MISTRA

Reflection paper

Accelerated Circular Economy and Reduced Resource Use

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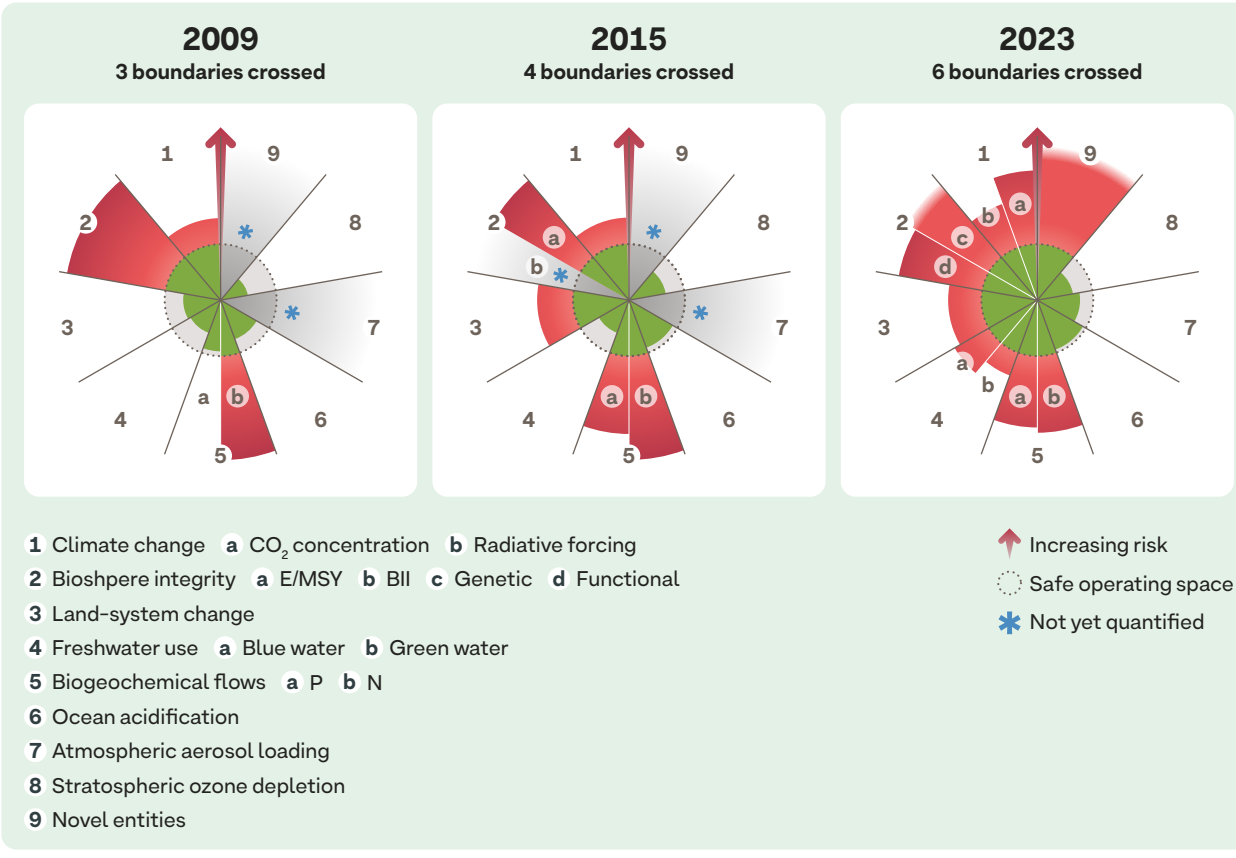
Current resource use: Main driver of severe environmental and human consequences

For the first time in human history, we face the emergence of a single, tightly coupled human social-ecological system of planetary scope. We are more interconnected and interdependent than ever. Our individual and collective responsibility has enormously increased. Human activity is driving overshoot of six out of nine planetary boundaries – pushing us out of the safe operating space in which our societies have evolved.[1]

FIGURE 1. Evolution of planetary boundaries evaluation in time perspective.[2] (Credit: Azote for Stockholm Resilience Centre, Stockholm University).



Evidence from IRP's (The International Resource Panel) upcoming Global Resources Outlook – GRO24 (for publication in February 2024) shows that our current material extraction and processing, including cultivation and harvesting of biomass, account for more than 90% of impacts on biodiversity loss and water stress, 60% of greenhouse gas emissions, including emissions from land use change, and 40% of health-impacts related to pollution. All see an increasing trend since IRP's last Global Resources Outlook in 2019. In total, global material use has increased by almost a factor 4 since 1970.[3] If current trends continue, it is projected to grow from approximately 100 billion tons in 2020, to 160 billion tons in 2060.[4]

Currently, the wealthiest benefit most from resource use, and are most responsible for most environmental impacts. High income countries are responsible for 8 times more climate impacts (GHG emissions) than low income countries.[5] Despite facing most environmental impacts due to resource extraction within them, many low income countries still do not consume enough material to meet basic human needs.[6] 36% countries globally do not have their basic nutritional needs met, 40% do not have adequate access to energy, and 79% do not meet the threshold for overall life satisfaction.[7]

If we continue with current production and consumption patterns, people will face increasingly severe environmental impacts, while not having their basic human needs met. Continuing current trends means increasing global inequality (itself a major driver of climate change). This risks rapidly increasing social tensions: some modelling studies, such as Club of Rome's Earth for All, project that, left unchecked, rising global inequality in the next 50 years will lead to increasingly dysfunctional societies.[8] According to the authors "*regional societal breakdown cannot be ruled out this century*".[9] Equality and poverty alleviation is key if we want people to be concerned about regenerative economics and decarbonisation. Social and environmental efforts must go hand in hand.

Systemic societal shift: Towards optimised delivery of human needs

We depend on resources for all our basic needs: mobility, nutrition, safe shelter, clothing, sanitation, and more.[10] But, looking at the overwhelming body of scientific evidence, we need a fundamental and systemic societal shift in how we use resources: away from wasteful, linear, production and consumption systems, towards resource efficient societies, optimising wellbeing for all. To avoid severe environmental impacts, breaking the links between ever-increasing resource use, economic development, human wellbeing, and environmental impacts – *decoupling* – is a must. In high-income countries absolute decoupling should be the aim: decreasing material use, while maintaining or improving wellbeing outcomes. In low and some middle-income countries, where additional material use is still needed to build up infrastructure and meet people's basic wellbeing needs, relative decoupling should be the aim – sustainably raising resource use at a slower rate than growth in wellbeing (including economic growth), while minimising environmental impacts and maximising essential needs delivery. This is necessary and just.

To operationalise decoupling, our most powerful instrument is **circular economy**. Building a circular economy will be vital in achieving truly sustainable consumption and production, and optimal resource efficiency. It is also one of the oldest concepts on planet earth: all nature is based on the principles of a circular economy.[11] Nothing is lost and everything has its purpose. We humans, as part of nature, should abide by the same principles.[12] Unfortunately, what seems logical in theory is not so clear in practice: we are yet to make it a reality for our material consumption systems.

Much work has been done by many organisations to develop frameworks for operationalising circular economy: several models exist, including IRP's material efficiency strategies in product lifecycles,[13] the UN Environment Programme's circularity approach,[14] the Ellen MacArthur Foundation's circular system model (the 'butterfly diagram'),[15] and the 9R Framework.[16] While these frameworks have differing nuances, their key messages can be summarised in four broad dimensions, captured in Figure 2.[17] These four circular economy dimensions underpin the circular economy strategies needed for decoupling. The focus to date has been on the "Leaner", "Longer", "Cleaner" dimensions: improving the supply side of production and consumption systems—for example, through strategies for lightweighting or recycling.[18] However, the "Better" dimension has been overlooked: better system design should be the starting point – planning how resources can best be used to meet essential human needs.

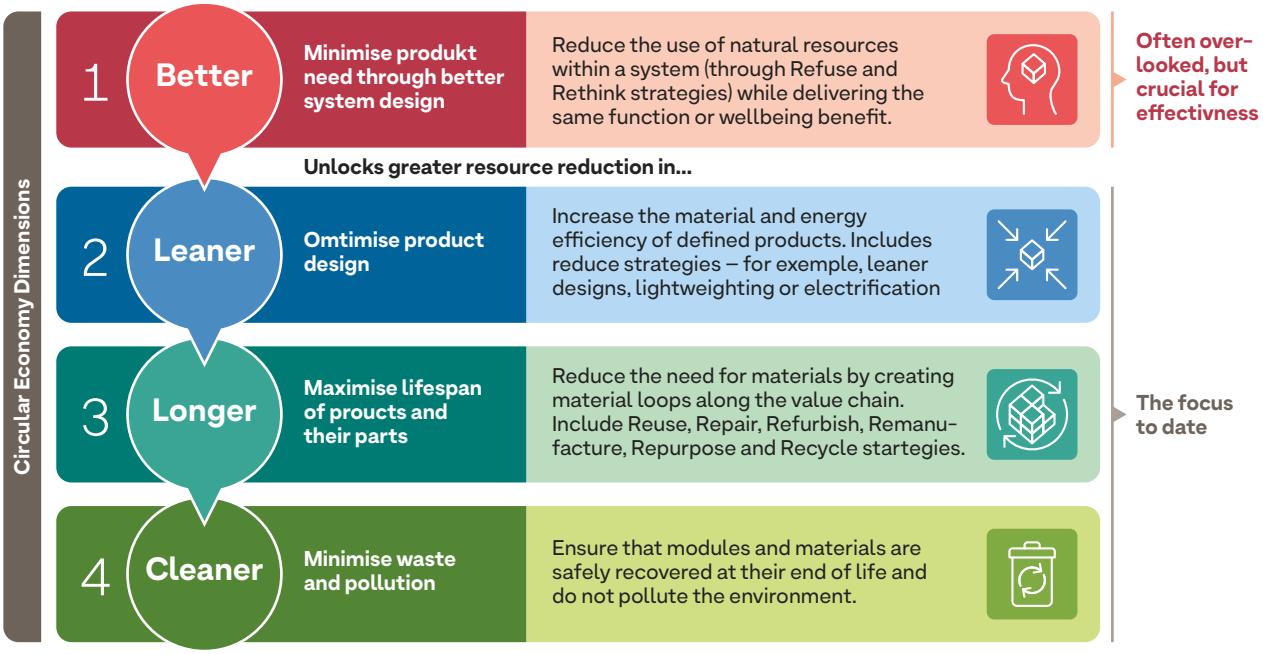


FIGURE 2. Framework for applying the concept of circular economy holistically.[19]

By turning our attention to the "Better" dimension, we can aim for a future where human needs are delivered in the most resource efficient ways possible – while maximising overall health and wellbeing. And we can do this by designing solutions for "provisioning systems" – not continuing narrow focus on optimising the output of traditional economic sectors (Box 1).

Already existing science from the Intergovernmental Panel on Climate Change (IPCC) shows the power of demand-side changes in key provisioning systems for climate change mitigation. Wellbeing is the central aim of the solutions modelled by IPCC: the 2022 report from their Working Group on climate mitigation states "*Development targeted to basic needs and well-being for all entails less carbon intensity than GDP-focused growth*".[20] Their modelling found that demand-side measures in mobility could reduce GHG emissions by approximately 60% by 2050.[21] Building on this approach, IRP's upcoming GRO24 will include modelling on the material implications of ambitious demand-side solutions in key provisioning systems: for example, optimising the mobility system could reduce its material stock by 50% by 2060, compared to continuing with current policies.[22] Changing mobility by reducing the need for travel in the first place, and by maximising use of communal and active transport, would have the added benefits of improving air quality and health, and leaving more urban space for nature (due to less space being taken up by under-used individual vehicles).[23]

Deep resource efficiency principles have the potential to make our societies more resilient overall. Let's take the example of materials for the energy transition. All countries need to undertake the energy transition – it is imperative in the fight against climate change. Though its total material footprint would be smaller than continuing with a fossil fuel system, it depends on large amounts of key materials (often called critical raw materials), bringing new material complexities. Therefore, managing supply and demand of energy transition materials is a growing area of concern for governments around the world. But, by implementing deep resource efficiency, and targeting resource use to human needs, we can improve overall energy transition feasibility. According to GRO24, optimising material and energy intensive systems (mobility, housing, nutrition, and others) can reduce global energy demand by around 50% by 2060 (compared to continuing with historic trends).[24] This would significantly reduce dependence on transition materials for decarbonised

energy production. Optimising systems is the most immediate solution for critical raw materials security: as material demand for certain materials will grow so rapidly, recycling today's materials in use can only make up a small proportion of tomorrow's demand.[25] Ramping up supply is of course important but takes time: there are often 15 years or over between planning and opening a new mine.[26]

Box 1: Benefits of a Provisioning Systems Approach

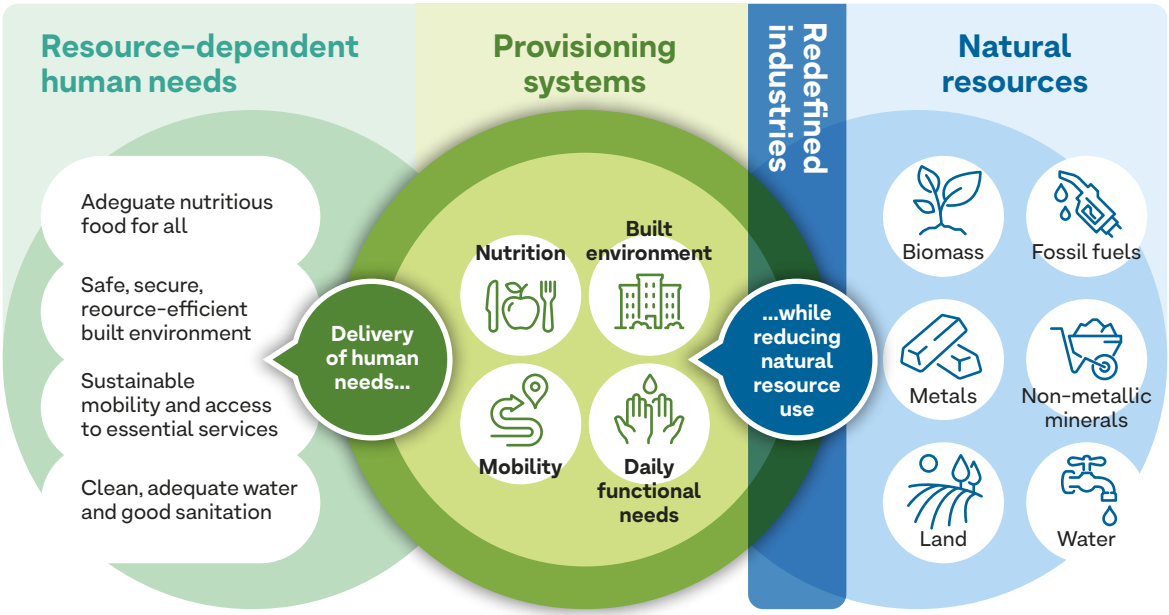


FIGURE 3. Provisioning Systems use natural resources to deliver human needs[27]

To decouple resource use from human wellbeing, we can design solutions for "provisioning systems": resource-intensive systems which deliver human needs. Optimising these systems to meet societal needs with minimal resource input would improve overall wellbeing, while mitigating growth in resource use and its environmental impact.[28,29]

Designing holistic solutions for a **provisioning system** brings greater opportunities and increased societal co-benefits than applying supply-side solutions to individual sectors. For example: applying resource efficiency to the automotive sector, rather than solutions for providing the human need of mobility, may produce leaner and more efficient vehicles, but it would miss opportunities linked to new ownership models that increase vehicle utilisation, a shift to other transport modes or reduced need for travel in the first place through more compact city design or increased working from home. Significant potential for absolute resource reduction would be overlooked.[30]

Next steps: Solutions and Recommendations

Following the main recommendations for implementing the Just Sustainability Transition scenario from GRO24 which would secure a pathway towards sustainable resource use, maintain, and even enhances human wellbeing, while prevent planetary boundaries to be crossed.

Focus policy attention on the most resource-intensive provisioning systems

These are: food and nutrition, mobility, built environment, water and sanitation, energy, water sewage and health and daily functional needs.

Correct market signals to mainstream sustainable production and consumption

We need a new approach to 'value': redefining 'value' as delivery of genuine human needs, not concentrated sectoral profit. This will help decision-makers shift to long(er)-term thinking, and holistic measures of success. Currently, government decision-making hinges on short-term projections, which are not necessarily aligned with long-term wellbeing and planetary stability.[31]

First, we also need the right metrics for measuring our redefined value. Governments currently use GDP as their major metric for human wellbeing, but it does not provide information on how, or whether, essential human needs are met.[32,33] Strong, science-based metrics on material dependent human wellbeing are lacking: existing metrics do not adequately capture how provisioning systems are performing. For example, the major available metrics on performance of the nutrition system are restricted to number of calories consumed and say nothing about comprehensive human health (and environmental impacts).[34] IPCC also recognises development of strong metrics for human wellbeing as a serious knowledge gap.[35]

Second, prices for our resource use should reflect our redefined values. The cheapest option currently is to destroy the planet, rather than conserve it, and not many economic signals are sending us in the opposite direction: this needs to change. The solution starts with understanding and accepting a simple truth, captured by the landmark Dasgupta Review:[36] our economies are embedded in nature, not external to it. Acknowledging this, and reflecting it in our resource prices, is a core step towards making circular economy strategies cost effective. Incorporating the true environmental and social costs of resources into their prices would make secondary materials cheaper than primary materials. We must correct market signals through polluter pays and tax systems, public procurement, avoiding the rebound effect. Modelling for IRP's upcoming GRO24 shows that appropriate pricing for materials could significantly reduce consumption, and drive innovative mate-

rial efficiency solutions.[37] However, more scientific, and economic work is needed to accurately 'price-in' environmental and social costs of resource use.

Institutionalise resource governance and define resource use paths

Set overall targets to guide resource use and ensure consistency with globally agreed environment goals. A target serves as a clear guide, offering concrete direction and aiding in prioritising actions to achieve a policy objective.[38] When appropriately enforced and supported by a well-balanced mix of policy measures ensuring fair global market conditions, a target creates a level playing field for business, and can become a powerful tool for addressing environmental challenges. Numerical targets prove to be the most straightforward method to mobilise both government and business initiatives. The target approach's effectiveness is evident in the climate change agenda, exemplified by the 1.5°C target limit in the Paris Agreement. The 1.5°C target has given rise to "carbon budgets", offering guidance on permissible greenhouse gas emissions to stay within temperature limits. Carbon emissions targets have successfully attracted investment to low-carbon and carbon-negative solutions.[39] Similarly, introducing relative reduction targets for material footprints would set direction for policymakers, and make resource efficiency solutions appealing to investors. To establish such targets, we require clear scientific evidence on the resource use implications of globally agreed-upon climate and biodiversity targets, and we need this science to be accepted by governments.

Create low-carbon, clean and circular business models

(Re)organise production to use less energy and resources, invest in and monitor effectiveness of circular business models based on everything-as-a-service and extended producer ownership logic.

Redirect finance to serve the transition

Vision the future to unlock investment and innovation. To put these solutions into action, we need positive, forward-thinking perspectives on what's achievable. To facilitate this transformation, the world's most ambitious researchers and governments can play a crucial role in establishing and reimagining goals. By guiding decision-makers in these nations and beyond towards a global economy that maximises human well-being through efficient provisioning systems, visionary countries can collaborate to envision the future of value creation in dematerialised economies. Many countries around the world possess significant innovation potential, exceptional talent, and substantial public and private resources. If leading countries and thinkers can articulate a compelling vision of an economy built on decarbonised and dematerialised provisioning systems, clean business models, and cutting-edge industries, substantial investments are likely to follow.[40]

Make trade an engine of sustainable development

Incorporate the impact of resource use into trade agreements, border adjustment taxes and mandatory due diligence; enable producer countries to capture a larger share of resource value.

To summarise, we know enough for immediate action across many fronts – policy-makers should not wait before investing in the optimised provisioning systems we need. But, some solutions, such as target-setting, and accurate resource pricing, could be strengthened through addressing key knowledge gaps. The science and economics communities, and other thought leaders, can work towards:

- Modelling on the resource implications of meeting climate and biodiversity commitments, including materials for the energy transition.
- Developing strong science-based metrics for resource-dependent human wellbeing.
- Linking resource use impact science and economics to reflect environmental and social costs in resource prices.
- Creating positive visions for optimised provisioning systems.

To preserve our safe operating space, the window is closing. System change is possible, but we have a steep and narrow path towards the future we want, and no time should be lost in addressing knowledge gaps and implementing the necessary solutions. The future will be green, or there will be no future.

Endnotes

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