JN Asia Infrastructure Fund

Newsletter Dec 2021 Quarter

Dear Investor,

This is the Dec 2021, quarterly newsletter of JN Asia Infrastructure Fund ("the Fund" or "JNAIF").

In the past quarter, the Asia market was negatively impacted by both local and global factors. Some of them could be temporary and some of them are structural. As we get into 2022, we need to be mindful of them while building a portfolio. Among the regional factors, **China continues to drive uncertainty both on regulatory front** specifically targeting internet sectors and platform economies, and **slowdown in macroeconomy** - driven by catharsis action among weaker real estate developers and zero COVID-19 policy.

Among the global factors, the COVID variant – viz. Omicron acted as a drag to the reopening themes. The other structural drag is stubborn inflation driven by both supply factors as well as demand pull factors. This is prompting most of the Central Bankers – in particular Fed to reduce monetary stimulus and prepare the world for **increasing real interest rates**, which are at historic lows.

All these factors led to a subdued performance of the regional market **(-1.06% decline in MSCI Asia-Pac (x-J)** in the past quarter, with the Chinese stocks acted as the biggest drag. This also led to underperformance of Asia-Pac (x-J) vs. the World market.

Going forward, we have some reason for optimism for the following reasons:

- a) The Chinese government seems to have started a new round of monetary and fiscal stimulus at a moderate pace, even though the regulatory crackdown continues. **This should put a floor to the Chinese stocks and the economy.**

- b) the recent data show that Omicron, despite higher infection rates, is less likely to lead to higher hospitalization. This means the lockdown of economies is likely to be temporary and the reopening themes and the tourism bound economies (e.g. ASEAN) should perform well in the medium term, past the Omicron wave;

- c) both the **supply and demand factors for inflation may see their peaks in the coming months.** The demand-pull inflation viz. above the trend demand for consumption goods and the related supply chain bottlenecks may soften with the **peak out Global PMI and ISM indices.** Among supply factors, the energy prices should see a moderate decline after the peak winter demand and supported by 0.4m bbl per day increase in OPEC's oil production quota from Feb 2022. We also expect some pragmatic **re-calibration of "Energy transition policy"** in view of its potential impact on inflation and economic growth. First it was China, which dialled back to **"focus on Carbon intensity reduction" instead of "absolute reduction in Carbon emission"** with renewed emphasis on nuclear power. Now it seems the EU may include investment in **Gas infrastructure and nuclear energy** as part of their "**Green Investment**" mandates.

This sets up the scene for us to discuss different facets on "Energy Transition" in greater detail in this quarterly newsletter. We believe the "**Energy Transition**", a much-talked topic, has an overarching impact on the global environment, decarbonisation agenda and ESG investment. At the same time, 'Energy Transition' may also have its **untended consequence on economy like slower growth, higher inflation, increasing income disparity.** We also dwell on this subject along with the *infrastructure investment* enabling this energy transition.

As the ambition behind 'Net Zero' gains momentum globally, the suppliers of traditional energies (viz. fossil fuel, nuclear) are scaling back investment, probably at a faster pace than at which demand is tailing off. At the other side of the Energy Transition lies a new, stable system, but the path is turbulent. **This newsletter is not about the destination, but about the journey.**

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What is your view on the current decarbonisation agenda which is driving Energy transition and what could be the untended consequences?

Despite the last 25 years of investment in Renewable energy (viz. Wind, Solar and Biomass), renewables represent only ~5% of Global Primary Energy needs. Even if we include hydro power, which has its own set of environmental impact, renewable adds to only 15% of Global Primary Energy needs. The balance comes from fossil fuel like Coal, Oil, Natural Gas, and non-fossil fuel like Nuclear- in order of carbon intensity. **Even in the most optimistic scenario, by 2050, fossil fuel will continue to dominate 50% of Global Primary** Energy needs unless we find a path-breaking alternative fuel that can provide base load energy in a cost-effective way. Even this transition will not be painless and most of the economic cost could be borne by developing countries and particularly lower section of the society as reflected in current mini-energy crisis. The emerging economies will pay in terms of slower economic growth in absence of low-cost abundant energy and the middle/ lower economic class will pay in terms of higher electricity and transport bills.

We can trace back **the primary engine for 150 years of economic development and global population growth to discovery of hydrocarbon and its high energy density that was available at a cost-effective rate**. In absence of low-cost abundant hydrocarbon, the past century's economic growth and improvement in lifestyles would not have been possible. Hydrocarbon is not only the dominant fuel for transportation, but is also found in other facets of our daily life from textiles to sporting goods, and from electronics to medical supplies. However, this comes at the cost of environment, which is now being addressed by replacing fossil fuel by at a rapid pace with renewable.

If one looks at the major components of Primary energy, the largest segment is **Power generation**, followed by **Transport, Industry, Residential use** etc. Within power generation, renewables have made a greater inroad reaching 25-30% share. However, if one excludes hydropower, renewables are still only at 10-15% share; despite last the 25 years' of capacity addition. In case of **transport**, Electric vehicle is still at early stage of penetration, representing <5% of total passenger vehicle population. The same ratio is much lower for commercial vehicles.

The penetration of renewable in much lower in **Industry segment** as cost effective **Green hydrogen** or **Blue hydrogen** is still far away. This is true for **marine and air transport** as well, where fossil fuel continues to dominate. For **Residential usage**, migration to electrification has been slow as gas remains the most suitable fuel.

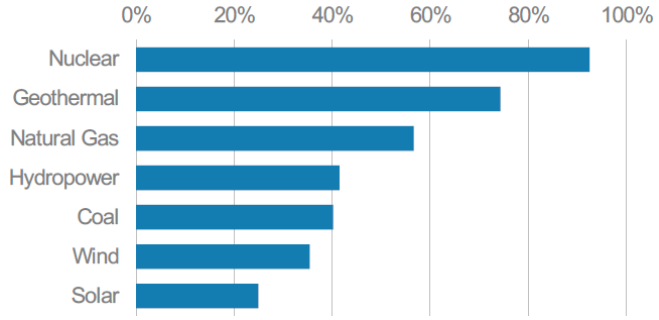
We all want faster disappearance of fossil fuel use however, what are the impediments and the practical difficulties? How should we transition with less untended consequence and what kind of role Infrastructure can play?

We see the following practical difficulties for the current energy transition agenda, which the current hype about ESG investment is missing out. The energy transition policy needs to be much more thoughtful rather than headline grabbing as demonstrated by the global leaders.

a) In the current form of renewable, it cannot replace the base load energy:

We all need green energy, which is reliable and cost effective. However, given the intermittency of renewable power, low-capacity factors, it needs to be complemented with a large battery storage system. This makes the current form of renewable viz. Wind and Solar a poor substitute for base load energy. We need renewable power, which has high-capacity factor and reliability. Besides **nuclear power**, the only other alternative at this stage is **Gas-based power**.

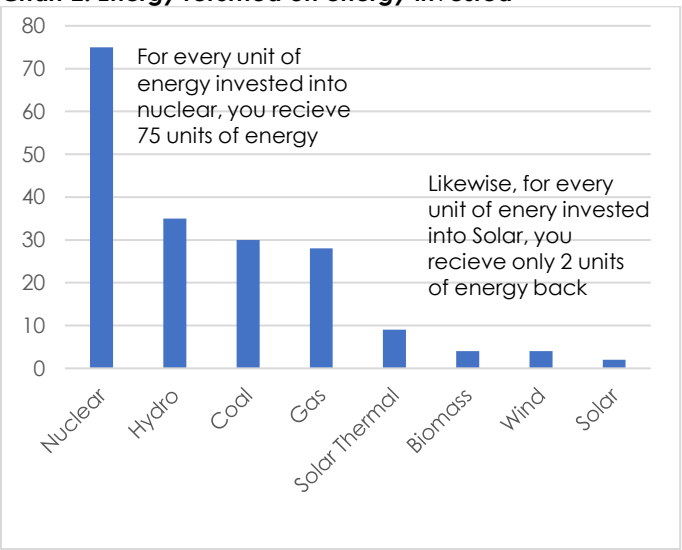
Chart 1 - Capacity factor by energy source in 2020



Source: US Energy Information and Administration

The other option is to offer **carbon neutral fuel** - which comes with appropriate carbon offset mechanism like Carbon Capture System (CCS). However, question arises on how the Carbon offset will work and how the Carbon Trading market will evolve? Will there be a global standard/ platform or will individual countries decide their carbon limits and offsetting mechanism? Will Carbon capture and other offset mechanism be enough and who will validate them? How will **clean oil & gas** be priced?

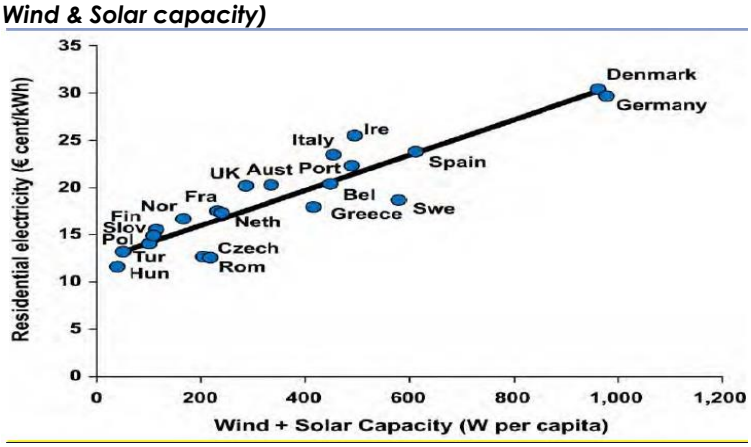
Chart 2: Energy returned on energy invested



b) Who will pay for the price of energy transition?

Electricity gets more expensive with greater share of Solar and Wind. Unfortunately, the cost is hidden in the form of significantly higher **transmission grid and energy storage capex**. The higher electricity bill is ultimately borne by the society but **its share of consumption basket is disproportionately high for lower section of the society,** who have practically no say in the energy transition policies of the government.

Chart 3: Residential electricity cost by EU countries (vs. Wind & Solar capacity)



Source: Eurostat; Mark Mills

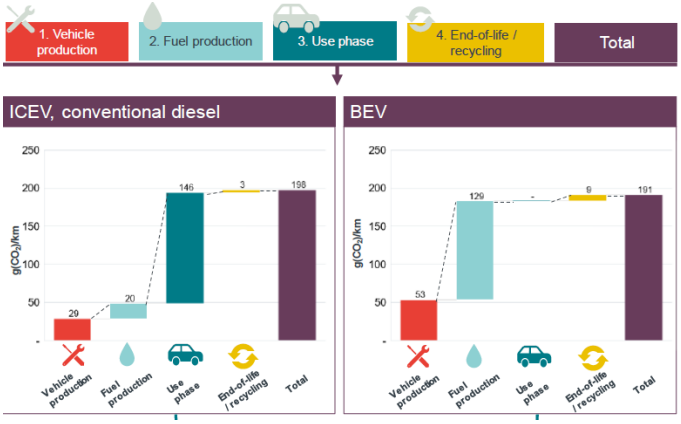
Just for a comparison, Germany by 2025, would have spent USD 580bn on renewable while shutting down its nuclear plants. All that Germany will have for its energy transition is a **50% increase in electricity prices**, flat emissions and an electric supply system which is 10 times more carbon intensive than France, while still chronically dependent on gas supply from Russia.

c) Renewable energy and EVs are much more energy intensive. Public transport infrastructure can play a useful role

As the charts below reflect that energy and material intensity of Solar and Wind power are significantly higher in comparison to traditional power generation, thus **ending up creating a larger energy footprint** – though in a different form. Similarly, EVs are much more material

intensive (and hence have a higher carbon footprint) compared to ICE and only after running 80-100,000 km, EVs becomes carbon neutral compared to ICE driven vehicles.

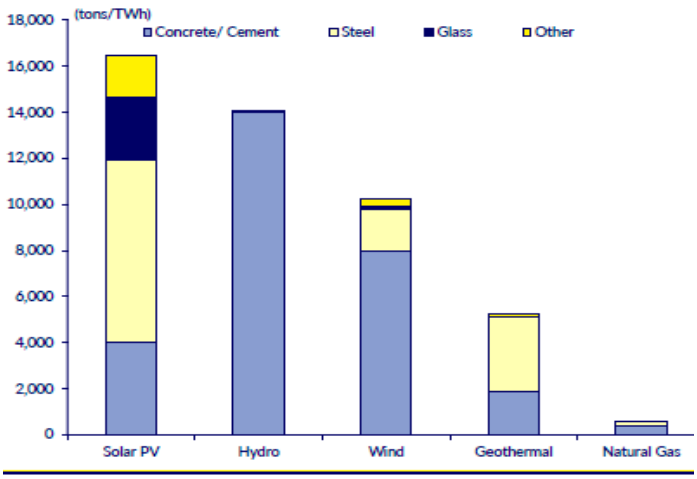
Chart 4: Differences n CO2 emissions between EV and ICEV



Source: Frontier Economics; Medium size cars with 15K km annual mileage, 10 years of usage

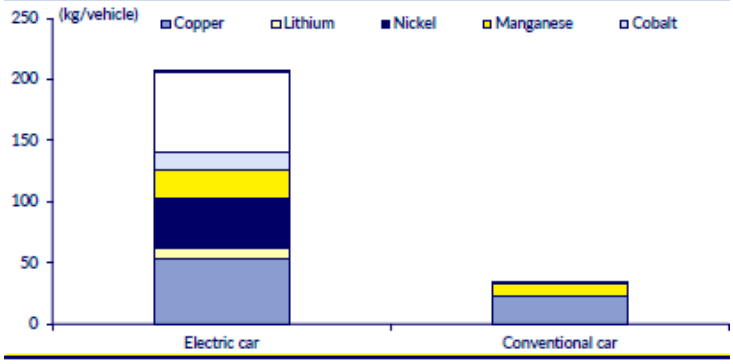
Thus, question arises why the government shouldn't be spending more on public transports, which can be electrified easily and can replace a vast number of personalised vehicles clogging up cities instead of providing subsidies to EVs.

Chart 5: Substantially more material used for renewable energy machines – higher energy footprint



Source: IEA, US department of Energy

Chart 6: EVs require multiple more minerals than ICE



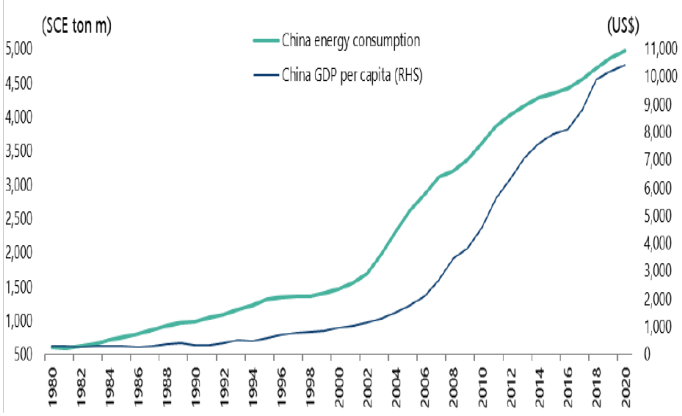
Source: IEA

d) Total energy demand is still going up:

According to the World Bank data, world's population is growing by 1 billion people every 13-14 years. As per the OECD forecasts, every 13-14 years, global GDP per capita in real terms is set to increase by around 35%. Historically, energy consumption has scaled strongly with population and GDP. Further, there is a deeply uneven distribution of energy consumption around the world: for example, the average person in North America consumes 12 times as much energy as the average person in India. ***The top 1% of wealthy population consumes 30 times more energy than the global average***. It would be a tough ask of those that already consume very low per capita energy to consume even less.

Energy demand explodes once GDP per capita moves towards USD 2000. This dynamic was reflected in case of China and is now true for India (per capita GDP of US$1960) as seen from recently monthly imports of oil touching historic high despite all-time high domestic prices for fossil fuels. As people get wealthier, they will buy cars, which in turn increases road miles. Billions of people in emerging economies are still waiting to buy their first car (EV or ICE) and will travel more (i.e. more air travel as well). **Therefore, total energy consumption will likely continue to rise for visible future.**

Chart 7: China's energy consumption and GDP per capita



Source: CEIC data

The potential energy demand from current developing technologies could be very high. E.g., Computers consume energy equivalent to 10mn bbl of oil per day from virtually nothing in 1970s. The next big source of demand could be **cloud computing** as spending on Information Infrastructure exceeds all other segments of the economy. Information infrastructure consumes energy, data centres consume energy, electronic devices consume energy, and manufacturing consumes energy. In fact, **the share of the world's electricity from the silicon ecosystem is already 8% or 10%.**

Ecommerce also serves as an example of how technological progress increases energy consumption. As a result of rising ecommerce trend, **warehouse space and haulage of truck tonnage have exploded in past 10 years.**

The society we live in is energy-intensive. The key building blocks of our society, require energy to build, and that trend rather than slowing is growing exponentially. *Thus, irrespective of decarbonization agenda, this dynamic is unlikely to change for emerging world, which needs a much better plan for energy transition - a mix of base load energy coming from nuclear, gas, hydro with peaking power coming from wind and solar.*

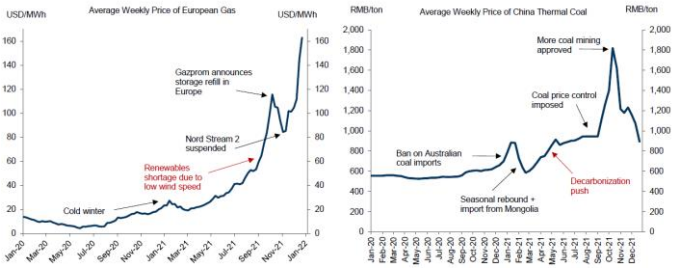
How we position our portfolio in this scenario of Energy transition?

Energy market is now seeing impact from rushed-up ESG implementation and "Green washing":

We at JNAIF have always looked at the ESG impact in energy market through its **'Life cycle'** i.e., **"Total Carbon footprint"** impact. We think the market has failed to realise the ripple effect that rushed-up ESG implementation in energy market and the 'Green washing' can cause. The energy consumption stands at ~10% of GDP or US$9trn. However, only **15% of world energy consumption is renewable** *(<5% excluding Hydropower)* with natural gas accounting for another 25%. Coal and Oil account for 60% of energy consumption and even by the end of 2050 they will account for 45-50% of energy consumption.

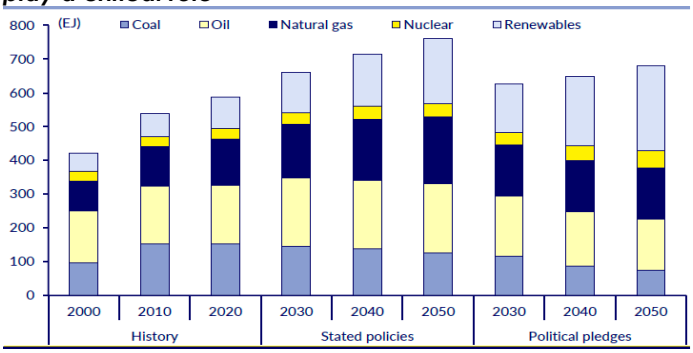
We believe, the **energy transition policy** needs to be much more thoughtful rather than headline grabbing as demonstrated by the global leaders. **Collapse of investment in hydrocarbons has led to unsustainable levels of energy costs for consumers.** The world needs a much longer and well-planned phase-out of hydrocarbons. Natural gas is likely to play a critical role over the next two decades (even when natural gas reduces carbon emissions by 40-50% when switched from coal or oil) and potentially hydrogen/ modular nuclear reactor playing the critical role from 2040 onwards.

Chart-8: Decarbonisation efforts led to higher gas prices in Europe and Coal prices in China



Source: Bloomberg, China National Bureau of Statistics

Chart 9: In all scenarios, hydrocarbon – specially gas will play a critical role



EJ: Exajoule; Source: IEA

Gas as a cost-effective transition fuel:

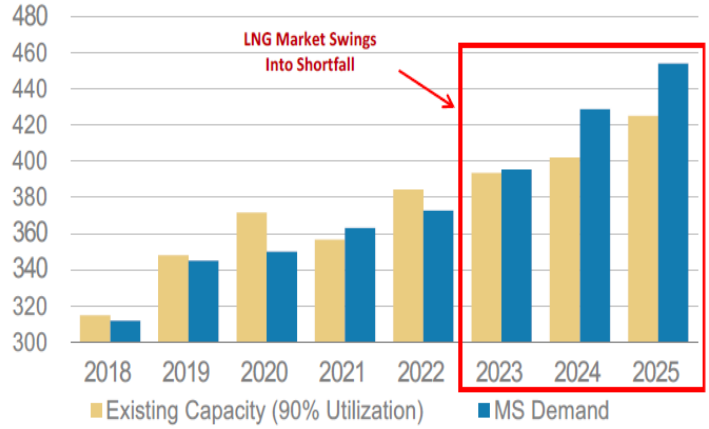
The penetration of renewables has begun to displace coal and oil, but the technology required to handle the swings, surges, and lack of consistency in renewable power generation is not yet widely available (reliable and cost-effective). Both industrial and retail customers understand the need to decarbonise the world but want this delivered at the lowest cost. Ultimately, the requirement to decarbonise needs multiple solutions including electrification to ensure **energy security, reliability and the lowest cost**.

The use of existing infrastructure reduces costs. Even if significant renewables are added, fossil fuels (in particular Gas) will likely remain the key source of supply and therefore set energy prices broadly. Contrary to the popular beliefs, we believe there will be a significant demand for more natural gas pipelines, LNG plants and other gas-to-power infrastructure to provide both the baseload and dispatchable power required to avoid extreme supply crunches like we're seeing in the market today

LNG business and associated infrastructure investment will stay robust

In view of current mini-energy crisis, we expect there to be a supply response from natural gas producers paired with strong demand for long-term gas supply agreements from governments, utilities, and enterprises to ensure adequate future supply. This should lead to additional investment in natural gas infrastructure such as LNG export facilities, pipelines, and tankers, which all enable us to more robustly and flexibly transport and store natural gas across the globe.

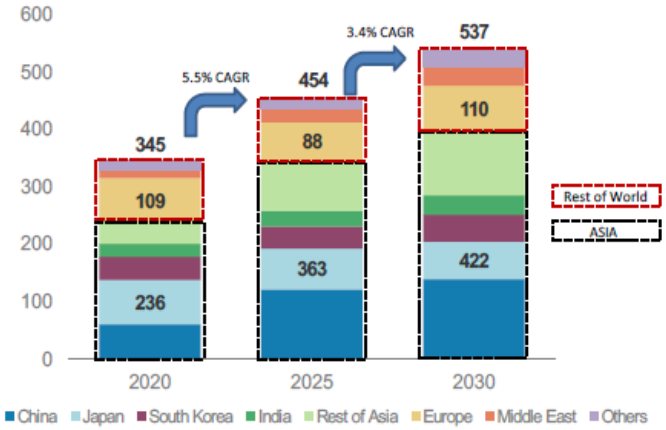
Chart 10: Global LNG Supply-demand



Source: Wood McKenzie, HIS Markit, Morgan Stanley

In Asia, the replacement of coal by natural gas will likely drive LNG demand up 50% by 2030. In China and India, coal usage is very high, while natural gas usage is still very low viz. 7.8% of China's energy mix in 2019 – compared with 20-30% for the US and Europe. China targets 15% penetration for natural gas by 2030.

Chart 11: LNG demand to grow by 50% by 2030 with Asia as the key driver



Source: Morgan Stanley

Gas playing complementary role with Hydrogen

Gas has greater reliability than electricity for residential heating purpose. Household demand for electricity will likely increase substantially as people switch to electric vehicles, placing pressure on grid and supply into people's homes. Retaining gas usage (via the conversion to hydrogen and biomethane) makes sense to avoid increased household investment in increased electricity capacity. In addition, hydrogen is already being injected into the **Gas transmission grid** in a number of places in Europe and Australia to the extent of 10-20% and studies are ongoing regarding how they can move it to 100% hydrogen. Due to **this potential for conversion of the Gas transmission infrastructure into hydrogen carrier by mixing hydrogen into natural gas,** the hydrocarbon players, in general, are spearheading the effort into hydrogen development.

In JNAIF, we are a strong believer in **natural gas and gas infrastructure's critical role in the energy transition**. The fund has around 10% of portfolio in Gas businesses viz. pipelines, distribution and LNG regasification. At the time of writing this newsletter, the EU is considering to include **Gas and Nuclear power as part of their Green Investment mandate.** This could be a result of the energy crisis in the current winter with a greater dependence on Russian gas supply.

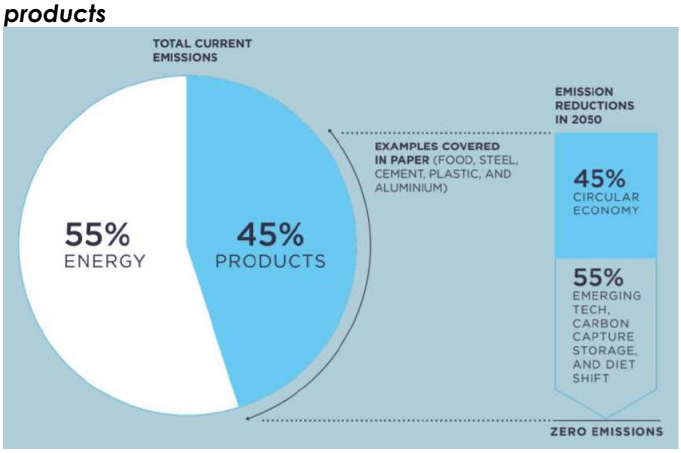
Long term potential of Green Hydrogen

Hydrogen – and particularly Green Hydrogen – has enormous potential to be the multi-industry fuel of the future. However, it will take around 10 years for Green Hydrogen costs to reach parity with less environmentally friendly blue and grey versions. Moreover, infrastructure build takes between three and ten years, depending on project size and location. While the potential is tremendous and expectations are high, this power source is certainly no silver bullet to near-term hydrocarbon energy supply and demand imbalances.

Hydrogen is a carrier of energy, not a source of energy and hence to produce Hydrogen it needs energy and complex processes viz. electrolysers, which are expensive and efficiency improvement is limited. Transportation and storage are the challenges for mass adoption of hydrogen. Long cycle and large-scale hydrogen storage and transportation can only be realized through the adsorption of hydrogen at normal temperatures and pressure.

Nonetheless, Hydrogen will play an important role to drive growth in 'hard to electrify and decarbonise industries like steel, cement, and chemicals. 45% of carbon emissions are derived from products while 55% are from energy production.

Chart-10: Emissions associated with energy vs making products



Source: Ellen Arthur foundation.org

JNAIF is more discerning about renewable investments

Within renewable, we have thus far avoided the crowded trades in **Wind and Solar power** for the following reasons:

- Both the segments are seeing a rush of capital from all kind of players – Pension fund, Private Infra funds, Power companies, Hydrocarbon producers, Sovereign funds, for whom the threshold return is quite low.

- In many markets, pricing power is low with PPAs not available or highly contested. Historically we have seen, contracts being dishonoured by the state electricity boards with poor financials.
- The grid connection is often delayed due to multiple competing projects thus leading to lower load factors.

At the same time, we like **Geothermal power** within renewable given the tremendous moat characteristics, long term sustainable energy generation in a cost-effective way and the scarcity premium. The other form of renewable energy we like is "**Waste to Energy" (WTE)** particularly in developed markets where there are long term PPAs with reliable trustworthy counterparties. This segment also has moats–

a) The WTE plants take long time to set up given tedious environment approval process,
b) need a tie-up with waste management company or municipalities which can provide long term assured source of putrescible waste,
c) the sophistication of technology ensures the energy output is maximised, stable and reliable;
d) Lastly, WTE needs strong environmental policy in the form of high **landfill fees/ gate fees**, thus incentivising incineration of waste.

Energy transition is an important part of ESG investment. We at JNAIF always look at the ESG impact in energy market through its **'Life cycle'** i.e., "**Total Carbon footprint**" impact and taking ***a nuanced approach to ESG investment***

The life cycle impact analysis includes all aspects of assets' *development, operation and disposal* (viz. closure of mining sites, nuclear power plants, battery disposal in Electric Vehicles), with focus on *Environment, Social and Human* factors. It also includes aspects like land acquisition, any resettlement or community engagement issues, environmental impact studies, net carbon impact including sources of raw materials and overall resource utilisation. This is particularly relevant for the EV/battery transition and its use as a decarbonation tool and similarly Solar and Wind. *We cannot look only at the end market impact without ignoring the mining and development cycle of the raw materials and its impact on carbon footprint and also the cost inflation that it is causing.*

Further to this, we prefer investment in **public infrastructure** which can replace thousands of personalised vehicles (viz. SUVs, Electric Vehicles) rather than incentivising ownership of EVs per se, which also have a very high energy footprint. Similarly, **data centres** by nature are energy intensive. However, we prefer those data centres which are taking the steps like – a) focusing on energy consumption (i.e., lowering PUEs) through efficient cooling system, b) sourcing renewable power to their operation; c) focusing on **carbon offsets** like afforestation, developing wastelands.

*We believe '**sustainable infrastructure investments**" are those that have a positive environmental and social impact, **and also provide sustainable economic returns** across the life cycle.*

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JNAIF portfolio snapshot at end of Dec 2021

Country Allocation	Portfolio %
China	25.0%
Australia	19.4%
New Zealand	12.4%
India	11.8%
Singapore	9.5%
Hong Kong	9.2%
Thailand	4.2%
Taiwan	3.3%
Malaysia	1.6%
Philippines	0.4%
Cash	3.1%
Emerging Markets	**46.3%**
Developed Markets	**50.6%**

Sector Allocation	Portfolio %
Health Care Infrastructure	18.8%
Digital Infrastructure	13.5%
Industrial Real Estate & Warehouse	13.4%
Gas Utilities	12.0%
Highways & Railtracks	10.0%
Air Freight & Logistics	7.7%
Airport Services	7.1%
Waste Management	6.9%
Education Services	3.6%
Renewables	3.5%
Others	0.4%
Cash	3.1%

Disclosures

The information and statistical data contained herein have been obtained from sources, which we believe to be reliable, but in no way are warranted by us to accuracy or completeness. We do not undertake to advise you as to any change in figures or our views.

This is not a solicitation of any order to buy or sell. We, any officer, or any member of their families, may have a position in and may from time-to-time purchase or sell any of the above mentioned or related securities. Past results are no guarantee of future results.

This report includes candid statements and observations regarding investment strategies, individual securities, and economic and market conditions; however, there is no guarantee that these statements, opinions or forecasts will prove to be correct. These comments may also include the expression of opinions that are speculative in nature and should not be relied on as statements of fact.

JN Asia Infrastructure Fund is committed to communicating with our investors as candidly as possible because we believe our investors benefit from understanding our investment philosophy, investment process, security selection methodology and investor temperament. Our views and opinions include "forward-looking statements" which may or may not be accurate over the long term. You should not place undue reliance on forward-looking statements, which are current as of the date of this report. We disclaim any obligation to update or alter any forward-looking statements, whether as a result of new information, future events or otherwise. While we believe we have a reasonable basis for our appraisals and we have confidence in our opinions, actual results may differ materially from those we anticipate. The information provided in this material should not be considered a recommendation to buy, sell or hold any particular securities

Calendar Returns	2017*	2018	2019	2020	2021	Annualized
JNAIF Return	2.66%	-0.88%	19.88%	7.04%	9.91%	9.06%
MSCI Asia Pacific Ex-Japan Index	1.59%	-16.25%	15.85%	19.80%	-4.88%	2.83%
MSCI World Infra Index	1.10%	-8.11%	17.77%	-2.71%	3.32%	2.31%

**2017part year from 8th November 2017 (Inception Date)*