic waste (ADHB, 2019); and a backlash against fast fashion is resulting in less consumer emphasis on the "newness" of clothing (McKinsey & Company, 2020).
[40] European Forest Institute, 2015; European Commission, 2015.

Investment in reforestation and the regeneration of depleted soils may sequester an amount of CO_2 nearly equivalent to all of Asia's emissions.[41] Even at today's carbon prices in the EU, 42% of the world's reforestation potential already represents an economically superior means of reducing net carbon emissions.[42] To achieve the net zero economy, we must first transition to a more bio-aligned economy.

- **Nature-related risks and opportunities are of a scale material to investors:** Physical, transitional, liability and market risks are intensifying. Newfound visibility gathered through improved disclosures, direct satellite-based monitoring, and stewardship and engagement, will lead to a re-pricing of assets to take into account nature-related risks – and opportunities. At the same time, the commercialisation of hundreds of new bio-based applications, for instance, presents a USD 4 trillion opportunity.[43] As markets shift, investors will play a key role in mobilising capital. Even today, meeting preservation targets is already estimated to require up to USD 440 billion per year, a figure likely to increase following the Kunming conference[44] – highlighting the scale and immediacy of these investment opportunities.
- **Investable ideas around the circular bio-economy and leaner industry abound:** Biorefineries are using wood-based materials to produce bio-based products ranging from bioplastics to medical products. Opportunities in food supply chains reduce agrochemical pollution, increase our reliance on the ocean, and reduce spoilage and waste. Technologies such as cloud-based computing and additive manufacturing are offering a step-change in productivity to avoid adverse environmental impact. Business models built around sharing, re-use, repair and recycling offer new sources of competitive advantage and growth. And rethinking the ways we organise our cities, waste, water and green spaces brings these transitions into our daily lives.

FIG. 5 EXAMPLE OF A BIO-ALIGNED BUSINESS MODEL THAT HARNESSES AND PRESERVES NATURE[45]

FORESTS REPRESENT ONE OF MOST PRECIOUS ECOSYSTEMS, SUPPORTING THE HEALTH OF OUR ATMOSPHERE, OCEANS, AND PROVIDING LIVELIHOODS TO MILLIONS. ASIDE FROM A SOURCE OF TIMBER, PAPER AND PULP, WOOD-BASED RAW MATERIALS CAN ALSO PROVIDE THE BASIS FOR PRODUCTS AS DIVERSE AS BIOPLASTICS, BIOCHEMICALS, BIOMEDICALS, AND BIOENERGY. CERTIFICATION IS KEY, HOWEVER, TO ENSURE FORESTS ARE RE-GROWN AND MANAGED SUSTAINABLY.



[41] Soil sequestration solutions may sequester between 3-29 Gt CO_2 per year from the atmosphere according to the IPCC (2019). The middle of this range, at around 16 Gt CO_2, is comparable to the total emissions of Asia in 2018, at 17.4 Gt CO_2 as per UNFCCC and CDIAC (2019).

[42] Nabuurs, Masera, & Andrasko, 2007.

[43] McKinsey Global Institute, 2020.

[44] UNEP, 2012; PWC, 2020.

[45] Adapted from UPM, used with permission.

Conclusion

At the World Economic Forum in Davos in January 2020, His Royal Highness the Prince of Wales called for a "paradigm shift" in how we allocate capital in the economy. "I have come to realise that it is not a lack of capital that is holding us back, but rather the way we deploy it," the prince said. "Sustainable markets generate long-term value through the balance of natural, social, human and financial capital." Outlining a ten-point action plan for an approach to sustainable markets, the prince argued that "we need to put Nature, and the protection of Nature's capital – from which we draw a return – at the heart of how we operate."[46]

The investment community is taking note. Natural capital forms the basis of our supply chains, economic value addition, wealth and prosperity. While the destruction of natural capital through the destruction of forests or the depletion of our natural resources may generate short-term gains, these actions also diminish our most productive asset and basis for human health and wellbeing. As we exhaust this finite resource, so too do we reduce our ability to generate future growth.

Today's take-make-waste economy has reached a scale where its adverse impact has grown beyond renewable proportions to a scale that threatens the viability of the business models that are built on it. It is an economy that overexploits natural capital, damaging its own productivity as much as it does ecosystems, and underutilises natural capital – failing to recognise the economic value that nature and nature-based products, if properly harnessed, managed and preserved, can provide.

At Lombard Odier, we believe that the world is embarking on a necessary transition to a Circular, Lean, Inclusive and Clean (CLIC™) economy. While the CLIC™ economy encapsulates the move to a net-zero-emissions economy in a fair and inclusive manner, it is first and foremost built on natural capital. If we are to reinvest in the restoration and growth of natural capital, the CLIC™ economy must have the shape of a butterfly with two circular wings: the first harnessing the productive and regenerative power of nature and deepening our reliance on the circular bio-economy; the second preserving natural capital by the transformation of our current industrial model into a leaner and more circular alternative.

The transition to this superior economic model that values and invests in natural capital is a necessary one to mitigate the physical, liability, transitional, and market risks ahead. Indeed, the World Economic Forum now recognises biodiversity risk as one of the top five threats facing humanity.[47] But even more so, the transition is one characterised by opportunities. "Looking forward," in the words of His Royal Highness The Prince of Wales, "new employment opportunities, entire new industries and markets rooted in sustainability are within our grasp, with the potential for unprecedented economic growth."[48]

We do not need to look far for the investment opportunities ahead. In the past, nature-linked investments might have been seen as the domain of startups and private equity. However, companies tackling the challenges linked to the circular bio-economy and leaner forms of industry can now be found also in listed equity markets that are the domain of the mainstream investor. This sets the stage for a larger-scale reallocation of capital to the transition ahead, and the trillions of dollars of reinvestment that will be required for the transition to position us onto a pathway towards sustainable growth.

To us at Lombard Odier, it is clear that the future must be both green and biodiverse. The transition to a more bio-friendly CLIC™ economy is first and foremost driven by value creation and superior economics. It is happening now and it is accelerating. Natural capital will be its most vital foundation.

[46] His Royal Highness The Prince of Wales, 2020.

[47] World Economic Forum, 2020.

[48] His Royal Highness The Prince of Wales, 2020.

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