Global Infrastructure Hub

Advancing the circular economy through infrastructure

Transition pathways for practitioners in circular infrastructure

17 November 2021

A G20 INITIATIVE

In 2021 the Global Infrastructure Hub (GI Hub) was asked by the G20 Italian Presidency to examine the role that infrastructure can play in advancing the circular economy. This work formed part of the G20's sustainable infrastructure agenda in 2021 and the initiative produced several deliverables, including:

- A thought piece entitled *The Role of Infrastructure in the Circular Economy* (published 16 April 2021)
- A workshop for the G20 Infrastructure Working Group (IWG) that discussed the potential for impact and key transition elements for a circular economy in infrastructure (held 30 April 2021)
- A roadmap to build knowledge of infrastructure's potential to enable the circular economy. This roadmap was welcomed by the G20 Finance Ministers and Central Bank Governors in their Communique issued in October 2021.

Purpose of this document – this paper consolidates the key findings from our work for the G20 in 2021. It aims to raise awareness and knowledge of circular infrastructure, its potential impact and transition pathways for public and private sector practitioners to apply circular economy principles to infrastructure.

The GI Hub welcomes expressions of interest from stakeholders to collaborate on this topic, please contact GI Hub's Infrastructure Specialist, Daniel del Rio at daniel.delrio@gihub.org.

Executive Summary

Circular infrastructure is a promising solution to address the world's major challenges

The infrastructure landscape is changing rapidly. Climate change, urban growth and stretched fiscal budgets (as a result of the COVID-19 pandemic) are adding unprecedented pressure and complexity to our ability to deliver 'infrastructure for 2050'. To address these challenges and support continued economic and social prosperity, it is essential to transition the development and delivery of infrastructure towards achieving transformative outcomes for people and planet[Error! Bookmark not defined.].

Circular economy is one of 13 transformative outcomes that can be achieved through infrastructure[1].
A 'circular economy' is an economic system that organises production, supply and consumption of materials into closed loops, thereby reducing the pressure on the world's finite materials and natural resource depletion.

> **"The 1.5°C Paris Agreement target can only be achieved by combining renewable energy and energy efficiency with other approaches, including circular economy.**
>
> Ellen MacArthur Foundation

While there is a substantial body of knowledge on the circular economy in general, there is limited awareness and data available on infrastructure for the circular economy. The GI Hub, being the G20's dedicated infrastructure entity, was therefore asked by the Italian G20 Presidency to explore the topic of 'circular infrastructure'.

This paper is aimed at public and private sector practitioners looking to apply circular economy principles to infrastructure. This paper summarises the key findings from the GI Hub's work for the G20 on this topic, highlights the data-based evidence in support of circular infrastructure and suggests transition pathways for circular infrastructure.

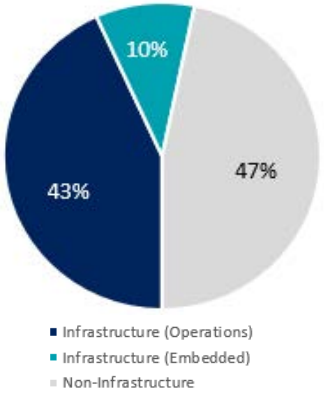
Circular infrastructure has clear potential to bring about long-term impact

The cross-section of infrastructure and the circular economy is what the GI Hub calls 'circular infrastructure'. Circular infrastructure comprises investments in transport, energy, social, communications, water, and waste sectors that:

1) Enable circular economy activity, and/or
2) Minimise material use across the infrastructure value chain in line with the 6R principles for circularity.[2]

The research and stakeholder consultation undertaken by the GI Hub identified two key benefits of circular infrastructure - mitigating climate change and mitigating the risk of resource scarcity. The GI Hub then undertook a high level analysis of infrastructure in line with these two benefits, finding that infrastructure consumes around 60% of the world's materials and **infrastructure contributes around 10% of global greenhouse gas (GHG) emissions through construction alone** (and 43% during operations). This indicates that better circularity in infrastructure has clear

Estimate of infrastructure's contribution to global GHG emissions (as % of total GHG, 2018)



[1] GI Hub (2021), *Transformative Outcomes Through Infrastructure*. Available here: https://transformativeinfratracker.gihub.org/overview/
[2] The 6R principles is an example of a 'hierarchy of action' for circularity and shows that the aim of the circular economy is to primarily refuse (1) or reduce (2) the raw materials entering the system. This is achieved by 'closing the loop' and maximising the amount of materials reused (3), repaired, refurbished (4), and recycled (5) to produce another product of equal or better quality than before. Residual materials are recovered (6) when they can no longer be reused or recycled. The remaining pathways for residuals are to extract the energy (e.g. through waste-to-energy) or to safely dispose them.

potential to bring about long-term impact in terms of climate change and resource scarcity[3].

Other key findings from this high-level analysis include:

- In terms of material consumption, non-metallic minerals (NMM) for construction is the largest proportion of global material consumption at around 48%. NMMs include materials like sand, gravel and clay which are used in very large quantities to produce concrete, asphalt and glass for infrastructure. This could be a focus area for circular infrastructure as its the foundation for construction, and extraction rates for NMMs are rapidly exceeding natural replenishment rates.
- In terms of GHG emissions, 10% of the 53% attributed to infrastructure is related to embodied emissions, or emissions from the material used and construction of infrastructure. In this context, the aim of circular infrastructure is to reduce the embodied emissions in infrastructure through innovative approaches to planning, design and construction.
- The production of steel and cement are the two largest contributors to infrastructure's embodied emissions.

Change is needed to advance circular infrastructure

Systemic change and innovation will need to be deployed at a global scale to advance the opportunities for circular infrastructure. To better understand the change required, the GI Hub developed four transition pathways, supported by 12 action areas, which offer a range of 'entry points' into applying circular infrastructure depending on specific capabilities and local contexts. The transition pathways are shown below and detailed in Section 3[4].

To kick-off the activity around these transition pathways, the GI Hub is undertaking action under the *Data-based evidence* pathway with the first action area of *Collecting data-based evidence on impact for circular infrastructure*. In November 2021, the GI Hub established the **Circular Economy in Infrastructure (CEI) Action Group** with aims to share data-centric knowledge and thought leadership on strategies for circular infrastructure. The CEI Action Group comprises a small, select group of global subject matter experts with access to deep knowledge and networks who are committed to enabling change in the sector. The outcomes from this Action Group will be shared publicly via GI Hub's website and social media channels.

The GI Hub welcomes expressions of interest from stakeholders to collaborate further on this topic, please contact GI Hub's Infrastructure Specialist, Daniel del Rio at daniel.delrio@gihub.org.

[3] This analysis only covers the emissions across the infrastructure value chain. There could be greater impact from circular infrastructure if the analysis was expanded to include the impact from infrastructure enabling circular economy activity (e.g. the recovery and recycling of materials more broadly). This could be an area for investigation as part of future work.
[4] The transition pathways and 12 suggested action areas are for information purposes only and are voluntary and non-binding for all stakeholders.

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1 Background and context

1.1 Rationale

Infrastructure is the backbone of the global economy. It comprises public assets that provide essential services to people and businesses through investments in the transport, energy, social, communications, water, and waste sectors.

Infrastructure is long-term in nature, and action taken now will determine a nation's economic, environmental and social trajectory decades into the future. However, the infrastructure landscape is changing rapidly. Climate change and population growth are adding unprecedented pressure and complexity to our ability to deliver 'infrastructure for 2050'. Many governments are also facing stretched fiscal budgets as a result of the COVID-19 pandemic, further limiting capacities for future infrastructure investment.

To address these challenges and to support continued economic and social prosperity, it is essential to begin transitioning infrastructure towards transformative outcomes[5]. Circular economy is one of the transformative outcomes that can be achieved through infrastructure and serves as the focus of this paper.

Purpose of this paper

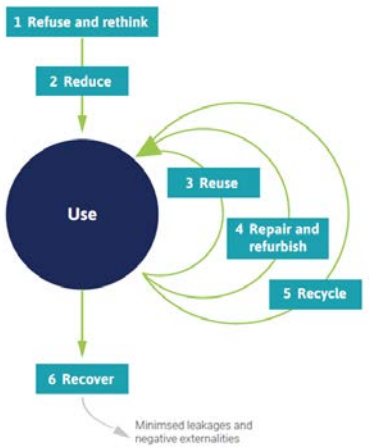
This paper is aimed at public and private sector practitioners looking to apply circular economy principles to infrastructure. This paper summarises the key findings from the GI Hub's work for the G20 Italian Presidency on this topic, highlights the data-based evidence in support of circular infrastructure and suggests transition pathways for circular infrastructure.

1.2 What is the circular economy?

A 'circular economy' is an economic system that organises production, supply and consumption of materials into closed loops, thereby reducing the pressure on the world's finite materials and natural resource depletion. The 6R principles[6] is an example of a 'hierarchy of action' for circularity and this is shown in Figure 1.

The 6R principles shows that the aim of the circular economy is to primarily refuse (1) or reduce (2) the raw materials entering the system. This is achieved by 'closing the loop' and maximising the amount of materials reused (3), repaired, refurbished (4), and recycled (5) to produce another product of equal or better quality than before. Residual materials are recovered (6) when they can no longer be reused or recycled. The remaining pathways for residuals are to extract the energy (e.g. through waste-to-energy) or to safely dispose them.

Figure 1: 6R Principles of circularity



[5] GI Hub (2021), *Transformative Outcomes Through Infrastructure.* Available here: https://transformativeinfratracker.gihub.org/overview/
[6] The circularity diagram for the 6R principles was adapted from PBL Netherlands Environmental Assessment Agency (2019). *Outline of the Circular Economy.* PBL Netherlands Environmental Assessment Agency. Available at: https://www.pbl.nl/sites/default/files/downloads/pbl-2019-outline-of-the-circular-economy-3633.pdf

There is a substantial body of knowledge across the industry on the circular economy in general, however a key finding from the GI Hub's research was that there is limited awareness and data available on infrastructure for the circular economy. The GI Hub, being the G20's dedicated infrastructure entity, was therefore asked by the Italian G20 Presidency to explore the topic of 'circular infrastructure'. The GI Hub undertook an extensive scan of existing literature and consulted with over 150 stakeholders globally[7] to produce the data insights and transition pathways detailed in this paper.

2 Impact from circular infrastructure

The cross-section of infrastructure and the circular economy is what the GI Hub calls 'circular infrastructure'**.** Circular infrastructure comprises investments in transport, energy, social, communications, water, and waste sectors that:

1. Enable circular economy activity, and/or
2. Minimise material use across the infrastructure value chain in line with the 6R principles for circularity.

Some examples of circular infrastructure include:

- Infrastructure that reduces or forgoes the demand for materials in construction, such as repurposed infrastructure
- Infrastructure that replaces finite materials with renewable materials, such as green and nature-based solutions
- Infrastructure that enables the recovery and recycling of materials, such as waste collection and recycling facilities, sharing networks, and reverse logistics.
- Digital infrastructure or infrastructure technology (InfraTech) that enables connectivity, automation and optimisation in line with circular economy principles across the value chain.

The research and stakeholder consultation undertaken by the GI Hub identified two key benefits of circular infrastructure. These are **1) mitigating climate change** and **2) mitigating the risk of resource scarcity**.

1. Mitigating climate change

The 1.5°C Paris Agreement target can only be achieved by combining efforts on renewable energy and energy efficiency with other approaches, including circular economy.[8] The GI Hub analysis (detailed later in this paper) shows that infrastructure contributes 53% of global GHG emissions. Around 10% of this relates to the embodied emissions of infrastructure, the component directly linked to circularity. Circular infrastructure therefore has potential to mitigate climate change.

[7] These interviewees represented international organisations, multilateral development banks, infrastructure bodies, government line agencies, infrastructure practitioners, non-governmental organisations (NGOs), and financiers. Of those interviewed, 46 people (29%) represented governments, 88 people (56%) represented private sector and 22 people (14%) represented NGOs.

[8] Ellen MacArthur Foundation (2019). Completing the picture: How the circular economy tackles climate change. Ellen Macarthur Foundation. Available at: https://www.ellenmacarthurfoundation.org/assets/downloads/Completing_The_Picture_How_The_Circular_Economy-_Tackles_Climate_Change_V3_26_September.pdf

2. Mitigating the risk of resource scarcity

Circularity can reduce supply chain risks and short-term supply shortages by requiring less raw material input and establishing a more local supply of secondary materials. The GI Hub analysis has shown that infrastructure consumes around 63% of the world's materials, and the G20 share of this consumption is around 80%[9]. Embedding circularity principles into the infrastructure lifecycle has the potential to reduce the need for raw material input, thereby mitigating the risk of resource scarcity in the future. This could offer some security of supply for construction and mitigate a rise in the energy intensity related to the extraction of scarce materials.

It should also be acknowledged that **minimising waste disposal and pollution** appeared in the research as another driver for the transition to circular infrastructure. However, while more sustainable waste management and recycling infrastructure can be an important and necessary part of a transition to a circular economy, waste and recycling is not enough on its own to drive circular economy outcomes[10]. A recent study quotes that 80% of a product's environmental impact is determined during the design phase,[11] indicating that a transition to a circular economy requires a transformation of the entire operating system, not just at the end-of-life.

The circular economy can also provide compelling **economic, environmental and social co-benefits**. It has been estimated that by 2030, globally, the circular economy will create 65 million new jobs[12] or 18 million net jobs[13]. Circular economy also has potential for environmental benefits (beyond mitigation of GHG emissions) by encouraging 'regenerative design'. Regenerative design enables a product to have a positive (rather than a negative or neutral) impact on the environment.[14]

The GI Hub has also seen trends in circularity featuring in COVID-related stimulus, therefore circularity also has the potential to play a role in facilitating economic recovery from the pandemic[15].

[9] Data notes: Employing a population, urbanisation and economic growth scenario based on the Socio-Economic Pathways 2 of the IPCC 'Middle of the Road Scenario'; Materials for infrastructure include iron and steel, concrete, bricks, non-ferrous metals, and structural timber; In 2020, infrastructure is expected to consume 52% of the world's resources. This is expected to increase to 54% in 2060. Other major contributors to global material usage include fossil fuel extraction and biomass.

[10] Hanemaaijer et al (2021). *Netherlands Integral Circular Economy Report 2021*. Available at: https://www.pbl.nl/sites/default/files/downloads/2021-pbl-icer2021_english_summary-4228.pdf

[11] Ellen Macarthur Foundation (2021). *Recycling and the circular economy: what's the difference?* Available at: https://ellenmacarthurfoundation.org/articles/recycling-and-the-circular-economy-whats-the-difference

[12] Global Commission in the Economy and Climate (2018). *The New Climate Economy*. Available at: https://newclimateeconomy.report/2018/executive-summary/

[13] IISD & SITRA (2020). *Effects of the Circular Economy on Jobs.* Available at: https://www.iisd.org/system/files/2020-12/circular-economy-jobs.pdf

[14] Globe Advisors (2012). *British Columbia's Green Building & Energy Efficiency Sector*. Available at: http://globeadvisors.ca/wp-content/uploads/2015/06/Green-Building.pdf

[15] GI Hub 2021, *Transformative Outcomes Through Infrastructure.* Available here: https://transformativeinfratracker.gihub.org/overview/

2.1 Circular infrastructure to mitigate climate change

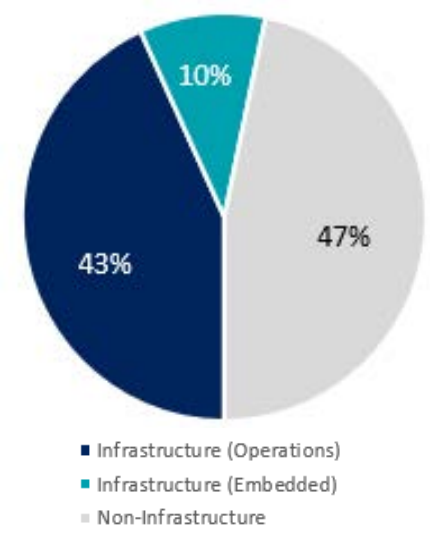
The GI Hub undertook a high-level analysis of GHG emissions in infrastructure to identify the areas of circular infrastructure that could have the highest impact on climate-related outcomes.

Emissions from infrastructure was segregated into **operational emissions** (from the use of infrastructure) and **embodied emissions** (from material use and construction of infrastructure). The aim of circular infrastructure is to reduce the embodied emissions of infrastructure through innovative approaches in planning, design and construction. However, circular infrastructure can also have a secondary impact on operational emissions as a result of material innovations and efficiencies.

The key finding from the high-level analysis on GHG emissions (as shown in Figure 2) is that infrastructure contributes more than half of global GHG emissions. Furthermore:

- 43% of global GHG emissions relates to infrastructure's **operational emissions** (e.g. electricity use in buildings or emissions from vehicles on roads)
- 10% of global GHG emissions relates to infrastructure's **embodied emissions** (e.g. emissions from the manufacturing of construction materials and the construction process)

Figure 2: Estimate of infrastructure's contribution to global GHG emissions (as % of total GHG, 2018)



An overview of our definitions for operational and embodied emissions is shown in the infrastructure value chain diagram in Figure 3. Figure 4 to Figure 6 provide a further breakdown of infrastructure-related emissions in line with the value chain. **The key take-away is that the production of steel and cement are the largest contributors to infrastructure's embodied emissions.**

Note that this analysis only covers the emissions across the infrastructure value chain. There could be greater impact from circular infrastructure if the analysis was expanded to include the impact from infrastructure enabling circular economy activity (e.g. the recovery and recycling of materials more broadly). This could be an area for investigation as part of future work.

Figure 3: Operational and embodied emissions in the context of the infrastructure value chain

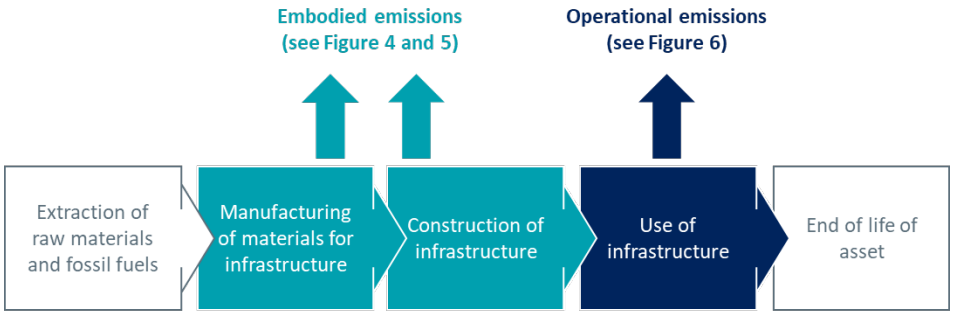


Figure 4: Operational emissions - use of infrastructure (as % of infrastructure emissions)

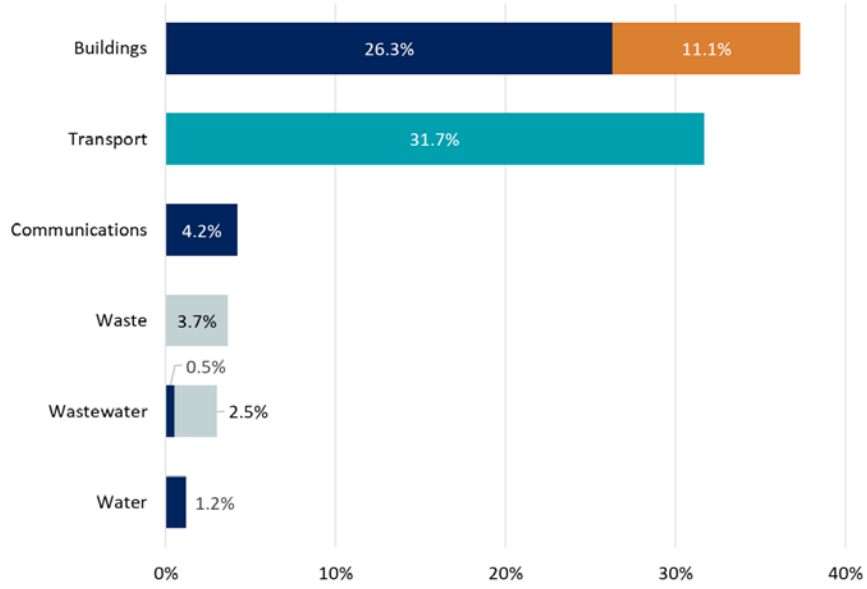


Figure 5: Embodied emissions - manufacturing of materials for infrastructure (as % of infrastructure emissions)

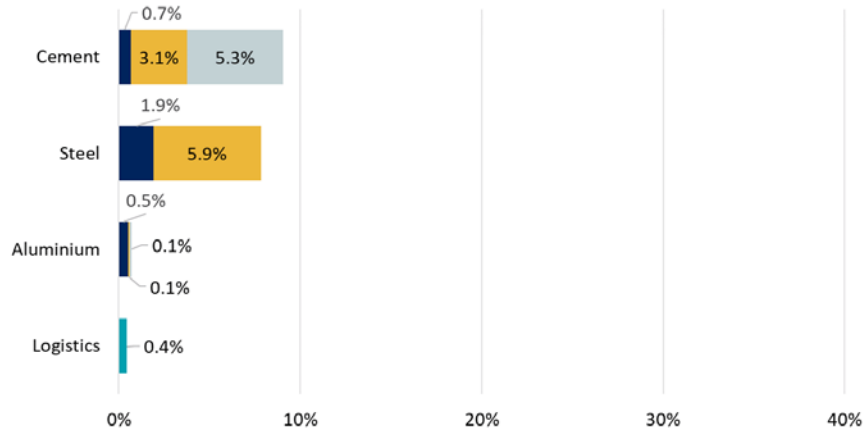


Figure 6: Embodied emissions - construction of infrastructure (as % of infrastructure emissions)

Opportunities for circular infrastructure in mitigating climate change

Renewable electricity is only part of the equation in mitigating climate change in the context of infrastructure emissions. Based on the GI Hub analysis (Figures 4 to 6), a move to renewable generation can potentially address up to 32% of electricity / heat emissions from the operations of infrastructure. In addition, a transition to electric vehicles can address another 32% emissions from the transport sector. The remainder of emissions can be addressed through other low carbon approaches, including the adoption of circular economy principles across the infrastructure value chain to reduce embodied emissions, which is can potentially address up to 19% of total infrastructure emissions.

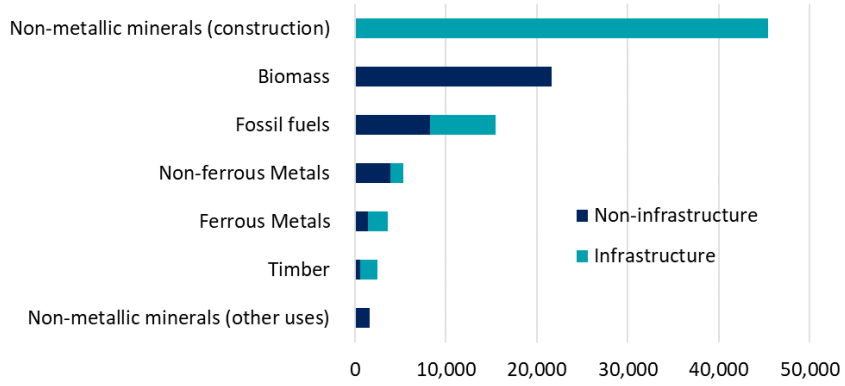
Cement and steel manufacturing are the two largest contributors to infrastructure's embodied emissions (see Figure 5), therefore there is clear potential in adopting 'green' cement and steel solutions e.g. using hydrogen as an alternative fuel for manufacturing. It is important to note that a relatively small proportion of these embodied emissions is related to electricity / heat, therefore a move to renewable electricity can only achieve so much in this space. Other opportunities include increased recycling and repurposing of materials (particularly cement and steel) and the broader adoption of circular principles across the infrastructure lifecycle in accordance with the 6R framework. This can include innovative policies and approaches to planning, financing and design in line with the impactful areas as highlighted by the analysis.

2.2 Circular infrastructure to mitigate the risk of resource scarcity

It is estimated that the world consumed around 95 billion tonnes of materials in 2018, which can be classified into seven different types: biomass, timber, ferrous metals, non-ferrous metals, non-metallic minerals, and fossil fuels[16].

The GI Hub undertook a high-level analysis of the global material consumption that is relevant to infrastructure and found that infrastructure's consumption was around 60% of global consumption for 2018. The breakdown by material type is shown in Figure 7.

Figure 7: Breakdown of material demand globally (in million tonnes per year, 2018)



Non-metallic minerals (NMM) for construction is the largest proportion of global material consumption. NMMs include materials like sand, gravel and clay which are used in very large quantities to produce concrete, asphalt and glass for infrastructure. Extraction rates for NMMs are exceeding natural replenishment rates, and illegal extraction is threatening natural ecosystems and biodiversity[17]. NMMs, being the foundation of materials for infrastructure, mitigating scarcity from these materials should be an objective under circular infrastructure.

Another crucial issue is the rapidly increasing demand for materials that enable the clean energy transition – in particular, non-ferrous metals such as aluminum, lithium, copper, and cobalt – which are key components of renewables and electric

[16] IRP (2019). *Global Resources Outlook 2019: Natural Resources for the Future We Want*. United Nations Environment Programme. Available at: https://www.resourcepanel.org/reports/global-resources-outlook
[17] UNEP (2019). *Sand and Sustainability.* GRID-Geneva, UNEP, Geneva, Switzerland.

vehicles. Many of these metals are used in low volumes to date (and as such have a low carbon footprint by comparison), but it is anticipated that these materials could become scarce over the next two decades, leading to shortages of supply and an increase in the energy needed to extract them.

3 How to advance the transition to circular infrastructure

The evidence shows that circular infrastructure has the potential to address global challenges. To advance the opportunities for circular infrastructure, systemic change and innovation will need to be deployed at a global scale.

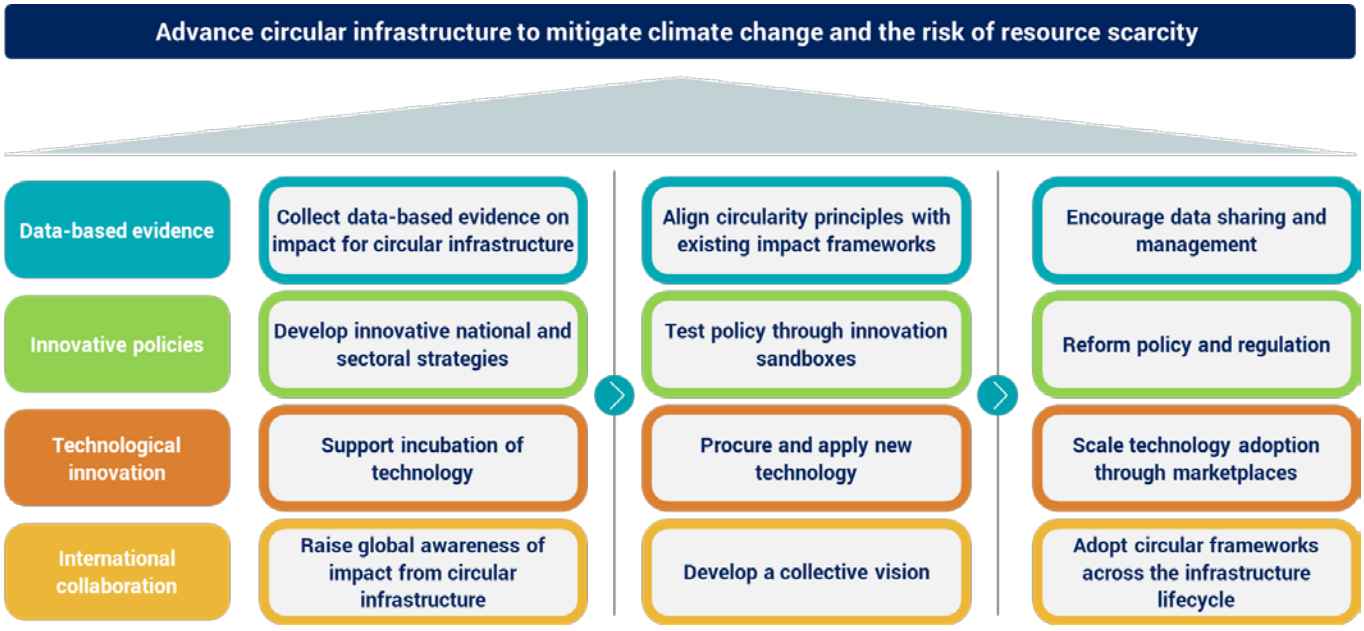
To better understand the change that is needed, the GI Hub (through research and stakeholder consultation) developed four transition pathways and 12 suggested action areas which offer a range of 'entry points' into applying circular infrastructure depending on specific capabilities and local contexts. While these transition pathways are shown in a linear fashion in Figure 8 (i.e. progression from left from right), in reality these pathways are interconnected and interdependent, and certain actions will need to be undertaken in parallel to others.

These pathways were developed with public sector leadership in mind; however, collaboration with the private sector, multilateral development banks and/or international organisations will be essential to their success.

Call to Action

The GI Hub aims to continue gathering data and insights into effective or innovative circular economy practices under each transition pathway. We welcome submissions of examples that may be considered best practice or innovative. Examples can be submitted on GI Hub's website here: https://www.gihub.org/infrastructure-and-the-circular-economy/.

Figure 8: Transition pathways to advance circular infrastructure



Further details around each of these 12 suggested action areas are outlined in the table below:

Table 1: Description of the 12 action areas for circular infrastructure

Data-based evidence	
Transitions start with raising awareness through data-based evidence on the impact of circularity, which can go a long way to making the case for circular infrastructure among policymakers and practitioners.	
Collect data-based evidence on impact for circular infrastructure	Gather and aggregate data on circular infrastructure to help stakeholders better understand how others define circular infrastructure and its likely impact.
Align circularity principles with existing impact frameworks	Aligning circularity principles with impact frameworks to make more informed circular infrastructure decisions. Voluntarily disclosing data on circularity can also be integrated with wider sustainability and climate action disclosure frameworks.
Encourage data sharing and management	Widespread data sharing results in an internationally accessible pool of data and impact frameworks to help practitioners assess plans and projects for circular infrastructure. The data sharing helps establish transparency and accountability and can enable the assessment of progress against targets.
Innovative policies	
Data-based evidence, as outlined in the previous step, helps to build the case for change. This could lead to the development of innovative policies (including strategies) for circular infrastructure. A strategy sets a clear direction through a common vision, as well as a set of well-defined objectives. This leads to a list of prioritised initiatives to guide policymakers and practitioners on key areas to focus on.	
Develop innovative national and sectoral strategies	Raising awareness of innovative approaches around policy could help industry develop strategies for circular infrastructure. It would send a signal of commitment to investors, encouraging further investment into circular infrastructure.
Test policy through innovation sandboxes	Some economies have started developing new policies for circularity and they are being tried and tested through 'innovation sandboxes' (e.g. through city transformation programs). Innovation sandboxes are being used internationally to examine real (and perceived) barriers and impacts of new policies through safe, real-world trials.
Reform policy and regulation	Data on the economic case for circular infrastructure and results from policy innovation sandboxes would provide the knowledge base to reform policy and regulation. In turn this would support widespread adoption of circularity by changing the behaviour, culture and capability of the industry, and incentivise further investment into this space.
Technological innovation	
Technological innovation is critical to the circular economy transition as it provides the infrastructure solutions that enable the integration of circularity principles across the infrastructure lifecycle. Effective models for financing and delivering technological innovation at scale is needed.	
Support incubation of technology	Circular infrastructure technologies are already being developed by the private sector; albeit on a sporadic and ad-hoc basis. There is appetite to scale these

	early stage opportunities; however, more is needed to incentivise incubation, for example through direct fiscal support, dedicated funds or blended finance.[18]
Procure and apply new technology	Governments can assist through the aggregation of market demand for circular infrastructure solutions and by being early adopters of technologies across their infrastructure portfolios.
Scale technology adoption through marketplaces	Creation of an ecosystem by aggregating demand and sharing data from early deployments would help establish marketplaces for technological solutions.
Collaboration	
International collaborative action can boost outcomes from all the above transition pathways by facilitating better shared knowledge and experiences and work towards a common goal. Collaboration can speed up technological innovation, ensure robust national policy and effective sharing of results of interventions more broadly.	
Raise global awareness of impact from circular infrastructure	Raising awareness of the impact from circular infrastructure could trigger actions towards circular infrastructure. This could happen through an action group comprised of public and private stakeholders.
Develop a collective vision	Learnings from data initiatives, innovative policies and technology demonstrations could lead to more informed views of the opportunities for circular infrastructure. This information can be used to develop a collective international vision– a role that could be taken on by the G20.
Adopt circular frameworks across the infrastructure lifecycle	The International Monetary Fund[19] has shown that a 'synchronised' approach to infrastructure investment across the G20 can achieve two-thirds more growth at the same cost than if a country acts in isolation. International coordination in the implementation of circular infrastructure could therefore amplify its impact.

4 Conclusions and next steps

Circular infrastructure is a solution to the world's major challenges. Research suggests that the 1.5°C Paris Agreement target can only be achieved by combining renewable energy and energy efficiency with other approaches, including circular economy. For this work, the cross-section of infrastructure and the circular economy is what the GI Hub calls 'circular infrastructure'. Circular infrastructure comprises investments in transport, energy, social, communications, water, and waste sectors that:

- Enable circular economy activity, and/or
- Minimise material use across the infrastructure value chain in line with the 6R principles for circularity.

The research and stakeholder consultation undertaken by the GI Hub identified two main drivers for circular infrastructure. These are mitigating climate change and mitigating the risk of resource scarcity. The GI Hub undertook a high-level analysis of infrastructure in line with these two drivers, which found that **infrastructure consumes around 60% of the world's materials and contributes around 53% of global GHG emissions.** This indicates that better circularity in infrastructure has clear potential to bring about long-term impact in terms of climate change and resource scarcity.

18 Blended finance in this context is concessional donor funds that are used to mitigate and reduce certain risks in order to mobilise private investments in certain environments, as referenced in International Finance Corporation's Blended Concessional Finance publication. Available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/bf

[19] International Monetary Fund (2020) How a Collective Infrastructure Push Will Boost Global Growth. International Monetary Fund. Available at: https://blogs.imf.org/2020/11/24/how-a-collective-infrastructure-push-will-boost-global-growth/

To advance the opportunities for circular infrastructure, systemic change and innovation will need to be deployed at a global scale. The GI Hub developed four transition pathways, supported by 12 action areas[20], which offer a range of 'entry points' into applying circular infrastructure depending on specific capabilities and local contexts.

Transition pathways will differ by country and by organisation and will be influenced by a range of economic and demographic factors. This presents both a challenge and an opportunity for policymakers and practitioners. The challenge is that a uniform approach to circularity will not be possible and they will need to be adapted to specific local circumstances.

This does, however, present a set of opportunities for industry. To address these opportunities and to kick-off the activity around these transition pathways, the GI Hub is undertaking action under the *Data-based evidence* pathway with the first action area of *Collecting data-based evidence on impact for circular infrastructure*. The GI Hub established the Circular Economy in Infrastructure (CEI) Action Group to share data-centric knowledge and thought leadership on strategies for circular infrastructure. The CEI Action Group comprises a small, select group of global subject matter experts globally, with access to deep knowledge and networks, who are committed to enabling change in the sector. The outcomes from this Action Group will be shared publicly via GI Hub's website and social media channels.

What's next?

The GI Hub invites further collaboration on our circular economy work. We see this as just the beginning of a journey in the transition towards a circular economy. The aspiration is to continue the conversation in collaboration with international organisations and industry stakeholders, and to better understand and agree on priority areas of focus.

The GI Hub will hold the inaugural Circular Economy in Infrastructure (CEI) Action Group meeting on 23 November 2021. The near-term objective of this group is to develop a set of strategic objectives for circular infrastructure, build the pool of data to strengthen the evidence for change and to illustrate the potential of circular infrastructure to address material usage and global GHG emissions.

If you would like to get involved, please contact GI Hub's Infrastructure Specialist, Daniel del Rio at daniel.delrio@gihub.org.

[20] The transition pathways and 12 suggested action areas are for information purposes only and are voluntary and non-binding for all stakeholders

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