

Industrial Decarbonization

Ara Infrastructure's view on a
generational investment opportunity

Climate risk is investment risk

We believe the transition to net zero represents a generational investment opportunity.

Fifty percent of all CO₂ emissions have occurred in the past 25 years, exceeding the mass of all humans and all man-made structures.¹ Higher temperatures increase risk of fire, result in changes to precipitation patterns (drought and flooding), decrease biodiversity and have negative social implications on food systems, work, and lifestyle.

According to Munich Re, insurers had to cover \$120 billion for natural catastrophes in 2022. North America once again dominated the loss statistics due to the devastation caused by Hurricane Ian. In 2022 we also saw extreme summer weather in Europe – drought, heat, and hail. A recent study has shown that taking no action to combat the impact of climate change will result in an 18% loss in global output by 2050.² This poses a significant risk to investment portfolios.

The transition to net zero requires a fundamental re-wiring of our economies. Global spending on infrastructure assets to support the low-carbon economy is expected to total \$6 - \$10 trillion p.a. through 2050. In North America and Europe, the annual incremental spending need is expected to be \$3.4 trillion per year, or ~\$95 trillion in total.³ At Ara Partners we believe that investing in companies and projects that are driving the path to net zero, not just navigating it, represents a generational investment opportunity for our clients.

¹ "The Uninhabitable Earth", David Wallace Wells (2019)

² Swiss Re Institute "Climate Economics Interests stress tests" (April 2021)

³ Multiple sources, including McKinsey "Sustainable Infrastructure" (November 2022)

Inaction is not an option, the time is now

In 2015, the European Union and 193 other countries signed the Paris Agreement with the primary objective to limit the global temperature increase in this century to 2°C above preindustrial levels, while aiming for an increase of no more than 1.5°C. To achieve the 1.5°C target, net zero global emissions must be reached by 2050.⁴

Since this landmark agreement, policies and laws addressing climate change mitigation have consistently expanded. The share of countries committed to net zero represents 90% of global emissions while companies setting science-based emissions commitments or targets have increased by ~8x over the last 5 years from just over 300 to more than 2,400.⁵

Yet, the 6th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), completed in March 2023, finds that despite progress in policies and legislation around climate mitigation since the previous such report in 2014, it is “likely that warming will exceed 1.5°C during the 21st century.”

GLOBAL CO₂ EMISSIONS SCENARIOS: NET ZERO AND REFERENCE CASE

Emissions must be reduced by 40% by 2030 to reach the 1.5°C pathway by 2050

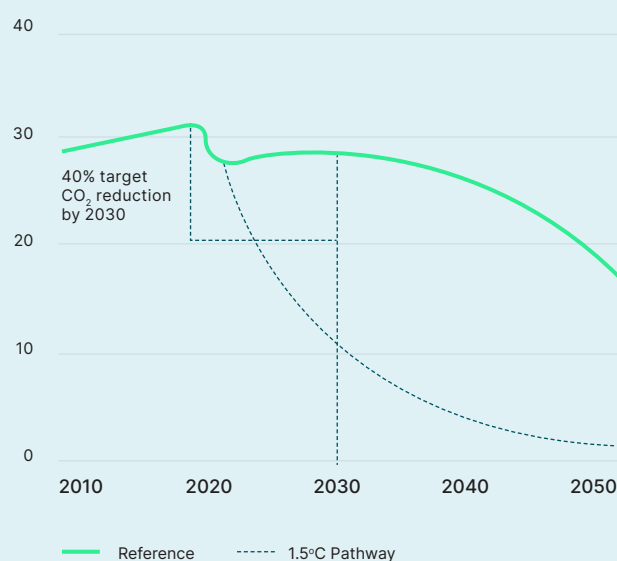


Figure 1: Global CO₂ Emissions Scenarios: Net Zero and Reference Case⁶

⁴ “Climate Change 2022: Impacts, Adaptation, and Vulnerability” (February 2022). Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)

⁵ Science Based Targets Initiative dashboard (referenced as of March 2023)

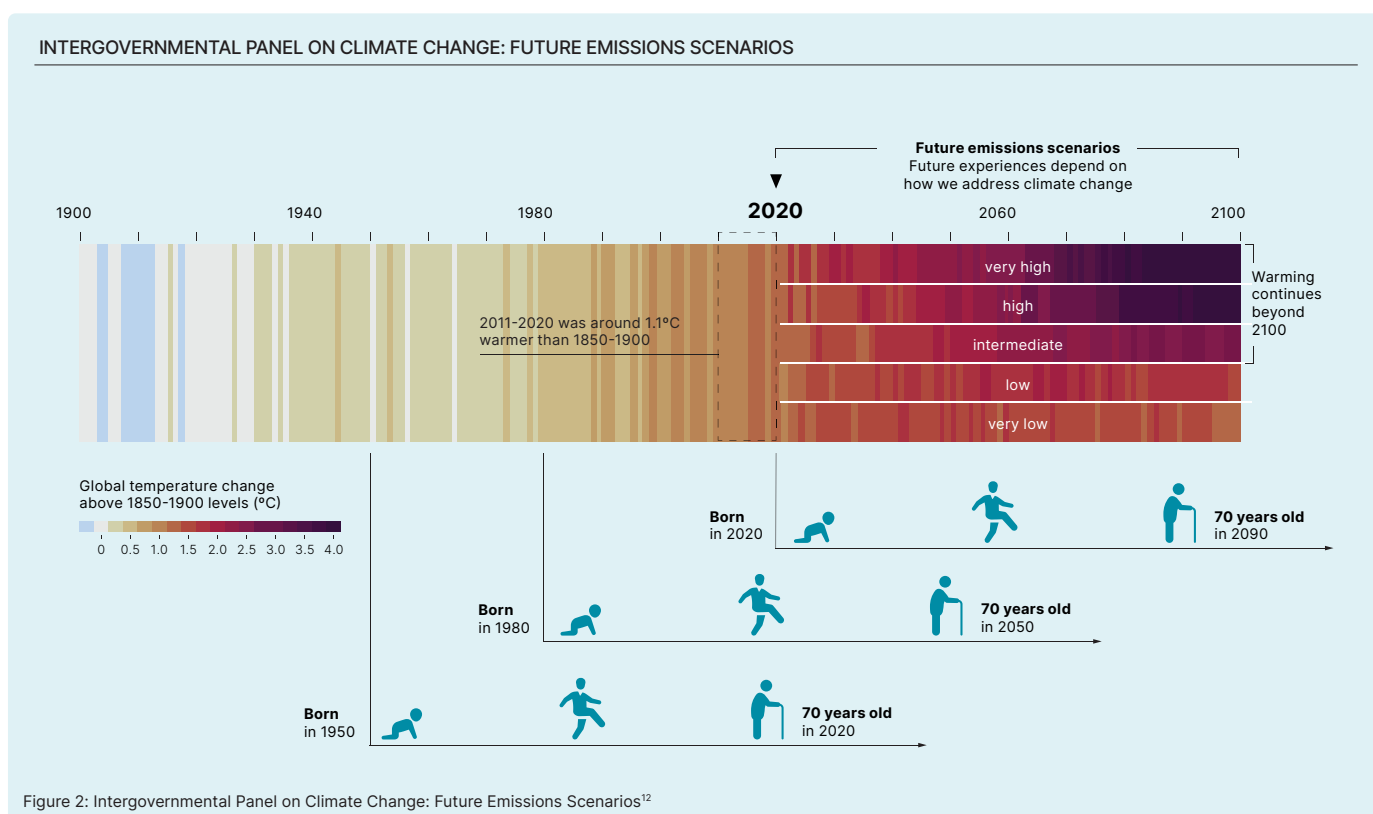
⁶ International Energy Agency “Net Zero by 2050: A roadmap for the Global Energy Sector” (October 2021)

Inaction is not an option, the time is now

At the current rate of global emissions, every three years of emissions, or ~150 gigatons, are enough to raise global temperatures by 0.1°C. At this rate, the entire carbon budget to achieve the 1.5°C target will be used up by 2030.⁷ The U.S. and Europe are the 2nd and 3rd largest emitters globally, together accounting for 18% of emissions⁸ and the U.S. has the highest per capital emissions at 1,265 tons.⁹ The U.S. continues to fall behind in its efforts to meet its target set under the Paris Agreement of reducing GHG emissions at least 50% below 2005 levels by 2030. In 2022, emissions were only 15.5%

below 2005 levels.¹⁰ In Europe, meaningful progress has been made with a reduction to GHG emissions by ~32% between 1990 and 2020, but it is expected Europe will fall short of its target of a 55% reduction by 2030.¹¹

Per the March IPCC report, “There is a rapidly closing window of opportunity to secure a liveable and sustainable future for all”. The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near term.



⁷ Bloomberg New Energy Finance (BNEF) “New Energy Outlook” (November 2022). 2021 global emissions of 49.5 gigatons CO₂e per Rhodium Group

⁸ Rhodium Group “Global Greenhouse Gas Emissions” (December 2022)

⁹ Energy Transmissions Commission (ETC) “Degree of Urgency” (November 2022)

¹⁰ Rhodium Group “Preliminary U.S. Greenhouse Gas Emissions for 2022” (January 2023)

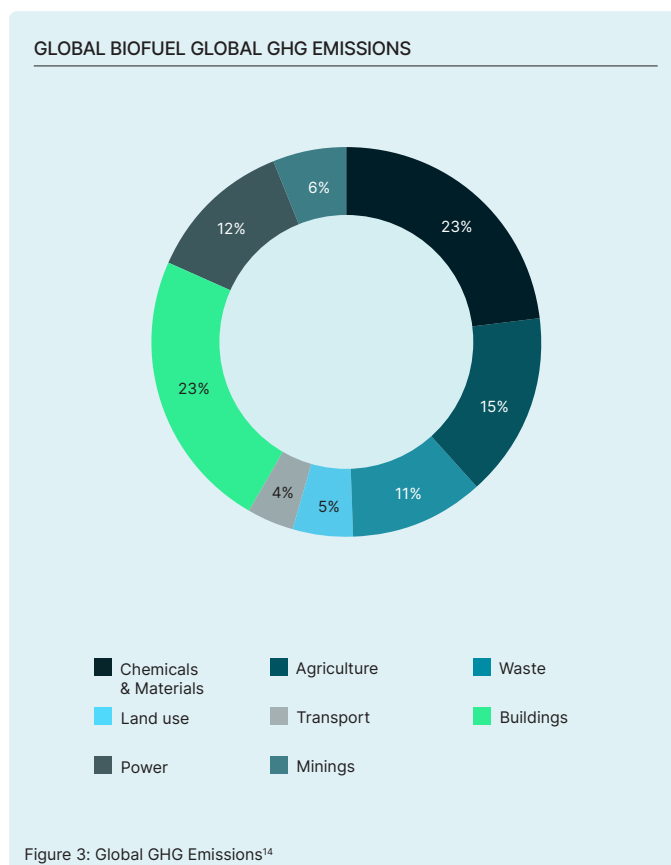
¹¹ European Environment Agency greenhouse gas database (April 2021)

¹² Intergovernmental Panel on Climate Change (IPCC), “6th Assessment Report” (March 2023)

The Industrial Sector has been overlooked – investment need and opportunity extends well beyond electrification

Decarbonization efforts to date have largely focused on the 23% of global emissions coming from power generation with over 90% of climate-focused capital investment directed towards wind, solar, battery storage, and EVs.¹³ By contrast, the industrial economy, which accounts for most building blocks of daily human life, contributes 59% of global emissions.¹⁴ The industrial sector constitutes the “world of made things”, which includes the production of materials, consumer goods and food products; the transportation of goods and people; the construction of man-made structures; and the processing of waste. The chart below illustrates sources of global emissions, which totals nearly 50 gigatons of CO₂e – out of which ~30 gigatons are attributable to the industrial space.

Less than \$700 billion of climate-focused capital has been deployed in the last two decades towards the industrial sector out of a total of \$6.7 trillion invested globally, according to BNEF. In infrastructure specifically, approximately \$41 billion of climate-focused infrastructure equity capital has been raised in the last 3 years, and 93% is focused on electrification including wind, solar, battery storage, and EVs.¹⁵ While continued investment in the “green electron” is critical, some sectors cannot easily be electrified. In particular, where high amounts of energy are required, batteries will not be sufficient to store and transport energy. Heavy duty transport, shipping, and aviation all require fuel in a liquid or gaseous form, as the weight of batteries makes it unsuitable for these applications. Many other sectors such as the steel and cement manufacturing value chains cannot rely solely on green electrons and will require “green molecules” to transition to the low-carbon economy.



¹³ Bloomberg New Energy Finance

¹⁴ McKinsey “The Net Zero Transition” (January 2022)

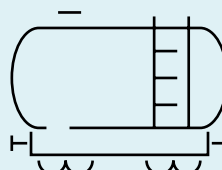
¹⁵ Preqin. Data as of February 2023

We see an attractive infrastructure investment opportunity within the Industrial segment

Even though the transition to net-zero will rely on new technologies and infrastructure to replace carbon-intensive assets, 50% of all in-ground infrastructure in 2050 is either already built, under construction, or already planned.¹⁶ As such, Ara Infrastructure believes that a dual approach to building new and repurposing legacy assets represents that fastest and most economical path to net-zero.

Ara Infrastructure focuses on sub-segments within the industrial sector that can be materially decarbonized in the near-term with (i) proven, commercial-scale technologies and (ii) business models underpinned by contracted, fee-based revenue which are not exposed to commodity prices. We have identified four principal investment themes where we believe these compelling investment opportunities are concentrated – Biofuels logistics, Landfill avoidance infrastructure, Hydrogen/ammonia production and logistics, and Low-carbon networks. Investment opportunities across these themes offer the combination of (i) significant growth potential to meet Ara Infrastructure's 15%+ IRR / 2x+ MOIC target returns,¹⁷ coupled with (ii) established technologies, business models and markets to help underpin strong downside protection through creditworthy revenue contracts and visibility to 4-6% current yield.

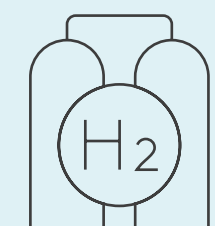
PRINCIPAL INVESTMENT THEMES



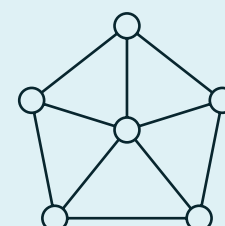
Biofuels logistics



Landfill avoidance structure



Hydrogen/Ammonia production



Low-carbon networks

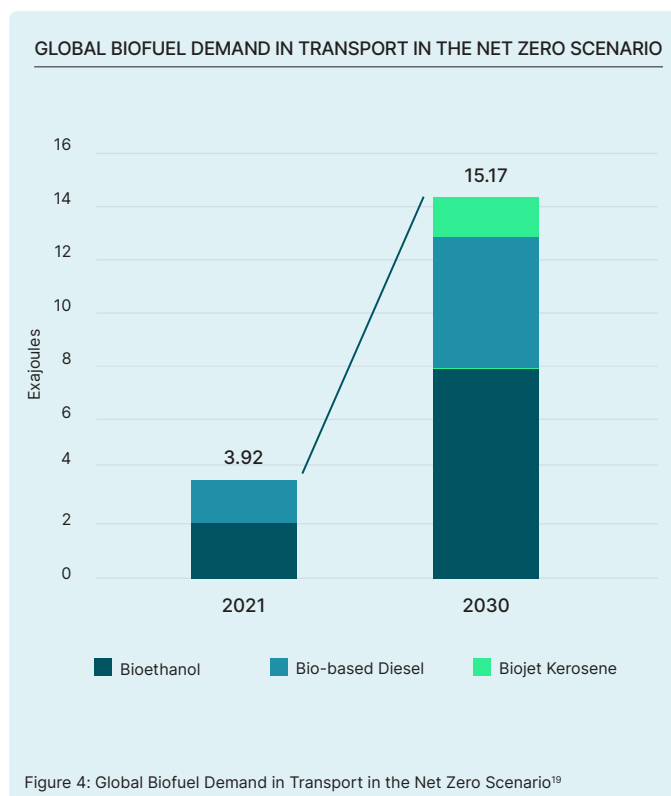
¹⁶ Global Infrastructure Hub "What is the path to net zero infrastructure" (July 2021)

¹⁷ For illustrative purposes only. Targeted returns reflect various assumptions (e.g., forecasted EBITDA, projected exit year, equity invested, valuation multiples) that are subject to change; actual returns may be substantially lower. No guarantee or assurance can be given that such targeted returns will be achieved or that the assumptions underlying such returns will prove to be accurate. The actual returns on unrealized investments may differ from the targeted returns indicated herein. These calculations are targets and do not represent the IRR or MOIC to any investor, and the assumptions described may not be indicative of any investor's actual experience. Please see the disclaimer at the end of the presentation for important information regarding the calculation of unrealized values, IRRs and multiples. Target net MOIC is modeled at 1.6x and target net IRR is modeled at 13%.

Biofuels logistics

Biofuels are low-carbon fuels produced from waste, residues, and dedicated crops that can reduce emissions by up to 90% compared to conventional hydrocarbon fuels according to the EIA. Many biofuels are either chemically identical or highly compatible with conventional hydrocarbon fuels; meaning that biofuels can be readily blended or dropped into the existing hydrocarbon fuel streams. Under the IEA's Net Zero scenario, biofuel production is projected to nearly quadruple by 2030, with policies in more than 80 countries supporting continued demand growth.¹⁸

To facilitate this growth, fuel logistics infrastructure in Europe and North America must be re-tooled and repurposed to account for changing product flows, a greater number of fuel grades, and blending infrastructure to facilitate the combination of biofuels into the broader fuels stream. These projects constitute attractive infrastructure investment opportunities because (i) fuel logistics assets such as pipelines and terminals are well proven and pose no technology risk, (ii) these projects are often backed by large, blue-chip energy and industrial companies that are willing to enter into long-term fee-based offtake contracts, and (iii) logistics assets do not typically have any revenue exposure to commodity prices that may be subject to volatility.



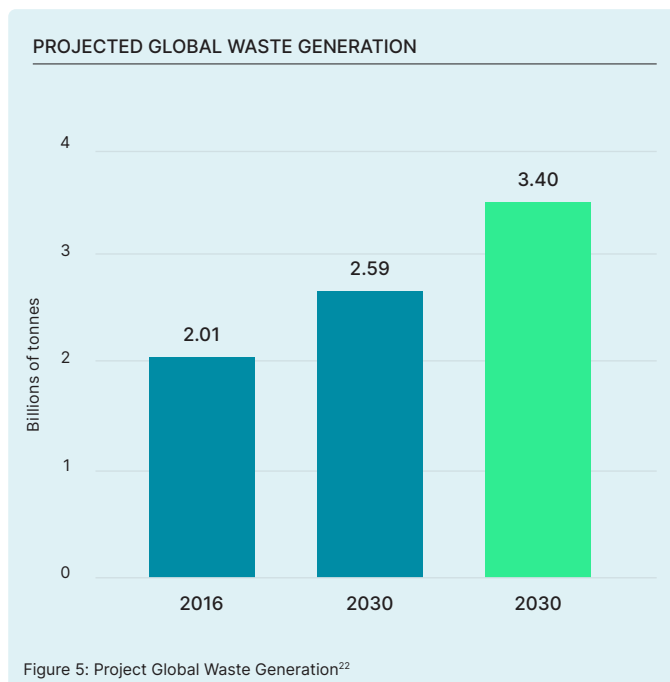
¹⁸ International Energy Agency "Biofuels Outlook" (September 2022)

¹⁹ For illustrative purposes only. Targeted returns reflect various assumptions (e.g., forecasted EBITDA, projected exit year, equity invested, valuation multiples) that are subject to change; actual returns may be substantially lower. No guarantee or assurance can be given that such targeted returns will be achieved or that the assumptions underlying such returns will prove to be accurate. The actual returns on unrealized investments may differ from the targeted returns indicated herein. These calculations are targets and do not represent the IRR or MOIC to any investor, and the assumptions described may not be indicative of any investor's actual experience. Please see the disclaimer at the end of the presentation for important information regarding the calculation of unrealized values, IRRs and multiples. Target net MOIC is modeled at 1.6x and target net IRR is modeled at 13%.

Landfill avoidance infrastructure

Over 2 billion tons of solid waste is generated each year, which is expected to grow by ~70% by 2050 to ~3.4 billion tons. While nearly all waste is collected in Europe and North America, only ~56% of waste is landfilled or composted / recycled globally.²⁰ Just 32% and 46% of waste is recycled or used as compost in the U.S. and Europe, respectively.²¹ Waste contributes 4% of global emissions, in large part due to methane emissions which are 80 times more potent than CO₂. The diversion of waste streams from landfills to alternative uses can have a disproportionate decarbonization impact through the compounding effect of avoided landfill methane emissions and the incremental carbon savings stemming from the alternative use case. For example, landfill gas collection infrastructure harnesses biogas that can be injected into the natural gas grid to reduce the need for conventionally produced natural gas.

Similarly, engineered fuel facilities divert pre-consumer industrial waste streams to create alternative fuels for difficult-to-decarbonize segments of industry such as cement and lime manufacturing. The cement industry accounts for ~6% of global emissions. With low-carbon cement technologies still years away from being scalable and competitive, engineered fuels offer a proven method to substantially decarbonize cement in the immediate future. Both landfill gas collection infrastructure and engineered fuel facilities are fully proven at commercial scale and attract offtake contracts from large, creditworthy energy suppliers and industrial manufacturers. Across many markets, especially in Europe, there is a movement towards the 'circular economy' a concept companies are adopting to meet regulatory requirements as well as internal sustainability targets.



²⁰World Bank "What a Waste 2.0" (December 2018)

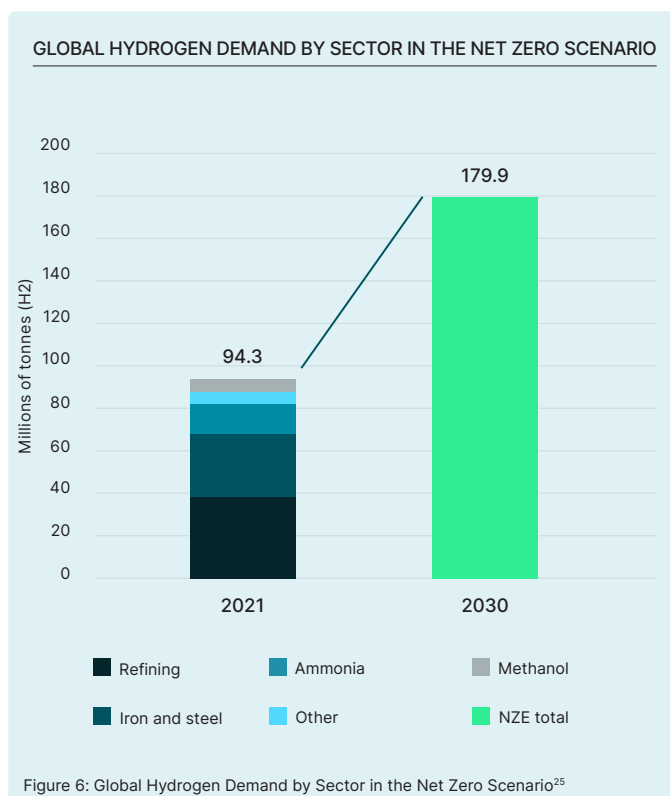
²¹U.S. Environmental Protection Agency "National Overview: Facts and Figures on Materials, Wastes and Recycling" (2018). European Environment Agency "Waste recycling in Europe" (November 2022)

²²International Energy Agency "Biofuels Outlook" (September 2022)

Hydrogen / Ammonia production and logistics

Hydrogen is a critical building block in the net zero transition with 26 governments involved in developing methods to integrate hydrogen strategies into their climate action plans²³, headlined by the United States, which has offered an estimated \$13 billion of support toward clean hydrogen through the PTC under the Inflation Reduction Act (IRA).²⁴ A \$3/kg IRA credit for green hydrogen brings commercial costs in line with grey (fossil fuel-derived) hydrogen. Europe is likely to become the largest global importer of clean hydrogen due to its target to import 10 million metric tons of hydrogen per year by 2030. The UK launched H21 initiative to convert homes and businesses from natural gas to hydrogen and plans to have 450k tons of green hydrogen capacity by 2030.

Ammonia is emerging as a critical enabler and catalyst for hydrogen adoption due to its highly efficient energy storage potential of hydrogen fuel. Clean hydrogen and ammonia have the potential to decarbonize multiple segments of industry, including (i) hydrogen-consuming sectors such as the petrochemical industry, (ii) difficult-to-electrify modes of transportation such as long-haul trucking, marine, and air travel, (iii) thermal power generation, and (iv) fertilizer use in agriculture. Under the IEA's Net Zero Scenario it is estimated that by 2030 hydrogen production will have increased 60% from 2021 levels. This broad potential has translated to numerous infrastructure opportunities across the hydrogen value chain, ranging from (i) the production of green/blue hydrogen using proven commercial scale technologies to (ii) the import and export infrastructure required to adequately stage, liquefy, offload, and distribute hydrogen across Europe and North America.



²³International Energy Agency – Hydrogen Outlook (September 2022)

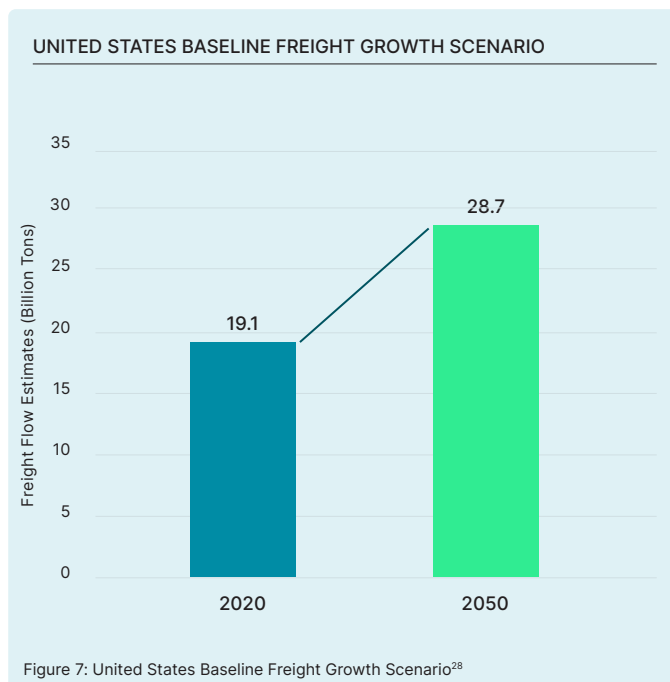
²⁴Fuel Cell and Hydrogen Energy Association (FCHEA) – “How the Inflation Reduction Act of 2022 Will Advance a U.S. Hydrogen Economy” (August 2022)

²⁵U.S. Environmental Protection Agency “National Overview: Facts and Figures on Materials, Wastes and Recycling” (2018). European Environment Agency “Waste recycling in Europe” (November 2022)

Low-carbon networks

Our everyday economy is built upon several essential networks – including transportation networks (e.g., ports, rail systems), to data networks (e.g. data centers, fiber cables) and the energy network (e.g. district heating grids). Each of these networks is continuously evolving and must be decarbonized with energy-efficient infrastructure. As an example, data center capacity has increased globally, adding significant electricity demand for computing and cloud storage. Beyond renewable electricity connectivity, solutions such as innovative energy efficiency can reduce the carbon emissions impact of these critical assets presenting an attractive investment opportunity. Similarly, substantial emissions savings can be achieved across the transportation network such as ports and destination warehouses by (i) streamlining existing supply chains (e.g. to reduce transit or idling times) and (ii) expanding the reach of proven low-carbon modes of transportation.

The movement of goods and people accounts for ~15% of global emissions, growing at ~1.7% p.a. since 1990 according to IEA data. Just in the U.S. market, freight volumes are forecast to grow by 50% by 2050, with ~65% handled by truck.²⁶ For example, rail terminals can extend the last-mile of the rail network and lower the overall cost of freight while promoting the displacement of diesel truck movements; trains are up to 75% more emissions efficient than diesel-fuelled trucks.²⁷ Similarly, large marine ports are increasingly relying on automated and electric-powered equipment for drayage, displacing emissions from diesel-fired trucks. Moving away from trucking requires an infrastructure alternative whether from rail or electrified transportation solutions, assets which are able to secure long-term contracts with highly creditworthy rail, shipping, and industrial counterparties.



²⁶ U.S. Department of Transportation's Bureau of Transportation Statistics (BTS) and Federal Highway Administration (FHWA) "Freight Activity in the U.S. Expected to Grow 50% by 2050" (November 2021)

²⁷ Association of American Railroads: "Freight Rail & Preserving the Environment" (October 2022)

²⁸ Fuel Cell and Hydrogen Energy Association (FCHEA) – "How the Inflation Reduction Act of 2022 Will Advance a U.S. Hydrogen Economy" (August 2022)

Industry is fragmented, making a mid-market solution optimal

While infrastructure capital has been shifting away from the middle market, the investment opportunity, particularly for industrial decarbonization has been increasing. New technology advancements, distributed models, and growth orientation within industrial decarbonization shifts the opportunity set towards smaller transaction sizes and a more fragmented market landscape.

As illustrated in the chart, infrastructure fund managers have been growing aggressively in the last decade, with sequentially larger fund sizes up to \$25 billion. One of the challenges these mega-funds face is the need to target very large transactions (\$1 billion+) in order to deploy their capital. There is a relative shortage of these types of opportunities, and they will almost always involve a competitive auction process

Since 2018, \$897 billion of private infrastructure capital has been raised or is in an active fundraise across more than 1,000 funds. The 15 largest funds, from just 9 managers, account for approximately 30% of total capital and the 100 largest funds account for more than 70% of total capital.

Fragmentation in the industrial sector lends itself to a mid-market investment approach – concentrated around investment opportunities ranging from \$50 million - \$200 million of equity. We also believe there is better value to be had in the mid-market space owing to less competition and the increased ability to source investments on a bi-lateral basis.

INFRASTRUCTURE FUND SIZE GROWTH



Figure 8: Infrastructure Fund Size Growth²⁹

²⁹Preqin. Data as of February 2023

The Ara Infrastructure view

The transition to net zero represents a generational investment opportunity for the infrastructure asset class. The decarbonization of industry has been overlooked by capital markets and must be addressed to meet society's climate objectives. This capital need comes amid a backdrop of rapidly growing support from governments and corporations to decarbonize – creating a highly investable ecosystem with strong growth potential and meaningful downside protection for infrastructure investors.

At Ara, we are focused on investing in infrastructure across the industrial ecosystem that generates at least 60% less GHG emissions or waste relative to alternatives. We believe that these meaningful impact features can be increasingly found in transactions with classic infrastructure properties and compelling risk-adjusted returns. If approached with the right investment discipline, this opportunity can help investors advance multiple goals – bringing consistent income, adding inflation protection, increasing asset class diversification, as well as ensuring better alignment of investment portfolios with net zero objectives.

Meet the infrastructure team

Teresa O'Flynn and George Yong co-lead Ara Partner's infrastructure strategy.

Teresa O'Flynn has more than 20 years of sustainable investing expertise, with extensive renewable power energy infrastructure experience both in the fund management sector and at the operating company level.

George Yong has over 15 years of experience in infrastructure private equity investment across the energy and industrial sectors. Many of George's transactions have focused on leveraging existing infrastructure to facilitate the transition to the low-carbon economy.



Teresa O'Flynn
Partner, Ara Infrastructure
20+ years of experience
in sustainable investing



Churchill George Yong
Partner, Ara Infrastructure
15 years of experience
in infrastructure investing

Ara Partners is a private equity and infrastructure firm specializing in industrial decarbonization investments. Founded in 2017, Ara Partners commercializes and scales companies that are critical for the transition to net-zero across the industrial and manufacturing, chemicals and materials, energy efficiency and green fuels, and food and agriculture sectors. The company operates from offices in Houston, Boston, Washington, D.C., and Dublin. Ara Partners closed its third private equity fund in December 2023 with over \$2.8 billion in capital commitments. For more information, please visit www.arapartners.com.

