Wise Response Society Submission on the Infrastructure Strategy to the Infrastructure Commission 2 July 2021

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Wise Response Submission to the Infrastructure Strategy Consultation 2021

1. Worldview sets the context for this Strategy

1.1. Our Society is heartened that key findings from "Our Aotearoa 2050" survey were "Our environment is the top priority when it comes to making infrastructure decisions" and "New Zealanders placed a higher priority on the "planet" in future decision making than "jobs" and "people"".

1.2. This is a most encouraging revelation, as it is now generally accepted that the economy ultimately depends on a healthy functioning environment. And if the environment is to be the "top priority" for infrastructure selection, then it provides the guiding principle for the Strategy. That is to plan infrastructure in such a way that it does not facilitate or promote a continuation of degradation in environmental quality so marked over the last few decades.

1.3. The challenge is that the scientific consensus is now that the growth - dependent, fossil - fuel based economy is on a collision course with the environmental and resource flow limits in the closed system that is our planet. Climate change is the most pressing example that this is occurring, but there are many other examples where trends indicate an overshooting of sustainable practice. It is the combination of multiple factors that now has our global footprint exceeding the earth's biocapacity by over 50%[1].

[1] https://bit.ly/3641P7E

1.4. This is the advancing environmental crisis that the Commission's survey discovered. Many New Zealanders are concerned about the crisis and they wish to see infrastructure decisions addressed by the Commission. Yet this stated priority is not convincingly represented in the outcome and decision-making principles set out in the consultation document.

1.5. Voluntarily achieving the safe targets seems increasingly improbable given our abysmal failure to contain fossil fuel use and the associated emissions over the last 3 decades and the now very steep emissions reduction required to retain a safe climate.

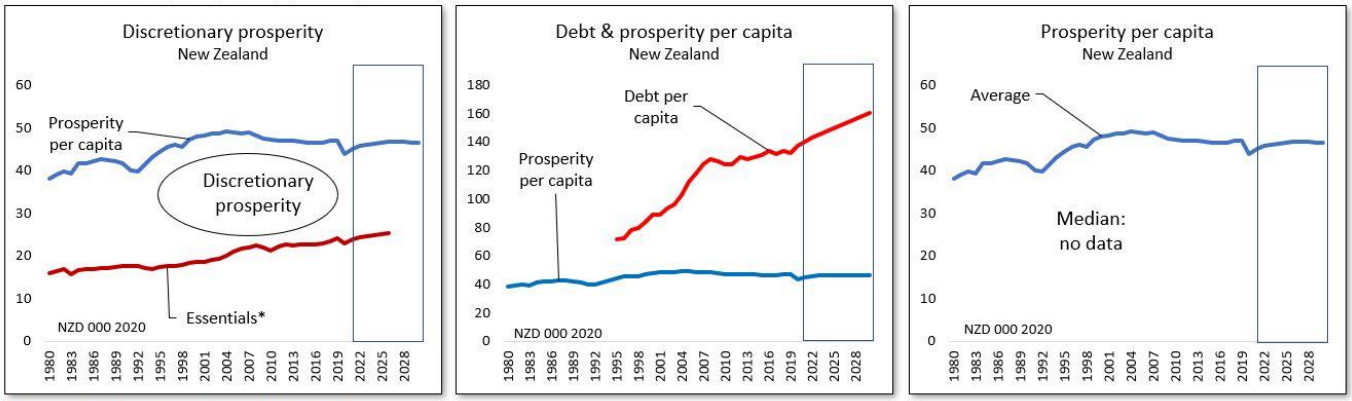
1.6. In this context, it is critical to consider diminishing net energy return to fossil fuel. Inevitably, the cheap and freely available energy that we have enjoyed for so long in the past will no longer continue into the future with the result that the economy will be forced into contraction.

1.7. Similarly, GDP is created by energy expenditure, and diminishing energy resource quality can only be masked by monetary policy for a finite period. Increasing debt per unit of GDP demonstrates this trend. It is therefore critical to try and analyse the limits of this trajectory[2].

1.8. From the above observations, it follows ironically and tragically that the global economic collapse scenario predicted to occur in

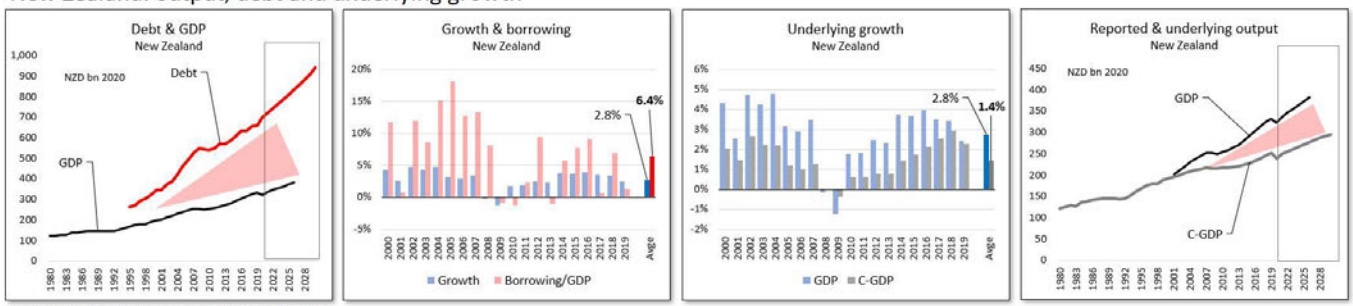
[2] https://bit.ly/3x9EI04

New Zealand: prosperity per capita



Source: SEEDS ©Surplus Energy Economics 2021
*Development project, see text

New Zealand: output, debt and underlying growth



Source: SEEDS ©Surplus Energy Economics 2021

the first half of this century by the Limits to Growth analysis[3], may be our best chance at retaining a habitable climate.

1.9. **As a result of this state of affairs, there are two broad worldviews that could be used for planning purposes:**

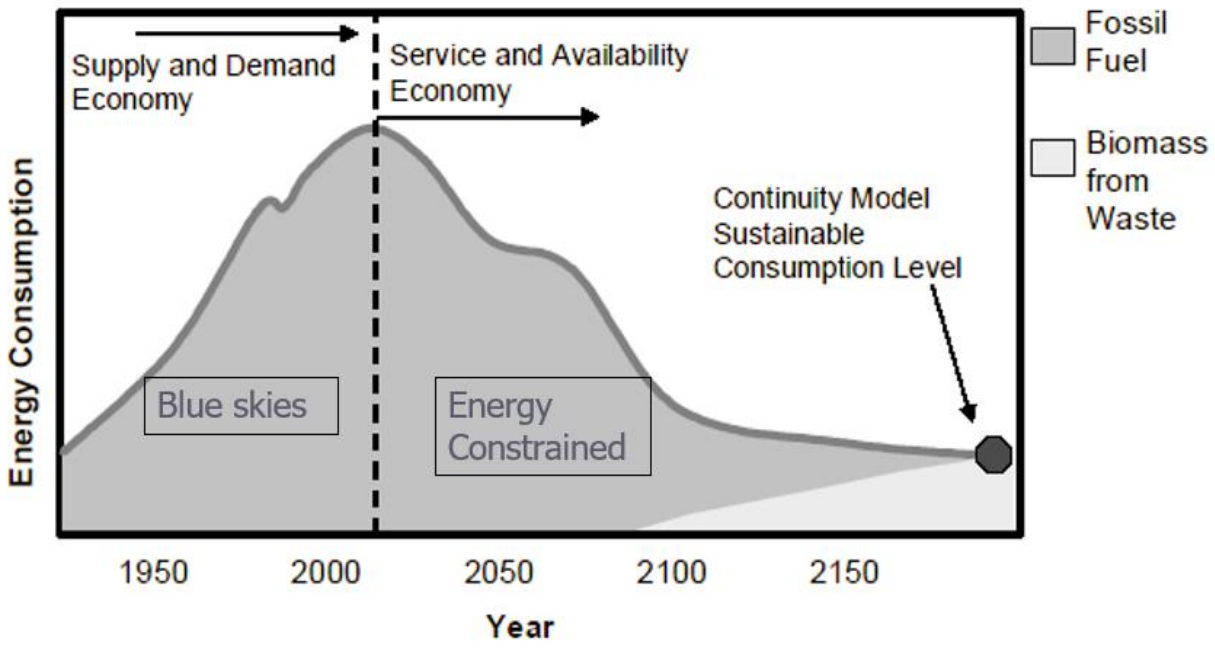
i. **A belief that improvements in technology, efficiency and substitution that flow from Business as Usual (BAU) will always keep us ahead and allow us to repair the damage already done, or**

ii. **An anticipation that the supply of fossil energy (which provides the primary energy for 84.7% of the world economy) and other critical non-substitutable**

[3] http://bit.ly/appglrd

resources will contract as outlined above, and therefore a subsequent contraction of the economy.

1.10. The distinction between the worldview appropriate for expanding and contracting energy consumption are contrasted in the following graph:



1.11. The implication of this contracting energy supply worldview is much broader than just energy issues described above. We will need to also organise our economic system to live within the biophysical limits of natural systems.

Doing so will require a different set of guiding principles for infrastructure after peak energy consumption. Some high-level examples are given in Table 1

Table 1: Generalized high level guiding principles for pre and post 'peak energy consumption' economies

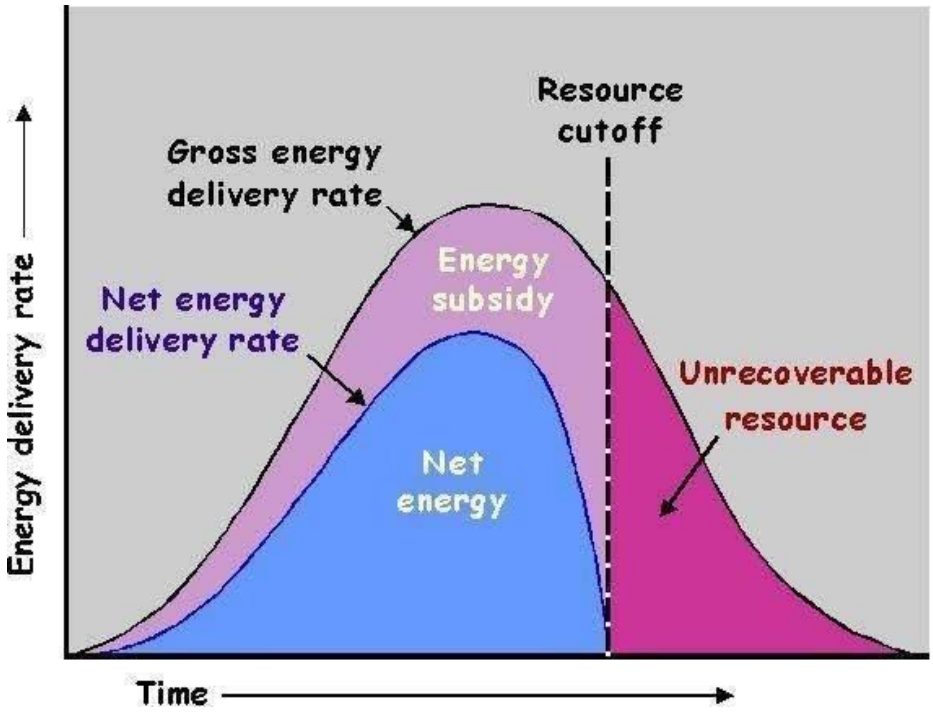
Pre-peak (supply and demand) economy	Post-peak (service and availability) economy
• Growth	• Fossil fuel independence
• Profit/Return to shareholder	• Local resource / simplicity
• Yield	• Community security
• Capital accumulation	• Permanence / durability
	• Value / usefulness
	• Necessity/frugality
	• Ecological integrity
	• Working and living in place

1.12. The dominant cultural response to this predicament has been to ignore or deny the post-peak energy scenario and continue with BAU while attempting to curb its worst effects on the environment. To some extent, this response is understandable because our current financial and economic systems are currently incompatible with economic contraction, due primarily to compound interest, and corporate growth targets mandated in law. We recognize that promoting such a pathway is also considered politically untenable.

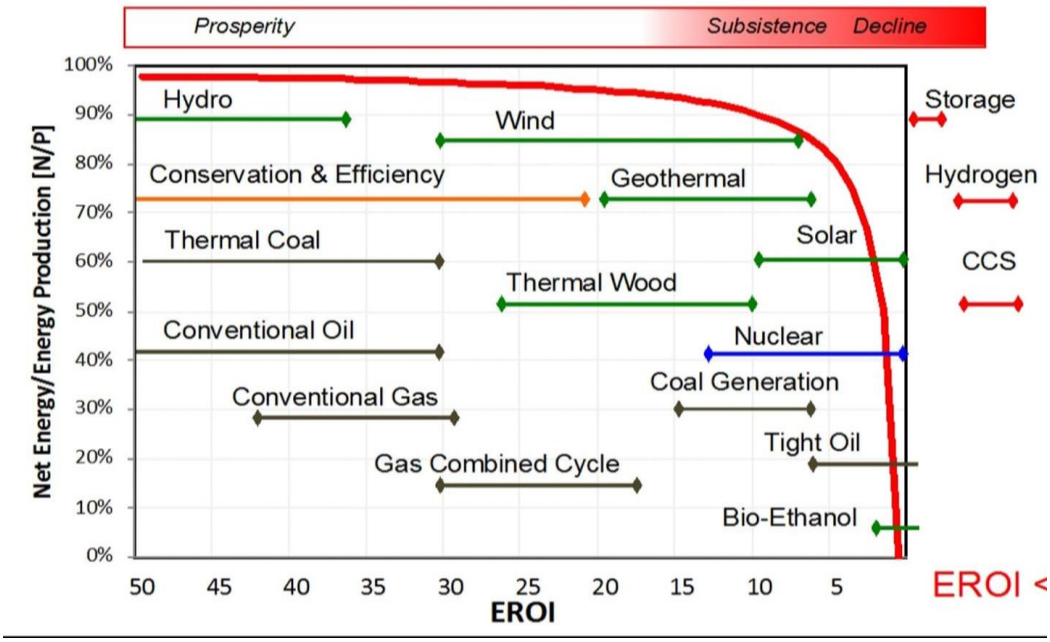
1.13. However, based on the laws of physics, ease of access to a widening array of key resources from now onwards will become increasingly challenging. By clinging to the BAU pre-peak

scenario, we are largely planning for an unattainable outcome by hoping that technological development (e.g. decoupling through efficiency, carbon capture and storage, etc) will eventually control climate change and that our former economy can and will 'get back to normal'.

1.14. It is important to note that the above graph depicts energy "consumption" and not energy resources. There is a critical distinction between gross energy supply and net energy available. This is because it is the latter which determines what is available to the economy.



1.15. Moreover, the decline in post-peak economic activity will be steeper than the remaining energy resource picture would imply due to the lower quality of remaining resources (we have naturally picked the low hanging fruit, or the high EROI resources first):



Selected further evidence from the extensive body available for this degrowth scenario is provided in Appendix A.

1.16. The above scenario of rapidly diminishing net energy available creates a radically different socio-economic operating environment for the planning landscape of the future. We have summarized our general expectations of this in the next section.

2. It follows that the context for infrastructure planning needs for a "service and availability" economy in New Zealand has the following principal characteristics that cannot be avoided:

2.1. **Diminishing returns to energy:** The current downward trend in energy returned on energy invested (EROI) will continue, undermining economic activity.

2.2. **Economic growth and revenue:** Reduced energy intensity will reduce economic throughput and reduce revenue and

resource availability for public works, in a stagnating and then contracting economy.

2.3. **Climate change:** Along with a background global warming trend, climate change is predicted to bring increasingly more extreme weather events including wind, rainfall and drought. Accordingly, increasingly stringent and **onerous** adaptation and mitigation will be required as the planet heats up. This will include abandoning certain zones, enterprises, and eventually rationing of physical travel.

2.4. **Sea level rise:** Sea level rise will continue beyond 2100 with massive implications for coastal infrastructure planning. Engineering solutions for low lying areas or where high value build environments are located such as embankments, groundwater pump-drainage schemes, erosion protection, etc. can and will be undertaken successfully over a short period of time, but these temporary measures will eventually be overwhelmed.

2.5. **Resilience and subsidiarity:** With shrinking resources, it will become increasingly difficult to provide centrally coordinated services. The most resilient communities will be those which have the capacity and knowledge to be relatively self-sufficient and where transport needs are minimized. Supply chains will need to be shortened.

2.6. **Demographic change:** It follows that with less fossil fuel energy, muscle power will become more important again for undertaking essential services including food production. For this reason and that of resilience, rural areas will be repopulated.

2.7. **Immigration:** The IPCC anticipates the direct weather impact of climate change on NZ will be less immediately debilitating

than in many other nations. As climate change worsens, NZ is therefore likely to be seen as an increasingly attractive residential destination initially for peoples of the Pacific and later on for climate and economic refugees where the climate is no longer habitable. There is a subsequent high probability that New Zealand's population will increase markedly from this point forward due to positive net migration. Migrants tend to expect high levels of infrastructure services, but in a post-peak economy this will become increasingly difficult to provide.

2.8. An example of infrastructure strategic thinking appropriate for a contracting energy supply future:

2.8.1. A "Three Waters" thought exercise for Invercargill offers a practical example of how such principles might be applied.

2.8.2. There is a need to reimagine storm water drainage to cope with more intense storm events. The City Council has been installing undersized primary drainage for decades. To rectify this situation, there is now an opportunity to install storm water retention ponds on the secondary drainage paths centered around low lying Council Reserve land.

2.8.3. With some water treatment local to these points, there is the opportunity to size these retention ponds to provide a secondary emergency source for town water as a buffer against longer drier periods, alongside distributed rooftop rainwater harvesting and storage. (The current reticulated water system has only a single river source which nearly ran dry a few years back.)

2.8.4. There is also the opportunity to address wastewater treatment. The current location on the edge of the estuary is vulnerable to sea level rise combined with larger flooding events. Wetland areas around the city perimeter can be restored and engineered as wastewater purification and perhaps even used to capture some of the nutrients with aquaculture operations, or growing of woody biomass for fuel and fibre.

3. The changes required in thinking or 'paradigms'.

Table 2 on the next page compares current approaches to infrastructure design with what we think will be required to plan infrastructure in a post-peak consumption economy.

Table 2: Summary comparison between pre- and post-peak energy consumption planning contexts and associated characteristics

Attribute	**Pre-peak energy consumption (supply and demand) economy (or Business as Usual)**	**Post-peak energy consumption (service and availability) economy (aka a Low Carbon or Post-Industrial future)**
Motivation for Strategy	Efficient use of resources, economic productivity with wellbeing a spinoff.	Optimised resource use for resilience to diminishing resource and energy flows and climate change to secure wellbeing into the future.
Spatial planning and scale	Tends to centralization and larger scale control and ownership systems	To control the extent of disruption and minimise dependence on transport, spatial planning must endeavor to facilitate discrete "communities of economy" that maximise self-sufficiency. This suggests a general reduction in the scale of our infrastructure, modular design and a level of technology and material selection that can be locally maintained (i.e., reversing complexity).

Efficiency vs redundancy	Economic efficiency is a primary goal to maximise profit	Relentlessly pursuing efficiency based on cost tends to create brittle systems that are vulnerable to single points of failure. That resilience demands alternatives implies a level of redundancy.
'Future focused	Currently we are driven by short term decisions to match financial and political time horizons	When making investment decisions in preparation for the future, we need to be very careful to distinguish between what is desirable and what is viable so as to avoid dead end pathways.
Transparency	Most members of the public and public and private sectors are currently unaware of the limitations of renewable energy and infrastructure. This lack of knowledge and awareness urgently needs to be remedied. Government publications that continue to espouse continued economic growth promote false expectations.	Wise Response agrees that the Infrastructure Commission should be "open, honest and transparent about how infrastructure decisions are made and the trade-offs it makes between different outcomes". So far, the Infrastructure Commission has failed to do this within the context we have outlined for how the future actually looks.

Focused on options	Wise Response agrees that the Infrastructure Commission should "consider all relevant options to deliver outcomes, including non-built alternatives to physical infrastructure".	Non-built alternatives to physical infrastructure should include promoting changes in the consumption patterns by New Zealanders. Also inspiration for a wider definition of infrastructure 'elegance' can be found at this reference[4].
Integration	Implies coordinated centralized control both for strategy and architecture. Recognition of deficiencies in the area of integration for setting infrastructure priority is one of the key drivers of this initiative.	Implies coordinated central centralized control in strategy but not necessarily in architecture. Distributed infrastructure will be locally adapted, and probably created using locally sourced materials.
Economic model and discount rate	Competition is promoted and discount rate is high (eg 7- 10%) which favours an option with cheaper up front cost but higher running costs over the reverse.	Cooperation is promoted. Competitive models may also be inefficient. Infrastructure choices are not dominated by monetary cost assessment to determine whether an action is sustainable or not.

[4] https://bit.ly/3qGEemN

		Arguably, getting ahead of the pack in hard and soft technologies that deliver a low carbon future is a significant future economic opportunity. Discount rate is low (or perhaps even negative) to promote durable infrastructure decisions.
Ownership	Economic system favours private ownership and minimum government involvement on the assumption it is more efficient.	Public ownership of infrastructure that provides the basic services may be more equitable and can be used as a device to control consumption and slow the rate at which resources are exhausted.
Wants vs needs	Distinction not considered important.	Clear definition of the distinction important so that priority is given to needs.
Climate Change	The BAU economy has been built on the energy from fossil carbon. The associated carbon emissions are the cause of climate change. Efficiencies have improved the output to emission relationship but ultimately the two are inextricably linked.	The critical need to reduce emissions globally sets the upper bound of energy consumption, and New Zealand's energy budgets, irrespective of availability.

Transport	Tendency to try and retain existing over-capitalization of private vehicle stock (much used for around 5% of the time) in the interests of convenience. The likes of EV's can only be a very small part of the solution partly because the inherent inefficiency of private transportation devices where one person takes two tonnes of glass, rubber and metal around with them are not addressed.	A mode shift to quality public transport and pedelec vehicles will be much more important. The Society is highly supportive of the survey funding that reducing the need to travel by implementing non-built infrastructure options like working from home was popular. This has the potential to reduce emissions but also to release time from commuting for other activities such as learning to garden, and build community through greater participation.

3.1. The vital message from the above is that the choice is stark. If we commit to a worldview that cannot eventuate in the planning period, most of the infrastructure will be, at best, only partially effective and partially useful, and may even be a significant liability.

3.2. We are fortunate to still have infrastructure built on the energy surpluses from the past, as well as some energy and other resources that give us a limited adaptive capacity to make our infrastructure as relevant as possible to the realistic future. This window of opportunity is shrinking rapidly…

3.3. It is therefore essential that intergenerational economic decision-making methodology be utilized, especially when the useful life of capital stock invested now exceeds the life time of current generations. We should not leave a legacy of redundant white elephants for future generations. In the modified words of Nicholas Georgescu-Roegen (1971) the resources of every Cadillac (or Tesla!) constructed now, uses the resources essential for realising the infrastructure systems of future generations.

3.4. In essence we must choose the right primary planning scenario. All strategies and decisions of significance flow on from that choice.

4. Submission Recommendations

The following are the three key recommendations for the Commission from this submission:

4.1. The Commission should satisfy itself that the most plausible future economy for all nation states is no longer one of simple "supply and demand", but is instead one based on "service and availability" which is dictated by increasingly severe constraints on physical resource and energy supply. New Zealand's infrastructure must be planned accordingly.

4.2. The planning criteria proposed in this submission for post-peak energy consumption should be applied for infrastructure selection and design. This includes evaluating current infrastructure for sustainable resource use.

4.3. It is mandatory that emission and energy budgets demonstrate that all infrastructure projects and procurement policies are consistent with safe climate targets and realistic physical and energy resource assessments of constraints and limitations.

5. Responses to the selected discussion questions

Q1. What are your views on the proposed 2050 infrastructure vision for New Zealand?

The Infrastructure Commission and associated government and private sector agencies persist in their current set of assumptions, some of which are implicit, and most at odds with the laws of thermodynamics. These assumptions must be made explicit, as well as a robust discussion about

them in the context of the future we face which is consistent with the known laws of physics and observable trends in resource and environmental quality.

To fail in this regard is to render this entire 'strategic' exercise a futile and meaningless exercise, based on wishful thinking.

The Wise Response Society has made a number of comprehensive submissions to the government on the same issues addressed above. For example, we refer the Commission to our submission to the CCC report[5], Zero Carbon Bill Consultation[6], Productivity Commission[7], Productivity Commission[8], etc.

Q2. What are your views on the decision-making principles we've chosen? Are there others that should be included?

A Biophysical Limits and Energy Availability perspective must be a part of the decision-making process. A recent document from the Geological Survey of Finland[9] undertook a sound analysis of the reality of resource depletion and its implications for infrastructure function, maintenance and replacement. The report concludes:

> *"The implications of this report suggest that with the depletion and unreliability in supply of oil, our industrial ecosystem would be required to evolve into a lower energy consumption profile with less complexity. As there is no real replacement for oil in terms of what it*

5 CCC_Submission_Wise_Response_Society_Full_Final_28032021_v2-1.pdf

6 Wise-Response-Societ-Submission-on-the-Zero-Carbon-Bill-19-July-2018-Finalb.pdf

7 Wise-Response-Inc-Submission-on-draft-Productivity-Commission-Report-for-low-carbon-economy-Final.pdf

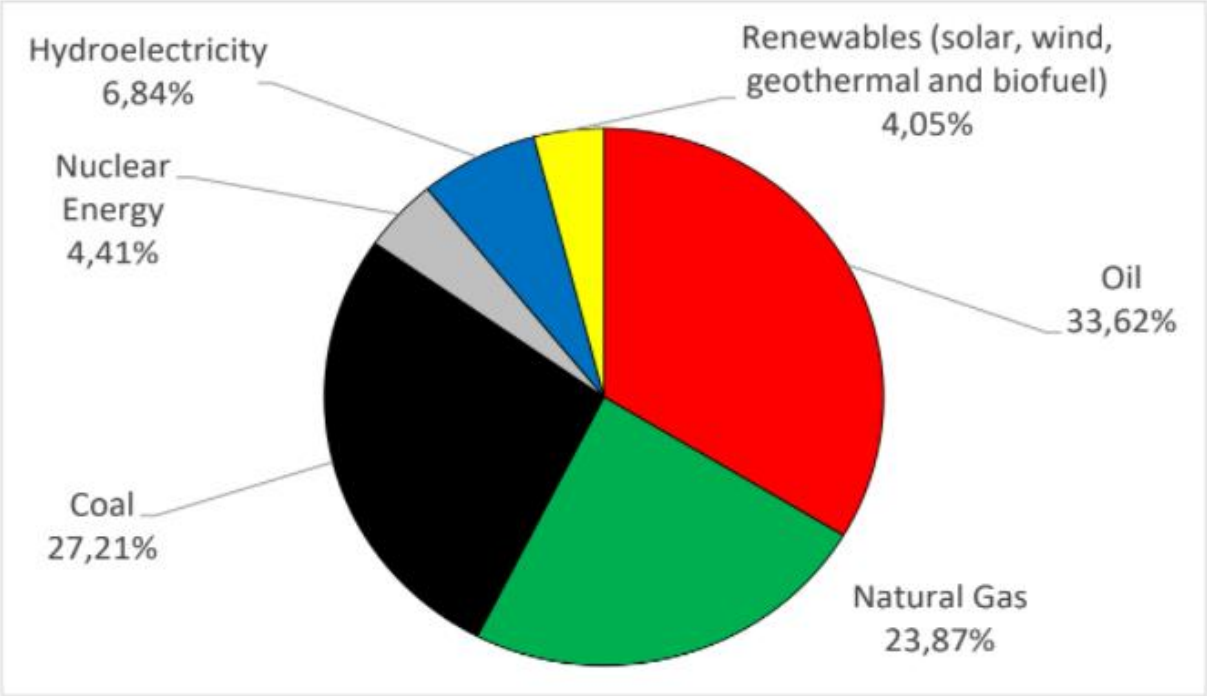
8 Wise-Response-Submission-Low-Emissions-Economy-Final.pdf

9 https://bit.ly/3wBpmbg

contributes, this necessitates a complete restructure of the demand side of energy requirements. This has far reaching implications in the structure of the industrial ecosystem. Due to the widespread environmental impact of the current system, this would be required for long term stability of any modern industrial society (like Europe) in a sustainable fashion."

The figure below shows the level of our global dependence on oil and other fossil fuels for economic activity and therefore the magnitude of the challenge.

Figure: Global primary energy consumption by source in 2018 (SourceBP Statistical Review of the World Energy 2019)[10]



[10] https://bit.ly/3wBpmbg

Table 3: General decision-making principles for the two alternative scenarios

Our Society considers that the post-peak Option 2 decision-making concepts should guide the development of New Zealand's infrastructure strategy.

A general comparison of approaches		
1. Economic philosophy		
Attribute	**Option 1: Pre-Peak Growth Society**	**Option 2: Post-peak degrowth or Stable Society**
Primary Concept	Scarcity	Scarcity
Attitude to Scarcity	Conflict	Acceptance
Purpose of Production	Consumption	Maintenance
Emphasis on Production	Productivity	Distribution
Timescale Horizon	Narrow	Wide
Incentive for Work	Income for consumption	Satisfaction
Typical Attitude to Work	Necessary imposition	Accepted part of life
Work and Leisure	Differentiated	Little difference

Place of Humankind in Ecosystem	Domination	Participatory
2. Population		
Typical Annual Growth Rate of Natural Population	2.0%	Ideally average 0 % (small fluctuations in population)
Doubling time	35 years	No doubling time with zero net immigration
Age Composition Profile	Triangular	Cylindrical
Total Fertility The average number of children in each family	Global peak of 5.10 in 1964 declining to 2.44 in 2016	Approx. 2.11
Net Reproduction Rate The ratio of women in one generation to the next	Global peak of 1.892 (1965-1970) declining to 1.099 (2015-2020). Dependent on death rate.	1.000
Family Structure	Nuclear family	Extended family
Urbanisation	High (80%)	Low (20-40 %?)
3. Capital Stock		

Durability	Low	High
Maintenance Energy Cost	High	Low
Recycling	Limited	Optimised within inevitable dissipation and energy constraints
Creation of New Capital Stock	A large proportion of new capital stock is additional capital stock using additional materials.	New capital stock is replacement capital stock. Materials of old capital stock are recycled within above constraints
4. Energy Production		
Source	Energy stock	Energy flow
Limits of Production	Peaking (maximum rate of extraction) and inevitable EROI decline to 1.0	Level of technology and availability of key scarce minerals invested in viable renewable energy sources
Permanence of Source	Non-renewable	Renewable over medium time scale, but ultimately long-term technological decline as minerals dissipate.
Level of Pollution	High Pollution	Low Pollution
Pattern of Energy Flow	Increasing then decline	Slow decline due to inevitable slow dissipation of materials and limits of recycling unless less

		abrupt fall precipitated by economic shock
5. Consumption		
Pattern per Capita	Increasing per capita	Constant per capita with minor fluctuations
Goods and Services Consumption	Unnecessary consumption	Necessary consumption
Tertiary Sector	Large tertiary sector	Small tertiary sector – self sufficiency
Distribution of Consumption	Unequal distribution	Equal distribution
Wastage	High wastage	Low wastage
6. Industrial Production		
Pollution	Heavy pollution	Light or no pollution
Energy Consumption	High energy consumption	Low energy consumption
Technological Accidents	Frequent and serious	Infrequent and insignificant
Type of Processes	Complicated	Comprehensible and ideally locally supported

Impact on other Life Forms	Widespread destruction of other life forms	Participatory dependence on other life forms as an integral part of a healthy ecosystem and associated energy flow
Risk of Processes	Ecologically dangerous	Ecologically adapted
7. Food Production		
Type of Agricultural System	Monoculture and uniformity	Permaculture and diversification
Participation in food Production	Industrialised production by large farm units	Production of food involves every family
Factors of Production	Energy and capital-intensive	More labour- intensive
Use of Fertilisers	Artificial fertilisers	Natural fertilisers
Use of Animals	Animals used primarily as food source	Animals perhaps used again for mechanical energy value
Impact on Soil	Erosion and depletion	Replenishment
EROEI of Food	Low < 1.0	High > 10
Control of Pests	Dangerous pesticides used	Ecological techniques used

Environmental protection	Largely treated as a "nice to have" and source and sink, often as an "externality" to the market	Environmental integrity and ecosystem services become increasingly important as the support for the economy and as material resources contract

See appendix A for references for this section.

Q3. Are there any other infrastructure issues, challenges or opportunities that we should consider?

Primary to any strategic consideration of what infrastructure we should be building, rebuilding, or prioritising is the reality of the energy resource depletion situation that we are in and the planetary boundaries that we have transgressed.

A declining oil supply (IEA[11]) should be a primary factor in considering the scope of economic activity in the future because any economy requires energy for each and every unit of GDP[12]. Money printing such as the government has recently embarked on does not ultimately resolve any underlying resource constraints.

Q4. For the 'Building a Better Future' Action Area and the Needs:

- What do you agree with?
- What do you disagree with?
- Are there any gaps?

[11] IEA 2018 World Energy Outlook: Peak oil is here, oil crunch by 2023

[12] https://bit.ly/2TYlyCO

Refer to the post- peak decision making criteria in the earlier parts of this submission.

The Proposed Action area of "enabling Competitive Cities and Regions is very limited - and seems to consider cities only in those terms - nothing about making cities and regions less damaging to people, society and the environment or enhancing connectivity of people who live there, making them pleasant, interesting or culturally fulfilling or resilient, with green space and so forth.

We think we should be expanding understanding of the need to have infrastructure for nature - e.g. corridors and habitats connected, the transport of nutrients, migration pattern maintenance of fish and other creatures, soakage and sediment traps, and measures to intercept and divert or neutralise pollutants and prevent further biodiversity losses and other ecosystem function harms.

Q5. How could we better encourage low-carbon transport journeys, such as public transport, walking, cycling, and the use of electric vehicles including electric bikes and micro-mobility devices?

Revise the vehicle definitions from NZTA to make higher-power four-wheel pedelec vehicles legal. Currently they are limited to 300W which restricts the 'legal' options for practical vehicles that could replace the car, provide adequate speed, and provide load carrying capability that would incentivise people to make the shift now.

Put a higher tariff on fossil fuels, using a mechanism like TEQ's[13]

[13] https://bit.ly/3gSPYj3

Q6. How else can we use infrastructure to reduce waste to landfill?

Promote local or suburban community operated recycling shops that retain resources and provide revenue for local community use (eg Hampden, Otago, which has funded its own Community EV from resale of recyclables and is planning to build its own Community workshop jointly with Hampden School.

Q7. What infrastructure issues could be included in the scope of a national energy strategy?

Refer to our responses to questions 1-3. The Infrastructure Commission consultation is not asking the right questions, and appears to be unaware of and blind as to resource depletion and constraint issues.

Q8. Is there a role for renewable energy zones in achieving New Zealand's 2050 net-zero carbon emissions target?

Our response is a definite yes. Renewable energy is 100% our future, but in a post-industrial context, renewables can perhaps ease only some of the pain of the transition at best. Renewable energy cannot be a total replacement for fossil energy sources which historically had a much higher 'energy profit'. As outlined earlier in our submission, this the key issue to consider in strategic decision making about our energy infrastructure[14].

There are many excellent text books and peer reviewed publications in high ranking international journals on this subject. InfraCom should review and incorporate the understandings from these references[15] in its deliberations.

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[14] http://bit.ly/ORFRHPCI

[15] Our Renewable Future (book) http://bit.ly/ORFRHPCI , Life After Fossil Fuels (book) https://bit.ly/3wQXVus , Energy and Human Ambitions on a Finite Planet (Textbook) https://bit.ly/35KLjZY , EROI of different fuels and the implications for society (paper)

Q.9. Of the recommendations and suggestions identified in the Ministry of Business, Innovation and Employment "accelerating electrification" document, which do you favour for inclusion in the Infrastructure Strategy and why?

Q10. What steps could be taken to improve the collection and availability of data on existing infrastructure assets and improve data transparency in the infrastructure sector?

Q11. What are the most important regulatory or legislative barriers to technology adoption for infrastructure providers that need to be Addressed?

Q12. How can we achieve greater adoption of building information modelling (BIM) by the building industry?

Q13. How should communities facing population decline change the way they provide and manage infrastructure services?

Q14. Does New Zealand need a Population Strategy that sets out a preferred population growth path, to reduce demand uncertainty and improve infrastructure planning?

New Zealand's Related Population Policies

For New Zealand to have a truly sustainable economy, it would need to adopt population policies that strive towards ZPG. However, as indicated earlier

http://stanford.io/1yifujq , Degrowth, Expensive Oil, and the New Economics of Energy (paper) https://bit.ly/3h5Se5s

in the submission, climate change is likely to cause an influx of refugees from the pacific and further afield. The Infrastructure Commission Consultation Document assumes that New Zealand's population will, and should grow over the next 30 years. No mention is made in this document of what might be the sustainable limits to population growth.

The total fertility of New Zealand's natural population has been below replacement level for several decades. The major source of growth in New Zealand's population has been due to positive net immigration. Many thousands of Kiwis have emigrated long-term overseas and have the right to return. Positive net immigration has topped up this exodus and contributed further to population growth. A child born in a New Zealand family does not immediately require housing until they reach maturity when they leave home and set up their own nuclear families, rather than extended families. Deaths equal births in a stationary state population, so no additional housing would be required.

In an expanding population, additional housing is required. Each family which emigrates to New Zealand over and above those which exit, requires immediate housing. NZ has a quota of refugees and, for humanitarian reasons, a quota for political refugees should continue. From a global point of view, each person who emigrates from under-developed countries to New Zealand increases their standard of living and consumption of resources. As long as current living standards remain high in NZ, the average global ecological footprint would increase as a result.

The average global ecological footprint could be less if New Zealand were to provide greater financial assistance to countries to improve their living standards in their own countries. Improvements in living standards in under-resourced countries would assist lowering population growth in these

countries. Immigrants to New Zealand from developed nations presumably had adequate housing in their former countries. Their arrival in New Zealand requires New Zealand to provide additional housing should New Zealand immigration policies continue to allow positive net migration.

New Zealand's past immigration policies based on the assumption that economic growth requires more people has created a dilemma. New Zealand citizens have a right to return to New Zealand. and we have given NZ citizenship to those who emigrated to NZ to top up previous decades of exodus. Limiting immigration to non-nationals in the future will not necessarily limit future growth of NZ's population should New Zealand citizens decide to return to their home country of New Zealand.

No one can foretell the future. In any event, we consider that we must aim to meet the essential wellbeing needs of our current population and, as a matter of priority, climate refugees from the Pacific. Our first priority with necessary infrastructure assets should be to identify what infrastructure is essential for a low carbon future and ensure it is in good condition. Any expansion of our infrastructure should only occur after a rigorous assessment to determine what emigration pressure NZ is likely to experience out until 2050. Given current climate trends it seems probable that some extremely difficult emigration policy decisions will be required within the next 2-3 decades.

Q15. What steps can be taken to improve collaboration with Māori through the process of planning, designing and delivering infrastructure?

A first step is to actually listen to Mātauranga Maori. The value of Maori indigenous wisdom to this conversation is that Mātauranga Maori matured culturally in a pre-industrial period when hard biophysical limits had not temporarily been 'transcended' by access to the one-time inheritance of fossil energy stores. "Our understandings and expectations of the world have been

shaped by our experience of economic growth. The dynamic stability of that growth has habituated us to what is 'normal.' That normal must soon shatter." – David Korowicz

Concepts such as tapu and rāhui are there to limit over-exploitation of non-renewable resources on meaningful human timescale. These concepts are going to be central to decision making in any ecologically mindful policy culture in this century.

Q16. What steps could be taken to unlock greater infrastructure investment by Māori?

Q17. What actions should be taken to increase the participation and leadership of Māori across the infrastructure system?

Q18. For the 'Enabling Competitive Cities and Regions' Action Area and the Needs:

- What do you agree with?
- What disagree with?
- Are there any gaps?

We consider that cities and regions should not be based on a competitive model, but instead should be based on collaboration and, as far as possible, self-resilience.

Q19. What cities or other areas might be appropriate for some form of congestion pricing and/or road tolling?

Use of any policy tools to reduce the need for the private car.

Q.20 What is the best way to address potential equity impacts arising from

congestion pricing?

Q21. Is a 10-year lapse period for infrastructure corridor designations long enough? Is there a case for extending it to 30 years consistent with spatial Planning?

Q22. Should a multi-modal corridor protection fund be established? If so, what should the fund cover?

Q23. What infrastructure actions are required to achieve universal access to digital services?

Q24. For the 'Creating a Better System' Action Area and the Needs:
• What do you agree with?
• What do disagree with?
• Are there any gaps?

Q25. Does New Zealand have the right institutional settings for the provision of infrastructure?

Emphatically no! In particular the reliance on neoclassical economic forecasts that are blind to biophysical limits and therefore blind those relying on them is of particular importance. For example, MBIE has a energy team that uses demand led forecasts. This has recently been reviewed and deemed satisfactory by auditors who themselves are unable to see past the assumptions and narrow worldview that their indoctrination into the civic religion of economics has inculcated in them. There is an urgent need to broaden the perspective of the economists across the ministries, to take into account the biophysical realities of the next century, and Wise Response is

recommending the www.medeas.eu systems dynamics model as a promising avenue for investigation.

Q26. How can local and central government better coordinate themselves to manage, plan and implement infrastructure?

By developing a common understanding of the biophysical reality outlined in the rest of this submission, and using the principles we have suggested to guide policy and implementation.

Q27. What principles could be used to guide how infrastructure providers are structured, governed and regulated?

Refer to our proposed criteria for a post-growth future.

Q28. What steps could local and central government take to make better use of existing funding and financing tools to enable the delivery of Infrastructure?

Q29. Are existing infrastructure funding and financing arrangements suitable for responding to infrastructure provision challenges? If not, what options could be considered?

Q30. Should local authorities be required to fund depreciation as part of maintaining balanced budgets on a forecast basis?

The whole practice of discounting is a large part of the problem. By reducing the future value of infrastructure assets to zero in Cost Benefit Assessments (CBA's), then the decision-making horizon for strategic planning is artificially curtailed. This could be changed by simply reducing depreciation to zero for current CBA's.

Q31. What options are there to better manage and utilise existing infrastructure assets?

When the assumptions about the future are corrected using the guidance in this submission, then the options that are better present themselves naturally, as in the Invercargill example outlined earlier. This example was derived from a study using the "Transition Engineering" methodology described by Prof Susan Krumdieck and the Global Association for Transition Engineers[16].

Q32. Are there benefits in centralising central government asset management functions? If so, which areas and organisations should this apply to?

Q33. What could be done taken to improve the procurement and delivery of infrastructure projects?

Q34. Do you see merit in having a central government agency procure and deliver infrastructure projects? If so, which types of projects should it Cover?

Only if the procurement process is guided by the principles for a low carbon, post industrial future, as described in this submission. But, in that case yes, as given its scale, New Zealand's regional and territorial authorities are unlikely to be able to gather the expertise to understand, model and extrapolate from the predicament we are in.

[16] https://bit.ly/2V1fgTB

Q35. What could be done to improve the productivity of the construction sector and reduce the cost of delivering infrastructure?

Material cost increases are a function of the reducing surplus energy that society is reliant on for discretionary GDP activity. Cost reduction and improvements in productivity are only likely to be possible through reducing the complexity of the systems, reducing their scale, and removing the reliance on fossil fuels. The Transition Engineering[17] process assists in these strategic decision-making processes.

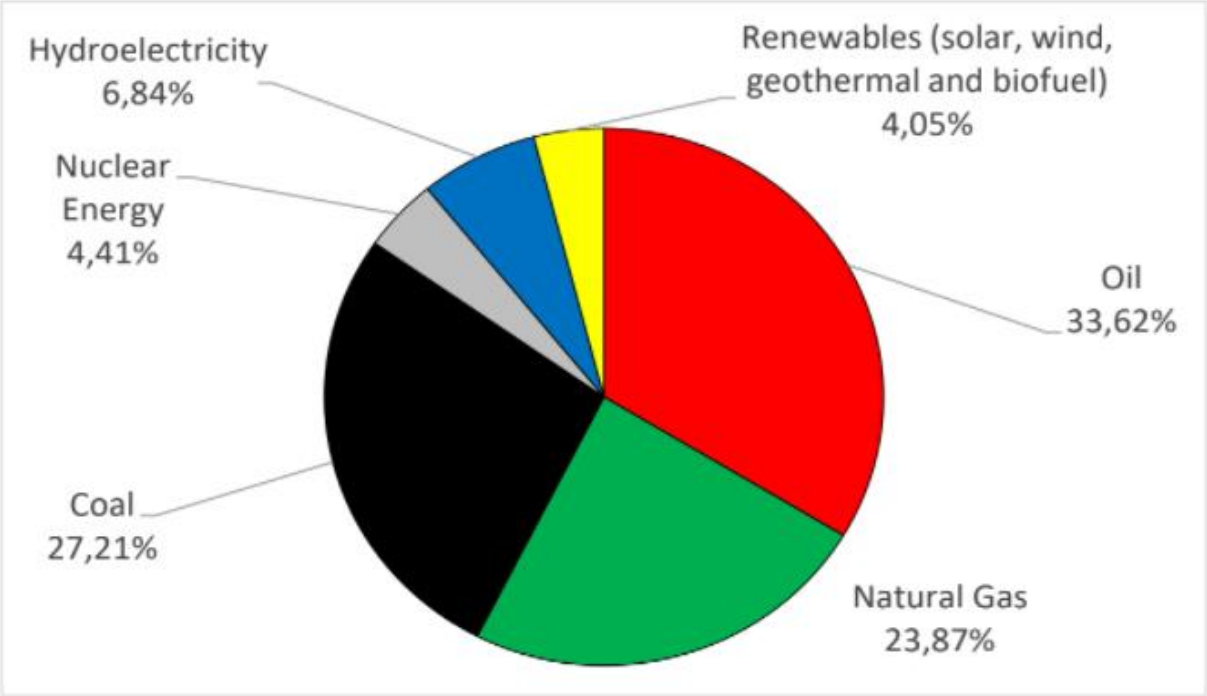
Q36. What components of the infrastructure system could have been improved to deliver effective stimulus spending during the Covid-19 pandemic?

[17] https://bit.ly/2V1fgTB

Appendix A

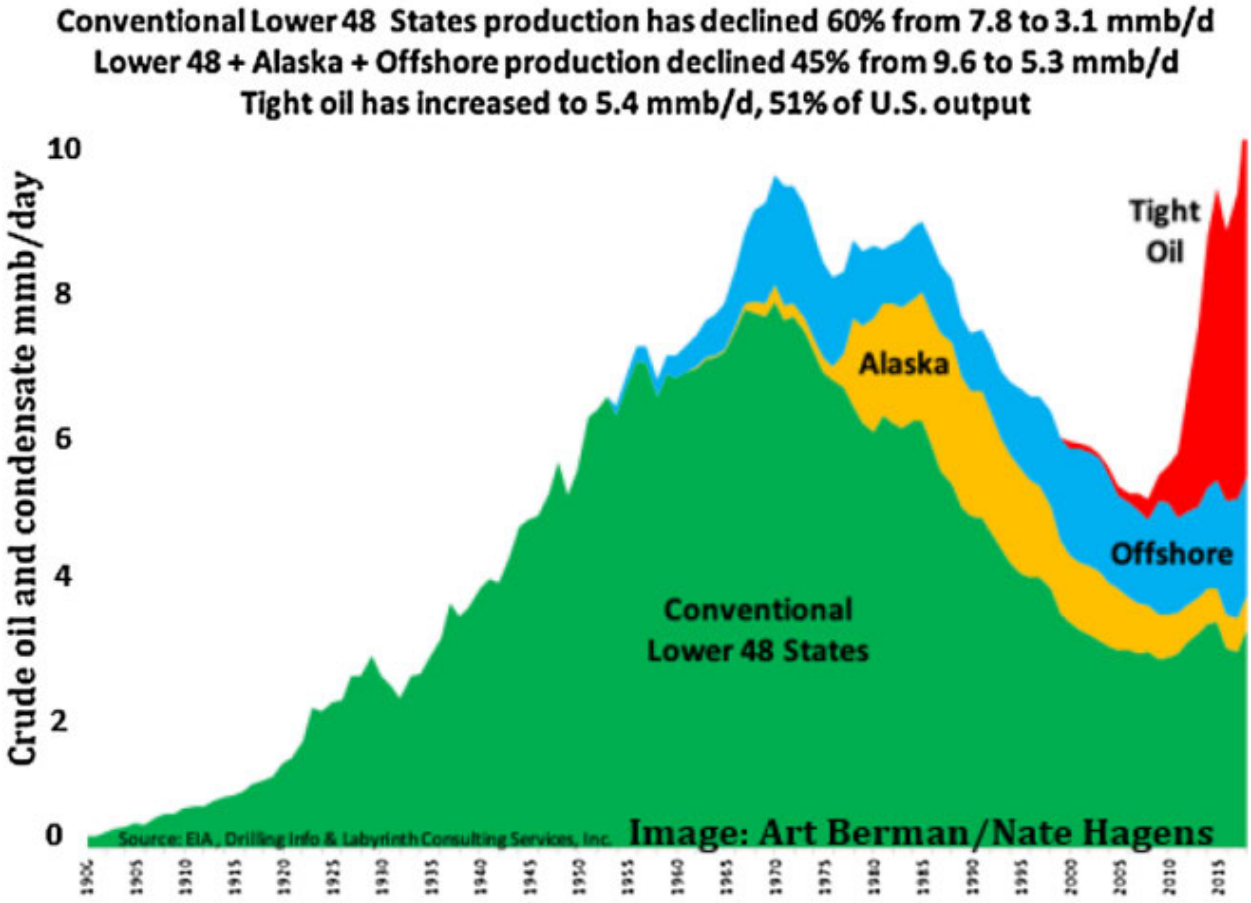
Primarily contains further evidence that supports our primary assertion that we are entering a period of post-growth due primarily to a decline in access to cheap, abundant and universally accessible energy.

<u>Global primary energy consumption by source in 2018 (Source BP Statistical Review of the World Energy 2019)[18]</u>



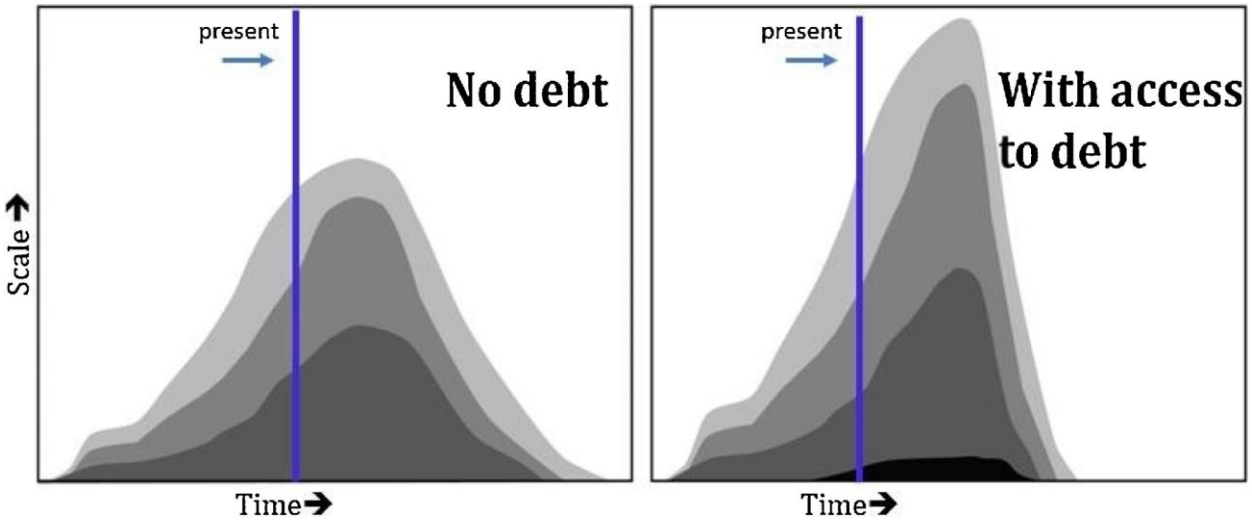
[18] https://bit.ly/3wBpmbg

1. In the graph below, considering total production only gives a false impression that technology has triumphed depletion making oil abundant and therefore not a risk to future growth.
2. However, reality is more accurately depicted when the sources of oil are considered, where collectively, non-shale oil sources are shown to be in permanent decline. The up-tic in total production is a consequence of tight oil (in red), recently scaling to 52% of all production. Tight oil is in the source rock where all other oil originated. Tight oil is economically and ecologically costly and quickly depleted (by as much as 90% in the first 3 years). Data is up to about 2018[19].



[19] N.J. Hagens, Economics for the future – Beyond the superorganism, Ecological Economics Volume 169, March 2020, 106520

3. Growing debt and marketing can also distort the manner in which the underlying resource is accessed and exploited, sometimes continuing use long after it makes energetic sense. The graph below illustrates such distortion.

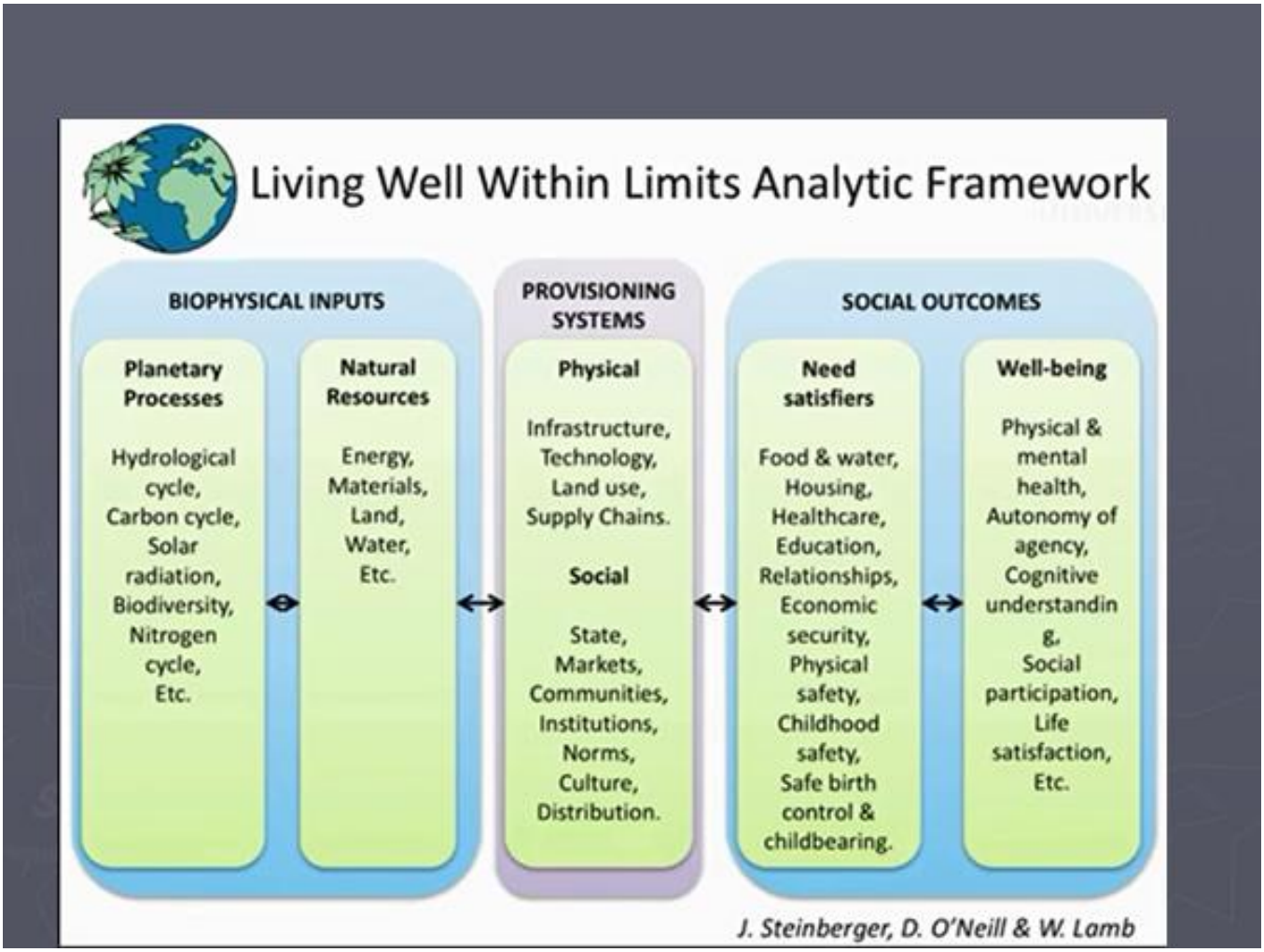


4. Nat Hagens explains the phenomena. The graphs "illustrates how debt pulls resources forward in time. In this hypothetical oil field, the differing shaded areas represent different cost tranches of an oil resource.[3] Obtaining access to cheap financing allows a company to expand drilling into marginally commercial areas as long as new creditors believe in future prospects….However, this results in steeper future declines because the temporary increase cannot be sustained".

5. Tim Morgan summed the effect of such distortion for the US economy as a whole. "In the twenty years before the pandemic – from 1999 to 2019 – reported 'growth' of $71 trillion (110%) in world economic output was accompanied by an increase of $206tn (198%) in aggregate debt. Annual average growth of 3.5% in global GDP was made possible by annual borrowing which averaged 10.0% of GDP. Each dollar of 'growth' was bought with close to $3 of net new debt.

6. Stenberger et al (Leeds University) have attempted to create a logical framework for developing what they term "provisioning systems" (including infrastructure) which need to be appropriate for both the resource limits on the left and to deliver the "need satisfiers" and "wellbeing" criteria on the right. We consider this is a good guide to developing the NZ strategy for the post-peak consumption future.

Living well within limits Analytic Framework



European Parliament

7. The recent resolution from the European Parliament (28.1.2021) indicates that limits are being acknowledged and planned for at a high political level in Europe:

> *"Underlines the need for an absolute decoupling of growth from resource use; calls on the Commission to propose science-based binding EU mid-term and long-term targets for the reduction in the use of primary raw materials and environmental impacts; calls for setting the EU targets through a back-casting approach to ensure that policy objectives are on a credible path to achieve a carbon-neutral, environmentally sustainable, toxic-free and fully circular economy within planetary boundaries by 2050 at the latest;*
>
> *"Calls on the Commission to propose binding EU targets for 2030 to significantly reduce the EU material and consumption footprints and bring them within planetary boundaries by 2050, using the indicators to be adopted by end of 2021 as part of the updated monitoring framework; calls on the Commission to build on the examples set by the most ambitious Member States while taking due account of differences in starting points and capabilities between the Member States;"*[20]

[20] https://www.europarl.europa.eu/doceo/document/A-9-2021-0008_EN.pdf

Appendix B – Wise Response Society

Wise Response is a Dunedin-based but New Zealand-wide, non-partisan Society, launched in 2013, with the purpose of persuading the New Zealand Parliament, Government and New Zealand society in general, to confront and respond effectively to any confirmed threats arising from the question: *"As demand for growth exceeds earth's physical limits causing unprecedented risks, what knowledge and changes do we need to secure New Zealand's future wellbeing?"*

This submission has been shared and developed with a Wise Response discussion list of 50 persons, many having academic expertise in different disciplines. Individual contributors listed may not, however, necessarily agree with all aspects of the final submission. Contributions to this submission do not limit members making their own submissions in a private or professional capacity.

Further information is available on the Society at www.wiseresponse.org.nz

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