City Centre Sustainable Housing Design Competition

Workshop 3: Economic Sustainability

Date: 23 August
Time: 16:00-18:00
Venue: Online hosted by the CIB

Presenter: Francine van Tonder

Economic Sustainability

- Employment
- Home working
- Onsite workshops
- Potential for food production
- Circular economy

Economic Sustainability

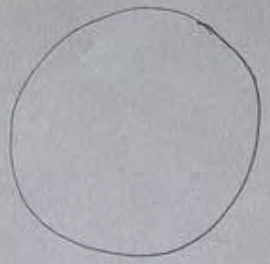
- ~~Employment~~
- ~~Home working~~
- ~~Onsite workshops~~
- ~~Potential for food production~~
- ~~Circular economy~~

- Let’s talk about carbon
- Let’s talk about money
- Circular economy vs linear economy

Now we can look at:
- Employment
- Home working
- Onsite workshops
- Potential for food production

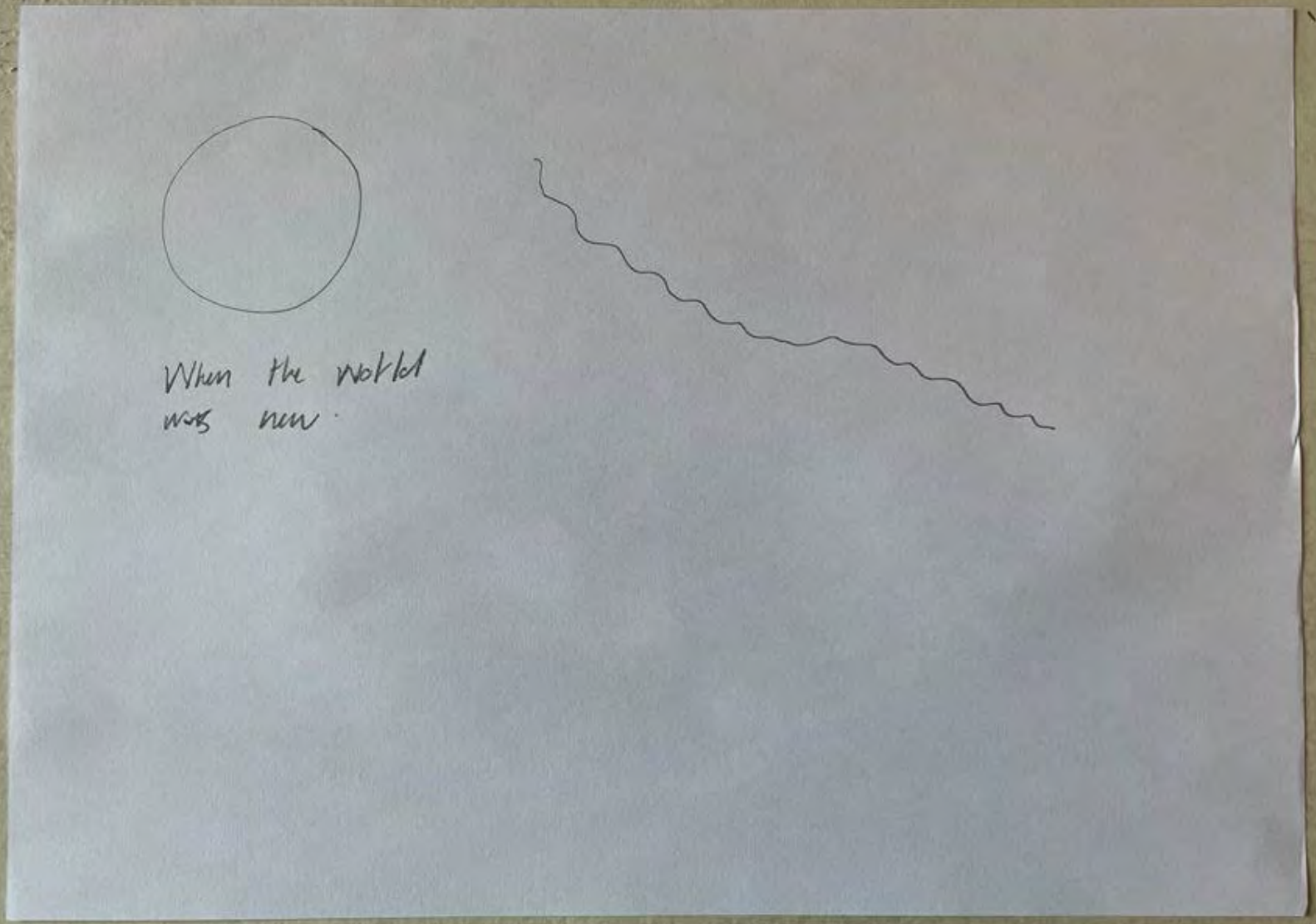
Let’s talk about carbon

How does fossil fuel work?



When the world was new.

How does fossil fuel work?



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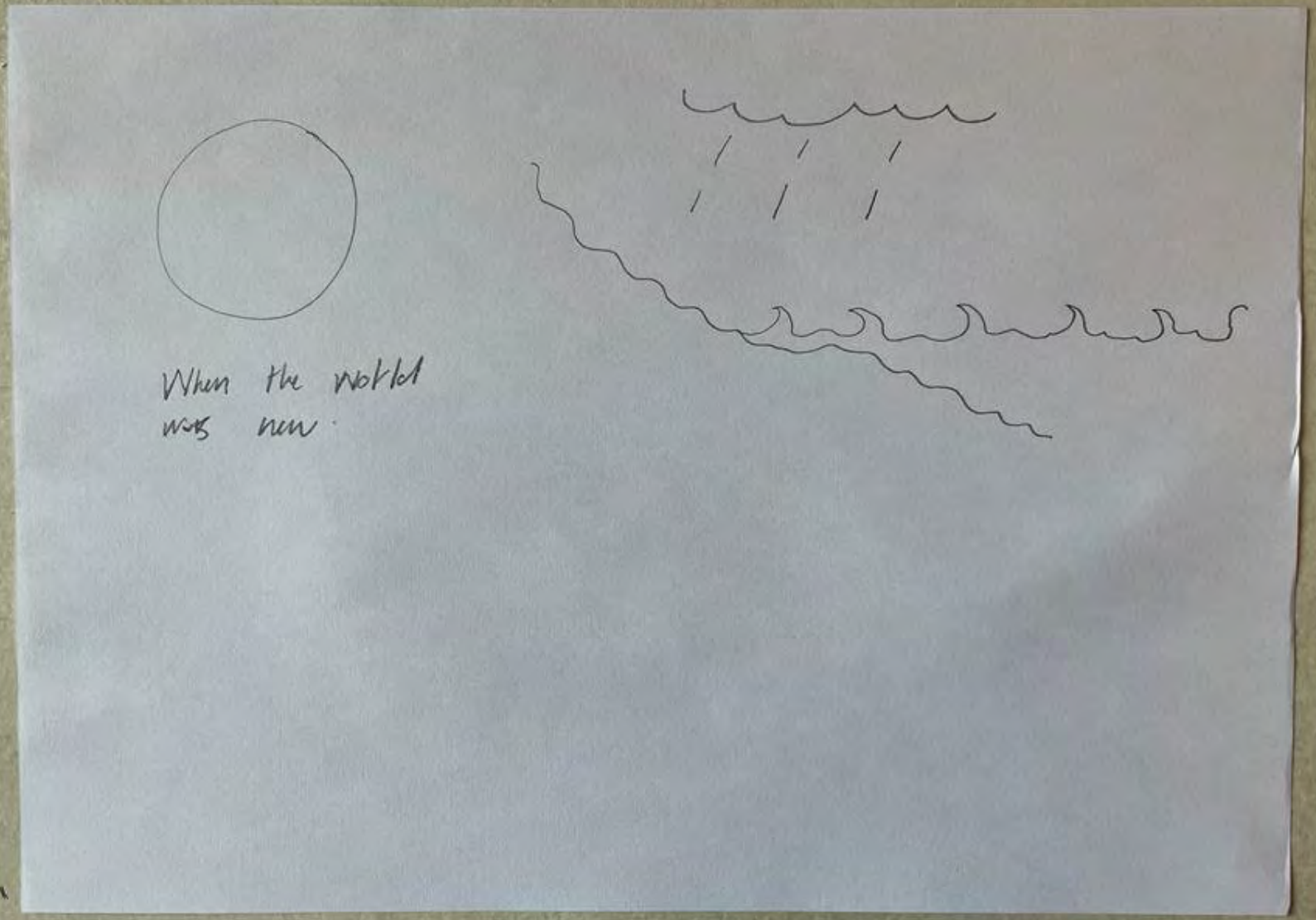

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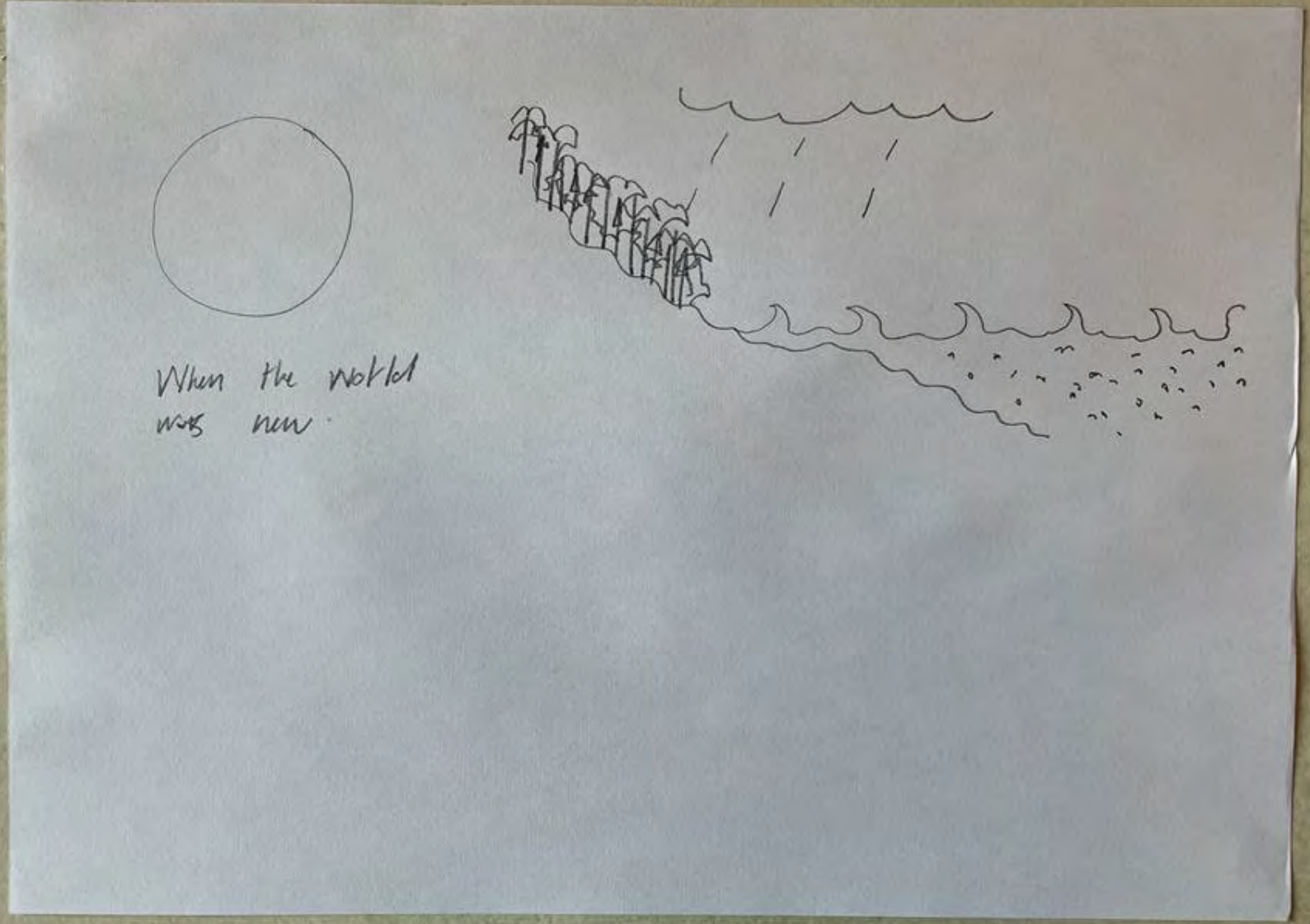

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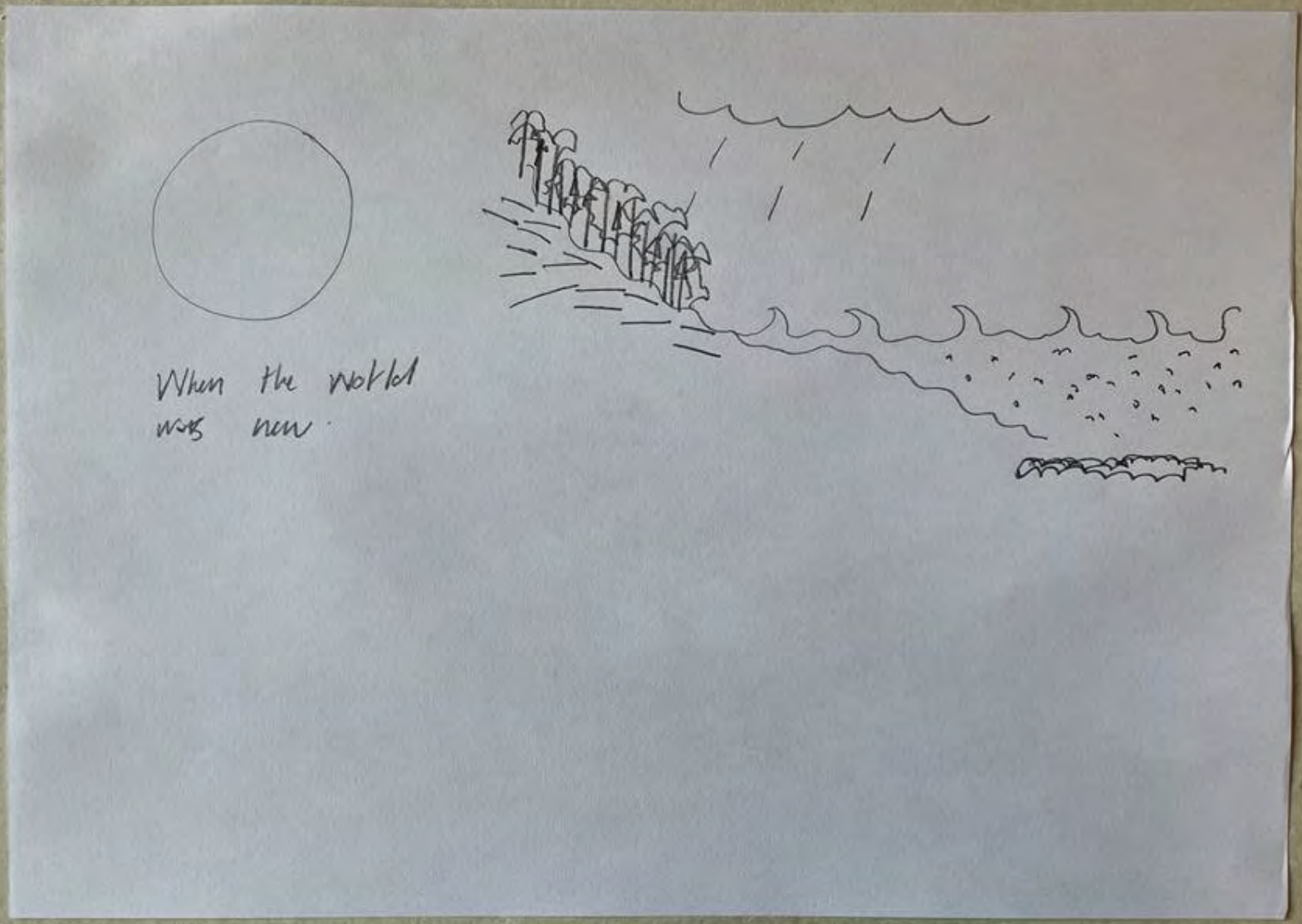

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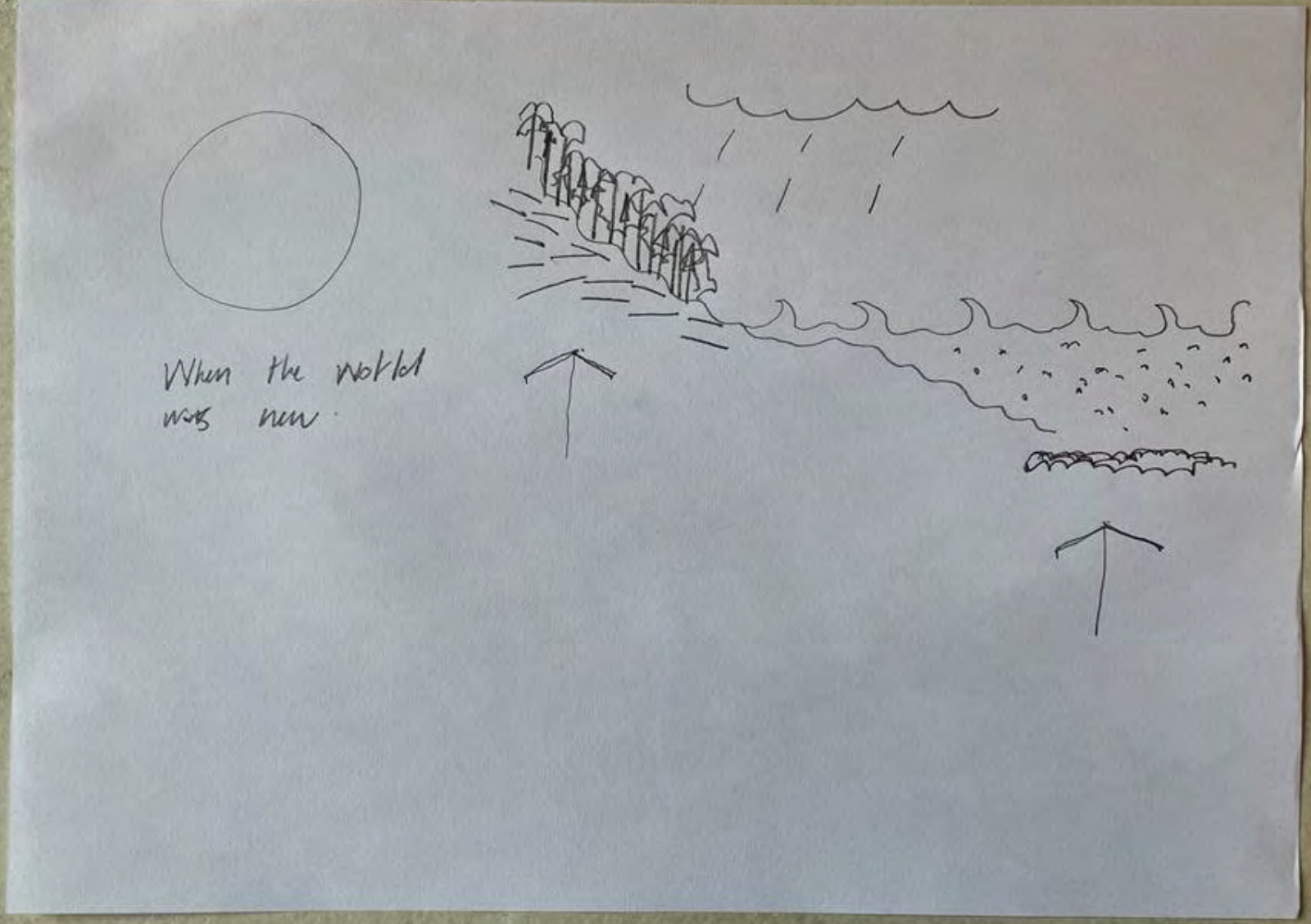

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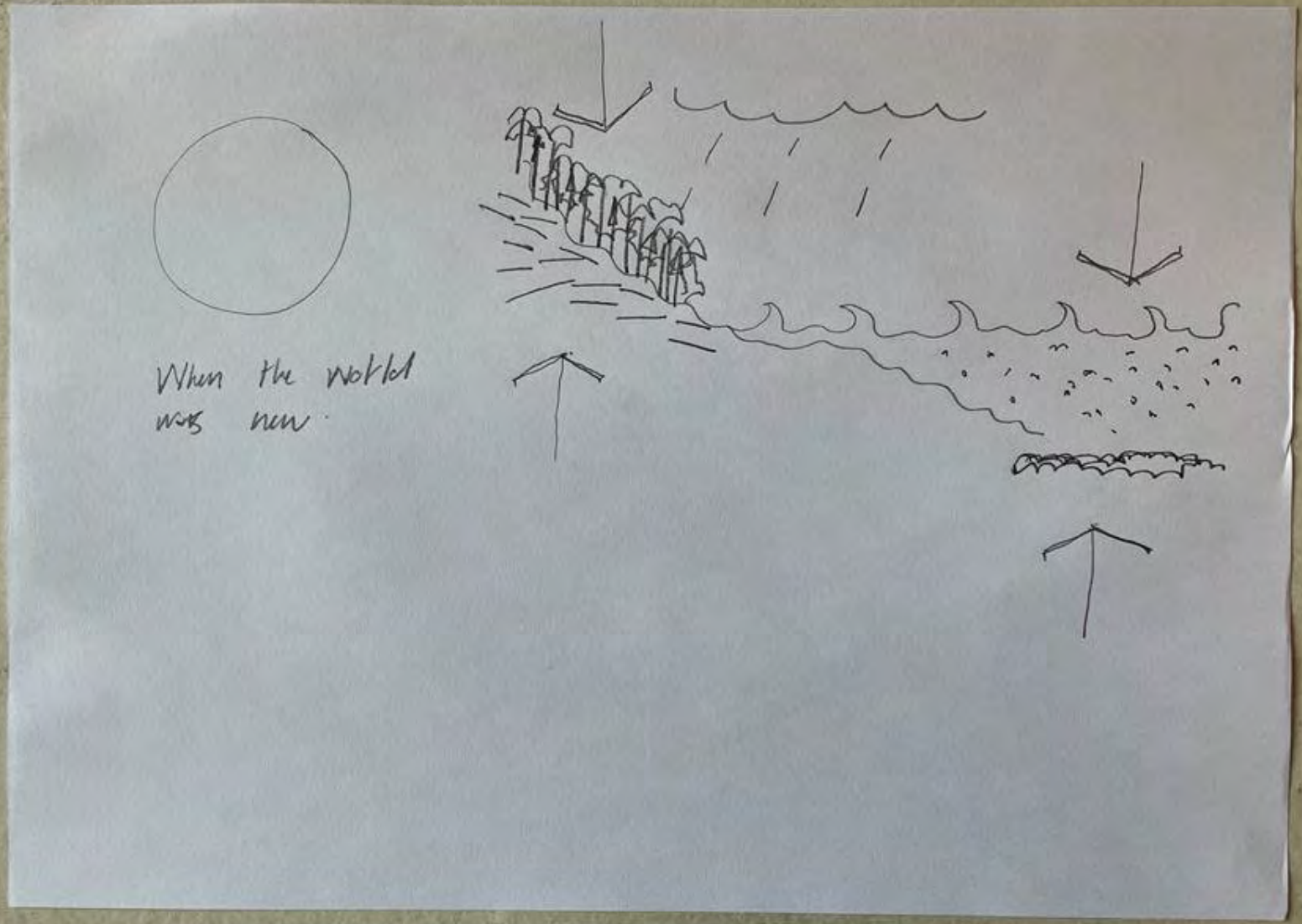

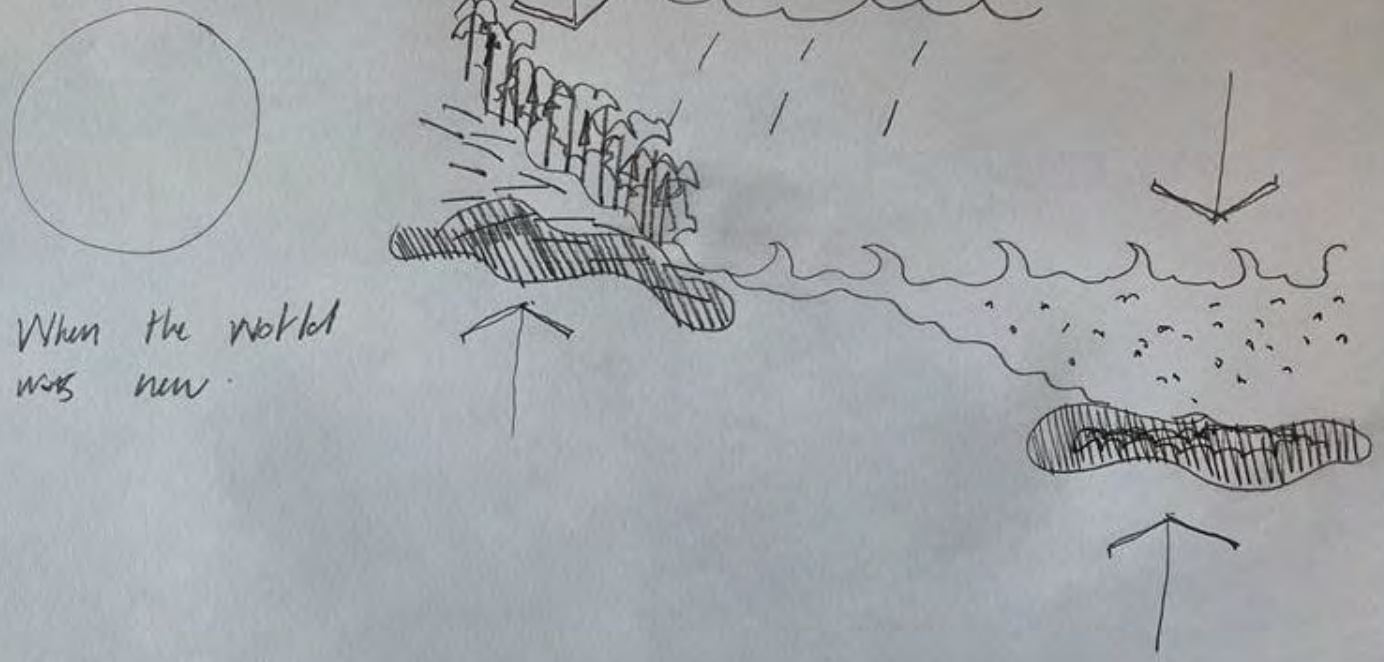

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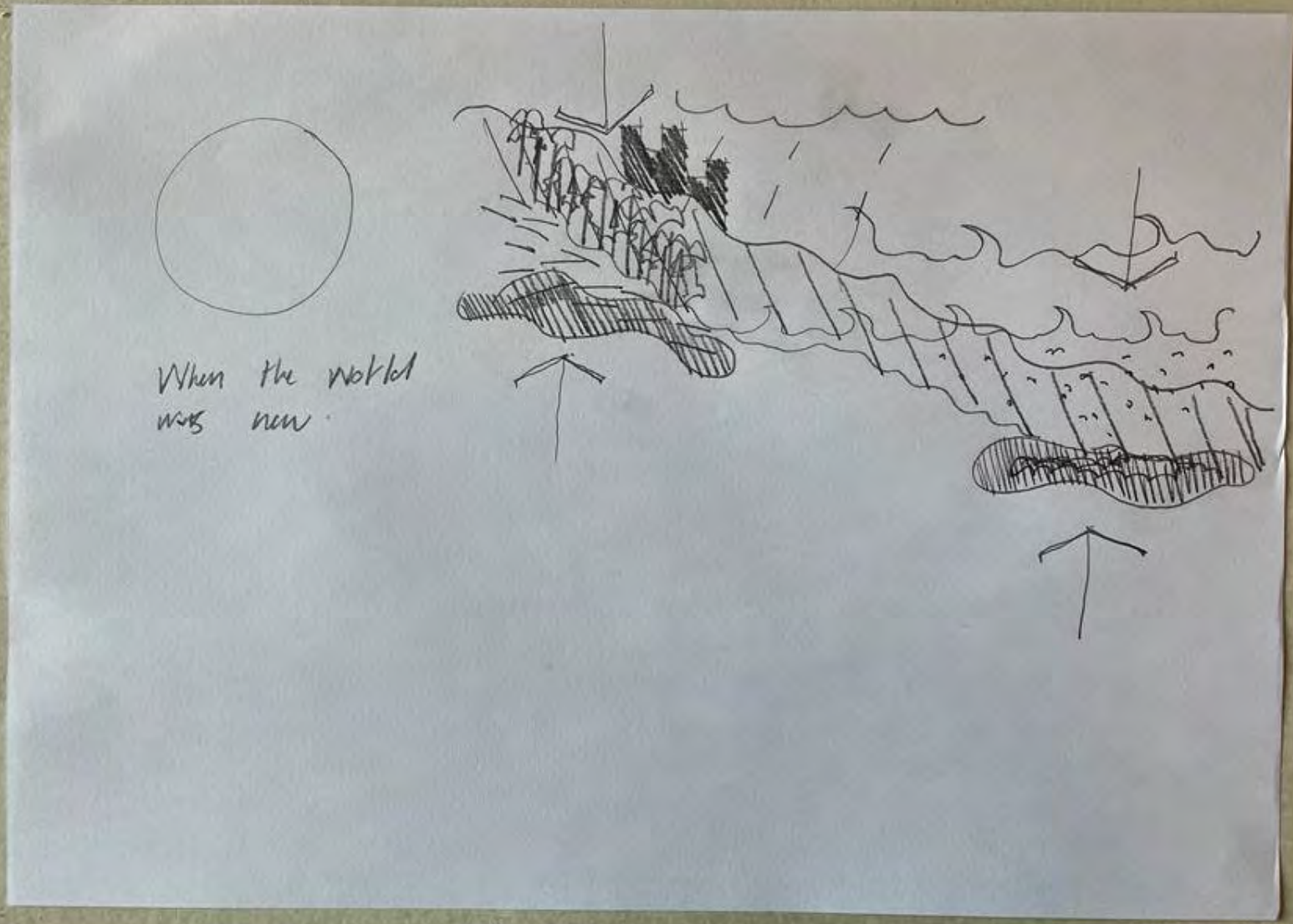

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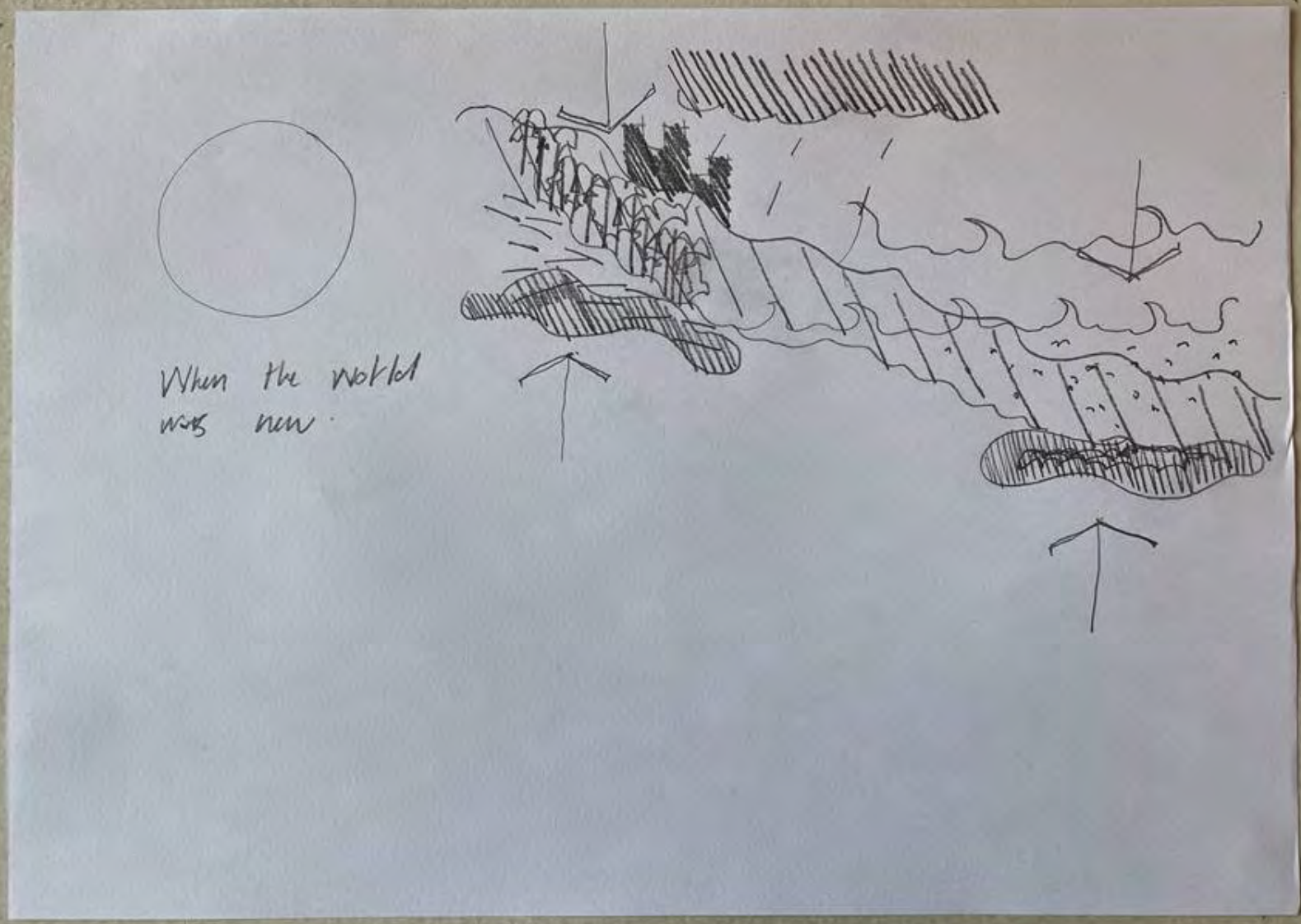
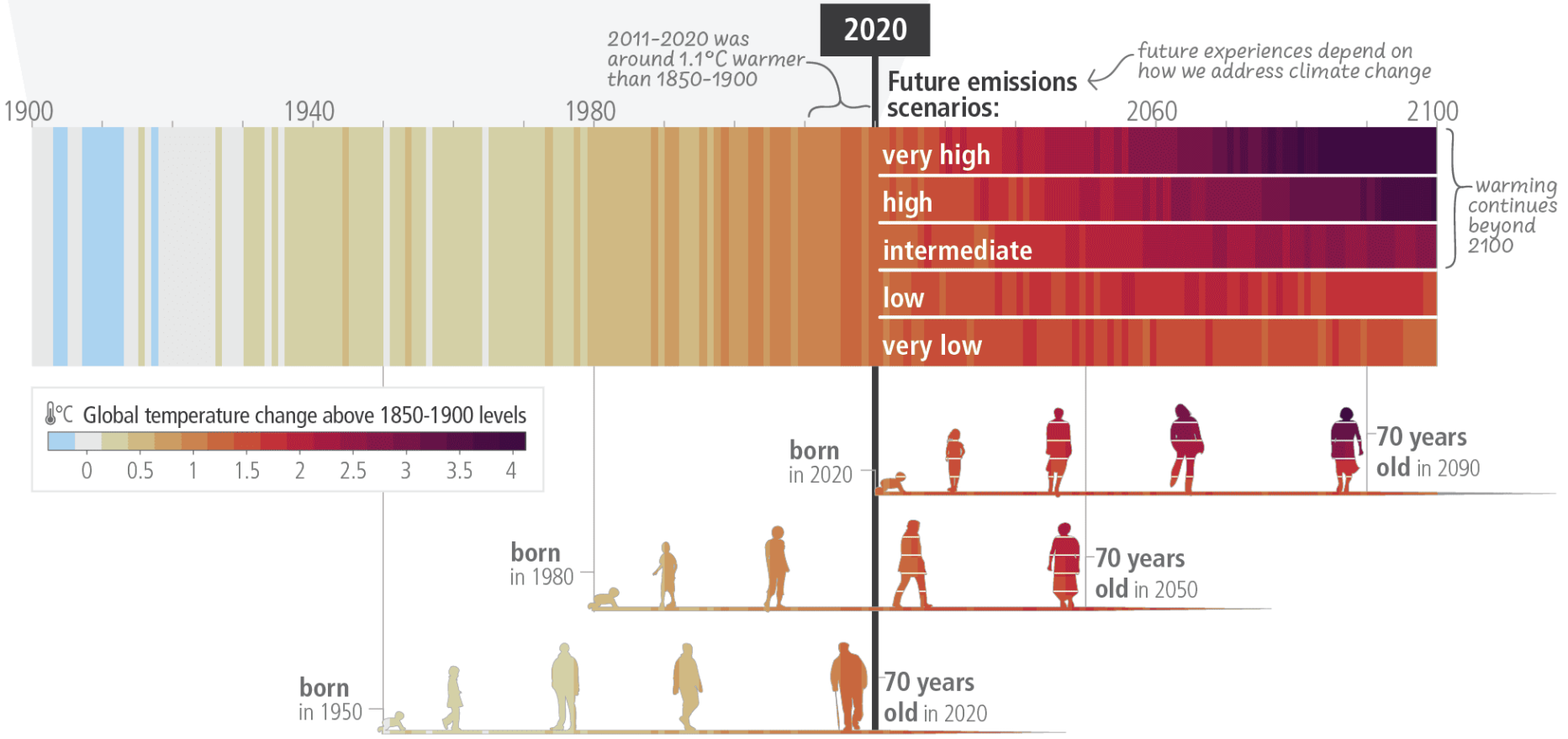


Let’s talk about carbon

c) The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term



Source: IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 36 pages. (in press). p7

IF THE WORLD'S POPULATION LIVED LIKE...

PER SQUARE MILE

How much land would 7 billion people need to live like the people of these countries?

BANGLADESH

CHINA

× 1.1

FRANCE

× 2.5

INDIA

COSTA RICA

× 1.4

UNITED STATES of AMERICA

× 4.1

UGANDA

NEPAL

× 1.9

UNITED ARAB EMIRATES

× 5.4

Data from Global Footprint Network (http://www.footprintnetwork.org/)

How many Earths would we need
if everyone lived like U.S.A. residents?

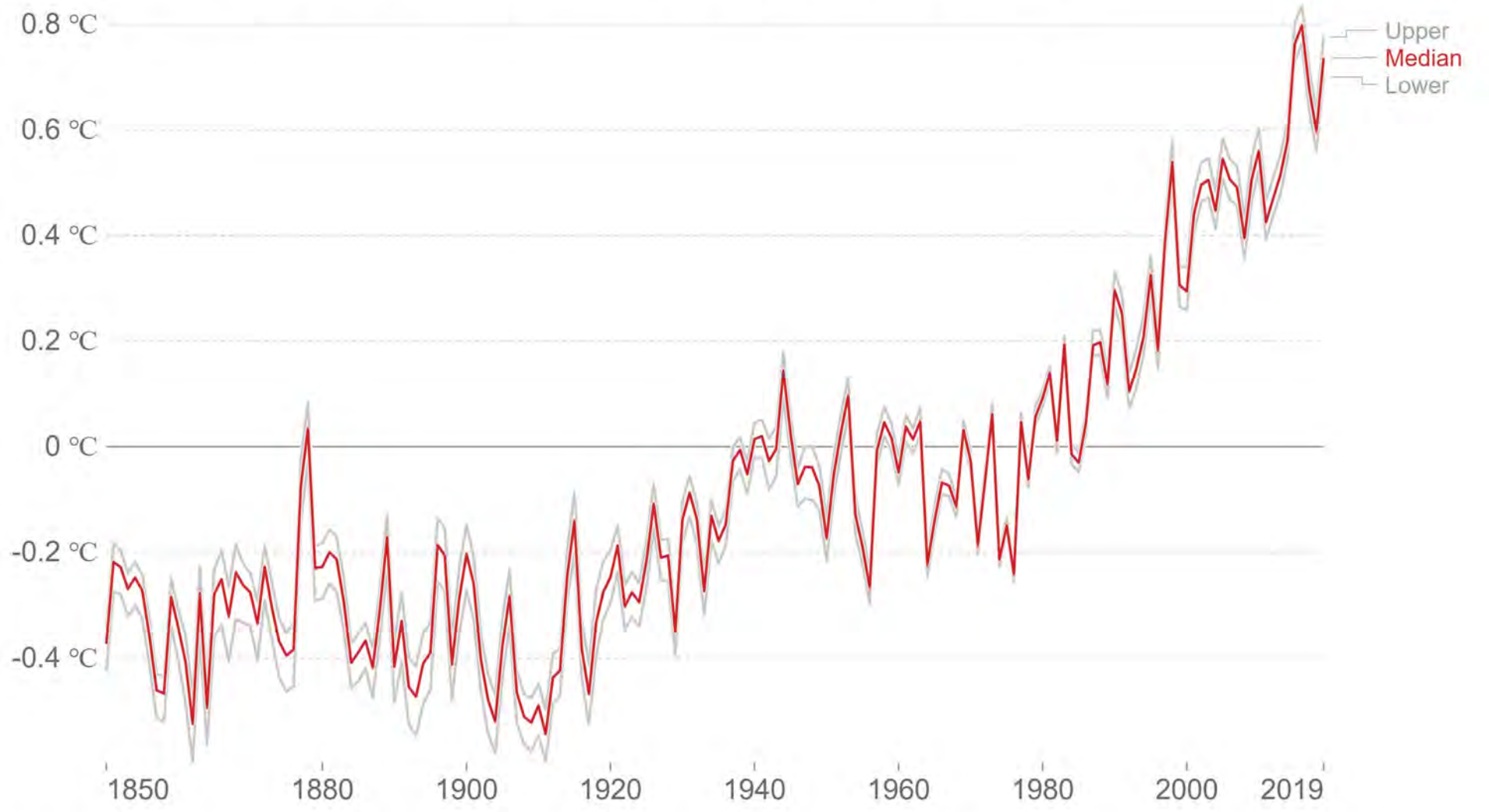
Source: National Footprint and Biocapacity Accounts 2022
Additional countries available at overshootday.org/how-many-earths

How many Japans does Japan need
to meet its residents' demand on nature?

Source: National Footprint and Biocapacity Accounts 2022
Additional countries available at overshootday.org/how-many-countries

Average temperature anomaly, Global

Global average land-sea temperature anomaly relative to the 1961-1990 average temperature.



Source: Hadley Centre (HadCRUT4)

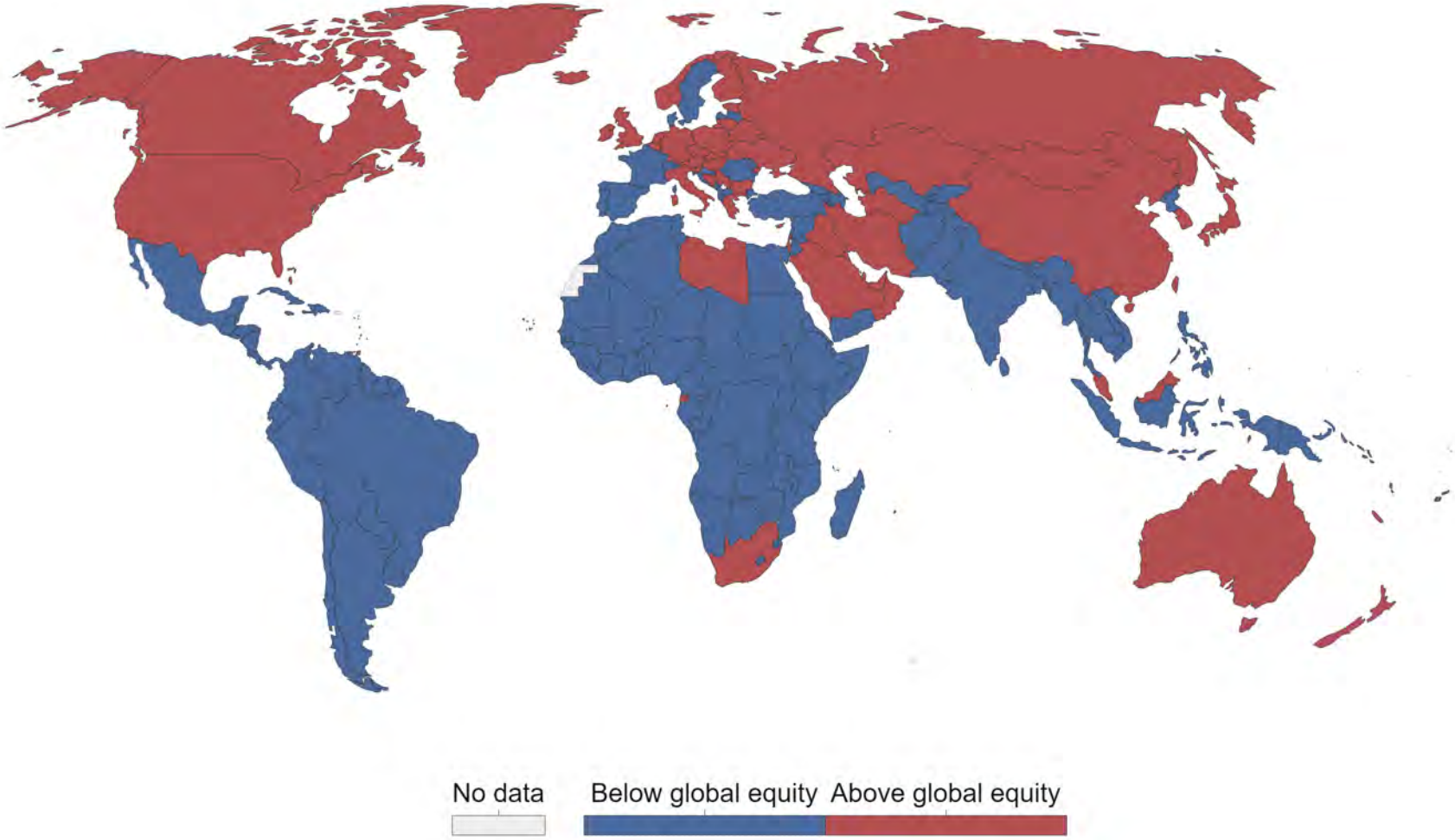
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

Note: The red line represents the median average temperature change, and grey lines represent the upper and lower 95% confidence intervals.

Are per capita CO_2 emissions above or below the global average?, 2020

Our World in Data

National per capita carbon dioxide (CO_2) emissions relative to the global average. This is based on production-based territorial emissions (without adjustment for emissions embedded in trade). This map denotes whether a country's average per capita emissions are above or below the value of global per capita equity.

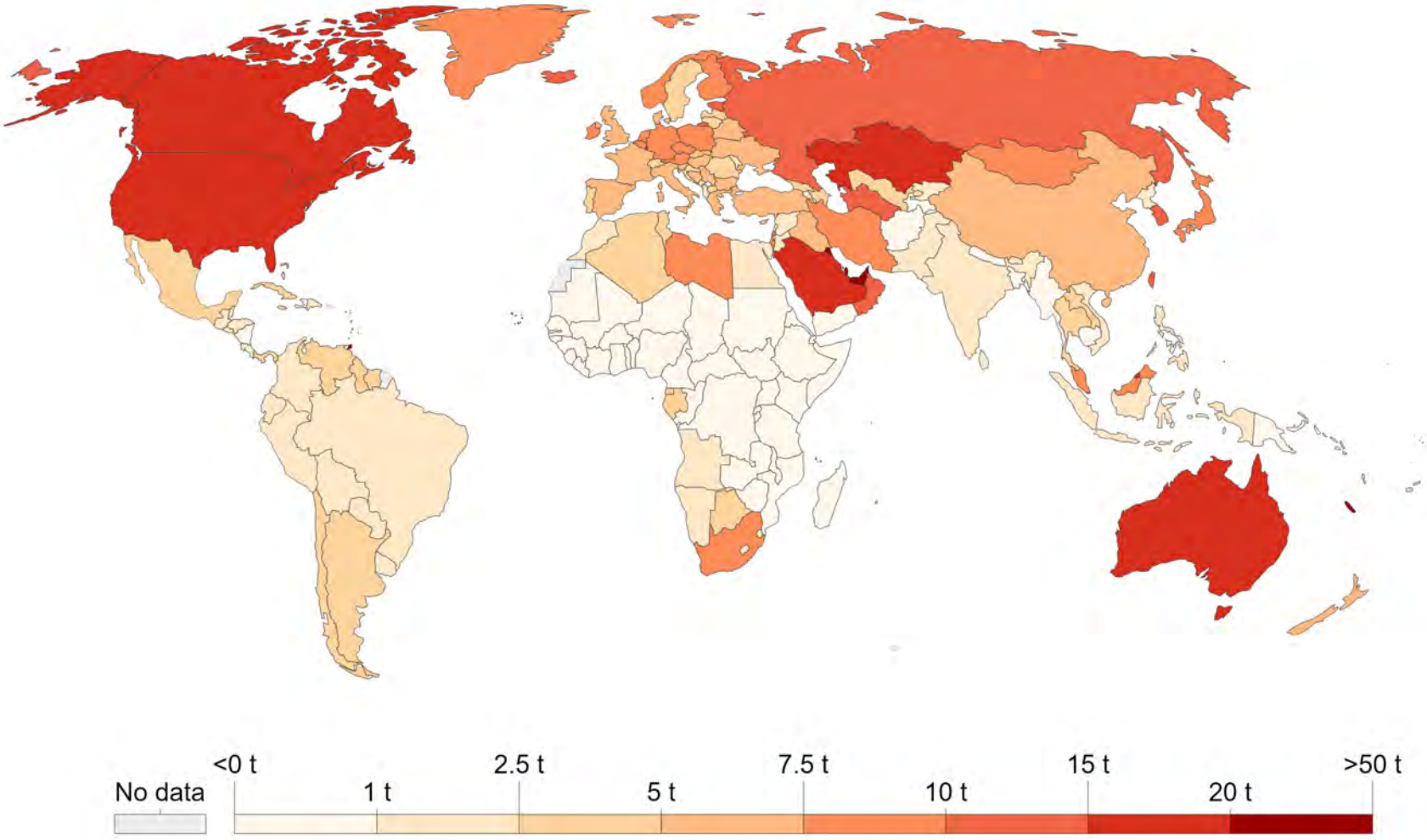


Source: Our World in Data based on the Global Carbon Project

Per capita CO_2 emissions, 2018

Average carbon dioxide (CO_2) emissions per capita measured in tonnes per year. This measures CO_2 emissions from fossil fuels and cement production only – land use change is not included.

Our World in Data

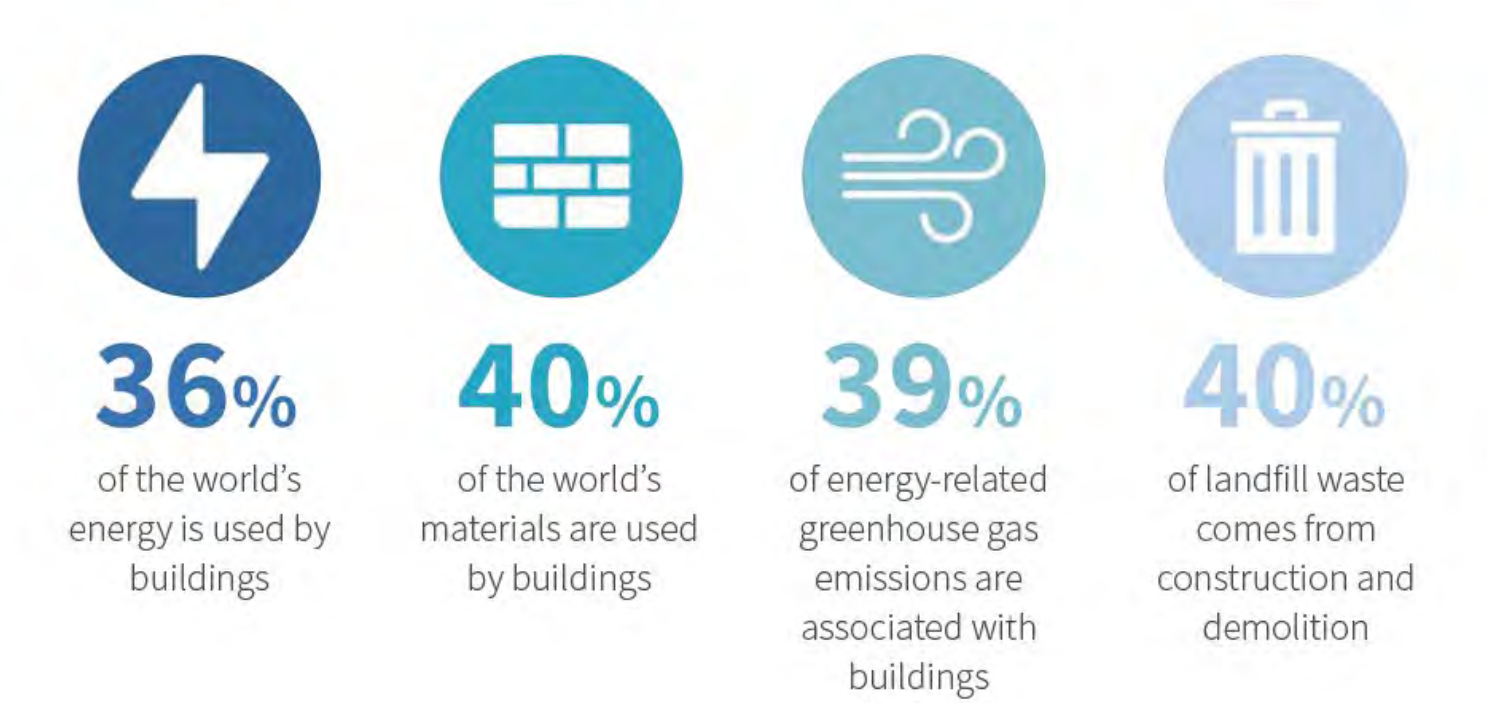


Source: OWID based on CDIAC; Global Carbon Project; Gapminder & UN
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

Carbon dioxide acts as a greenhouse gas, trapping heat in Earth's atmosphere.

Plants convert carbon dioxide into oxygen during photosynthesis, the process they use to make their own food.

What does this have to do with buildings?



Source: Crawford, R.H., Stephan, A. and Prideaux, F. (2019) Environmental Performance in Construction (EPiC) Database, The University of Melbourne, Melbourne. P17

Let’s talk about carbon

Let’s talk about money

Let’s talk about money

2014

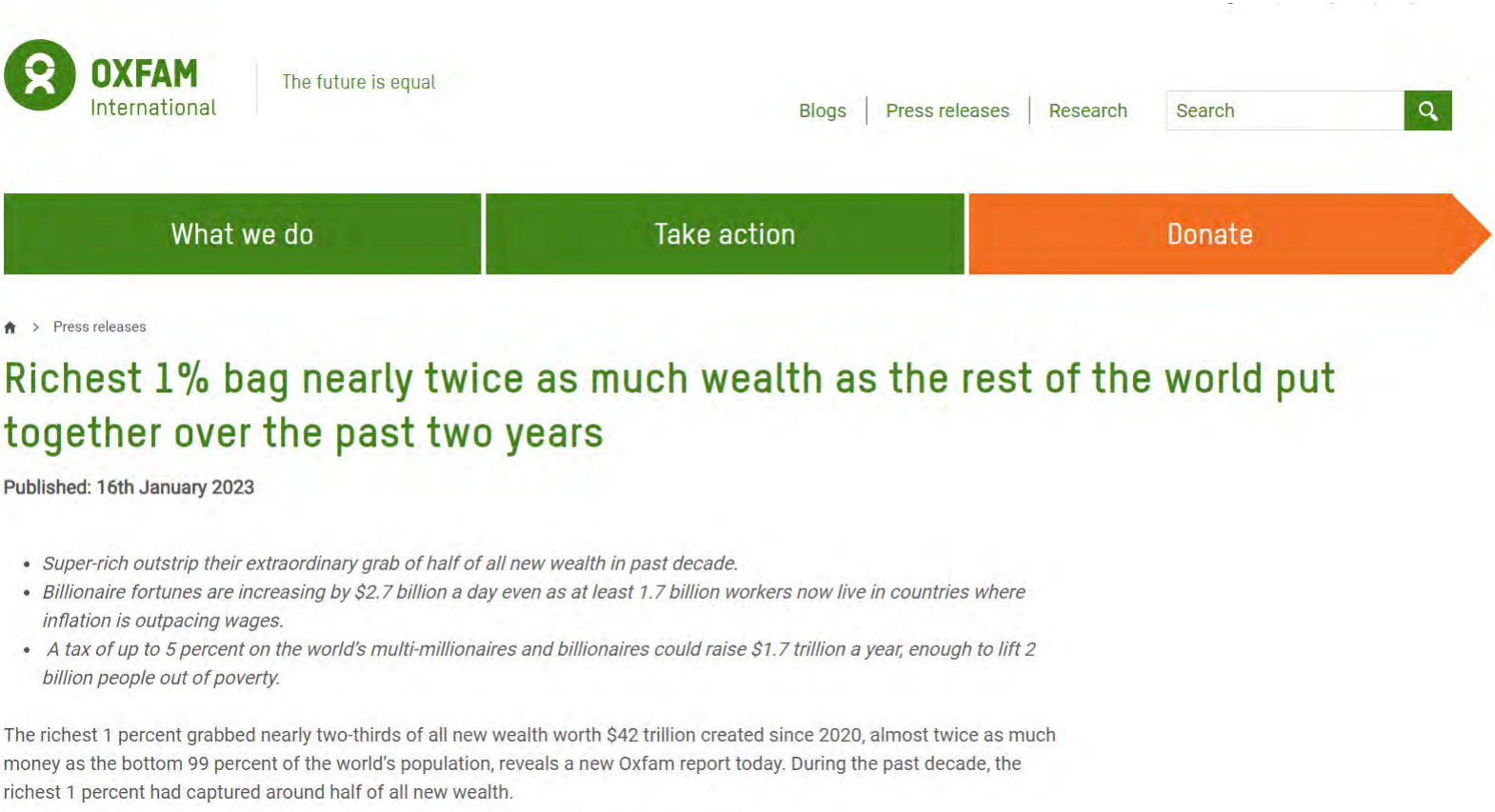
The extent to which so much global wealth has become corralled by a virtual handful of the so-called 'global elite' is exposed in a new report from Oxfam on Monday. It warned that those richest 85 people across the globe share a combined wealth of £1tn, as much as the poorest 3.5 billion of the world's population. 20 Jan 2014

The Guardian
https://www.theguardian.com › business › jan › oxfam-8...

Oxfam: 85 richest people as wealthy as poorest half of the world

Let’s talk about money

2023



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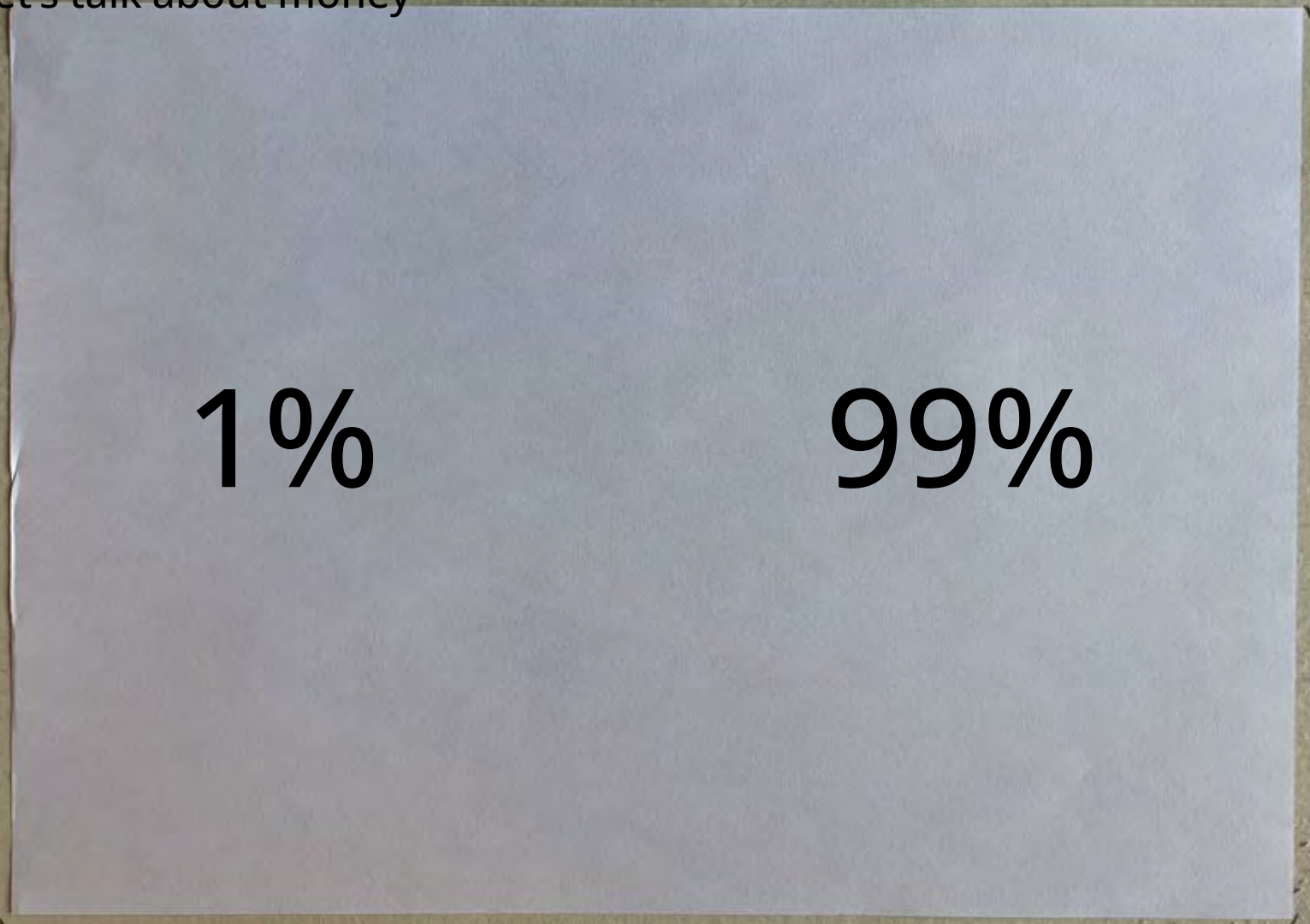
Richest 1% bag nearly twice as much wealth as the rest of the world put together over the past two years

Published: 16th January 2023

- *Super-rich outstrip their extraordinary grab of half of all new wealth in past decade.*
- *Billionaire fortunes are increasing by $2.7 billion a day even as at least 1.7 billion workers now live in countries where inflation is outpacing wages.*
- *A tax of up to 5 percent on the world’s multi-millionaires and billionaires could raise $1.7 trillion a year, enough to lift 2 billion people out of poverty.*

The richest 1 percent grabbed nearly two-thirds of all new wealth worth $42 trillion created since 2020, almost twice as much money as the bottom 99 percent of the world’s population, reveals a new Oxfam report today. During the past decade, the richest 1 percent had captured around half of all new wealth.

Let’s talk about money



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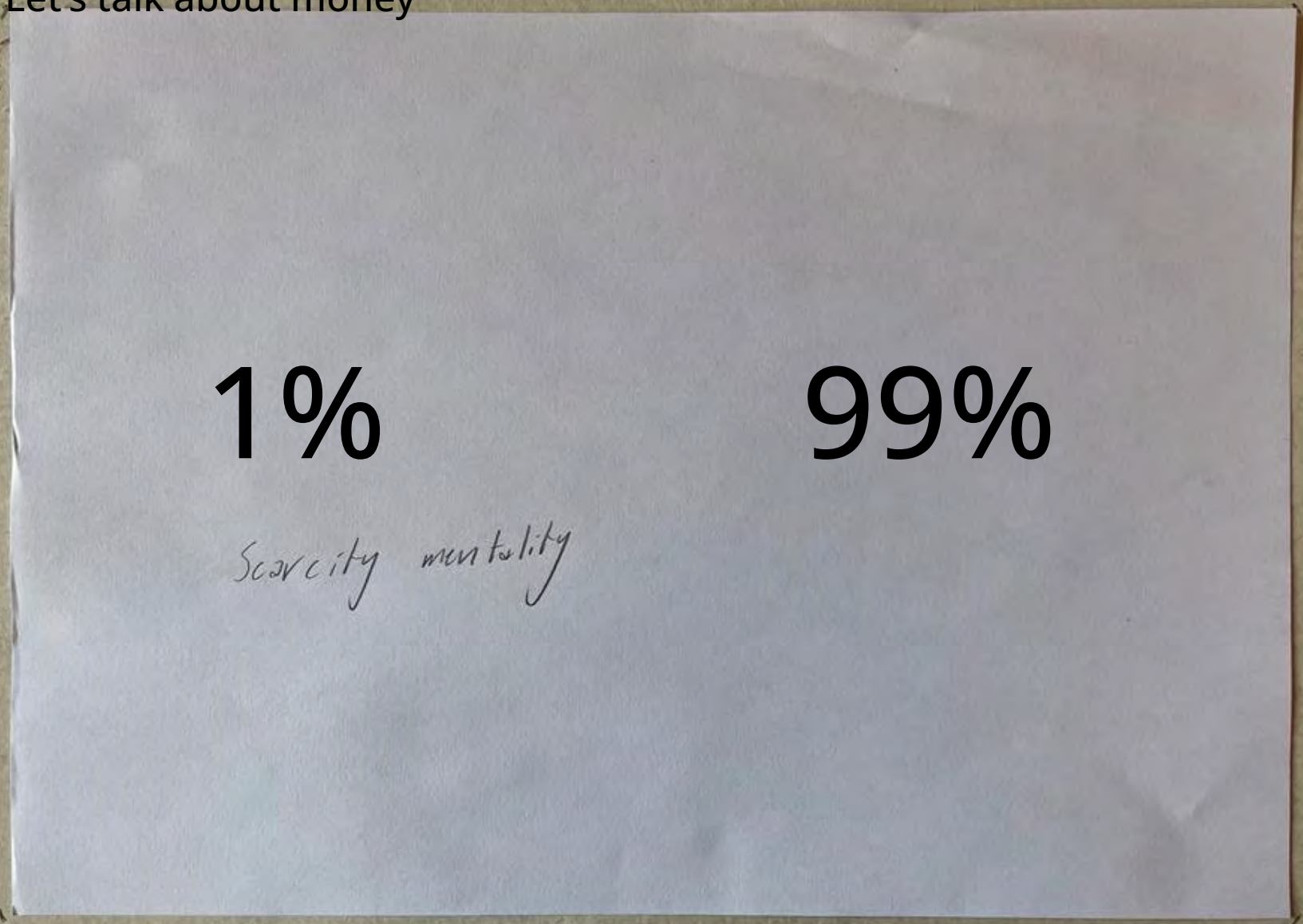


Let's talk about money

1%

99%

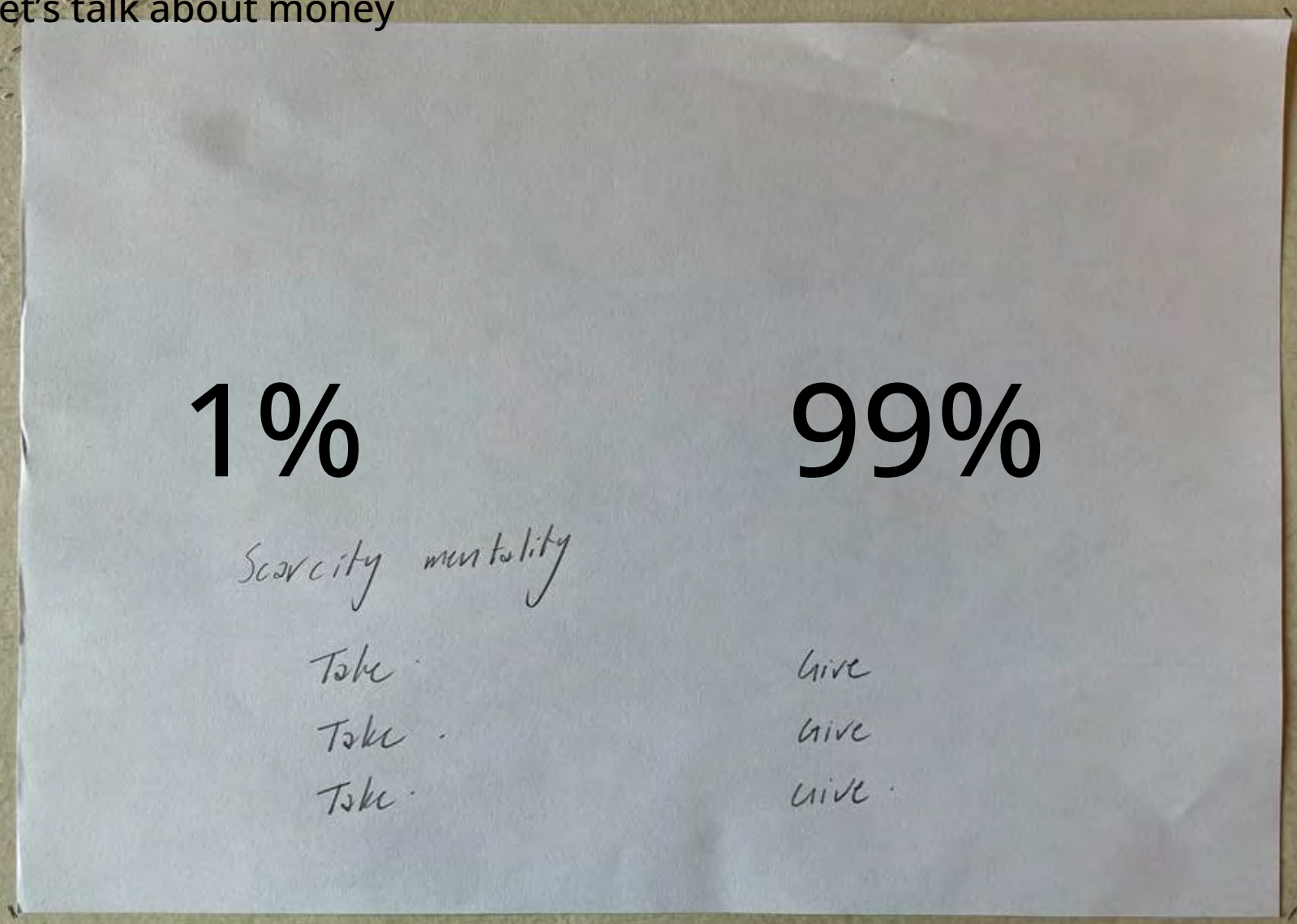
Scarcity mentality

Take.

Take.

Take.

Let's talk about money



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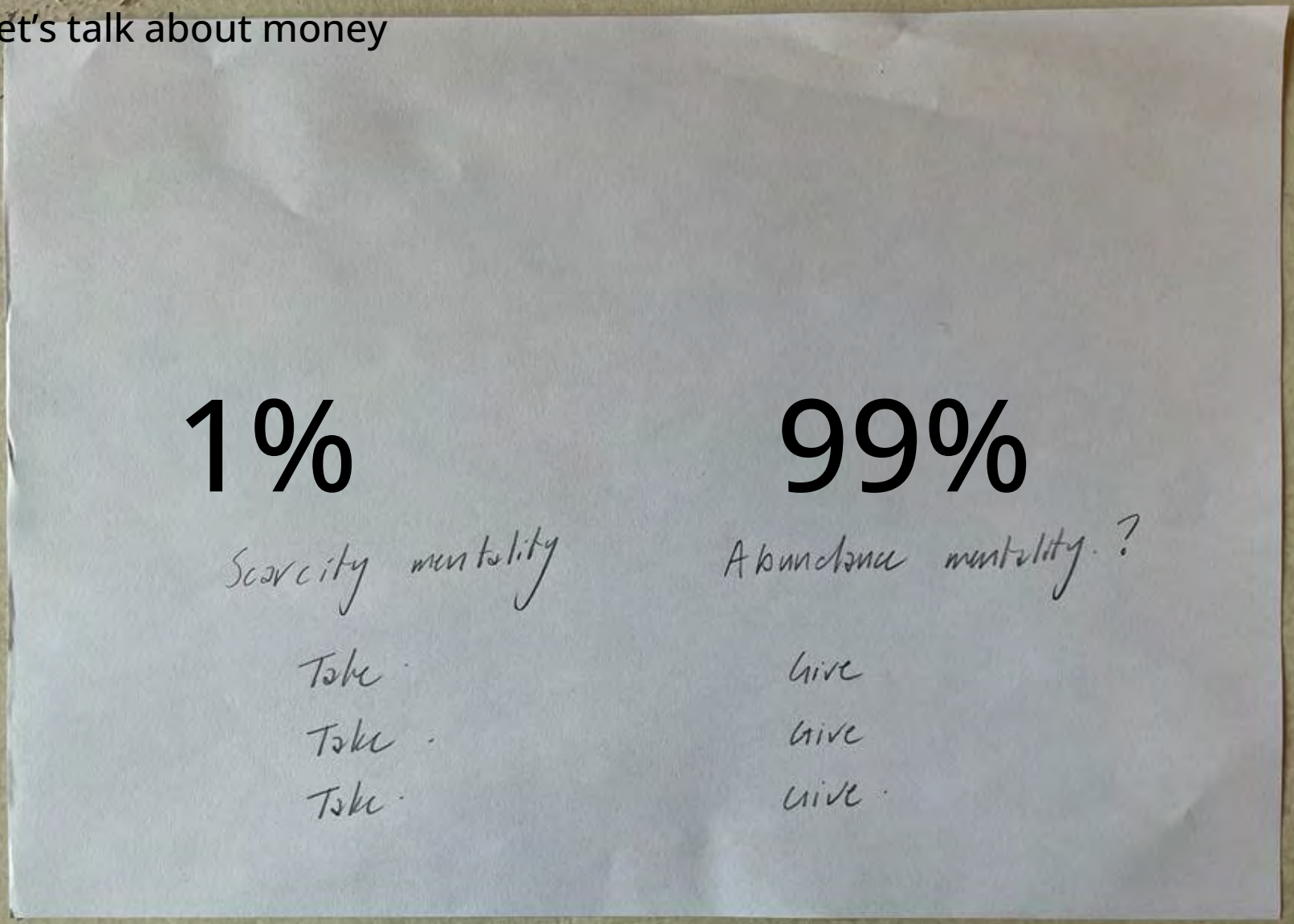

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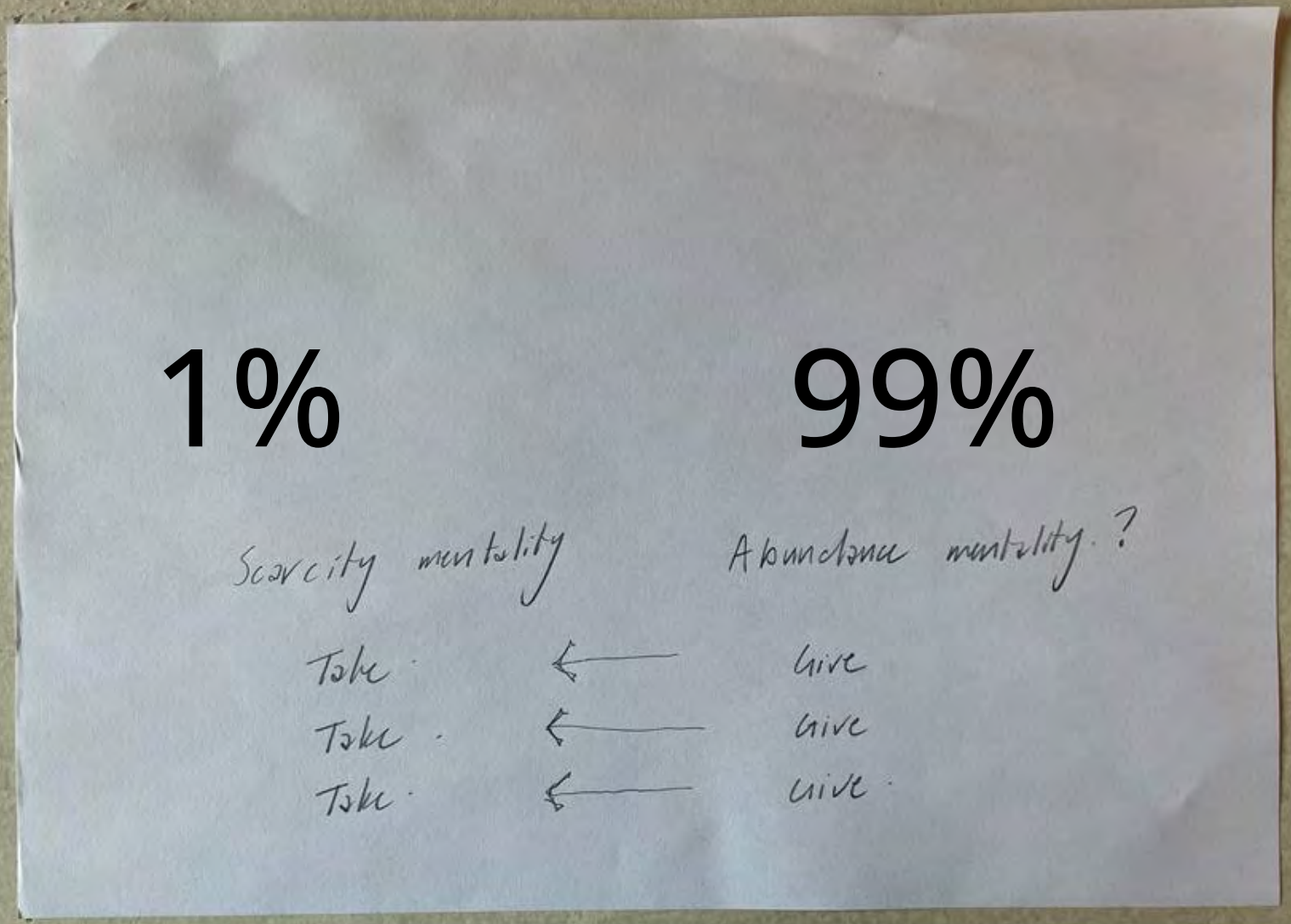


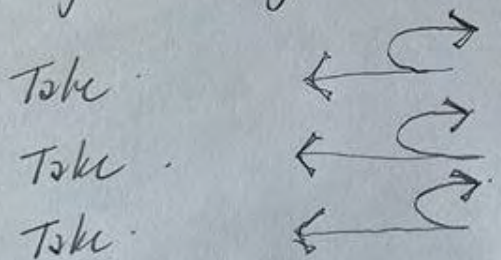
Let's talk about money

1%

99%

Scarcity mentality

Abundance mentality ?



Let's talk about money

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99%

Scarcity mentality

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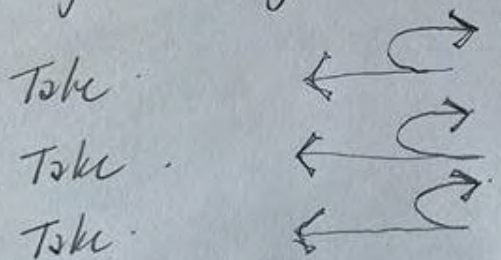

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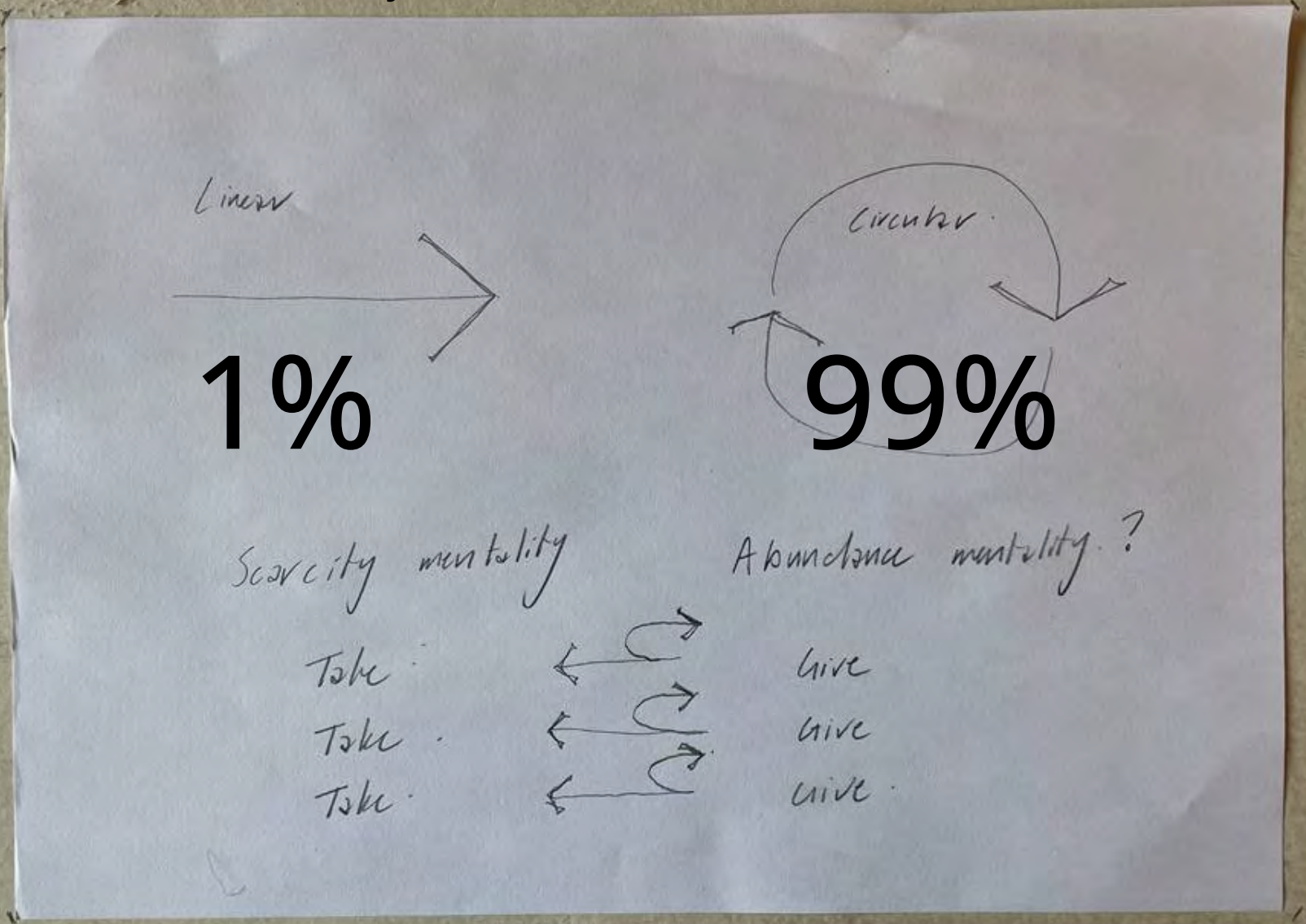
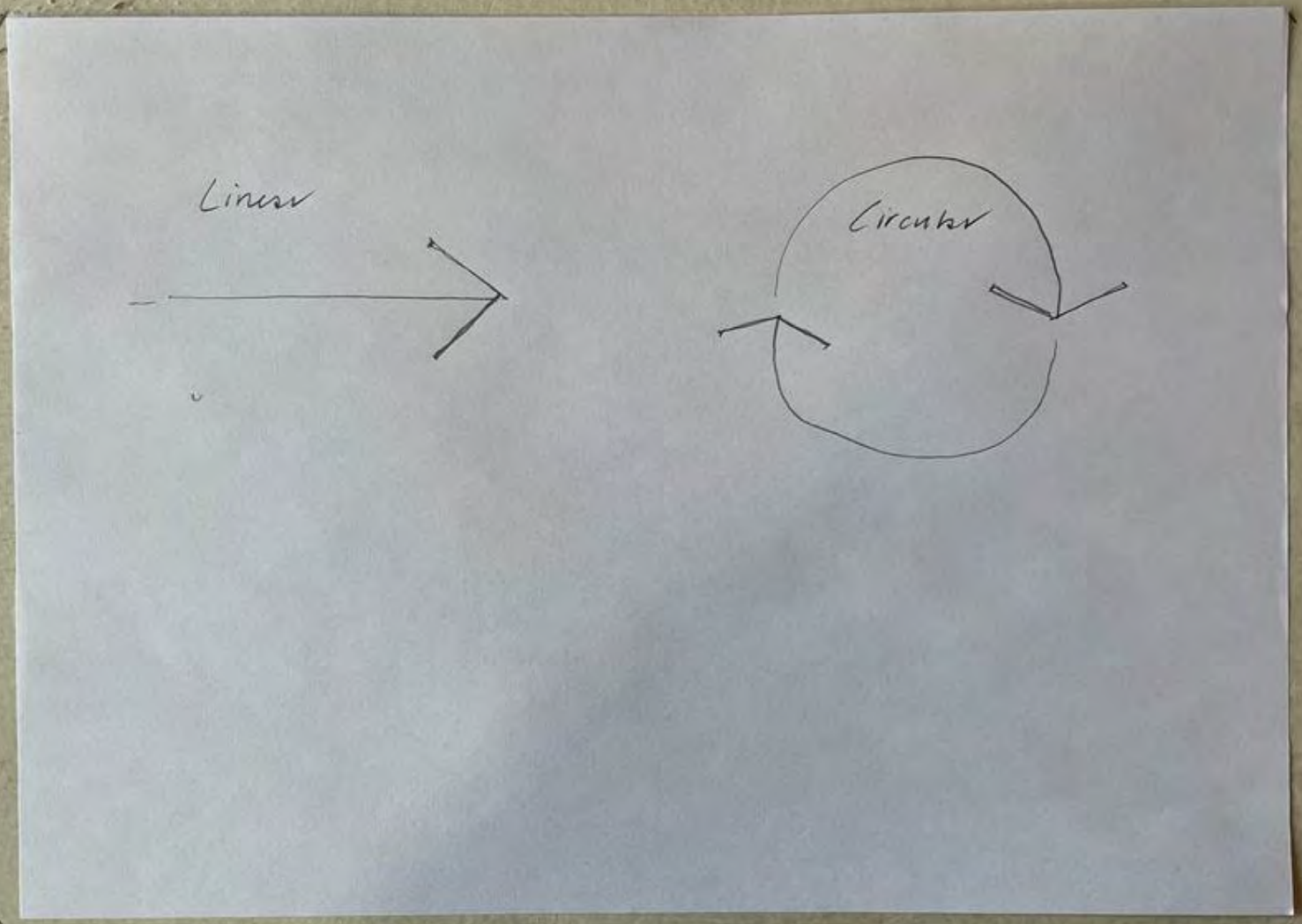
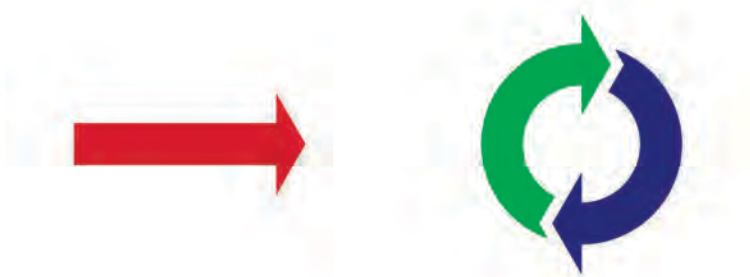


Circular economy vs linear economy

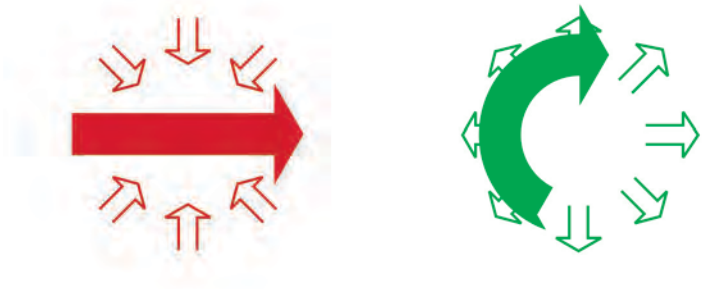


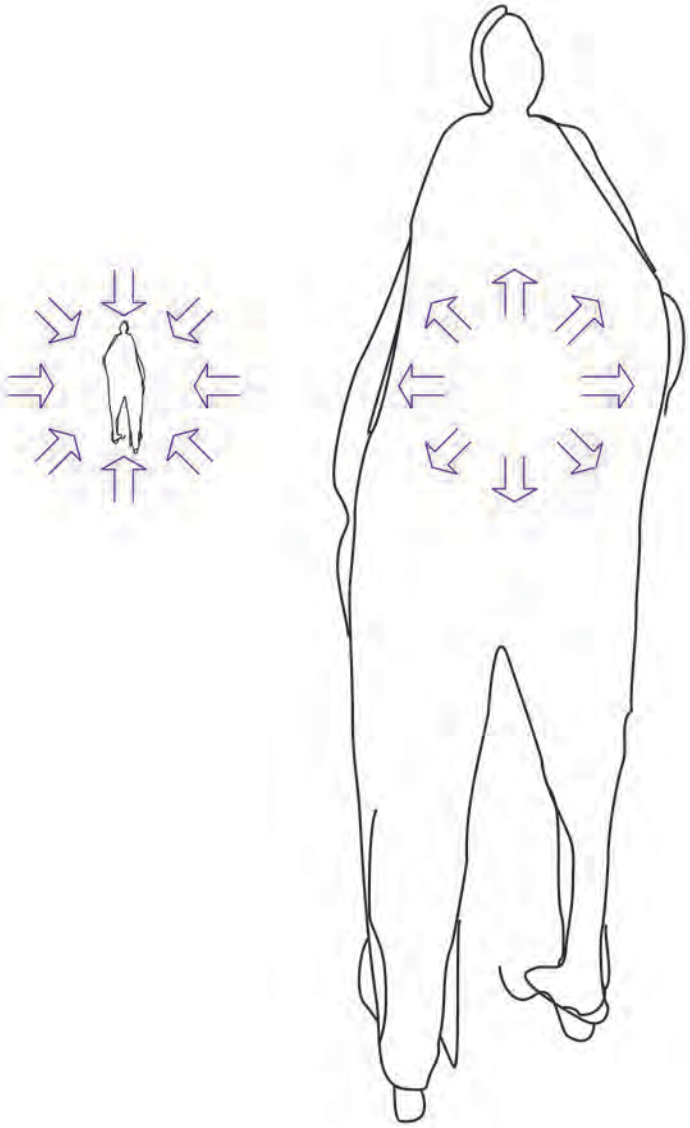


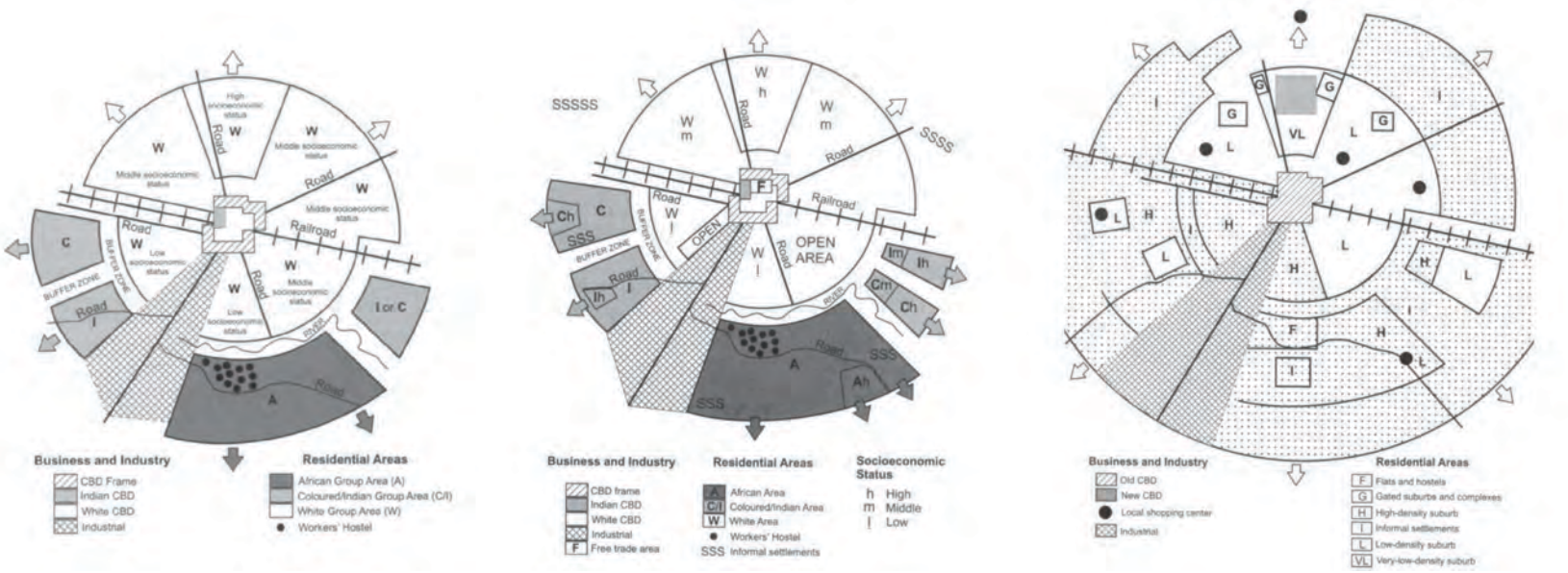
Circular economy vs linear economy

- Kate Raworth (2019) argues that we must transform economic mindsets away from the linear industrial system which are degenerative and divisive and addicted to growth. Towards economies that are regenerative and distributive and able to thrive beyond growth; such as indigenous thinking circular economies with economic equilibrium.

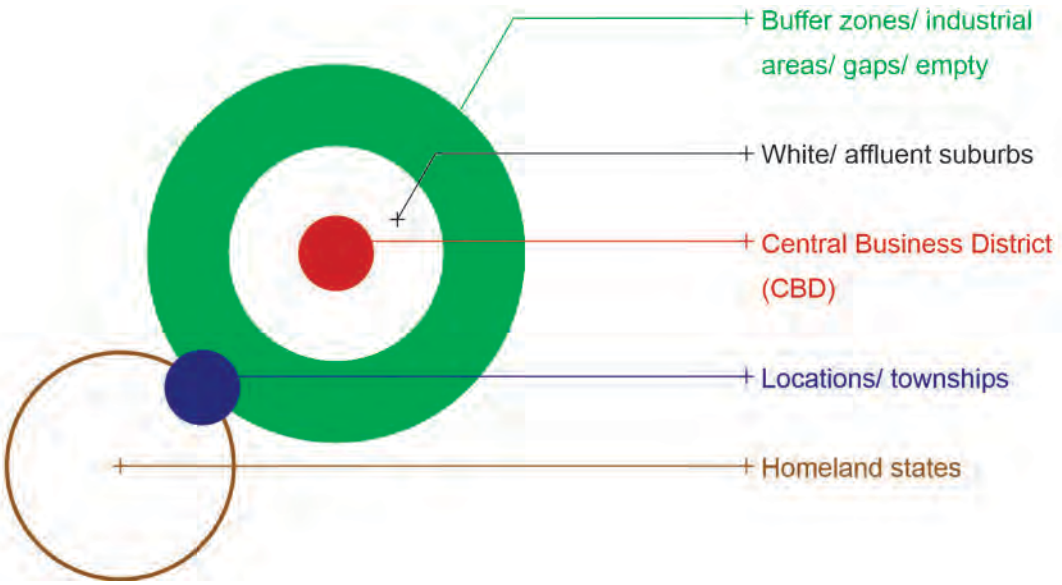
Raworth, K., 2019, A New Economics, Rebellion, E., This is not a drill: an extinction Rebellion handbook. Penguin UK.







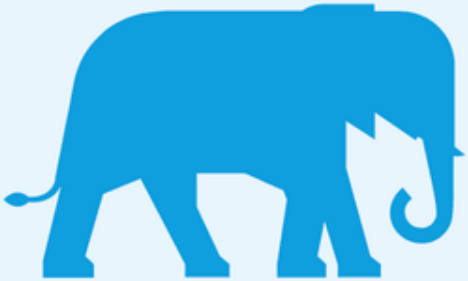
The Apartheid City. Source: Davies, 1981.



A diagram showing the persistent structure of the Apartheid city indicating how spatial planning is used to segregate communities. Source: Van Tonder & Osman, 2021

WEIGHT OF VERTEBRATE LAND ANIMALS

10,000 YEARS AGO



1% HUMANS

99% WILD ANIMALS

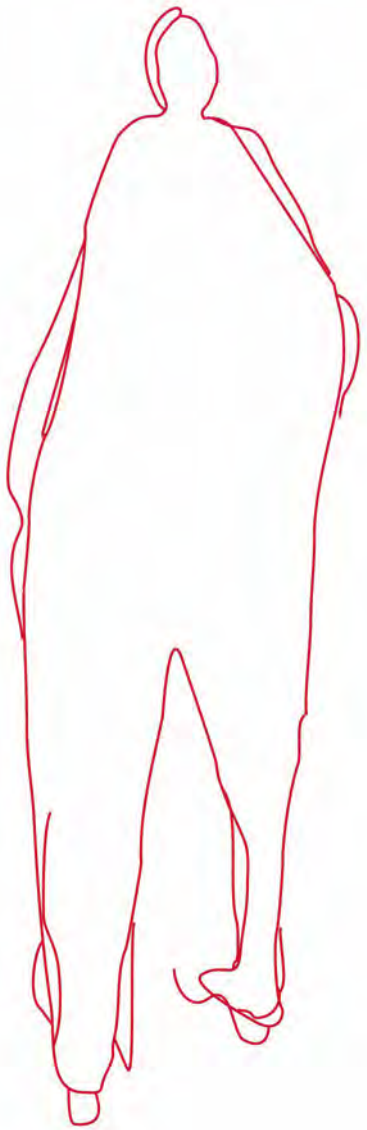
TODAY

32% HUMANS

1% WILD ANIMALS

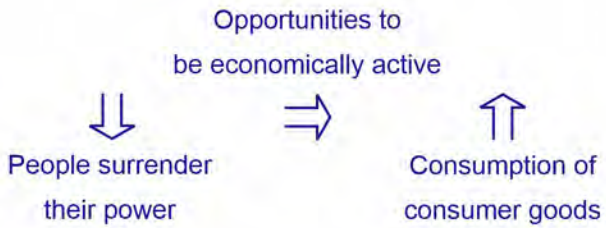
67% LIVESTOCK

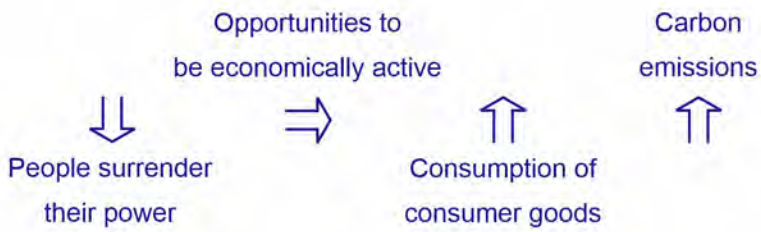
Calculations based on Smil (2011)




People surrender
their power


Opportunities to
be economically active
People surrender
their power


Opportunities to
be economically active
People surrender
their power
Consumption of
consumer goods


Opportunities to
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Opportunities to
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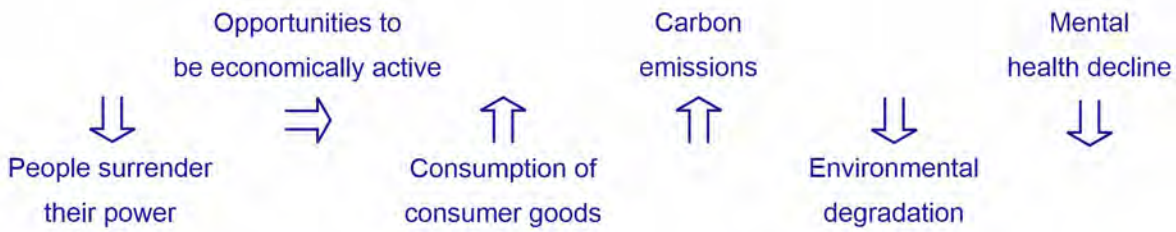
emissions
People surrender
their power
Consumption of
consumer goods
Environmental
degradation


Opportunities to
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Mental
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People surrender
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Consumption of
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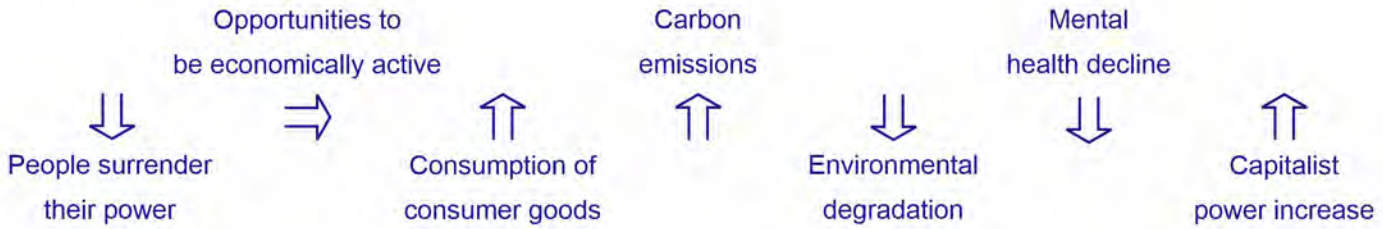
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Environmental
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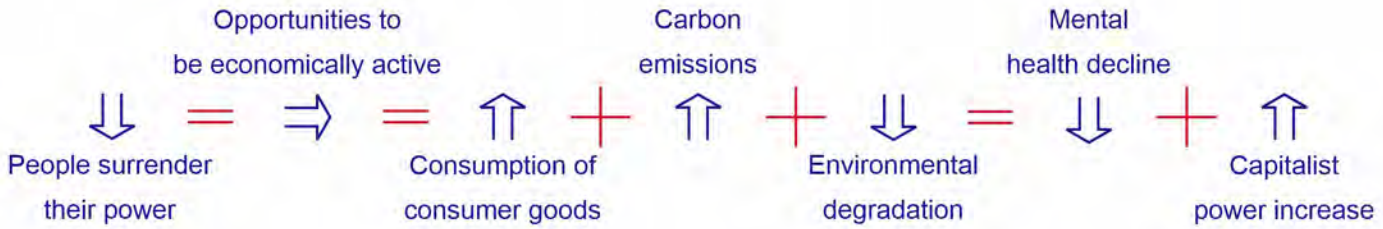
Capitalist
power increase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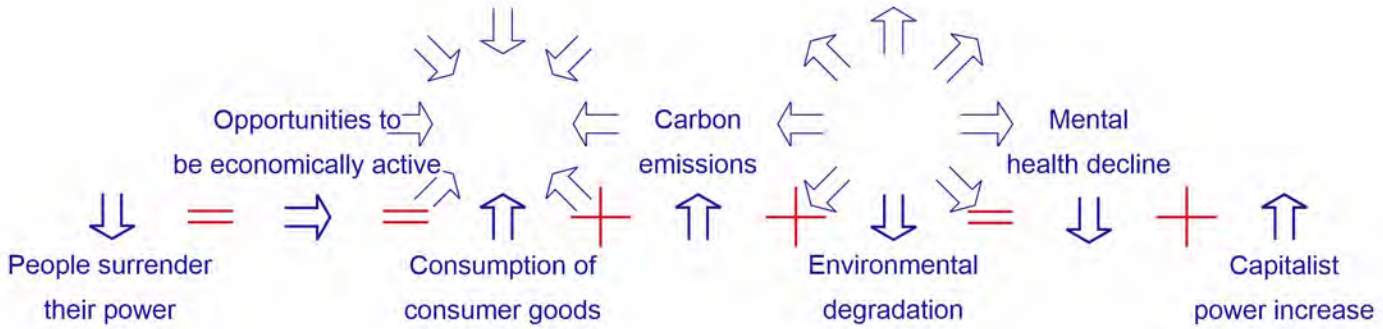
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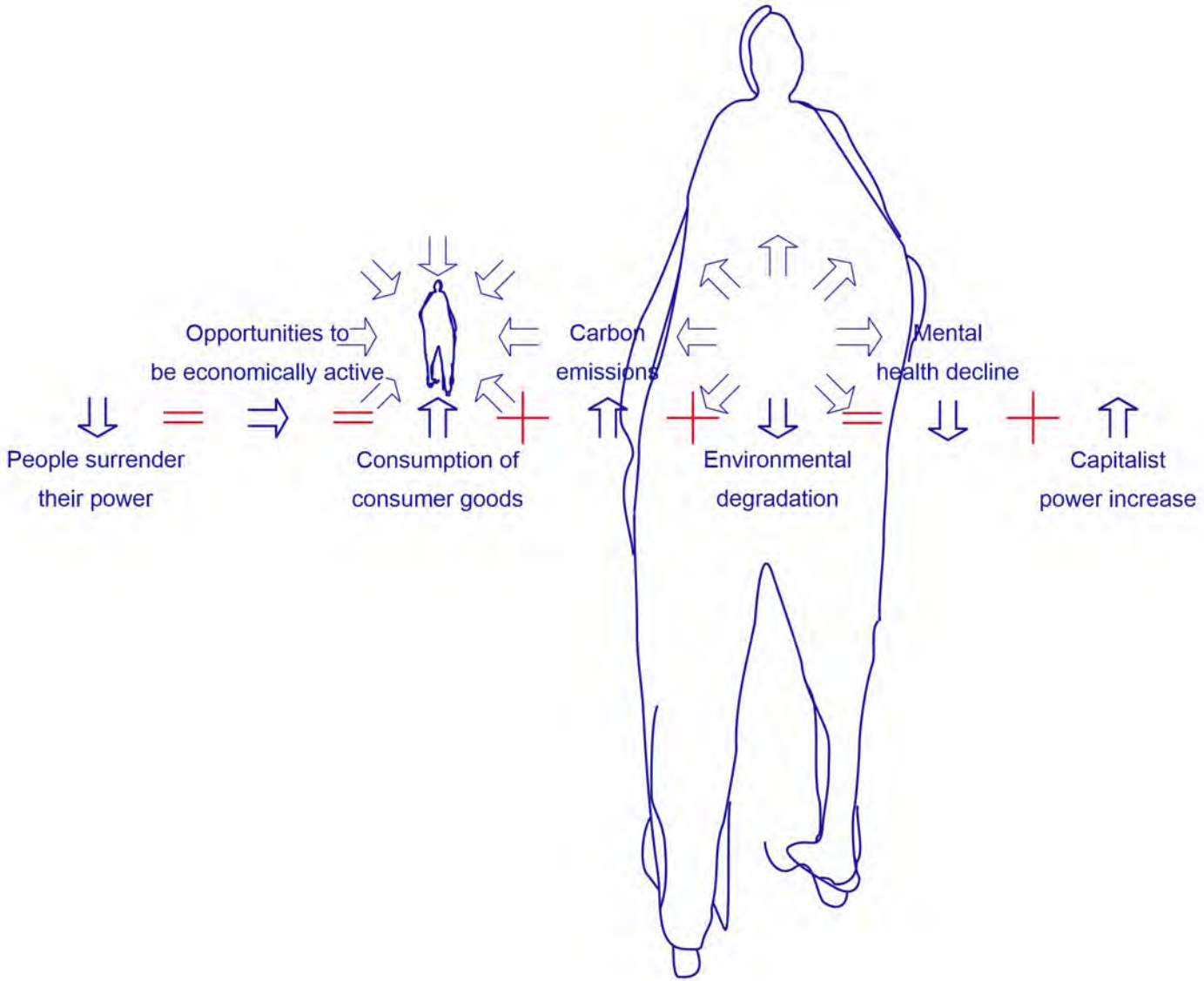
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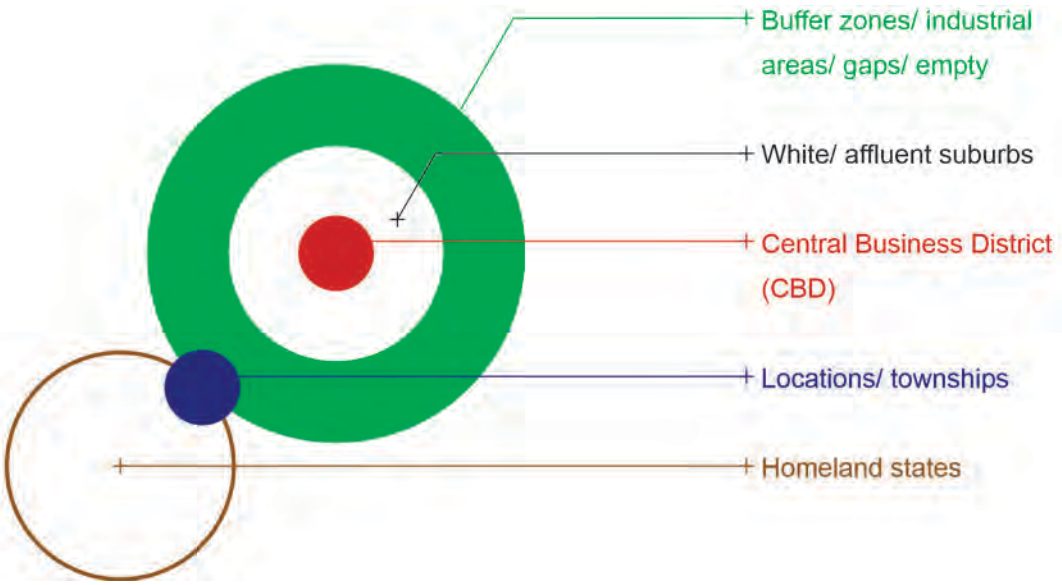
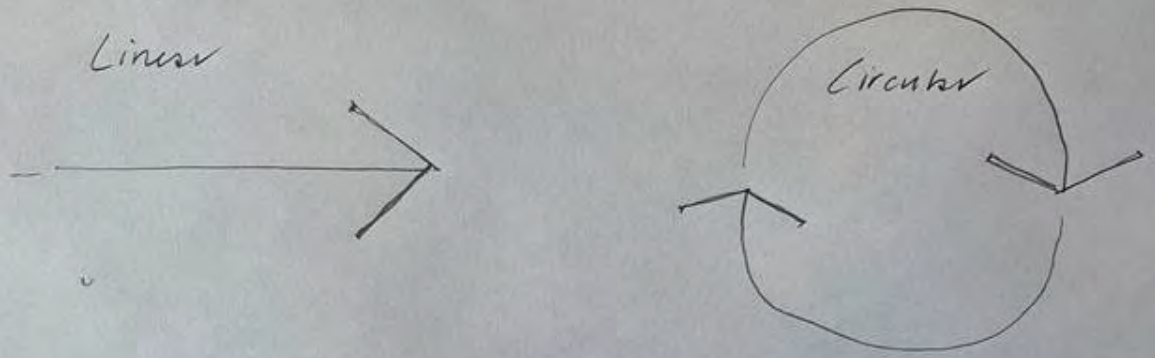


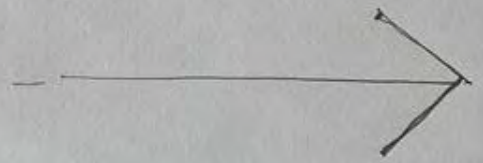
A diagram showing the persistent structure of the Apartheid city indicating how spatial planning is used to segregate communities. Source: Van Tonder & Osman, 2021

We are
consumers

We are
producers

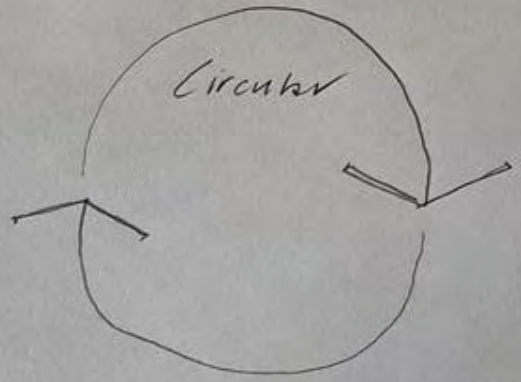

Linear
Circular

Linear



Industrial thinking

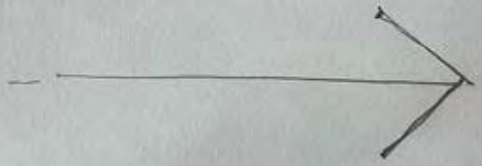
Circular



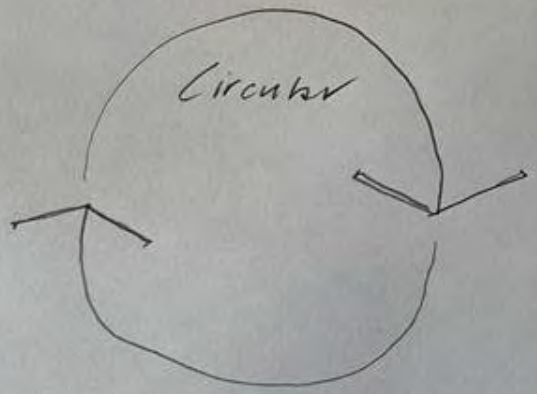
Indigenous thinking.

Resource, use, discard =
becomes depleted

Linear



Circular

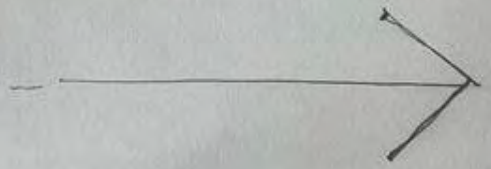


Industrial thinking

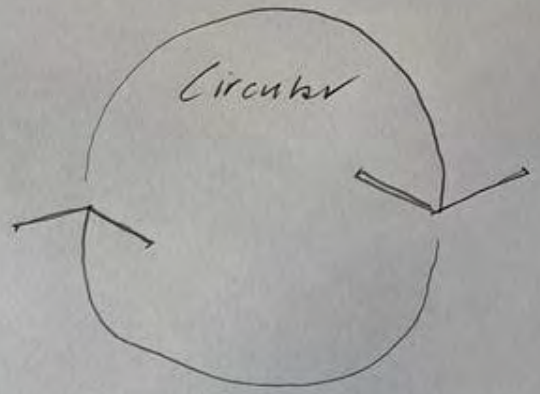
Indigenous thinking.

Resource, use, discard =
becomes depleted

Linear



Circular



Industrial thinking

Indigenous thinking.

Resource, use, discard =
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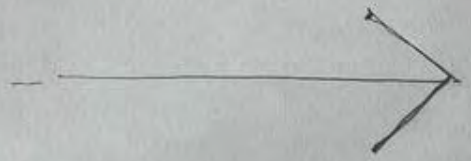
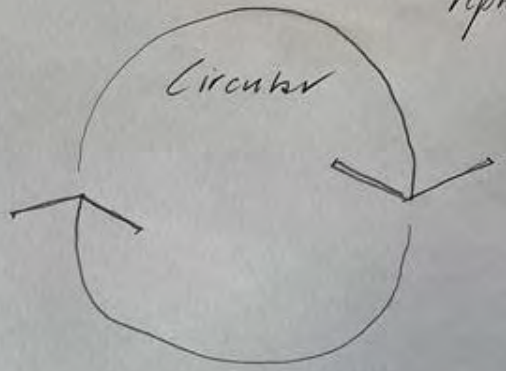
Linear



Industrial thinking

Resource, use, and reuse
= holds the potential to
replenish.

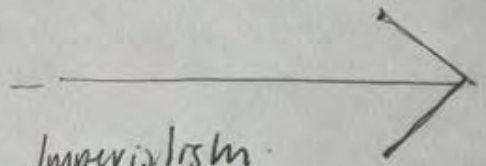
Circular



Indigenous thinking.

Resource, use, discard =
becomes depleted

Linear



Imperialism

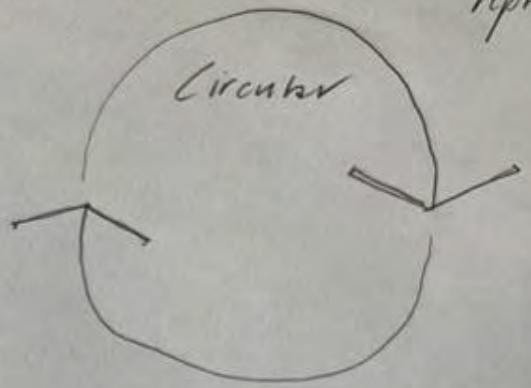
↑

Settler

↑

Industrial thinking

Resource, use, and reuse
= holds the potential to
replenish.



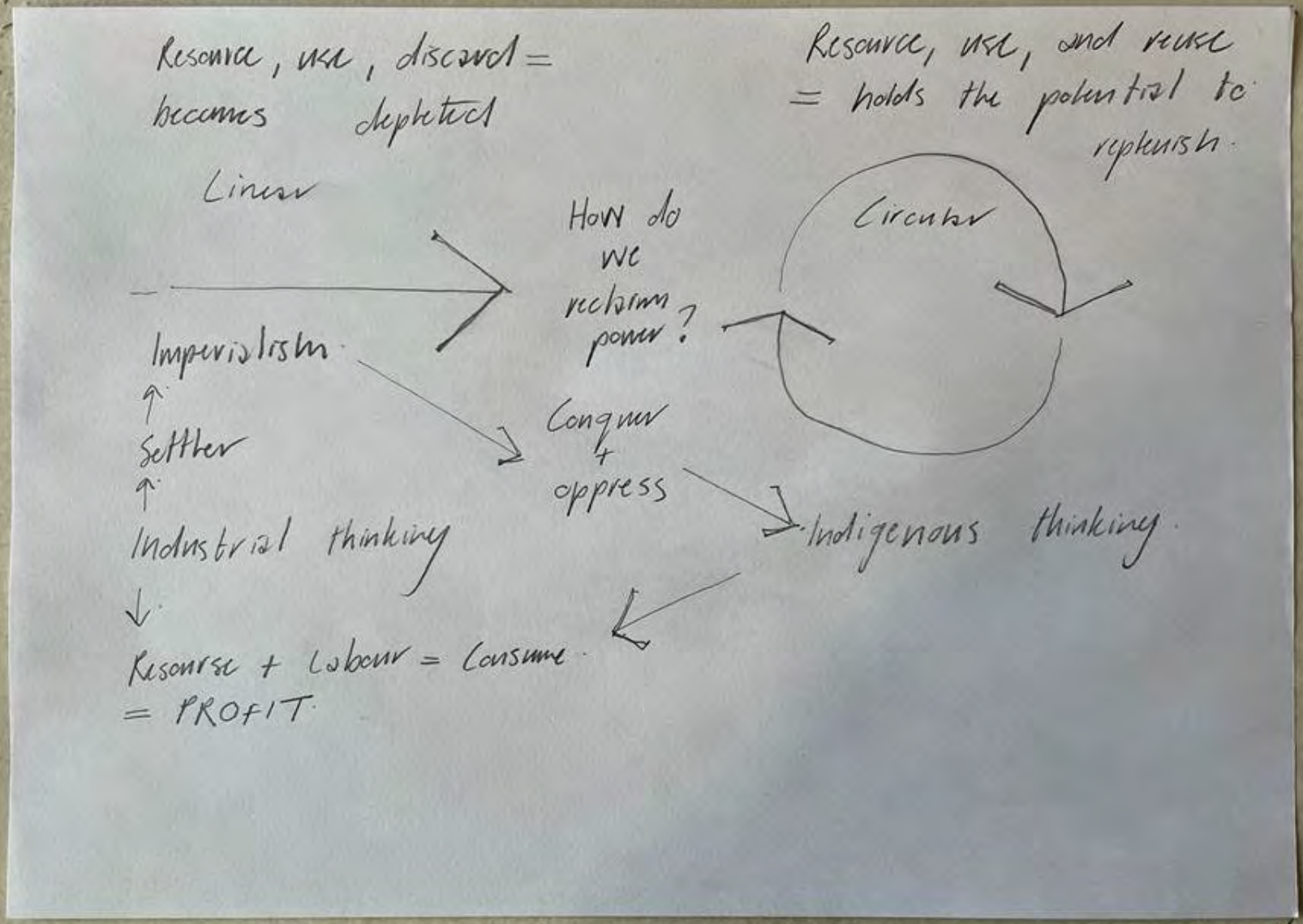
Indigenous thinking

Resource, use, discard = becomes depleted

Linear

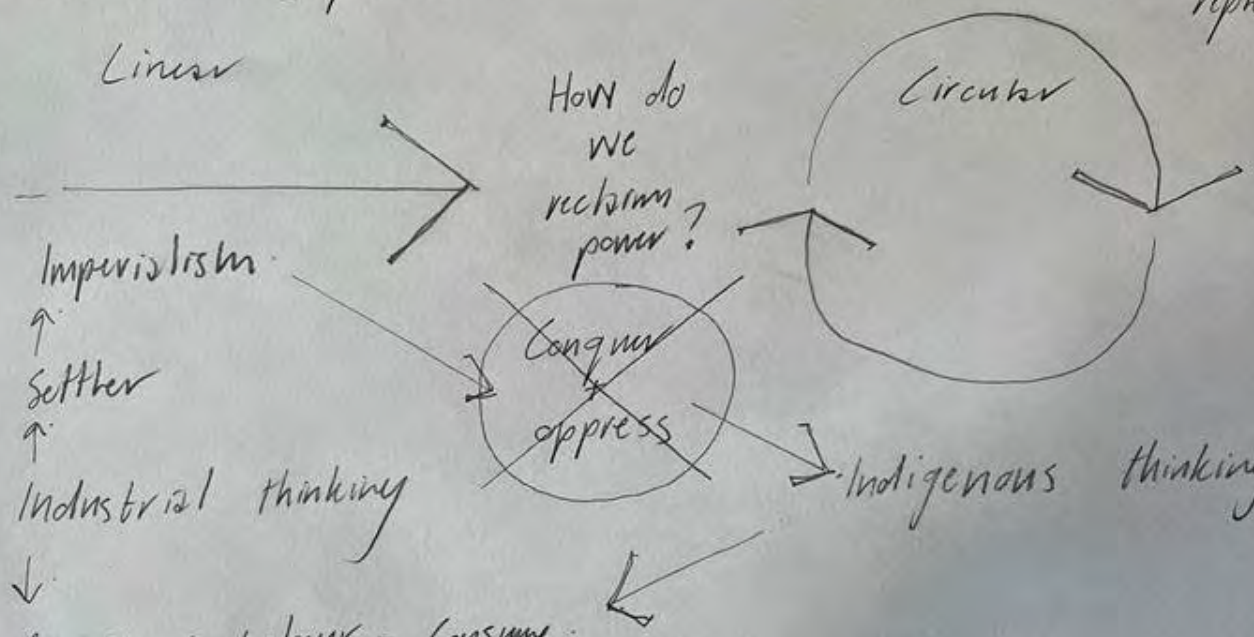
Resource, use, and reuse = holds the potential to replenish.

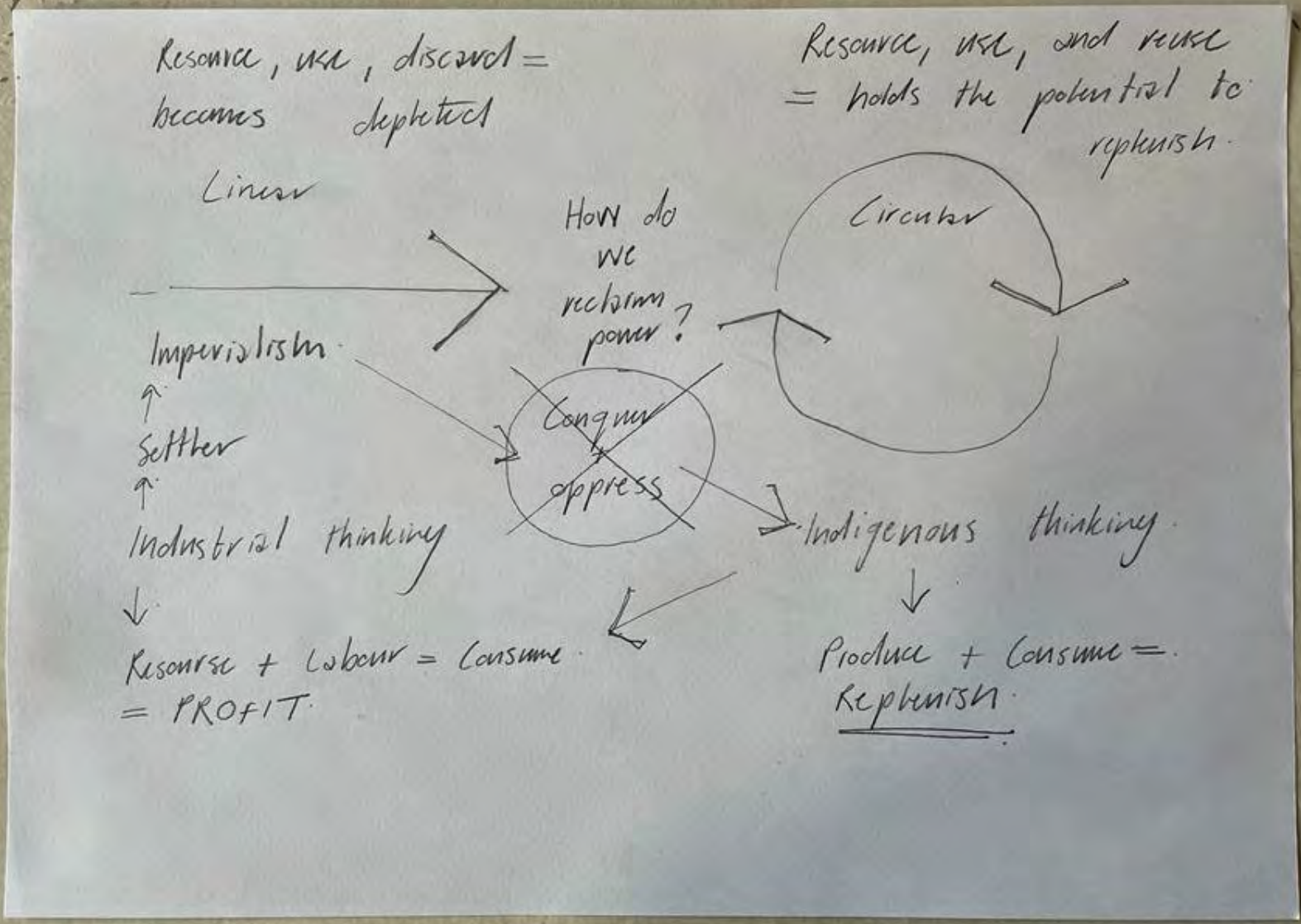
Circular

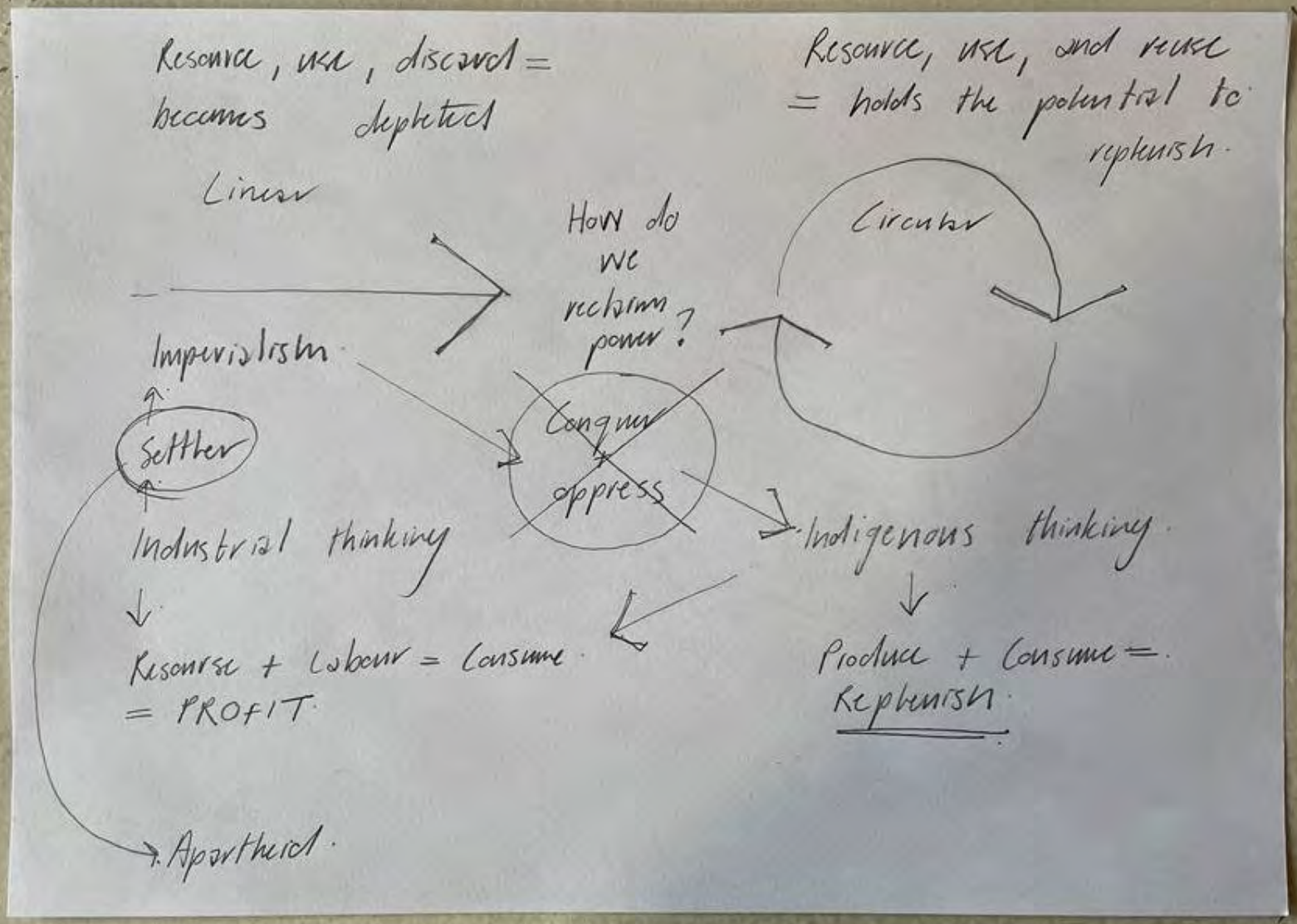

Resource, use, discard = becomes depleted
Linear
Resource, use, and reuse = holds the potential to replenish.
Circular
How do we reclaim power?
Imperialism
Settler
Industrial thinking
Conquer + oppress
Indigenous thinking
Resource + Labour = Consume = PROFIT

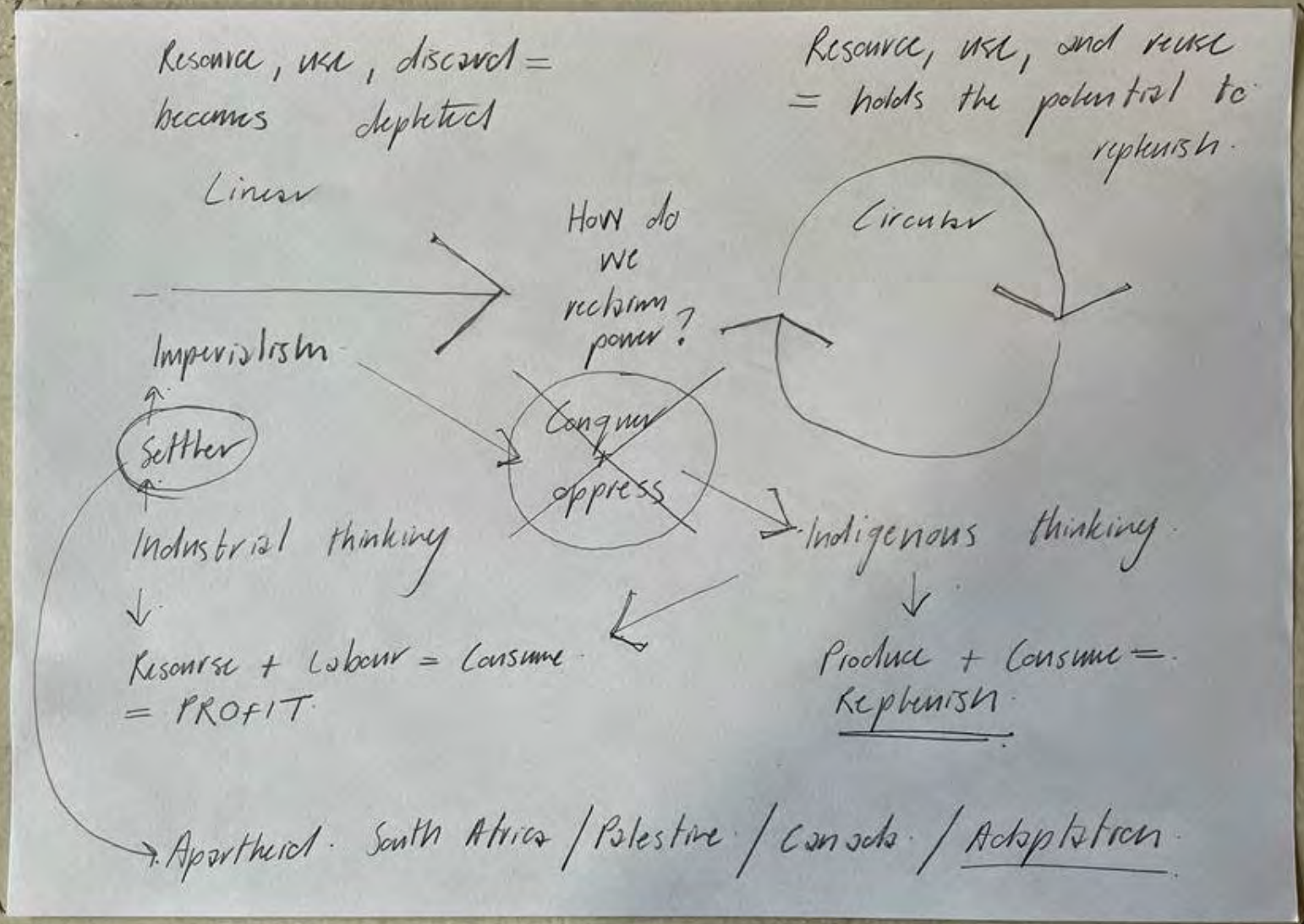
Resource, use, discard = becomes depleted

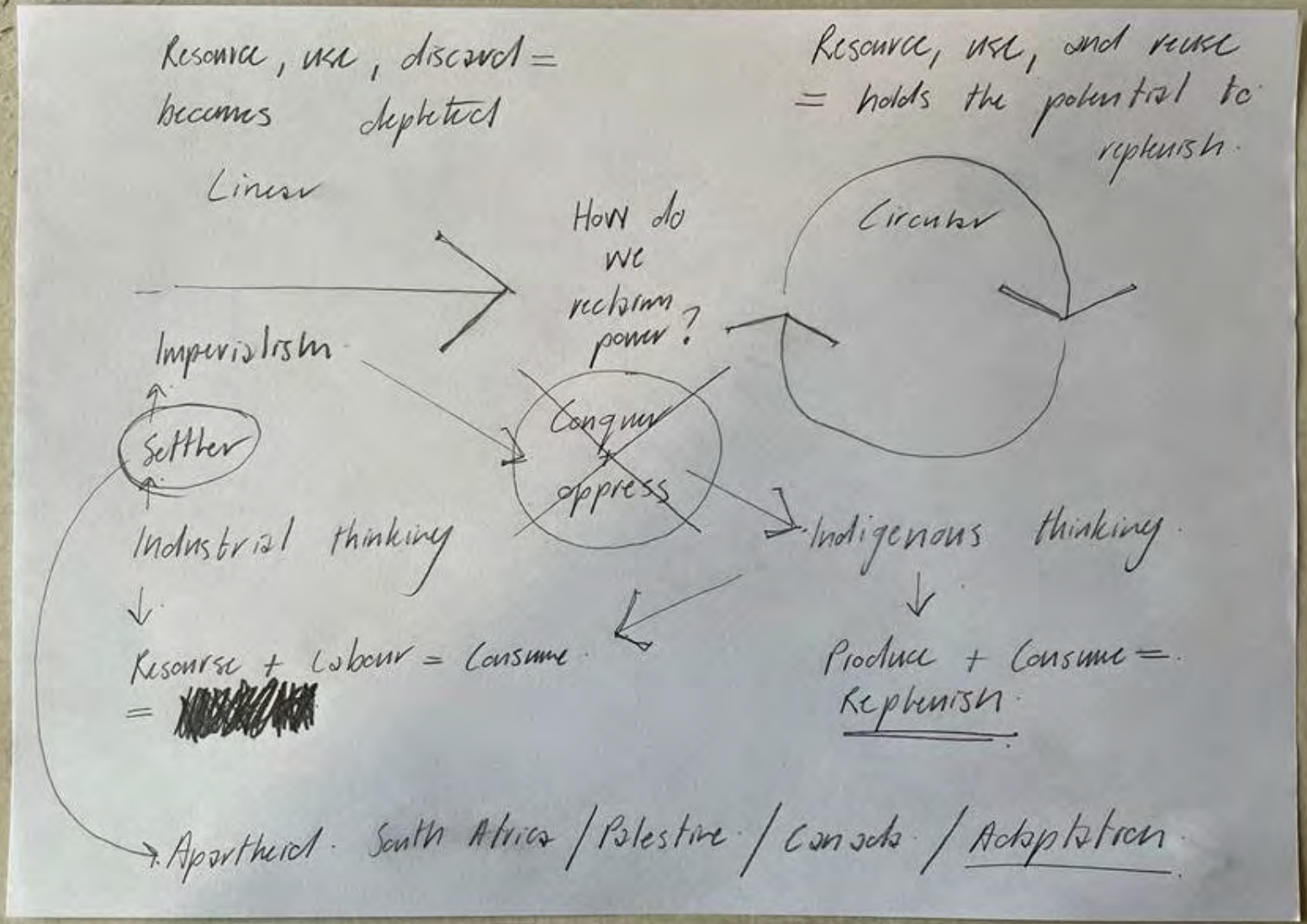
Resource, use, and reuse = holds the potential to replenish.

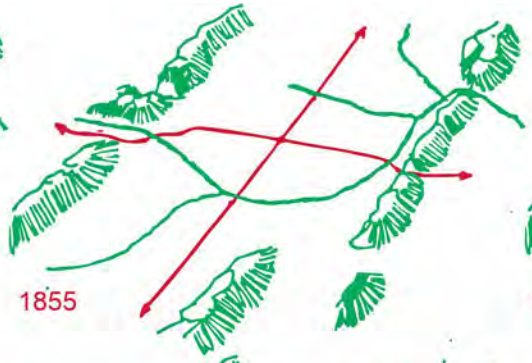



Resource, use, discard = becomes depleted
Linear
Resource, use, and reuse = holds the potential to replenish.
Circular
How do we reclaim power?
Imperialism
Settler
Industrial thinking
Congruity
oppress
Indigenous thinking
Resource + Labour = Consume = PROFIT
Produce + Consume = Replenish

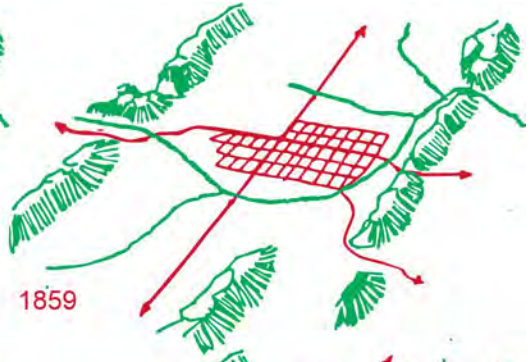

Resource, use, discard = becomes depleted
Linear
Resource, use, and reuse = holds the potential to replenish.
Circular
How do we reclaim power?
Imperialism
Settler
Industrial thinking
Resource + Labour = Consume = PROFIT
Apartheid
Congress
oppress
Indigenous thinking
Produce + Consume = Replenish


Resource, use, discard = becomes depleted
Linear
Resource, use, and reuse = holds the potential to replenish.
Circular
How do we reclaim power?
Imperialism
Settler
Industrial thinking
Resource + Labour = Consume = PROFIT
Congruity
oppress
Indigenous thinking
Produce + Consume = Replenish
Apartheid. South Africa / Palestine / Canada / Adaptation

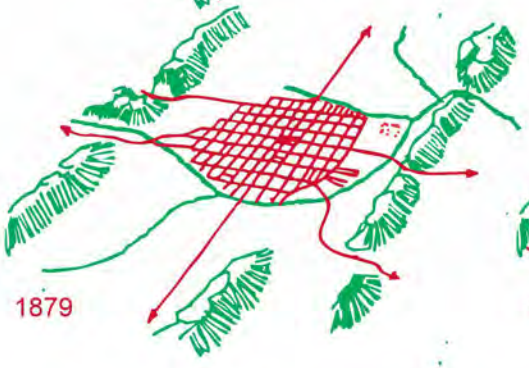

Resource, use, discard = becomes depleted
Linear
Resource, use, and reuse = holds the potential to replenish.
Circular
How do we reclaim power?
Imperialism
Settler
Conquer
oppress
Industrial thinking
Indigenous thinking
Resource + Labour = Consume
=
Produce + Consume = Replenish
Apartheid · South Africa / Palestine / Canada / Adaptation



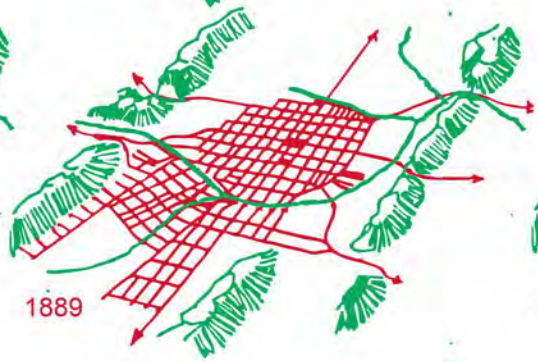
1855



1859



1879



1889

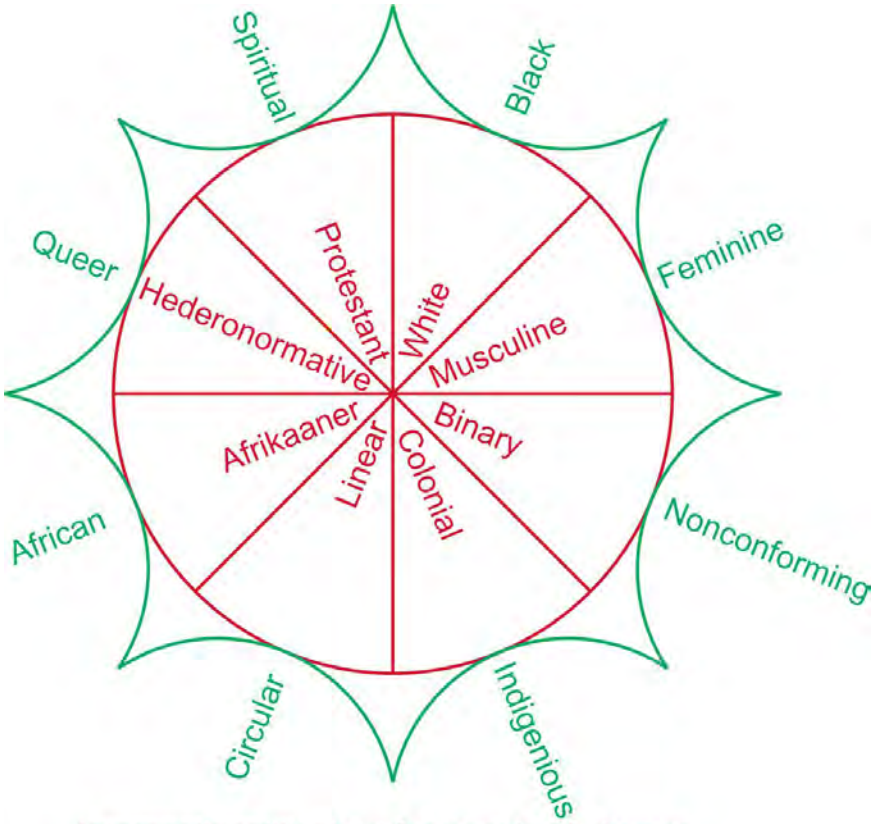
1902

1902
Overlaid on
2021

North

2021 Arial View

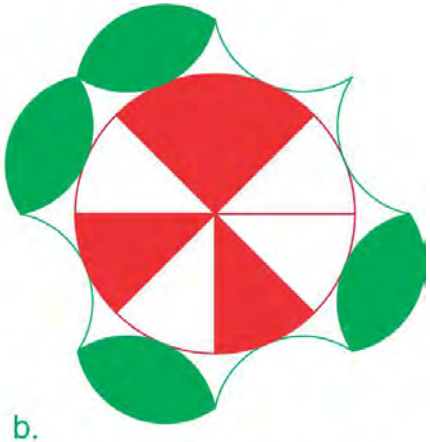
2021
Figure Ground with Nature



Intersectionality chart for agents of change to transform the post-apartheid city

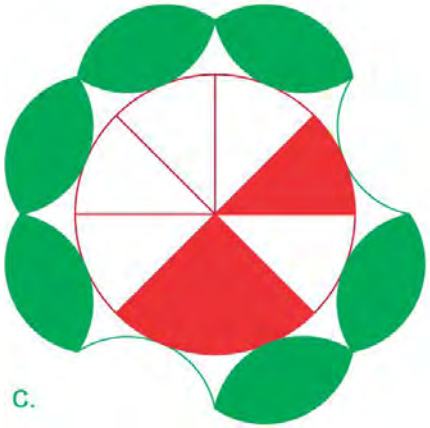
a.

Hypothetical participant 1



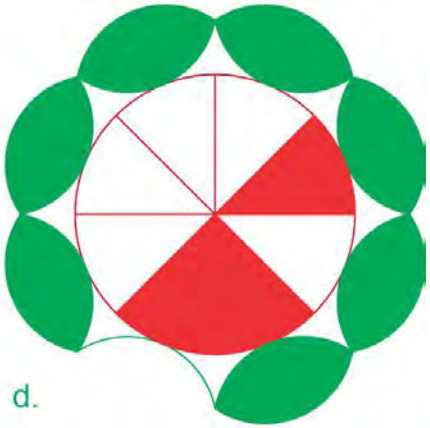
b.

Hypothetical participant 2



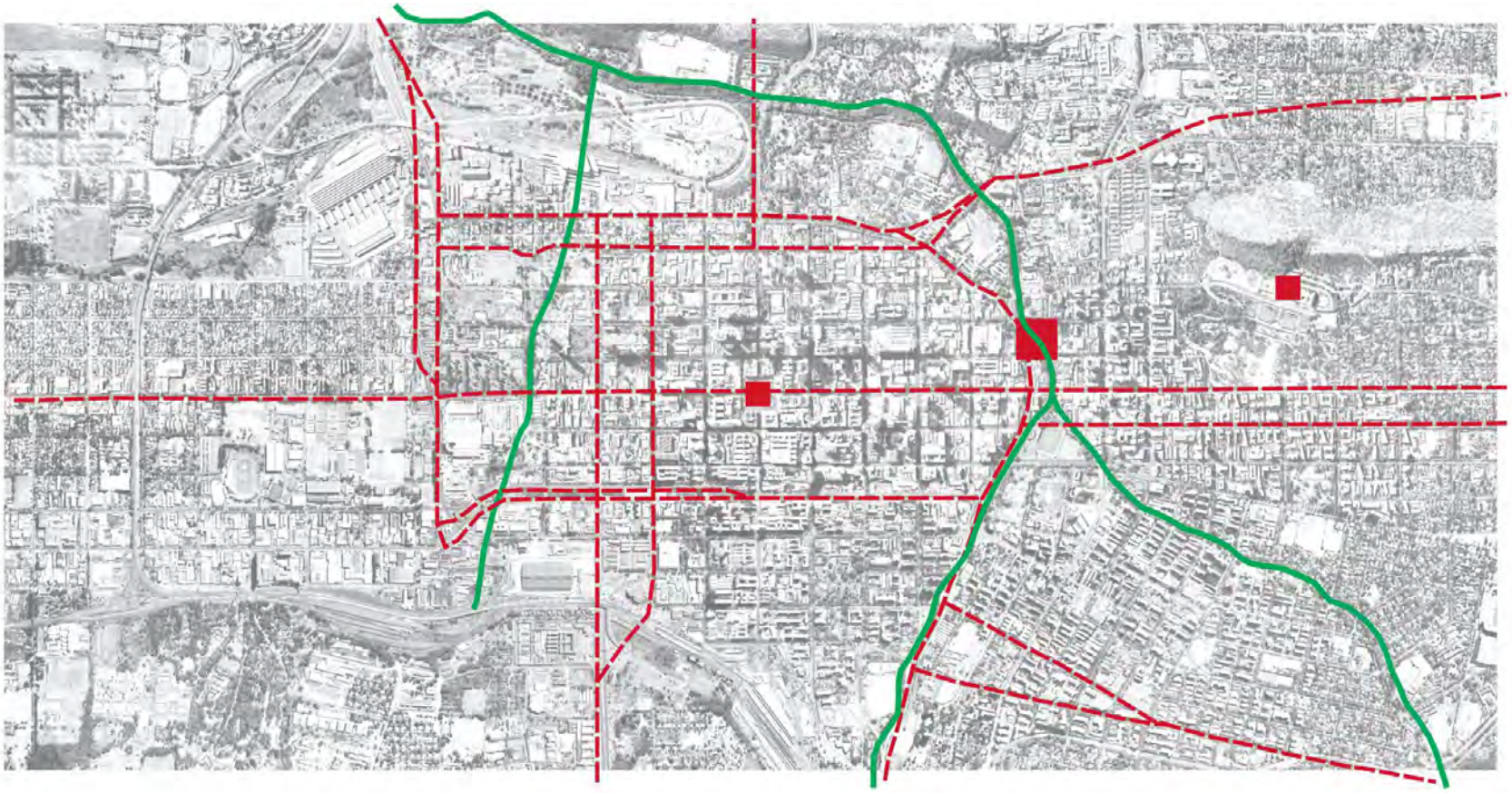
c.

Hypothetical participant 3



d.

Hypothetical participant 4



Arial View

Tshwane Central Business District

North

2 Km

Apies River and Walker Spruit

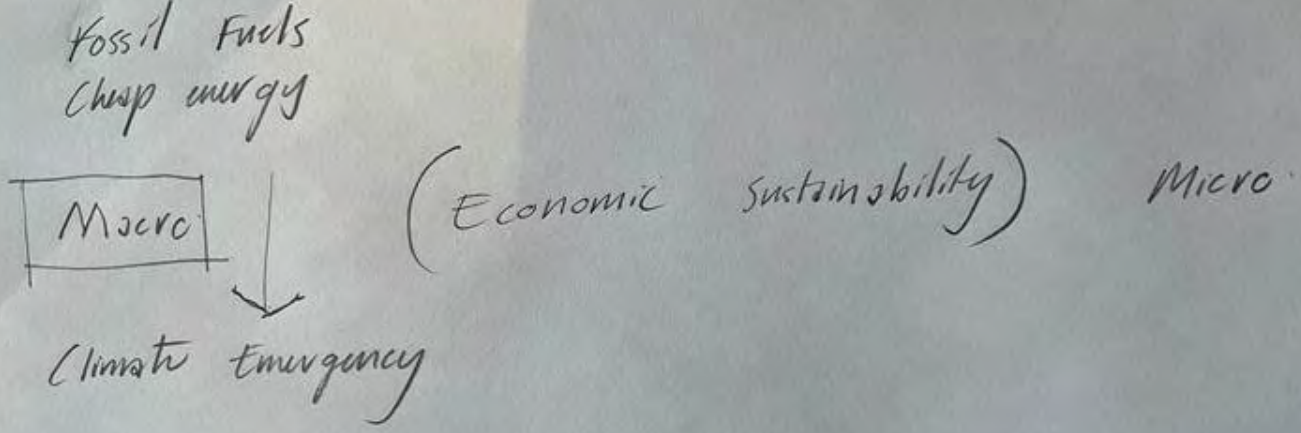
Site

Church Square

Union Buildings

Economic sustainability

Macro (Economic Sustainability) Micro


Fossil Fuels
Cheap energy
Macro
Climate Emergency
(Economic Sustainability)
Micro

Fossil Fuels
Cheap energy

Macro → Climate Emergency

(Economic Sustainability) Micro

Human Problems:
- Loss of life
- Loss of property
- Loss of human settlements

Nature: .....

Fossil Fuels
Cheap energy

Macro ↓ (Economic Sustainability) Micro

Climate Emergency

Human Problems:
- Loss of life
- Loss of property
- Loss of human settlements

Nature: .....

↓

- Displacement
- Refugees
- Migrants → Rural to Urban migration

Fossil Fuels
Cheap energy

Macro → Climate Emergency

(Economic Sustainability)

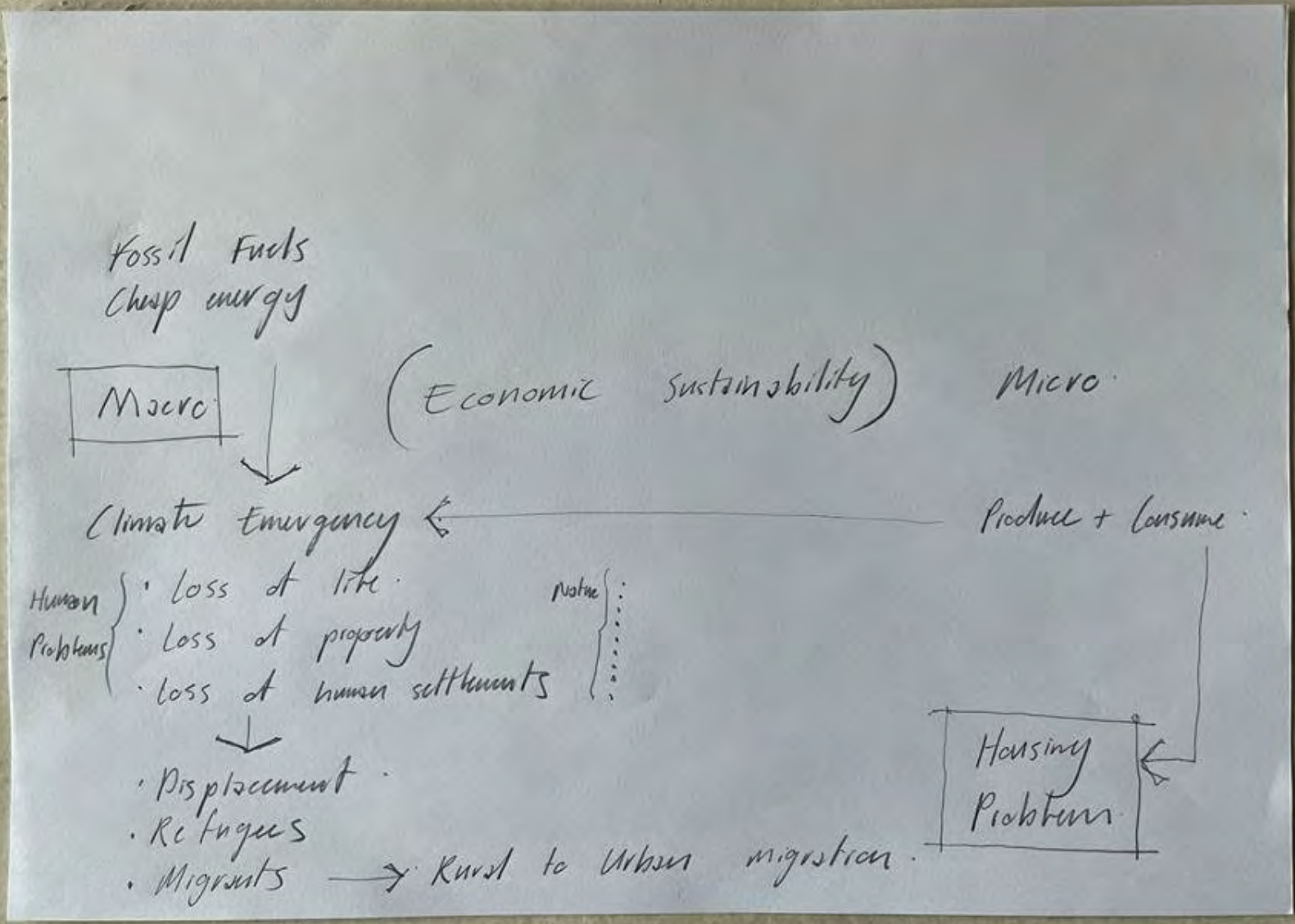
Micro

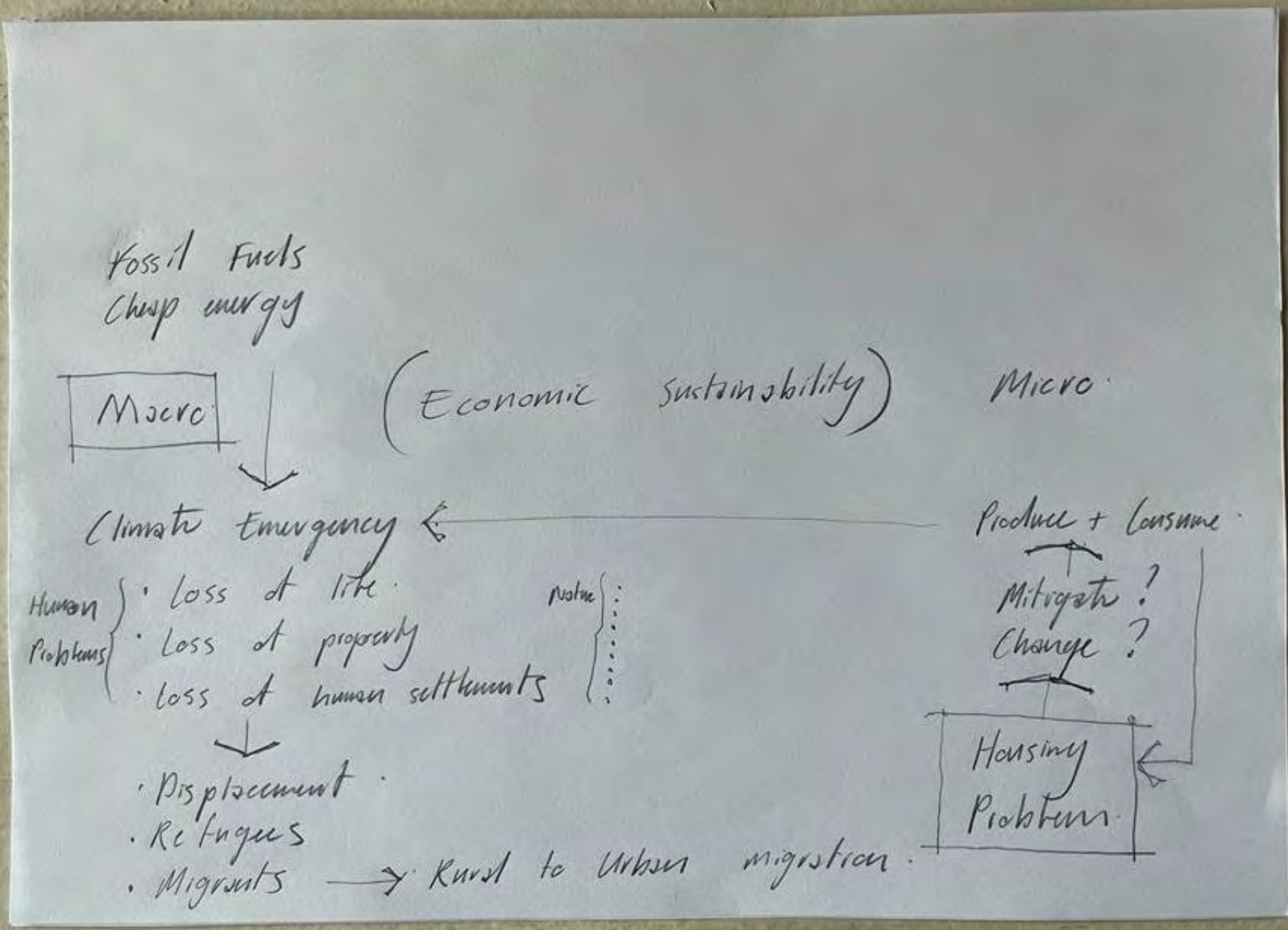
Human Problems:
- Loss of life
- Loss of property
- Loss of human settlements

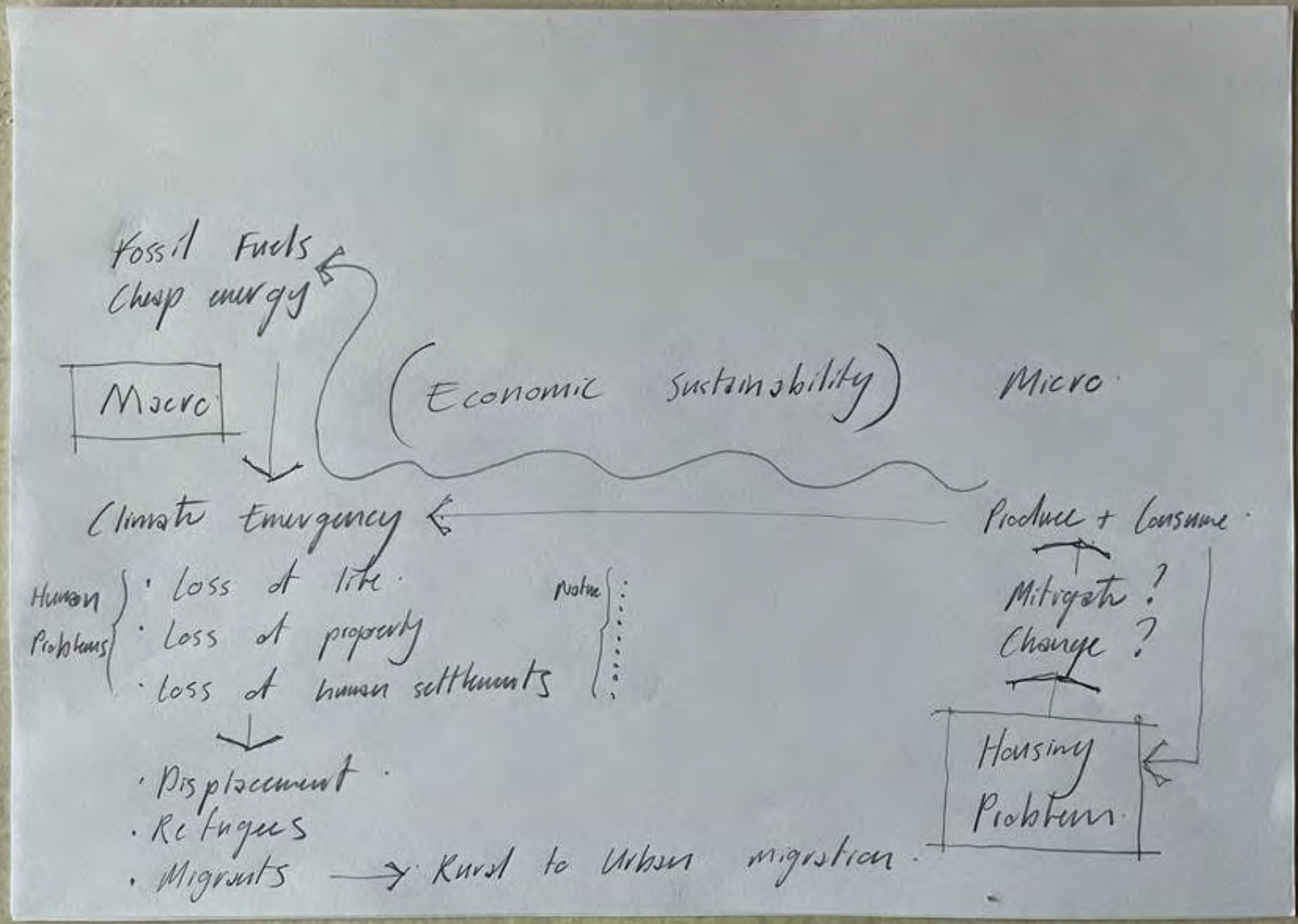
Nature: ……

- Displacement
- Refugees
- Migrants → Rural to Urban migration

Housing Problem


Fossil Fuels
Cheap energy
Macro
(Economic sustainability)
Micro
Climate Emergency
Produce + Consume
Human Problems
· Loss of life
· Loss of property
· Loss of human settlements
Nature
· Displacement
· Refugees
· Migrants
→ Rural to Urban migration
Housing Problems


Fossil Fuels
Cheap energy
Macro
(Economic sustainability)
Micro
Climate Emergency
Produce + Consume
Human Problems
· Loss of life
· Loss of property
· Loss of human settlements
Nature
Mitigate ?
Change ?
Housing Problem
· Displacement
· Refugees
· Migrants
→ Rural to Urban migration


Fossil Fuels
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Micro
Climate Emergency
Produce + Consume
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· Loss of human settlements
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Housing Problem
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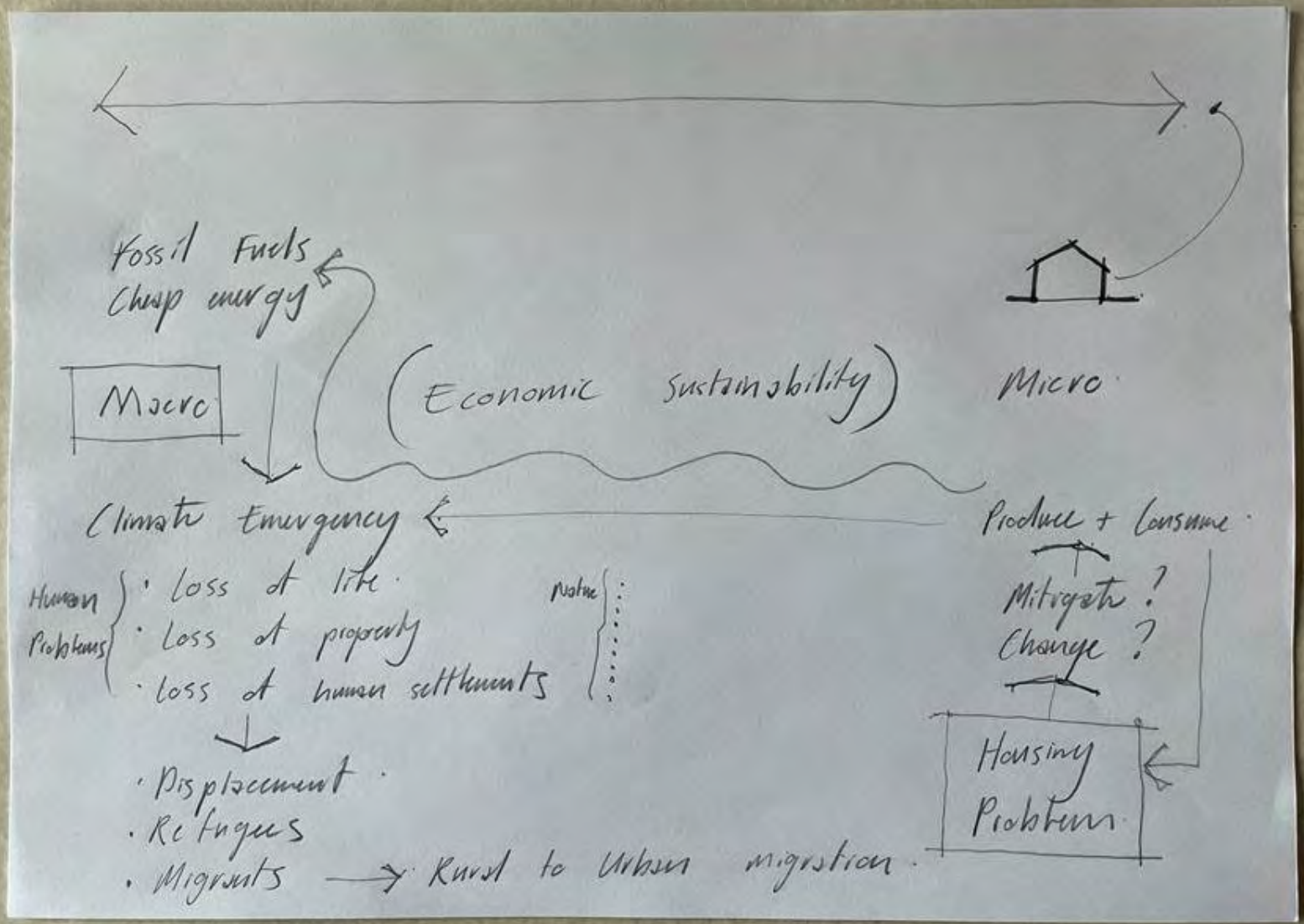
· Refugees
· Migrants
→ Rural to Urban migration


Fossil Fuels
Cheap energy
Macro
(Economic sustainability)
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Climate Emergency
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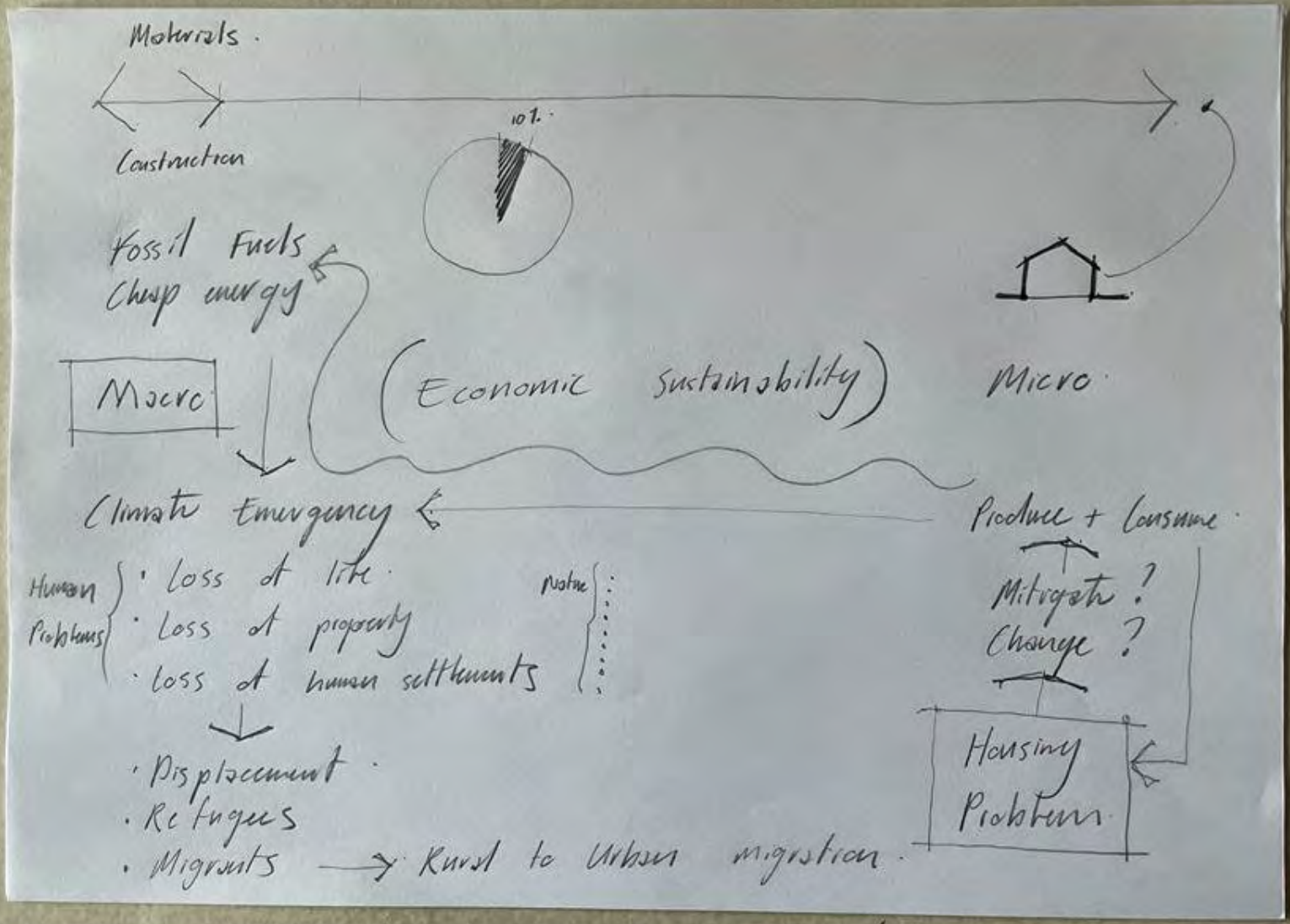
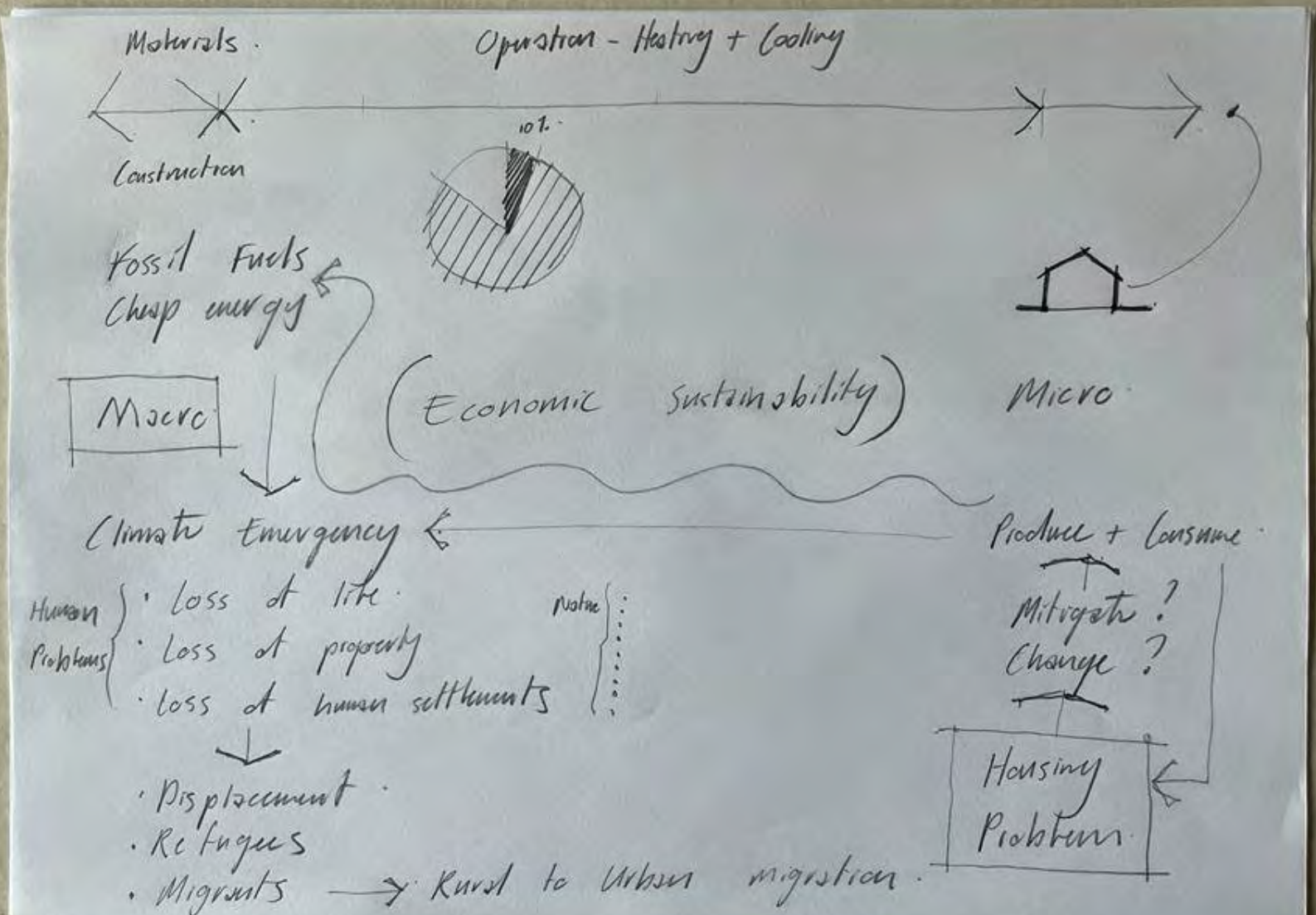
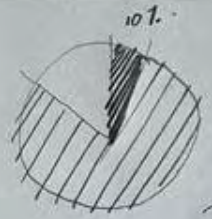
Nature
· Displacement
· Refugees
· Migrants → Rural to Urban migration
Housing Problem

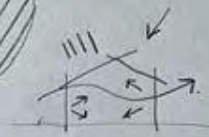

Materials
Construction
10%
Fossil Fuels
Cheap energy
Macro
(Economic sustainability)
Micro
Climate Emergency
Produce + Consume
Mitigate ?
Change ?
Human Problems
· Loss of life
· Loss of property
· Loss of human settlements
Nature
· Displacement
· Refugees
· Migrants → Rural to Urban migration
Housing Problem


Materials
Operation - Heating + Cooling
Construction
10%
Fossil Fuels
Cheap energy
Macro
(Economic sustainability)
Micro
Climate Emergency
Produce + Consume
Human Problems
· Loss of life
· Loss of property
· Loss of human settlements
Nature
Mitigate ?
Change ?
· Displacement
· Refugees
· Migrants → Rural to Urban migration
Housing Problems

Materials · Operation - Heating + Cooling

Construction





Fossil Fuels
Cheap energy

Macro

(Economic Sustainability)

Micro

Climate Emergency

Produce + Consume

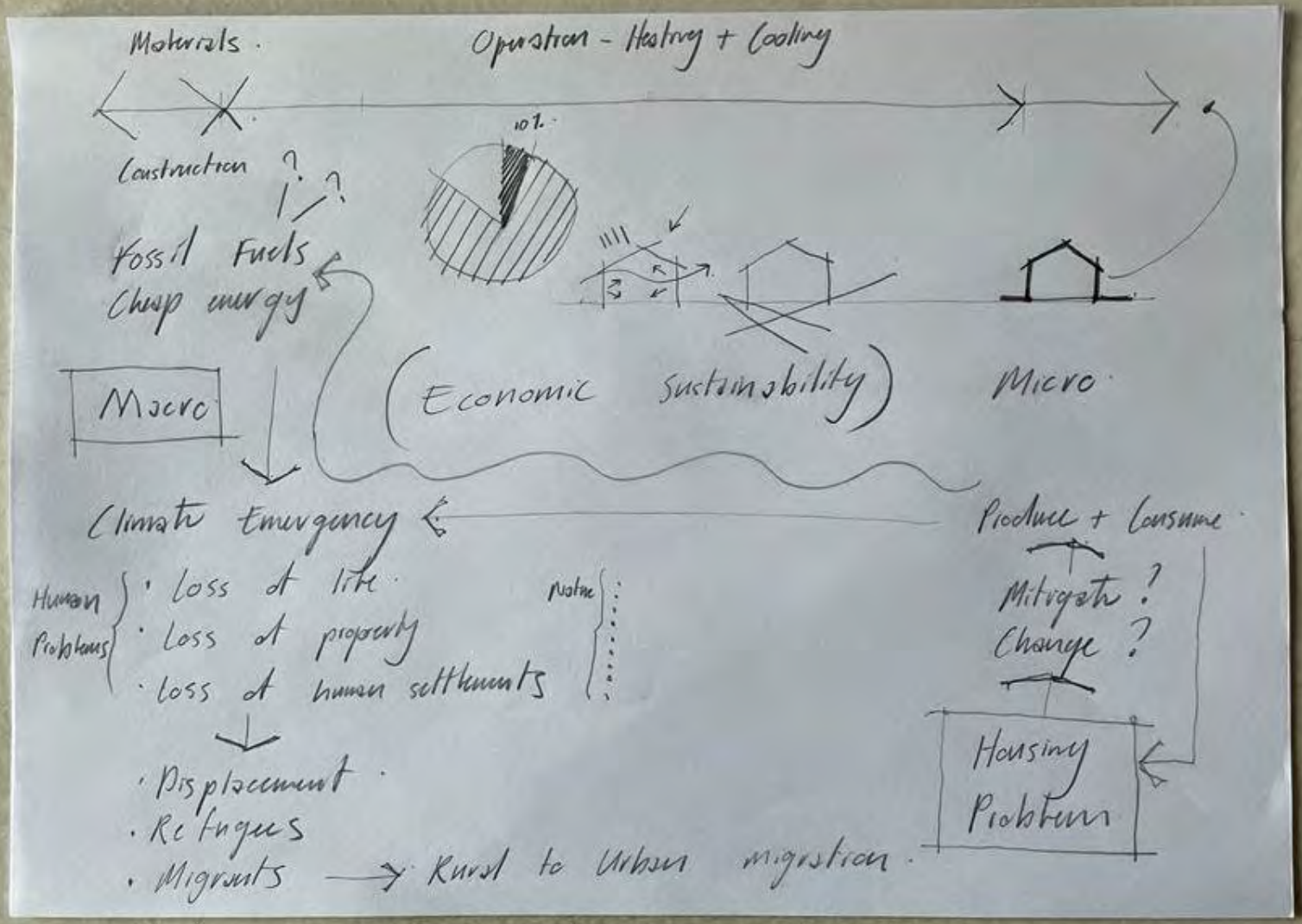
Human Problems:
- Loss of life
- Loss of property
- Loss of human settlements

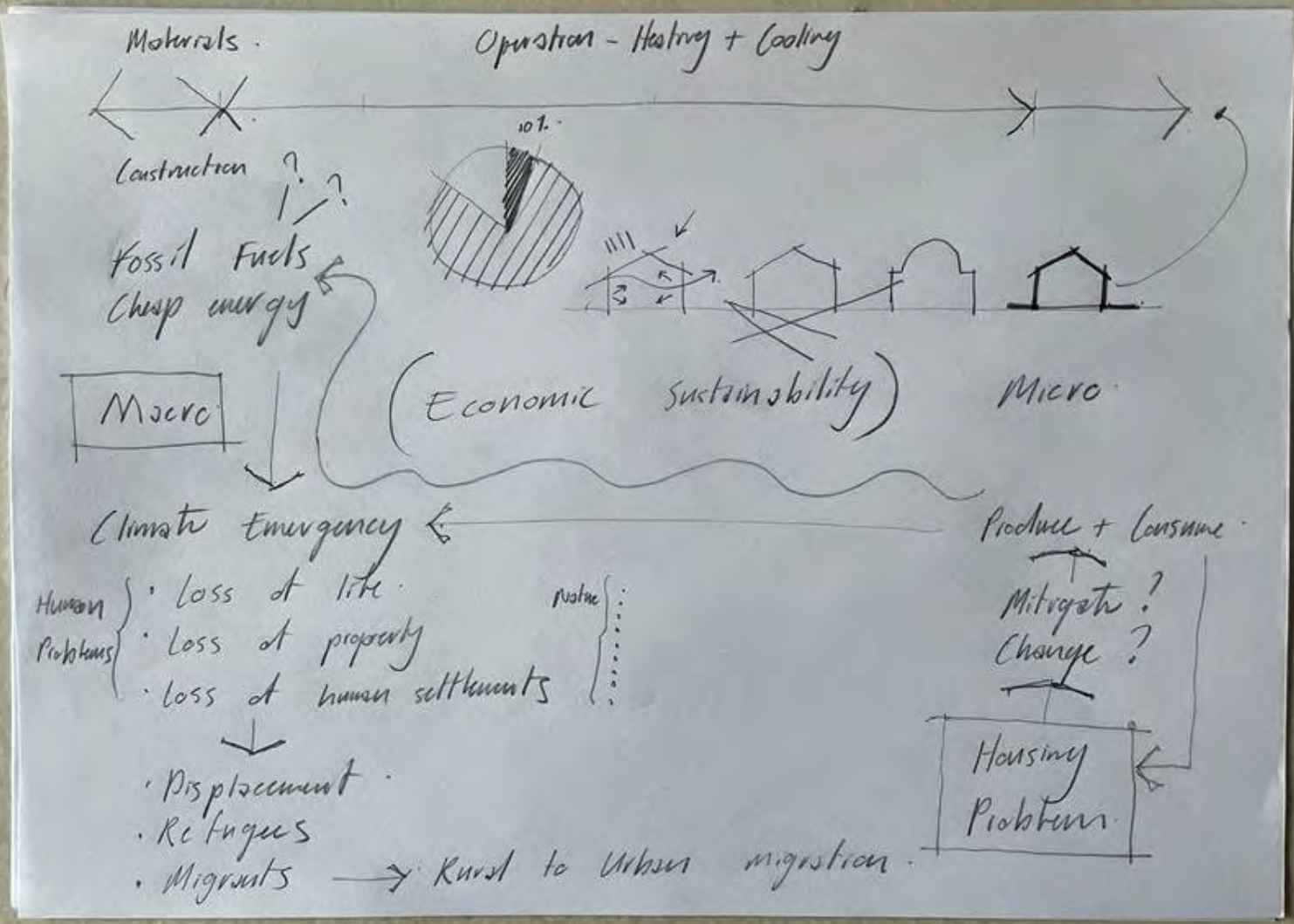
Nature: .....

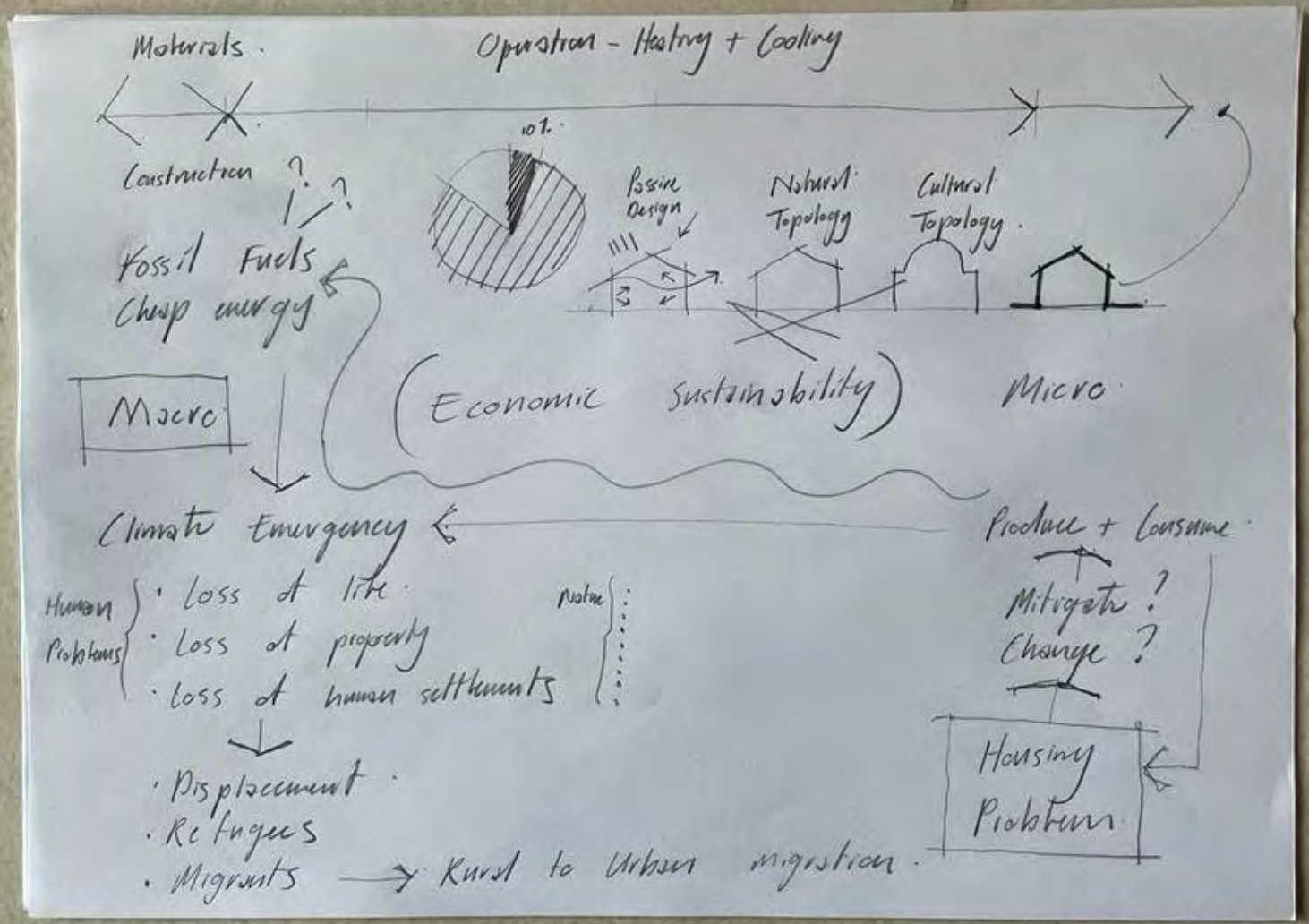
Mitigate ?
Change ?

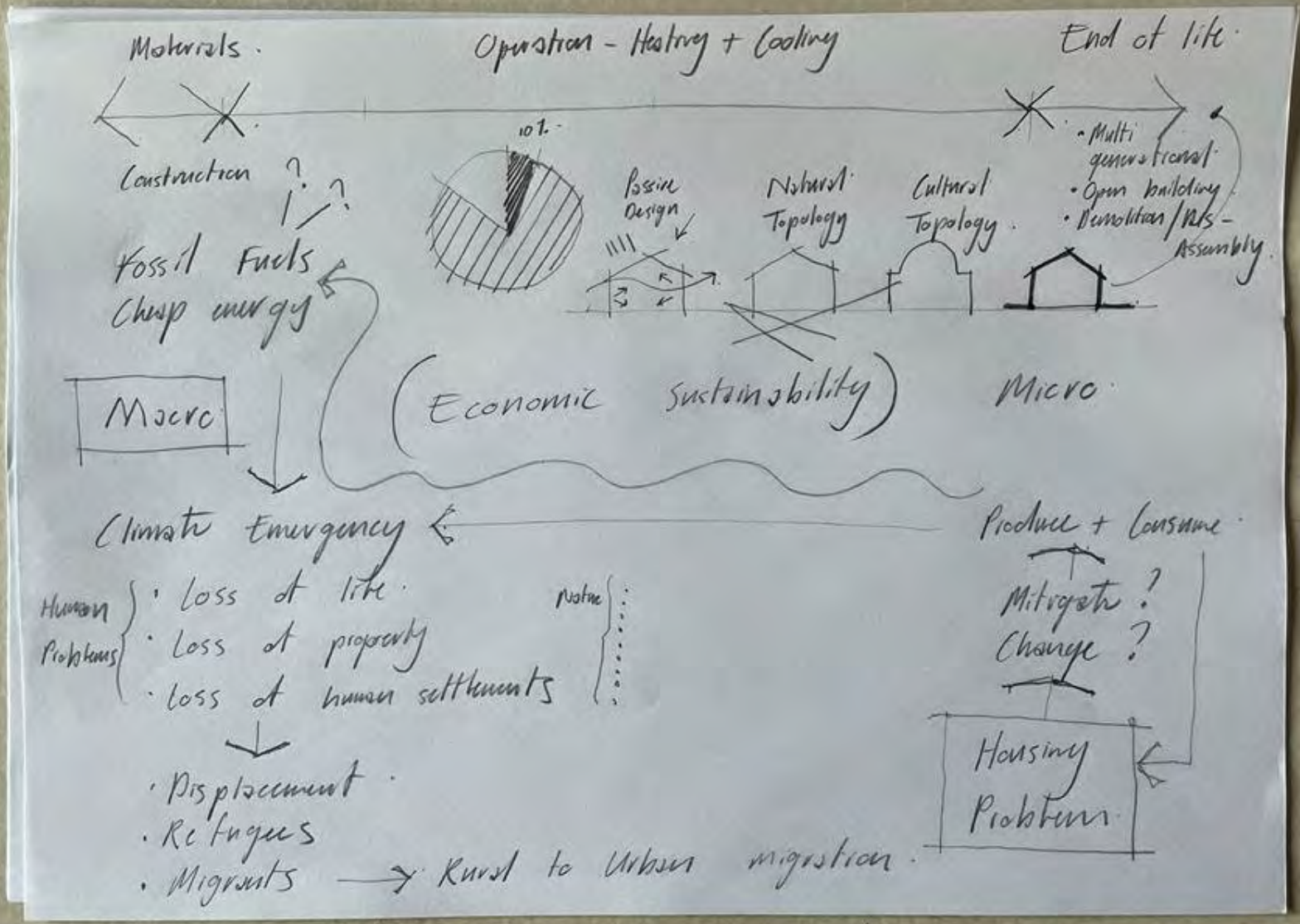
Housing Problems

- Displacement
- Refugees
- Migrants → Rural to Urban migration


Materials
Operation - Heating + Cooling
Construction
?
?
?
Fossil Fuels
Cheap energy
Macro
(Economic Sustainability)
Micro
Climate Emergency
Produce + Consume
Human Problems
· Loss of life
· Loss of property
· Loss of human settlements
Nature
Mitigate ?
Change ?
· Displacement
· Refugees
· Migrants → Rural to Urban migration
Housing Problem


Materials
Operation - Heating + Cooling
Construction
10%
Fossil Fuels
Cheap energy
Macro
(Economic Sustainability)
Micro
Climate Emergency
Produce + Consume
Human Problems
· Loss of life
· Loss of property
· Loss of human settlements
Nature
Mitigate ?
Change ?
· Displacement
· Refugees
· Migrants
→ Rural to Urban migration
Housing Problem


Materials
Operation - Heating + Cooling
Construction
Fossil Fuels
Cheap energy
Passive Design
Natural Topology
Cultural Topology
Macro
(Economic Sustainability)
Micro
Climate Emergency
Produce + Consume
Mitigate ?
Change ?
Housing Problem
Human Problems
· Loss of life
· Loss of property
· Loss of human settlements
Nature
· Displacement
· Refugees
· Migrants
→ Rural to Urban migration


Materials
Operation - Heating + Cooling
End of life
Construction
?
!
?
Fossil Fuels
Cheap energy
10%
Passive Design
Natural Topology
Cultural Topology
• Multi generational
• Open building
• Demolition / Re-Assembly
Macro
(Economic Sustainability)
Micro
Climate Emergency
Produce + Consume
Migration ?
Change ?
Human Problems
• Loss of life
• Loss of property
• Loss of human settlements
Nature
• Displacement
• Refugees
• Migrants
→ Rural to Urban migration
Housing Problems

Variables: an element, feature, or factor that is liable to vary or change.

"there are too many variables involved to make any meaningful predictions"

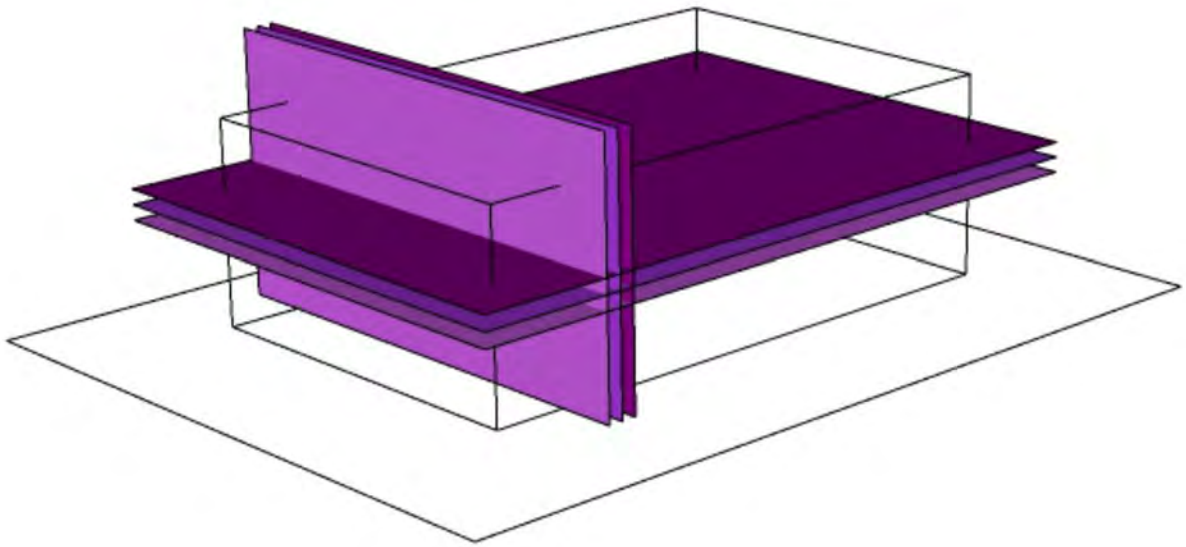
- Existing variables.
- Emerging variables.

Table 1. Existing and emerging variables that inform the specifics of architectural information in the architectural design process (Adapted from: van Tonder, 2022[3])

Existing design variable	Emerging design variable
Cultural topology (a)	Climate resilience adaptation (g)
Natural topology (b)	Redress of imperialism (h)
Industrial thinking typology (c)	Economic and social fairness and foothold toward a circular economy (i)
Indigenous thinking typology (d)	Service provision system interception with circular approach (j)
Visual tectonics (e)	Amenities system interception with circular approach (k)
Technology tectonics (f)	Regenerative potential (l)

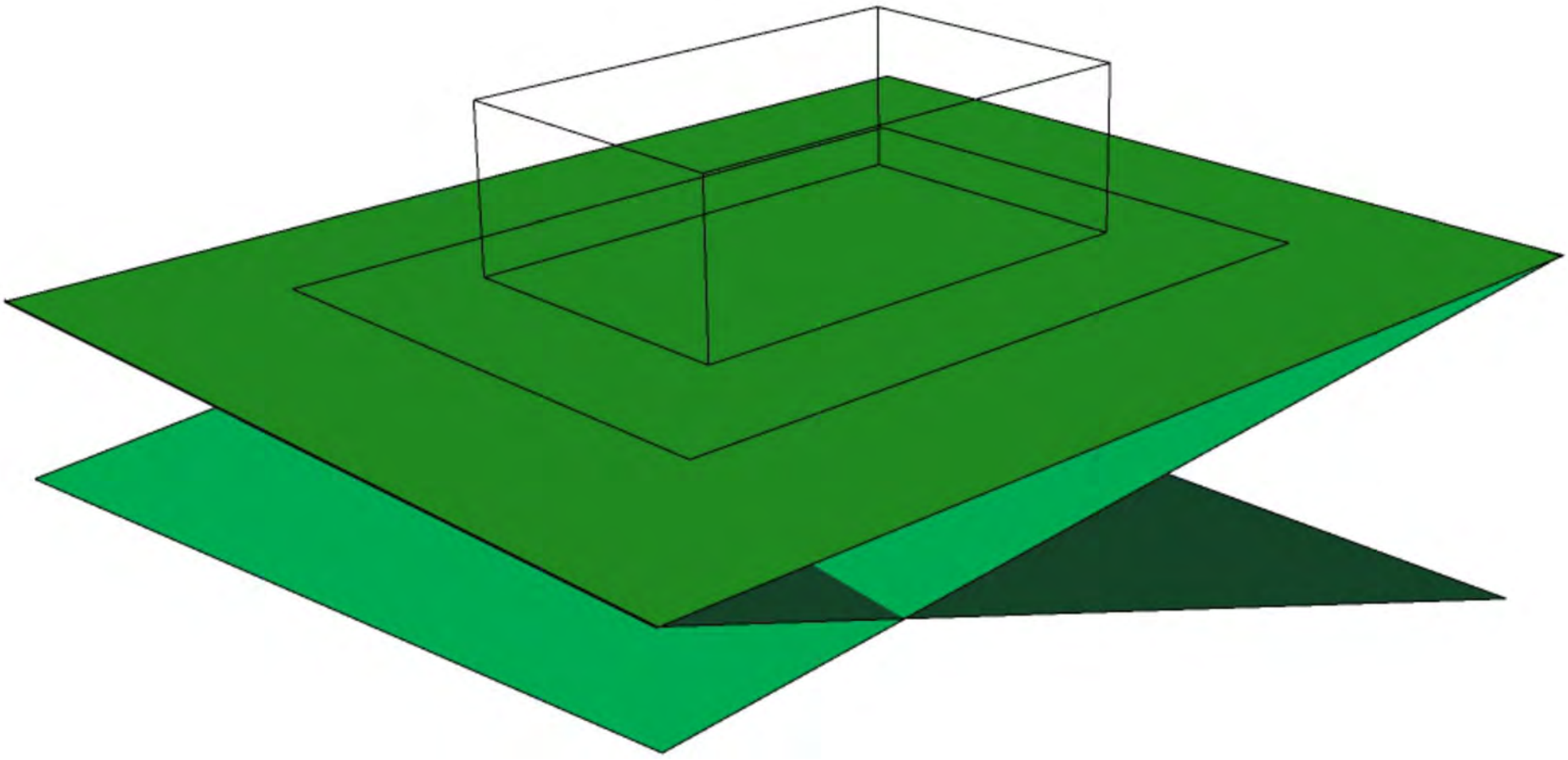
Existing variables:

- Cultural topology (a)



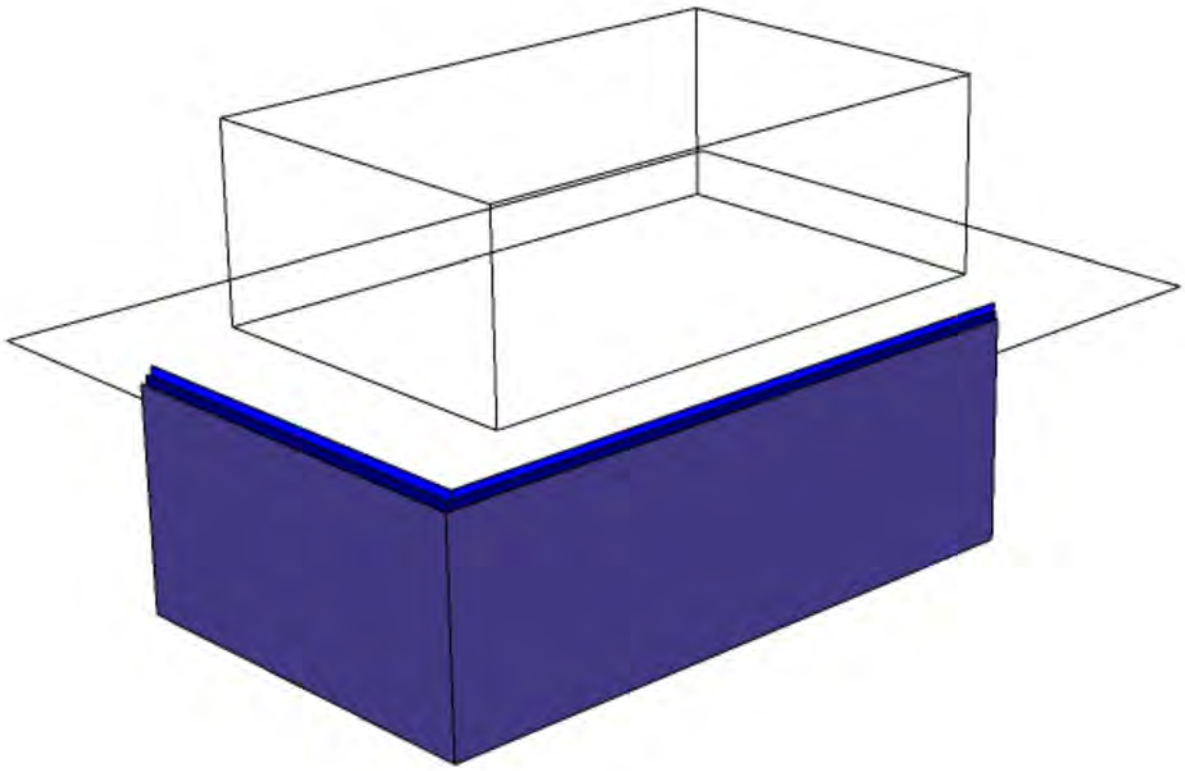
Existing variables:

- Natural topology (b)



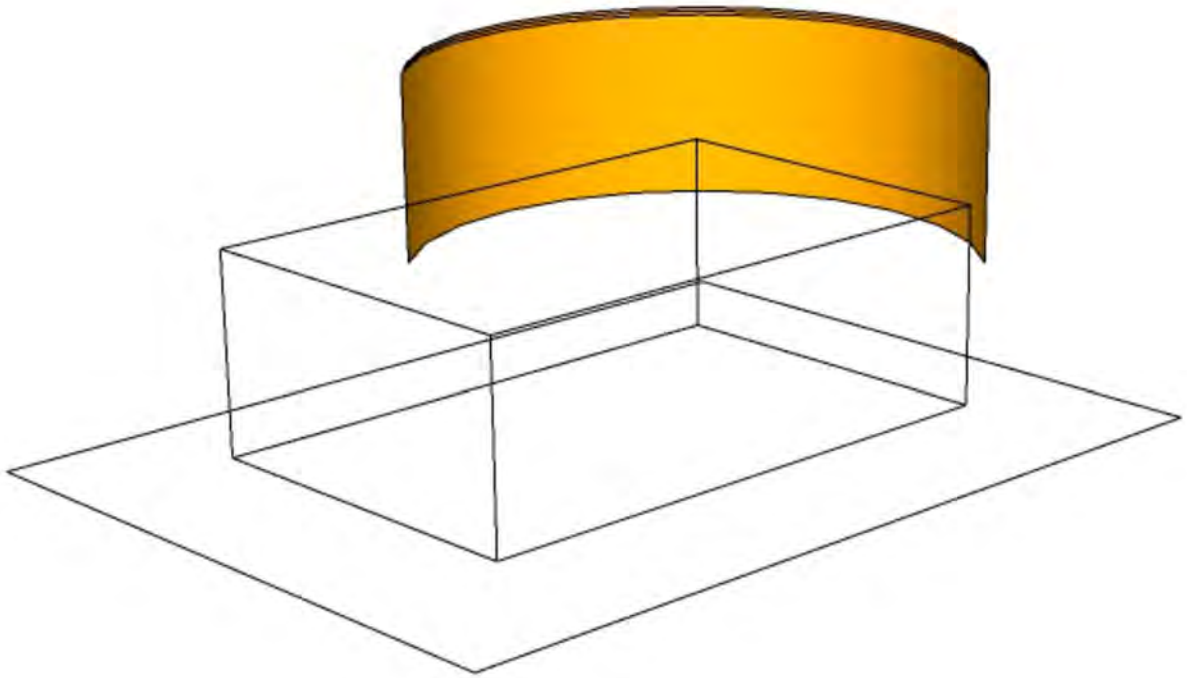
Existing variables:

- Industrial thinking typology (c)



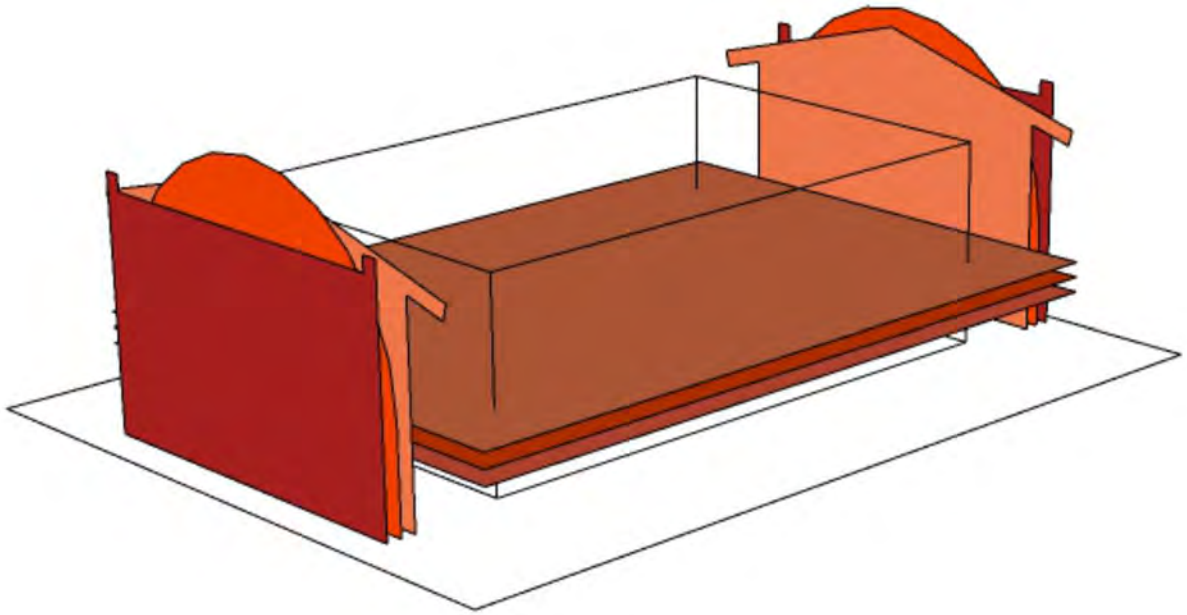
Existing variables:

- Indigenous thinking typology (d)



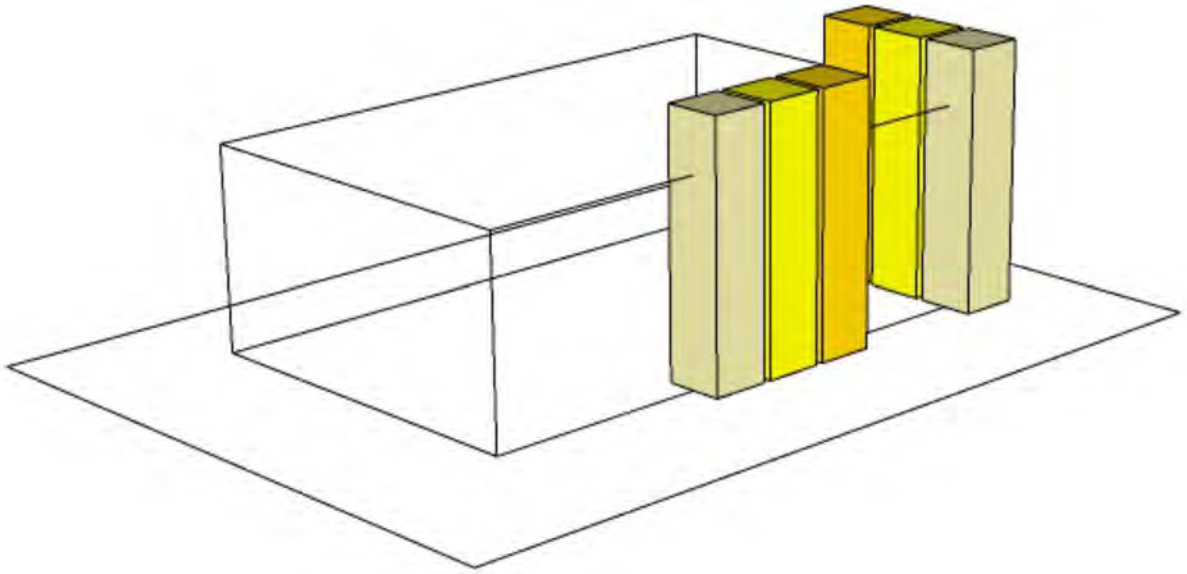
Existing variables:

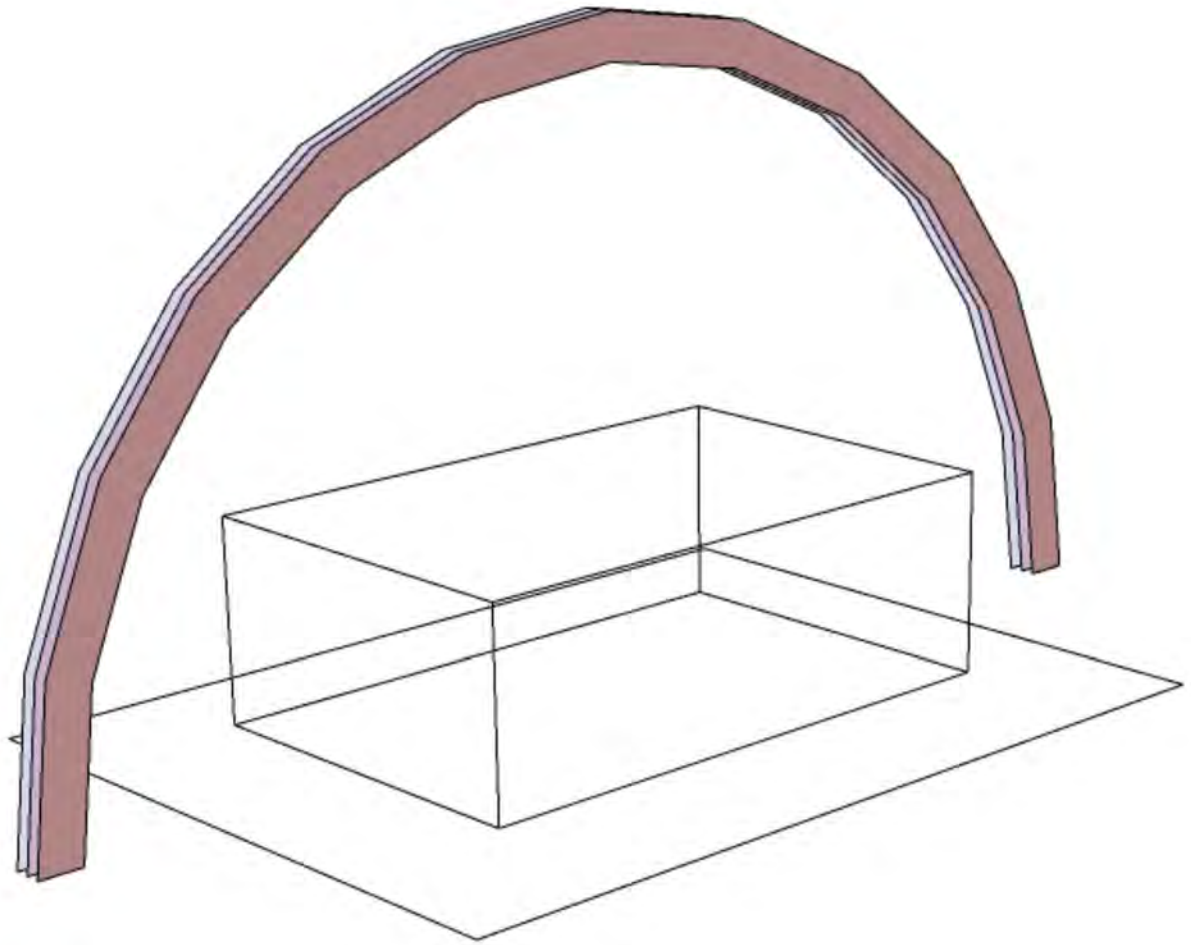
- Visual tectonics (e)



Existing variables:

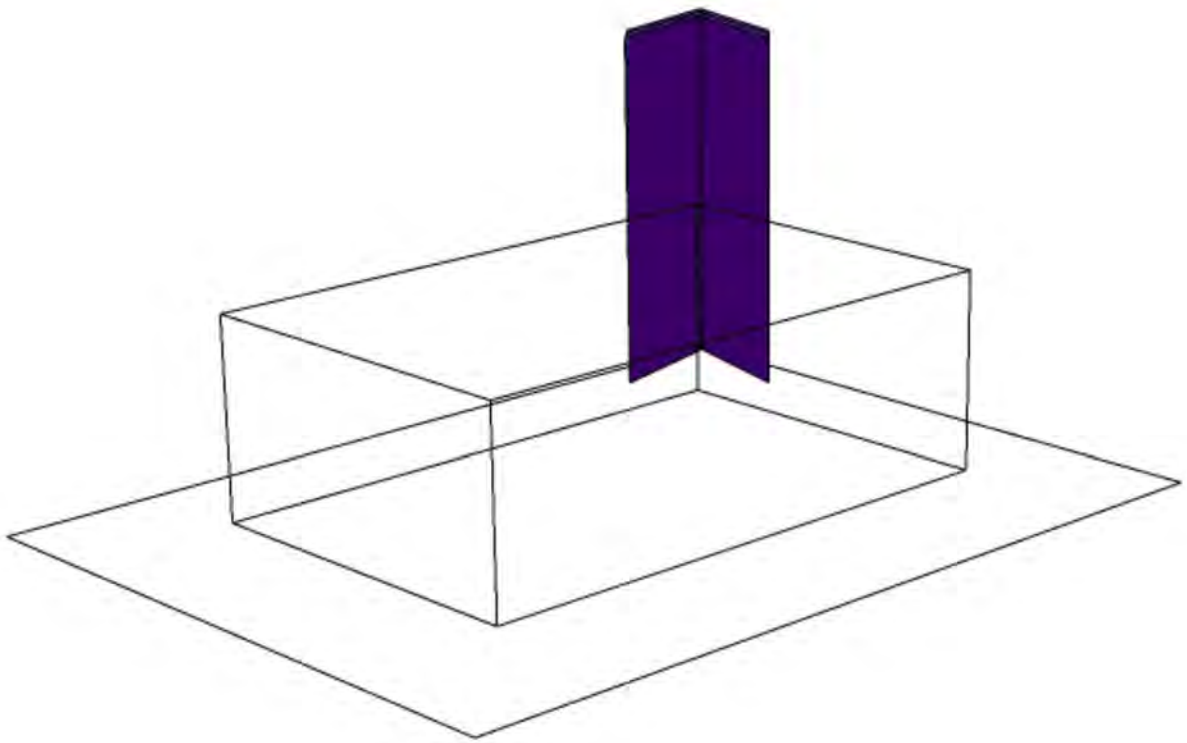
- Technology tectonics (f)





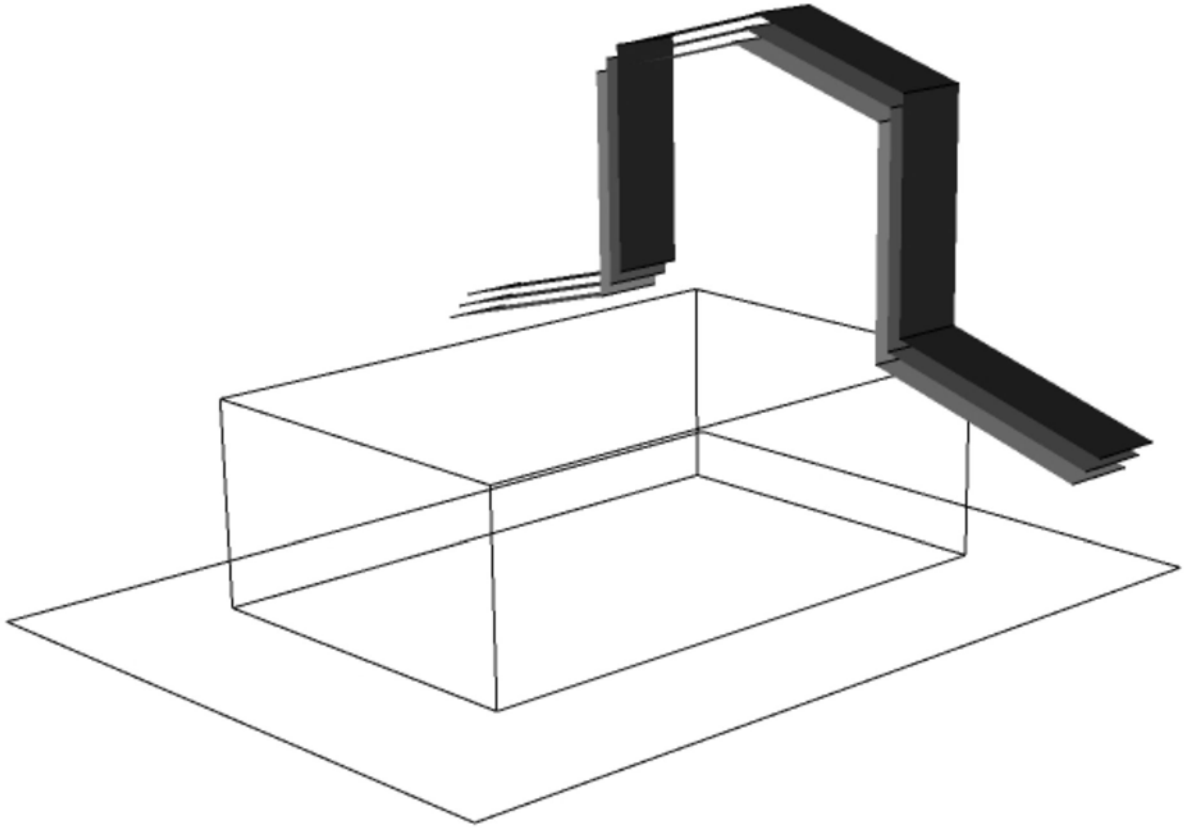
Emerging variables:

- Climate resilience adaptation (g)



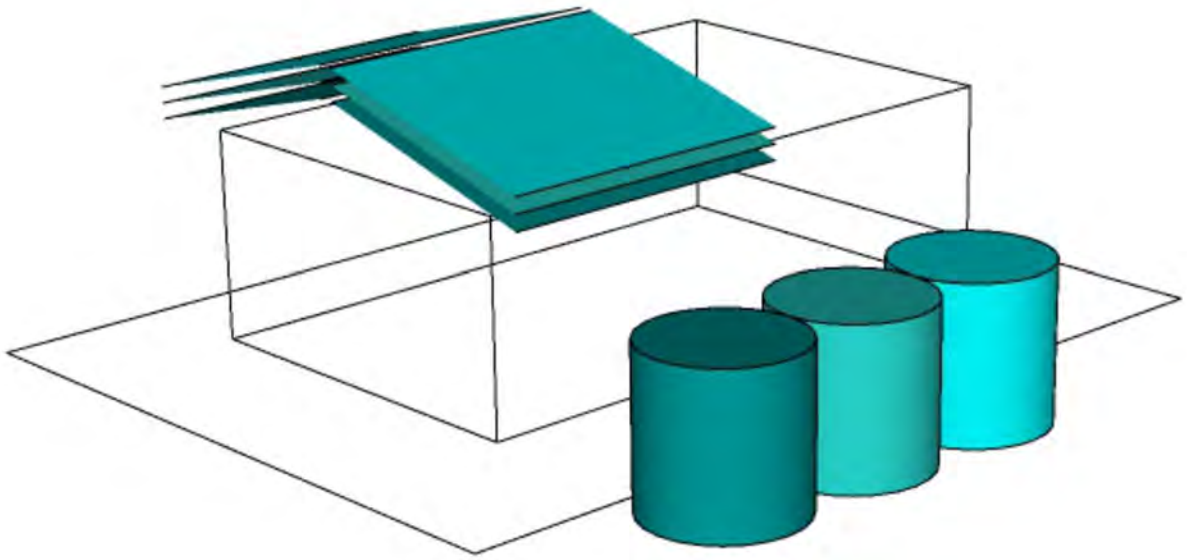
Emerging variables:

- Redress of imperialism (h)



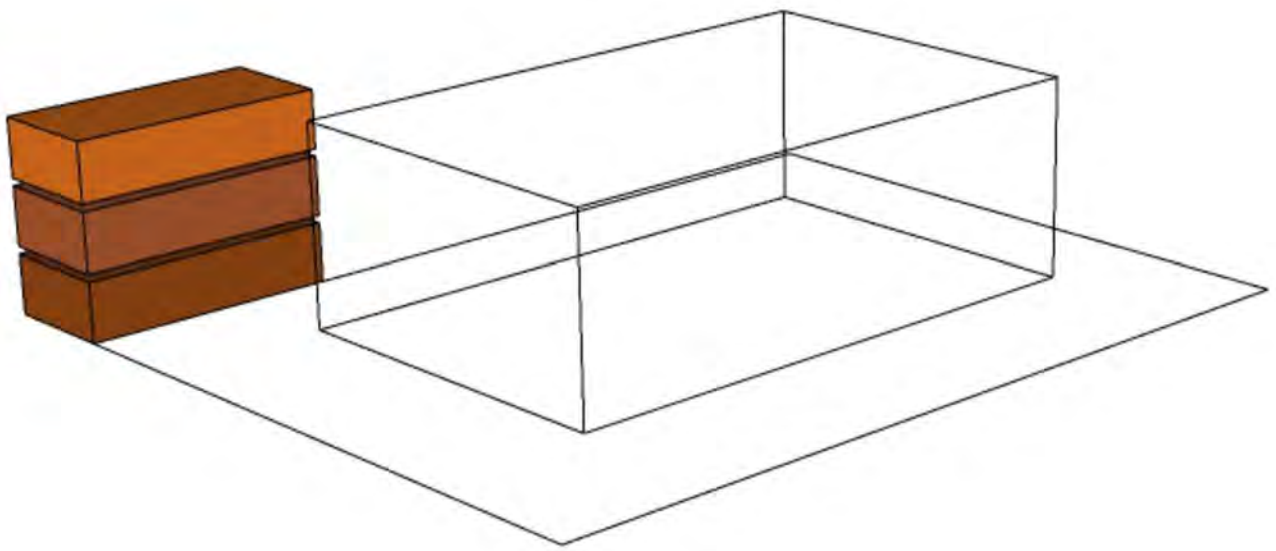
Emerging variables:

- Economic and social fairness and foothold toward a circular economy (i)



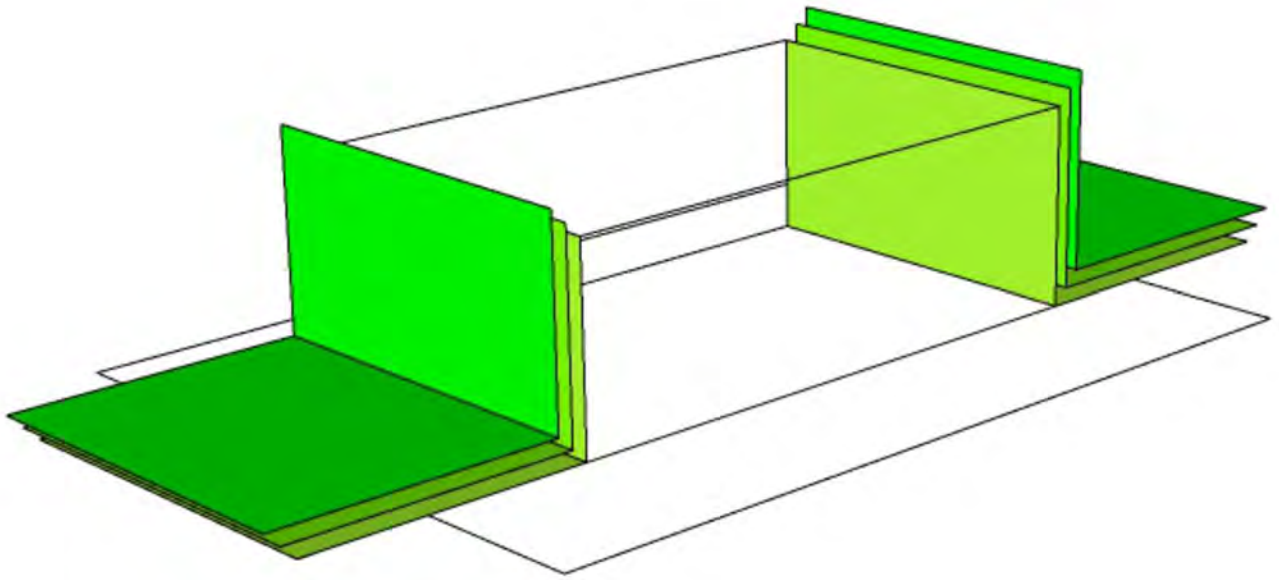
Emerging variables:

- Service provision system interception with circular approach (j)



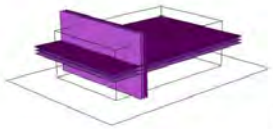
Emerging variables:

- Amenities system interception with circular approach (k)

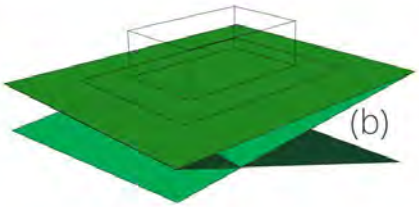


Emerging variables:

- Regenerative potential (I)

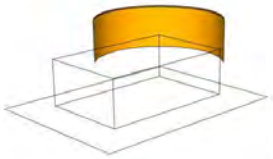


(a)

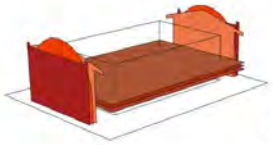


(b)

(c)



(d)



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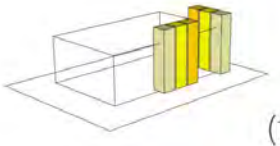
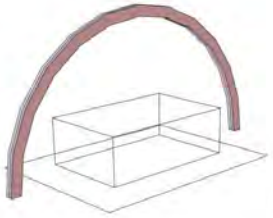
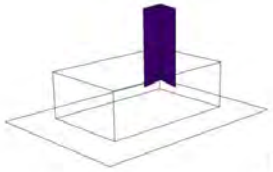


(f)

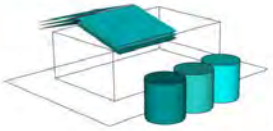


(g)

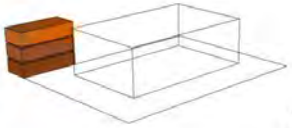


(h)

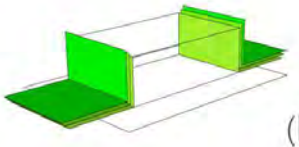
(i)



(j)



(k)



(l)

Table 4. A conceptual decision tree

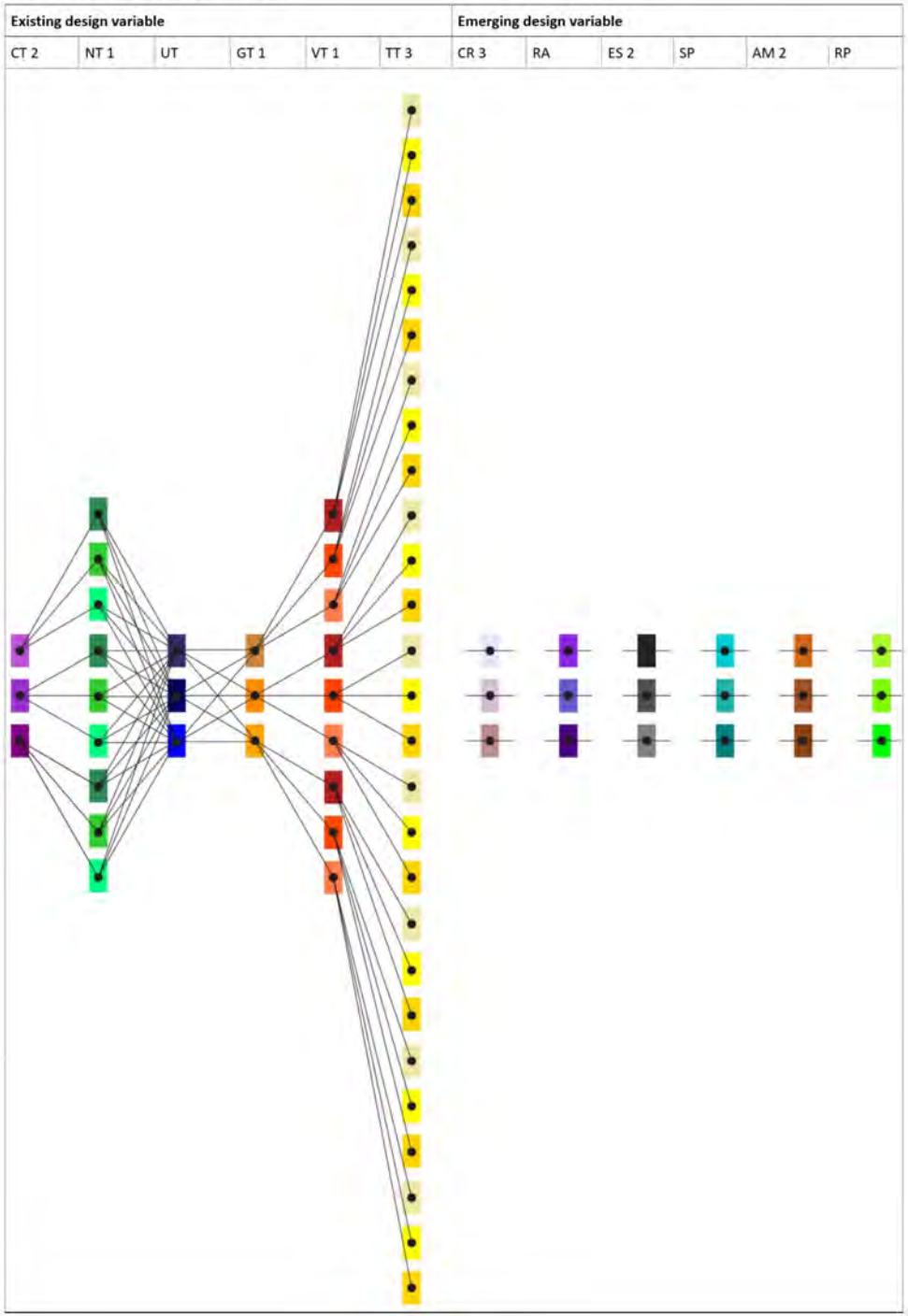


Table 6: A conceptual decision tree for Case Study 2

Existing design variable						Emerging design variable					
CT	NT 1	UT 1	GT	VT 1	TT 1	CR	RA3	ES	SP	AM	RP 2

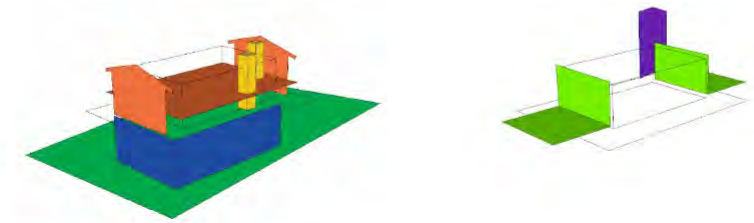


Figure 2: Graphical illustration of the low-cost housing unit for Case Study 2 with existing design variables to the left and emerging design variables to the right

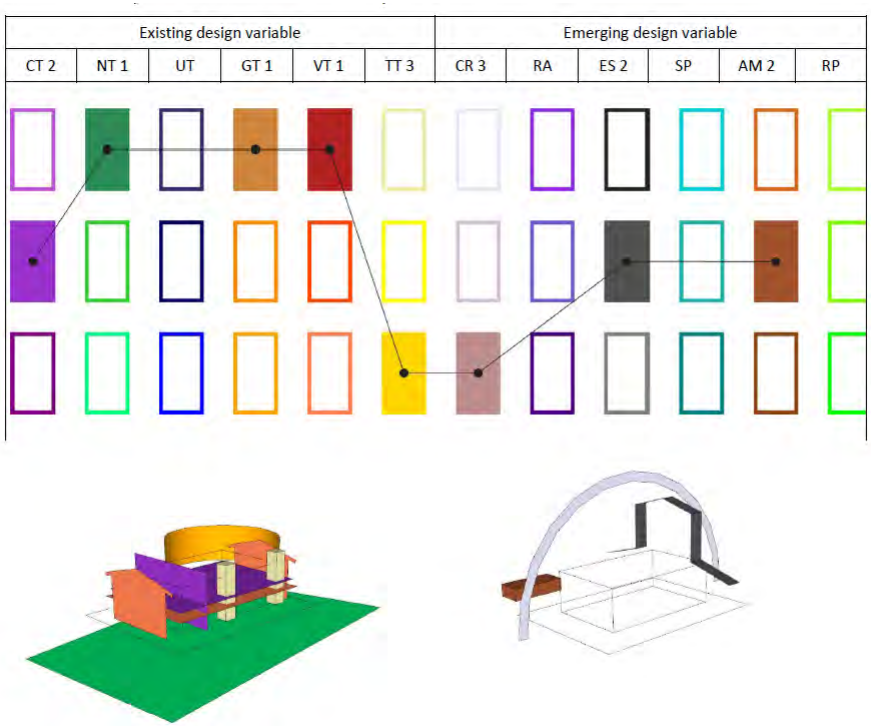
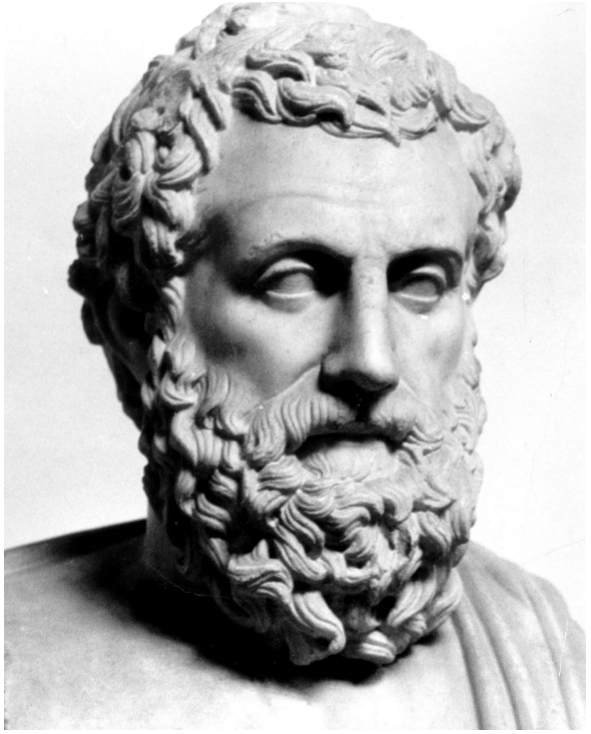


Figure 3: Graphical illustration of the low-cost housing unit for Case Study 3 with existing design variables to the left and emerging design variables to the right

SYSTEMS THINKING

- “the whole is greater than the sum-of-its-parts”, (Aristotle 384-322 B.C., 1966)



What are limits?

Source Limits: Resources to support aspirations & quality

Sink Limits:
Ability to absorb and neutralise wastes

SYSTEM BOUNDARIES

fin

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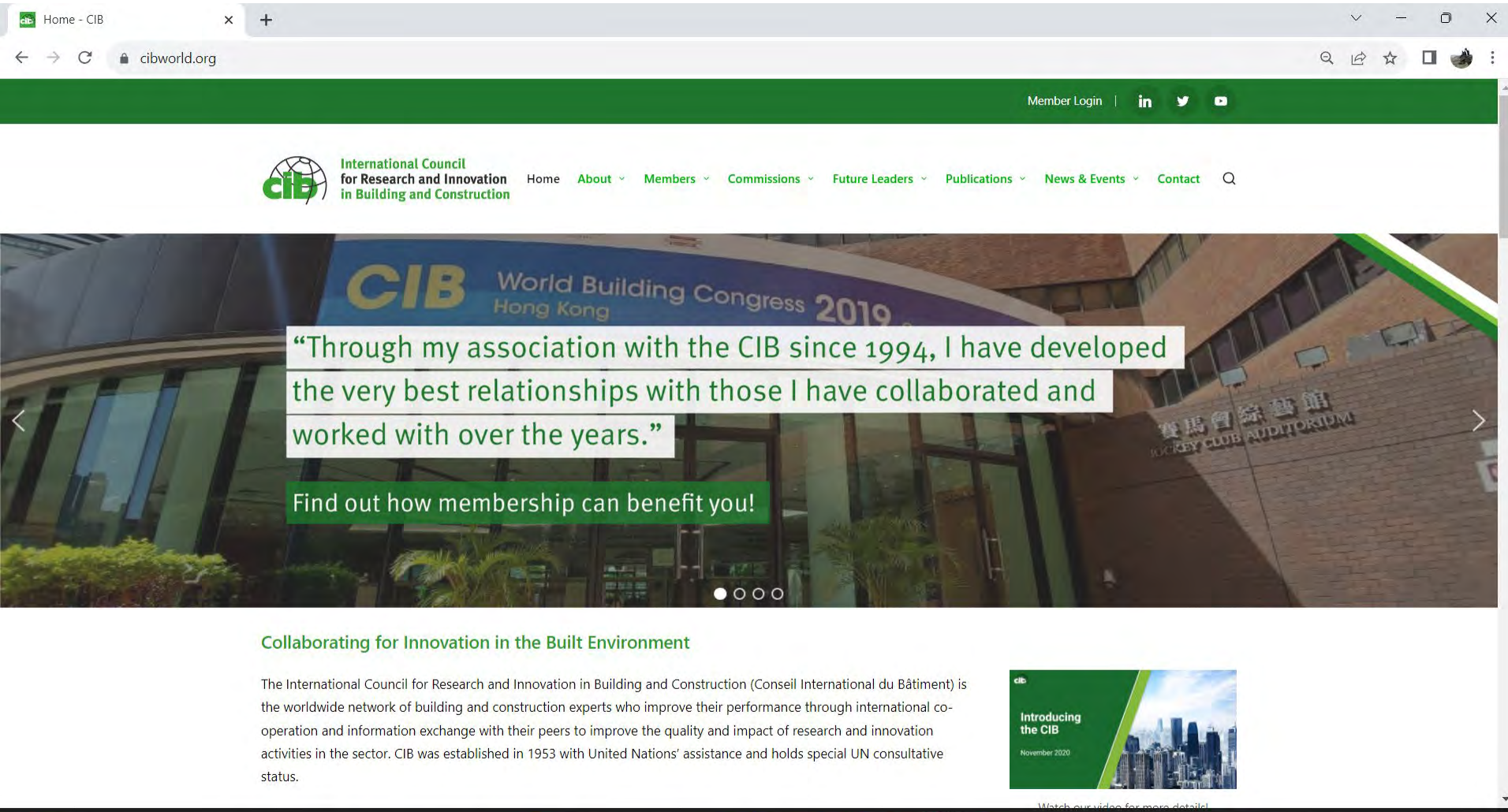

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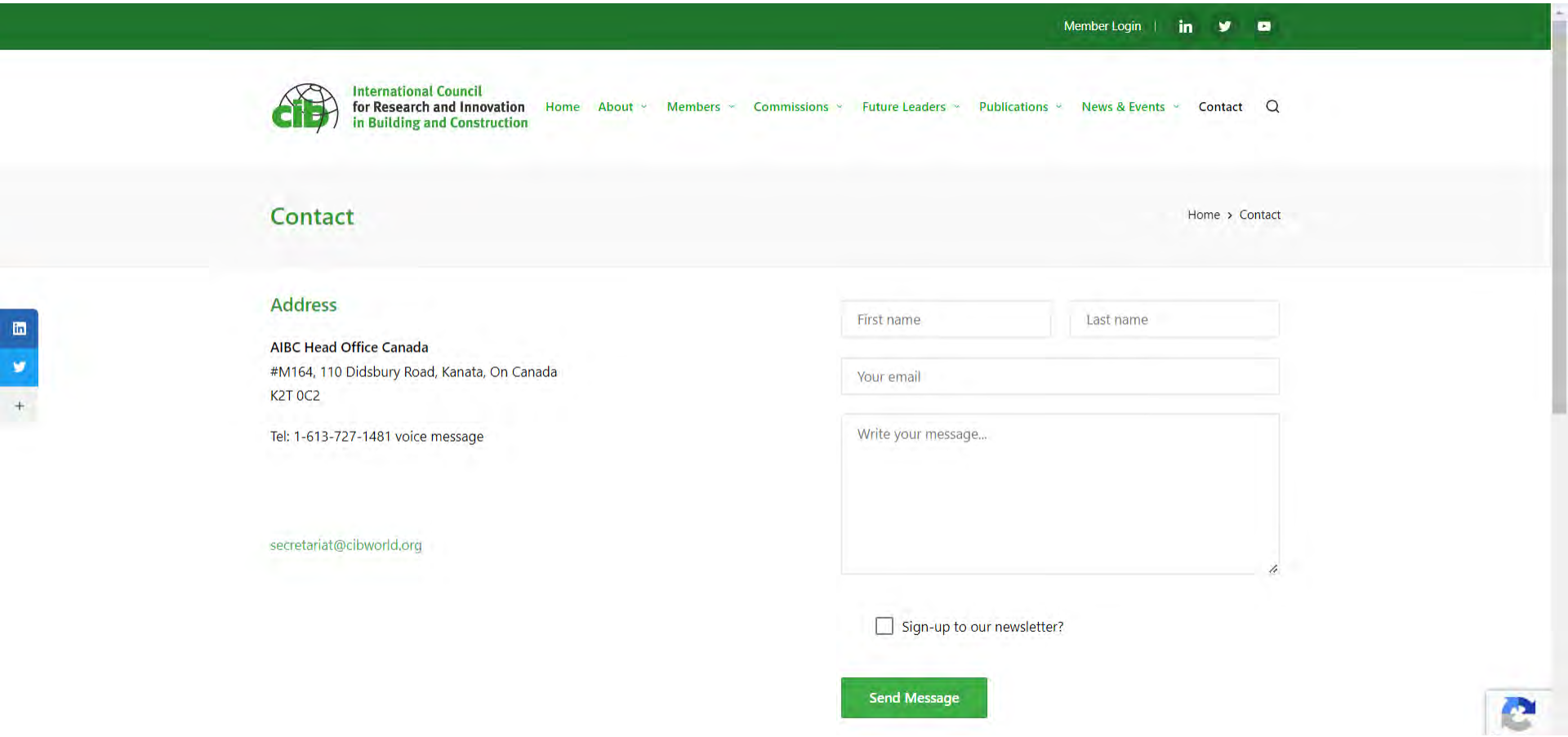

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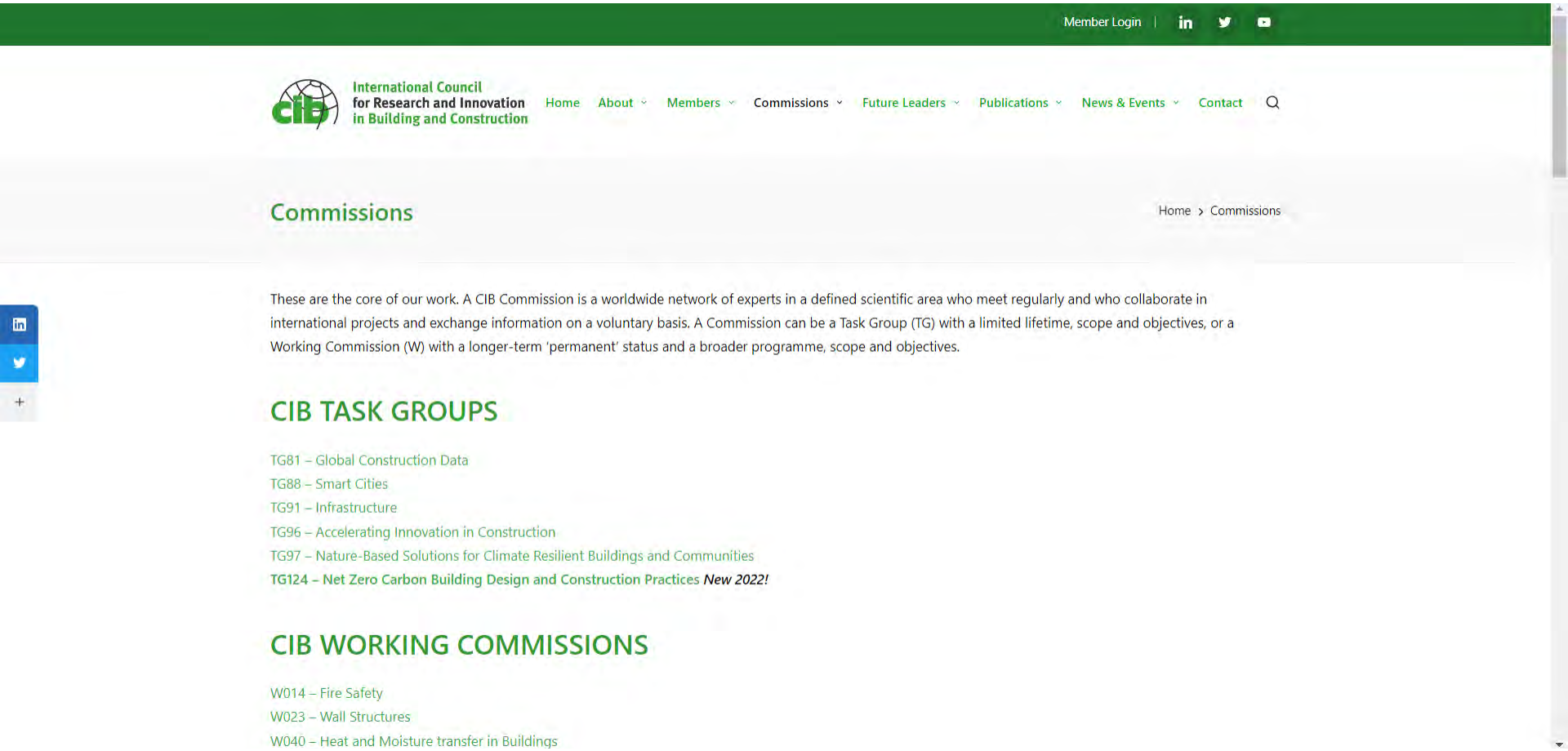

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