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?
How does fossil fuel work?
How does fossil fuel work?
How does fossil fuel work?
How does fossil fuel work?
How does fossil fuel work?

When the world was new.
When the world was new.
How does fossil fuel work?
How does fossil fuel work?
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.
IF THE WORLD'S POPULATION LIVED LIKE...

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

- BANGLADESH
- CHINA \( \times 1.1 \)
- FRANCE \( \times 2.5 \)
- INDIA
- COSTA RICA \( \times 1.4 \)
- UNITED STATES of AMERICA \( \times 4.1 \)
- UGANDA
- NEPAL \( \times 1.9 \)
- UNITED ARAB EMIRATES \( \times 5.4 \)

Illustration ©2012 Tim De Chant
Data from Global Footprint Network (http://www.footprintnetwork.org/)
How many Earths would we need if everyone lived like U.S.A. residents?

- U.S.A.: 5.1
- Australia: 4.5
- Russia: 3.4
- Germany: 3.0
- Japan: 2.9
- Portugal: 2.9
- France: 2.8
- Spain: 2.8
- Switzerland: 2.8
- Italy: 2.7
- U.K.: 2.6
- China: 2.4
- Brazil: 1.6
- India: 0.8

World: 1.75

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?

- Japan: 7.9
- Italy: 5.3
- Switzerland: 4.4
- China: 4.1
- U.K.: 4.1
- Portugal: 3.5
- Germany: 3.1
- Spain: 2.9
- India: 2.7
- U.S.A.: 2.4
- France: 1.9

World: 1.75

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)
Note: The red line represents the median average temperature change, and grey lines represent the upper and lower 95% confidence intervals.
Are per capita CO₂ emissions above or below the global average?, 2020

National per capita carbon dioxide (CO₂) 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 CO₂ emissions, 2018

Average carbon dioxide (CO₂) emissions per capita measured in tonnes per year. This measures CO₂ emissions from fossil fuels and cement production only – land use change is not included.

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?

- **36%** of the world’s energy is used by buildings.
- **40%** of the world’s materials are used by buildings.
- **39%** of energy-related greenhouse gas emissions are associated with buildings.
- **40%** of landfill waste comes from construction and demolition.

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
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

1%  99%
Let's talk about money

1% 99%

scarcity mentality
Let's talk about money

1% 99%

scarcity mentality
Take
Take
Take
Let's talk about money

1%  99%

Scarcity mentality

Take
Take
Take

Give
Give
Give
Let’s talk about money

1%  
Scarcity mentality
Take
Take
Take

99%  
Abundance mentality?
Give
Give
Give
Let's talk about money

1% 99%

Scarcity mentality

Take
Take
Take

Abundance mentality?

Give
Give
Give
Let's talk about money

1%  99%

Scarcity mentality
Take  Take  Take

Abundance mentality?
Give  Give  Give
Let's talk about money

1%  99%

Scarcity mentality
  Take
  Take
  Take

Abundance mentality?
  Give
  Give
  Give
Let’s talk about money
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 be economically active

People surrender their power

→

Consumption of consumer goods

↑↑

Carbon emissions

↓↓
Opportunities to be economically active

↓↓ People surrender their power

⇒ Consumption of consumer goods

↑↑ Carbon emissions

↓↓ Environmental degradation
Opportunities to be economically active

People surrender their power

Consumption of consumer goods

Carbon emissions

Environmental degradation

Mental health decline

Capitalist power increase
Opportunities to be economically active

\[ \Downarrow \quad = \quad \Rightarrow \quad = \quad \Uparrow \quad + \quad \Uparrow \quad + \quad \Downarrow \quad = \quad \Downarrow \quad + \quad \Uparrow \]

People surrender their power

Carbon emissions

Consumption of consumer goods

Environmental degradation

Mental health decline

Capitalist power increase
People surrender their power $\Rightarrow$ Opportunities to be economically active $\Rightarrow$ Consumption of consumer goods $\Rightarrow$ Carbon emissions $\Rightarrow$ Environmental degradation $\Rightarrow$ Mental health decline $\Rightarrow$ Capitalist power increase
People surrender their power → Opportunities to be economically active → Consumption of consumer goods → Carbon emissions → Environmental degradation → Mental health decline → Capitalist power increase
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

Industrial thinking

Circular

Indigenous thinking
Resource, use, discard = becomes depleted

Linear

Circular

Industrial thinking

Indigenous thinking
Resource, use, discard = becomes depleted

Linear

Industrial thinking

Circular

Indigenous thinking
Resource, use, discard = becomes depleted

Linear

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

Circular

Industrial thinking

Indigenous thinking
Resource, use, discard = becomes depleted

Linear

Imperialism → Settler → Industrial thinking

Circular

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

Indigenous thinking
Resource, use, discard = becomes depleted

Linear

Imperialism

Settler

Industrial thinking

Resource + labour = consume = profit

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

Circular

Conquer + oppress

Indigenous thinking
Resource, use, and discard = becomes depleted

Linear

Imperialism

Settler

Industrial thinking

Resource + labour = consume = profit

How do we reclaim power?

Conquer + oppress

Indigenous thinking

Circu...
Resource, use, discard = becomes depleted

Linear

Imperialism
↑
Settler
↑
Industrial thinking
↓
Resource + labour = consume
= PROFIT

How do we reclaim power?

Conquer & oppress

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

Circular

Indigenous thinking
Resource, use, discard = becomes depleted

Linear

Imperialism
Settler
Industrial thinking

Resource + Labour = Consume = PROFIT

How do we reclaim power?

Conquer oppress

Indigenous thinking

Produce + Consume = Replenish

Resource, use, and reuse = holds the potential to replenish
Resource, use, discard = becomes depleted

Linear

Imperialism

Settler

Industrial thinking

Resource + Labour = Consume = PROFIT

Conquer, oppress

How do we reclaim power?

Circular

Indigenous thinking

Produce + Consume = Replenish

Apartheid

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

Linear

Imperialism

Settler

Industrial thinking

Resource + Labour = Consume = PROFIT

Apartheid - South Africa / Palestine / Canada / Adaptation

Circular

How do we reclaim power?

Conquer oppress

Indigenous thinking

Produce + Consume = Replenish
Resource, use, discard = becomes depleted

Linear

Imperialism

Settler

Industrial thinking

How do we reclaim power?

Circular

Indigenous thinking

Produce + Consume = Replenish

Conquer oppress

Resource + Labour = Consume

Apartheid: South Africa / Palestine / Canada / Adaptation
Intersectionality chart for agents of change to transform the post-apartheid city.
Economic Sustainability
Micro (Economic Sustainability) Micro
Fossil Fuels
Cheap energy

Macro

Climate Emergency

(Economic Sustainability)

Micro
Economic Sustainability

Macro

Climate emergency

- Human
- Loss of life
- Property damage
- 

Micro

Fossil fuels

Cheap energy

...
Fossil fuels -> Cheap energy

**Macro**

Climate emergency

- Human
  - Loss of life
- Property
  - Loss of property
  - Loss of human settlements

**Micro**

- Displacement
- Refugees
- Migrants ➔ Rural to urban migration

(Economic sustainability)
Fossil Fuels
Cheap energy

Micro

Climate emergency

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

Economic sustainability

Micro

Displacement
- Refugees
- Migrants → Rural to Urban migration

Housing Problem
Fossil Fuels  
Cheap energy

Micro

Climate Emergency

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

Displacement
Refugees
Migrants  →  Rural to Urban migration

Economic Sustainability

Micro

Produce + Consume

Housing Problem

Note:
Fossil Fuels
Cheap energy

Micro

Climate Emergency

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

Displacement
- Refugees
- Migrants → Rural to Urban migration

(Economic sustainability)

Micro

Produce + Consume

Mitigate?

Change?

Housing Problem
Fossil Fuels
Cheap energy

Micro

Climate Emergency

Human Problems
- Loss of life
- Loss of property
- Loss of human settlements
- Displacement
- Refugees
- Migrants → Rural to urban migration

Economic Sustainability

Micro

Produce + Consume
Mitigate? Change?

Housing Problem
Fossil Fuels
Cheap energy

Macro

Climate emergency

Human problems:
- Loss of life
- Loss of property
- Loss of human settlements
  
  Displacement
  Refugees
  Migrants

$\rightarrow$ Rural to Urban migration

Economic Sustainability

Micro

Produce + Consume

Mitigate?

Housing problems

Change?
Materials

Construction

Fossil Fuels

Cheap energy

Macro

Climate Emergency

Human Problems

- Loss of life
- Loss of property
- Loss of human settlements

Displacement

Refugees

Migrants → Rural to Urban migration

Economic Sustainability

Micro

 Produce + Consume

Mitigate?

Change?

Housing Problem
Materials

Construction

Fossil Fuels

Cheap energy

Macro

Climate Emergency

Human Problems:
- Loss of life
- Loss of property
- Loss of human settlements
- Displacement
- Refuges
- Migrants → Rural to Urban migration

(Economic Sustainability)

Micro

Produce & Consume

Mitigate?

Change?

Housing Problems
Materials

Construction

Fossil Fuels
Cheap Energy

Macro

Climate Emergency

Human Problems

- Loss of life
- Loss of property
- Loss of human settlements

Displacement
Refugees
Migrants

Operation - Heating + Cooling

Economic Sustainability

Micro

Produce + Consume

Mitigate? Change?

Housing Problems

Kural to Urban Migration
Materials

Operation - Heating + Cooling

Construction

Fossil Fuels

Cheap energy

Micro

Climate Emergency

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

Displacement

Refugees

Migrants → Rural to Urban migration

Economic Sustainability

Macro

Produce + Consume

Mitigate?

Change?

Housing Problems
Fossil Fuels
Cheap energy

Materials

Operation - Heating + Cooling

Construction

Micro

Economic Sustainability

Macro

Climate Emergency

Human Problems

Loss of life
Loss of property
Loss of human settlements

Displacement
Refugees
Migrants

Kurd to Urban migration

Produce + Consume

Mitigate?
Change?

Housing Problems
Operation - Heating + Cooling

Construction

Fossil Fuels

Economic Sustainability

Natural Topology

Cultural Topology

Macro

Climate Emergency

Human Problems

- Loss of life
- Loss of property
- Loss of human settlements

Displacement

Refugees

Migrants → Rural to Urban migration

Produce + Consume

Mitigate?

Change?

Housing Problem
Materials → Operation - Heating + Cooling → End of life

Construction

Fossil Fuels
Chipped energy

(Economic Sustainability)

Climate Emergency

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

Displacement
Refugees
Migrants → Rural to Urban migration

Macro → Micro

Produce + Consume

Mitigate? Change?

Housing Problem

Multi-generational
Open building
Demolition/NS-Assembly
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\(^3\))

<table>
<thead>
<tr>
<th>Existing design variable</th>
<th>Emerging design variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural topology (a)</td>
<td>Climate resilience adaptation (g)</td>
</tr>
<tr>
<td>Natural topology (b)</td>
<td>Redress of imperialism (h)</td>
</tr>
<tr>
<td>Industrial thinking typology (c)</td>
<td>Economic and social fairness and foothold toward a circular economy (i)</td>
</tr>
<tr>
<td>Indigenous thinking typology (d)</td>
<td>Service provision system interception with circular approach (j)</td>
</tr>
<tr>
<td>Visual tectonics (e)</td>
<td>Amenities system interception with circular approach (k)</td>
</tr>
<tr>
<td>Technology tectonics (f)</td>
<td>Regenerative potential (l)</td>
</tr>
</tbody>
</table>
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)
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- Regenerative potential (l)
<table>
<thead>
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<th>Existing design variable</th>
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<tbody>
<tr>
<td>CT 2</td>
<td>CR 3</td>
</tr>
<tr>
<td>NT 1</td>
<td>RA</td>
</tr>
<tr>
<td>UT</td>
<td>ES 2</td>
</tr>
<tr>
<td>GT 1</td>
<td>SP</td>
</tr>
<tr>
<td>VT 1</td>
<td>AM 2</td>
</tr>
<tr>
<td>TT 3</td>
<td>RP</td>
</tr>
</tbody>
</table>
### Table 3: A Conceptual Decision Tree for Case Study 2

<table>
<thead>
<tr>
<th>Existing design variable</th>
<th>Emerging design variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>NT</td>
</tr>
</tbody>
</table>

**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.
<table>
<thead>
<tr>
<th>Existing design variable</th>
<th>Emerging design variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT 2</td>
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<td>VT 1</td>
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</tr>
<tr>
<td>TT 3</td>
<td>RP</td>
</tr>
</tbody>
</table>

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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TG88 – Smart Cities
TG91 – Infrastructure
TG96 – Accelerating Innovation in Construction
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