An aerial photograph of a city, likely Singapore, showing a dense urban landscape with numerous high-rise buildings. A river flows through the city, and a multi-lane highway with a bridge crosses it. The sky is overcast.

# Climate finance and identifying mitigation options in cities

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# Overview

## Climate finance

- Brief history of climate finance
- Funding sources and project examples in cities

## Metabolic approaches

- Focus of climate policy
- Opportunities



# Part 1: Climate finance



The background of the slide is a photograph of a modern, multi-story apartment building with a facade of yellow, grey, and teal panels and many windows. In the foreground, there is a tree with bare branches and clusters of small, bright red berries. A semi-transparent teal horizontal band is overlaid across the middle of the image, containing the title text.

# Brief history of climate finance



# Structuring climate finance sources (1)

## Sources

- Developed country governments/commitments
- Through multilateral agencies/banks
- **Private sector**

## Mechanisms

- UNFCCC trading mechanisms
- Voluntary offsetting
- Future UNFCCC mechanisms:
  - Cooperative approaches (CAs)
  - Sustainable Development Mechanism (SDM)
- Green Climate Fund

## Objectives

- Adaptation
- Mitigation

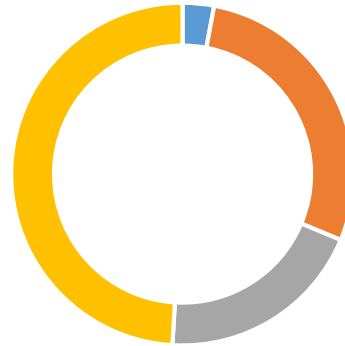


## Structuring climate finance sources (2)

### Financing required

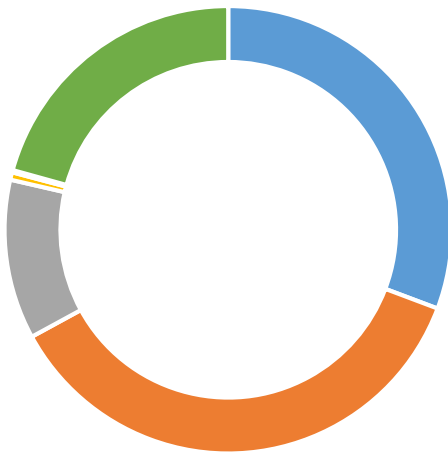
- Paris commitments of 23 emerging markets: USD 23 trillion
- Global economic gains of energy transition: USD 19 trillion

### Climate funds: USD 84 billion



- Multilateral and UNFCCC funds
- Bilateral climate finance (incl loans)
- Development Banks
- Mobilised private finance

### Private investment: USD 928 billion



- Public and private investment (renewables)
- Private energy efficiency
- Public and private investment (excl renewables)
- Private climate-relevant land-use
- Private adaptation
- Domestic climate related public investment



# The Kyoto offsetting mechanisms

## Clean Development Mechanism:

1. Project-based
2. Compliance-driven
3. UNFCCC-governed

-> *Program of Activities (PoA)*

- Pre-defined methodologies, Effective “search engines” for projects
- Leveraged private sector investment
- Primary/secondary CDM at its peak in 2008: USD 33 bln/yr
- Basis for Monitoring approaches, used in current funds







# What CDM looks like

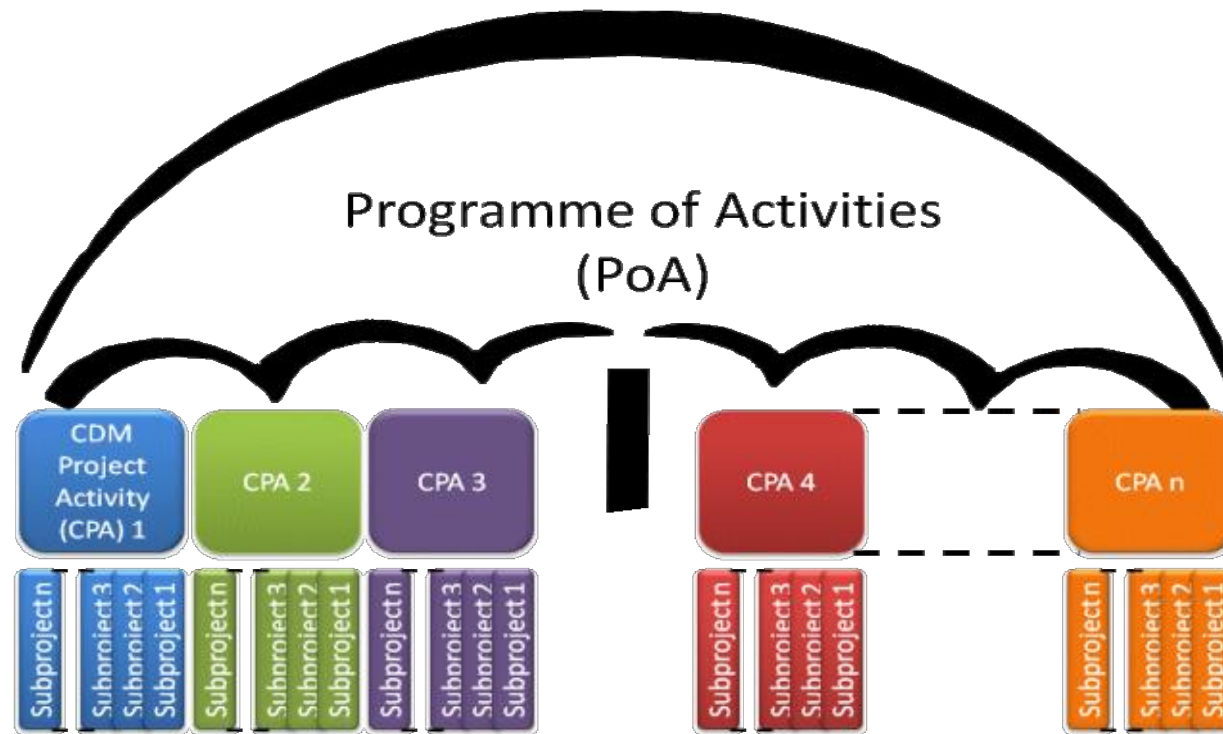


Sources: PDD, HFC decomposition project in Ulsan, PDD, Jilin Tongyu Huaneng 100.05MW Wind Power Project, Jingtieshan Hydropower, PDD, Amursk CHPP-1: Switch from Coal to Gas





# CDM Programme of Activities



- Bundling of many similar small projects under one umbrella
- Reduction of transaction costs, economies of scale
- Expand the umbrella over time



# What PoA looks like



750 LPD Installation at Pune

Sources: Climate Focus, PoA Handbook (2013): World Food Programme, Simgas, Nuetech



# CDM projects in cities

Project	Characteristics
Nuetech Solar Water Heaters, India PoA	Solar water heaters for households and SMEs.
Mexican Housing Commission Sustainable Housing PoA	Provides green mortgages for the purchase of energy efficient homes in Mexico, or houses that use renewable energy.
BRT Bogota, Colombia: TransMilenio	Bus rapid Transit: PPP with public sector investing in infrastructure and private parties investing in the bus fleet and its operation.
Single CDM projects	Landfills, waste water treatment etc.







# Example 1: Bogotá Transmilenio CDM

- Characteristics:

1. Bus Rapid Transit: new infrastructure for large busses
2. Scrapping 9,000 old busses
3. Aims at: efficient busses and mode shifting
4. CDM methodology: accurate monitoring

- Lessons:

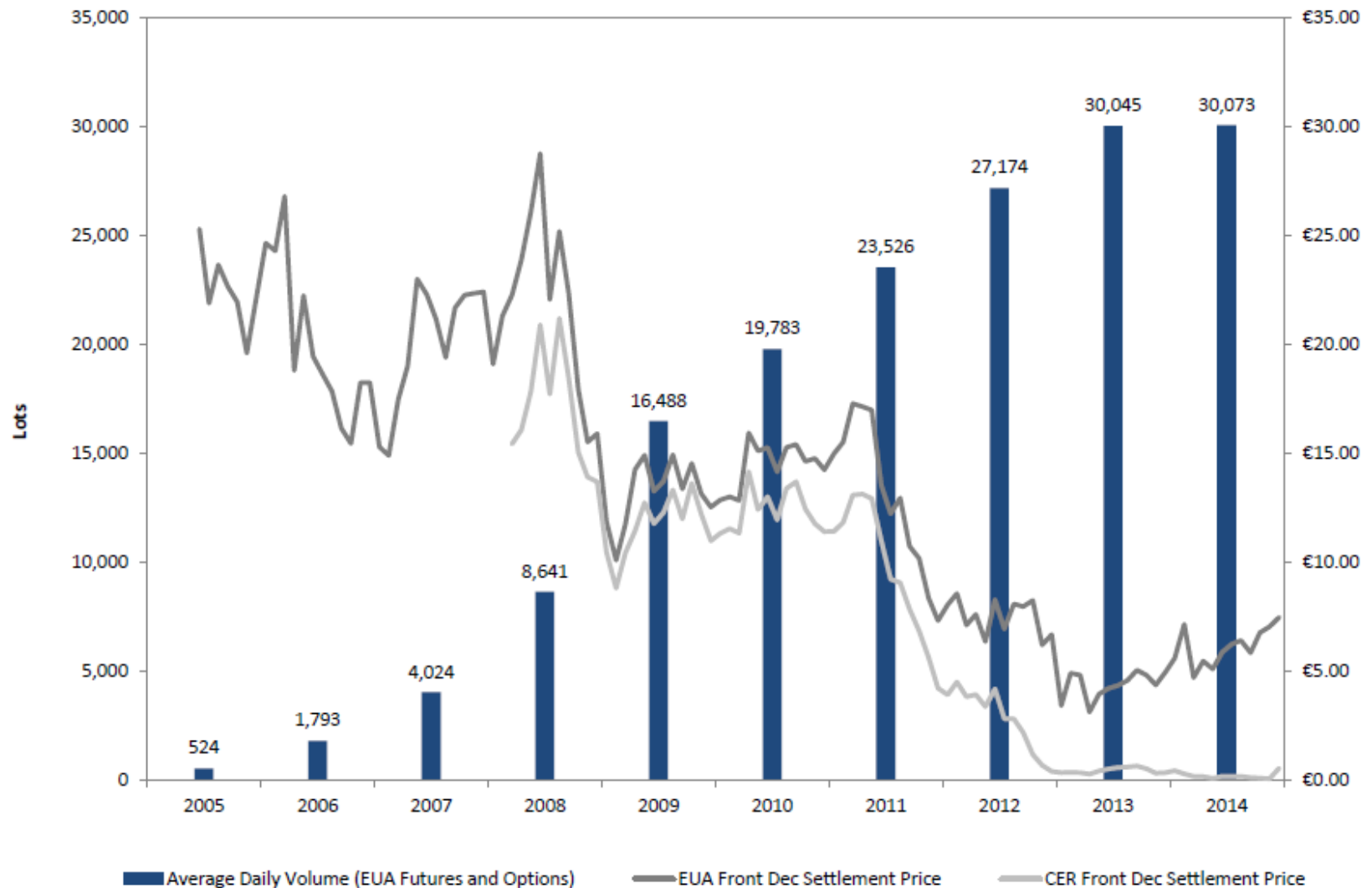
1. CDM, single technology
2. Clear MRV, also allows for continuous monitoring of the project







# CDM and EU ETS prices



Sources: ICE Futures Europe Monthly Utilities Markets Report – January 2015



# Funding sources and project examples in cities





# Different instruments

- High creditworthiness:
  - Public/private partnerships
  - Emission trading schemes
  - Climate bonds
- Low creditworthiness:
  - Grants/climate finance
  - Concessional loans
  - Risk management instruments (e.g. currency risk)





## Example 2: Tokyo emission trading

- Characteristics:

1. Covers a population of 32 million
2. Targets 25% reduction from 2000 by 2020
3. Covers 1,400 facilities or 20% of urban CO<sub>2</sub> emissions

- Lessons:

1. Compulsory green building plans
2. First city to implement an ETS
3. Issuance of credits only ex post, after a building surpasses its target







# 1<sup>st</sup> transactions under Paris Agreement

- All countries define domestic targets (nationally determined contributions, NDCs)
- Art 6.2: cooperative approaches, allows for linking trading schemes and crediting
- Art 6.4: Sustainable Development Mechanism (SDM) centrally governed mechanism. Potentially like the CDM.
  - Example: NEFCO pilot transaction in Peruvian waste sector



United nations conference  
on climate change

COP21/CMP11



# Green climate fund



GREEN  
CLIMATE  
FUND

- UNFCCC Fund, aiming for 100 bln/year by 2020
- Complements Global Environment Facility (GEF), which focusses on LDCs.
- Short of good projects
- Examples in cities:
  - Climate Resilient Infrastructure in Bangladesh, (USD 40 mln)
  - Energy Efficiency Green Bond in Latin America, (USD 217 mln)
  - Urban Water Supply and Wastewater Management in Fiji, with ADB (USD 31 mln)



# World Bank Funds



THE WORLD BANK

1. Carbon Initiative for Development (CiDev) purchases CDM credits from LDCs
2. Carbon Partnership Facility (CPF) purchases emission reductions from long-term investments
3. Pilot Auction Facility (PAF) an experimental facility where price guarantees for verified emission reductions are auctioned
4. Transformative Carbon Asset Facility (TCAF) will measure and pay for emission cuts in large scale programs e.g. payments for emission reductions to countries that remove fossil fuel subsidies



# International Climate Initiative

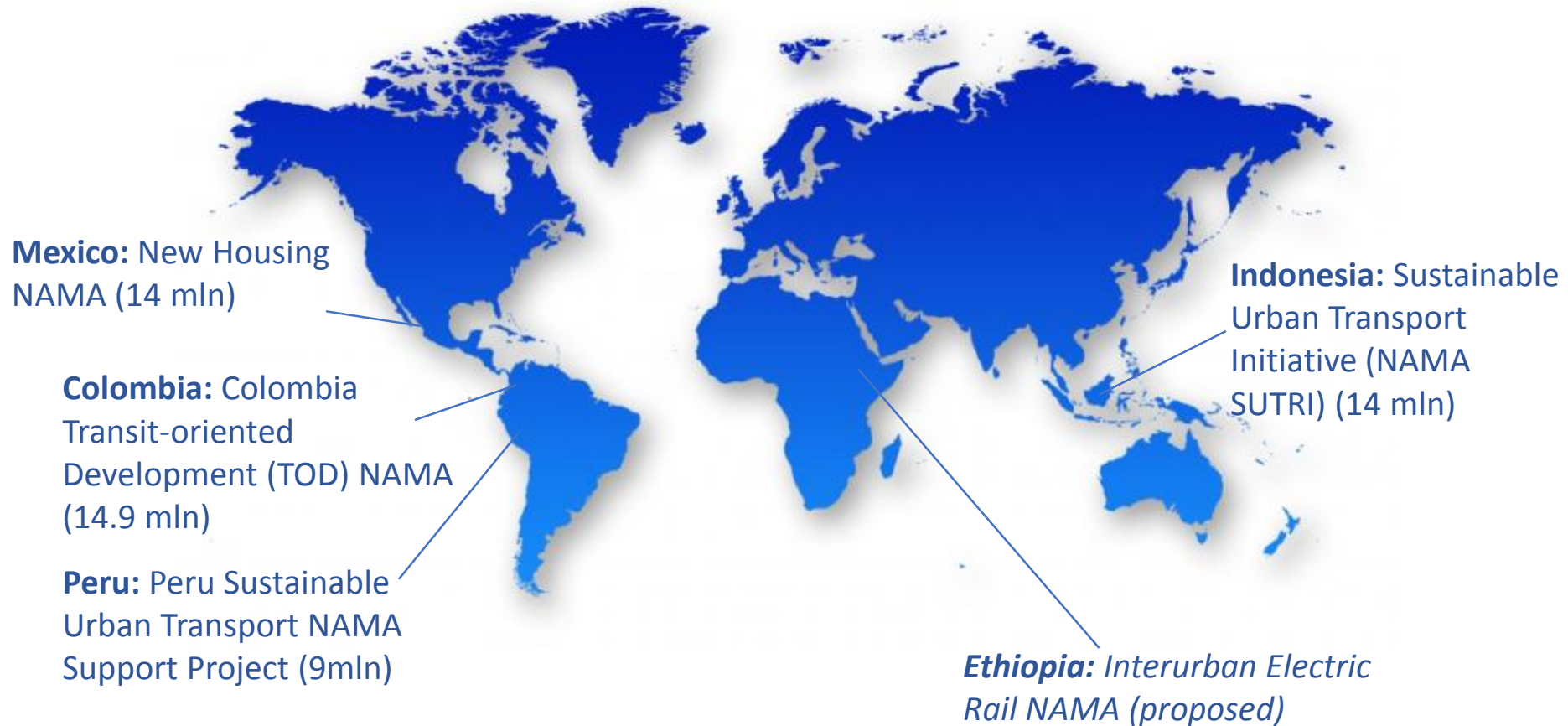
- International tender for grants from EUR 1-10 mln
- Funding from German EUA auctions
- Examples from cities:
  - Climate-Smart sustainability mobility  
(Ukraine, EUR 1.1. mln)
  - Ecologistics, low carbon freight in cities  
(Argentina, Colombia, India, EUR 3.5 mln)
  - Energy efficiency in buildings  
(Mexico, Morocco, Senegal, Tunesia, Vietnam, EUR 4 mln)
  - Reducing emissions from optimising public transport  
(Indonesia, EUR 1.7 million)
  - Energy efficient urban district heating  
(Ukraine, EUR 4.9 mln)





# NAMA Facility

- International tender for grants, with a policy focus
- Top-down, not technology specific





## Example 3: Mexico Efficient Housing

- Characteristics:

1. Housing 17% of Mexican energy consumption
2. Targets: penetration of efficiency standards and increased ambition
3. Supported NAMA
4. Activities include: investment grants, development of a market for efficient technologies, capacity building

- Lessons:

1. Full-house approach
2. Results-based approach (standards, no technologies)
3. Remove barriers to investment, not finance the full investment (low-cost loans)





## Example 4: Mexico Energy Savings Insurance

- Characteristics:

1. Supports energy upgrades for SMEs
2. Helps them overcome financing barrier
3. IADB Pilot: USD 25 mln in Mexican agricultural sector
4. Aims to drive USD 10-100 bln in investment globally and reduce 27-234 MtCO<sub>2</sub>/year by 2030
5. Provides standardised contracts

- Lessons:

1. Leverages private sector finance
2. Helps overcome financing barrier





# Summary and discussion







# Main messages

- Private sector still the largest climate investor: work together
- Ample financing available: most funds are short of good projects
- Tap into existing funds or pioneer new transaction models under the Paris Agreement



## Part 2: Metabolic approaches to identifying mitigation options

A photograph of a rainy street scene in front of a cafe. The cafe has a brown awning with the text "Café", "Glaces et Sorbets Verthillon", and "Restaurant". A sign above the entrance says "Brunch". A light blue scooter is parked on the wet cobblestone street. Several people are standing outside the cafe, some with umbrellas. The ground is wet and reflective, and the overall atmosphere is rainy and urban.

Focus of climate policy



Where it began...







## Focus of climate policy

- Focus on sources, not on causes
- Focus on energy, not on materials
- Limited by national and factory boundaries
- Fails to address the fundamentals: tax system

### Solutions:

- Cooperation along supply chains
- Start at the services which materials provide
- Consumption-based accounting



# Allow tapping into the international, scope 3 emissions upstream in our value chains

Scope 3 emissions should be included in carbon accounting and mitigation effort:

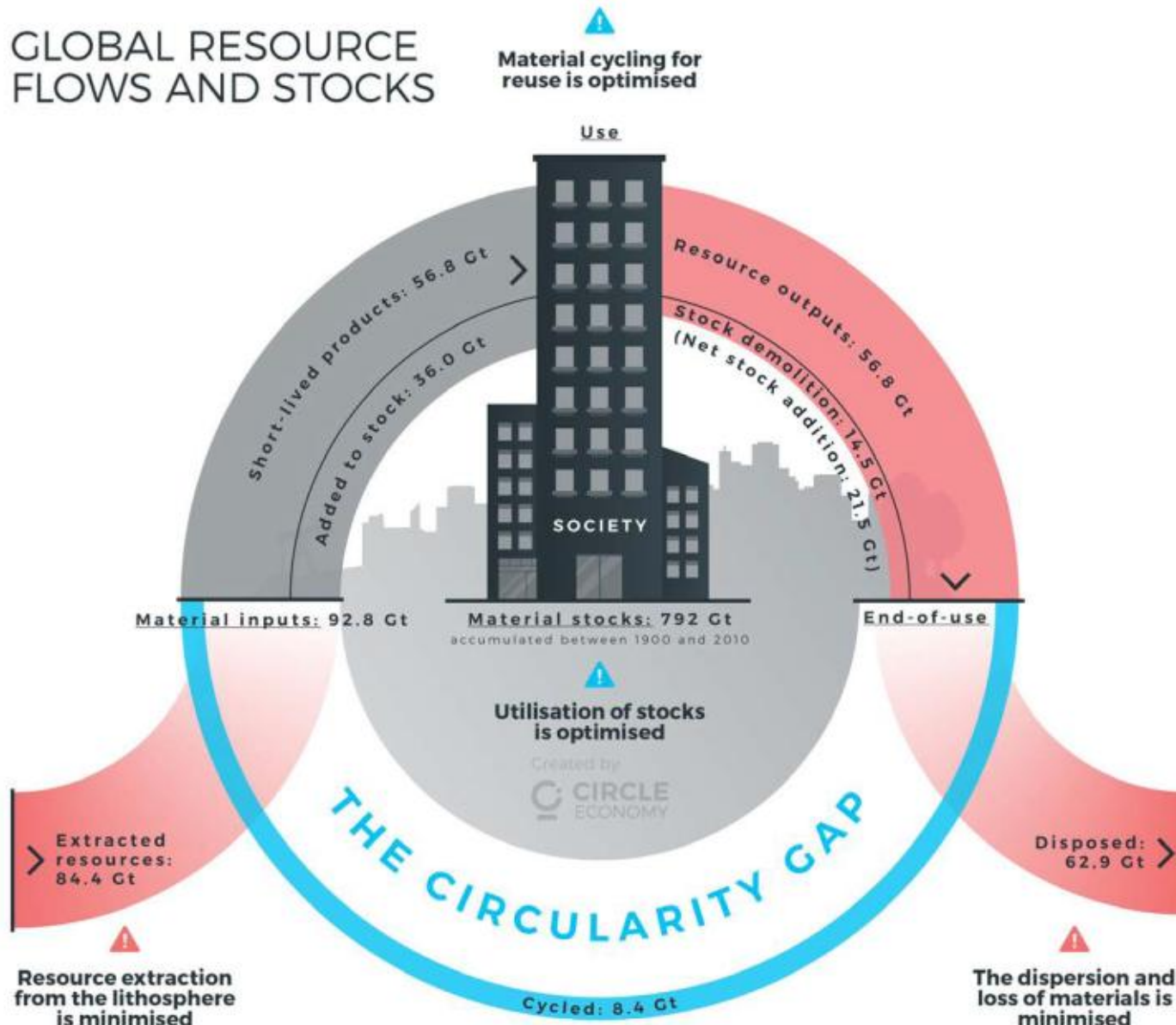
1. EU territorial emissions show 20% reduction, while consumption-based emissions increased 11%
2. 20% to 30% of a nation's carbon footprint lies in emissions embedded in products crossing its borders\*

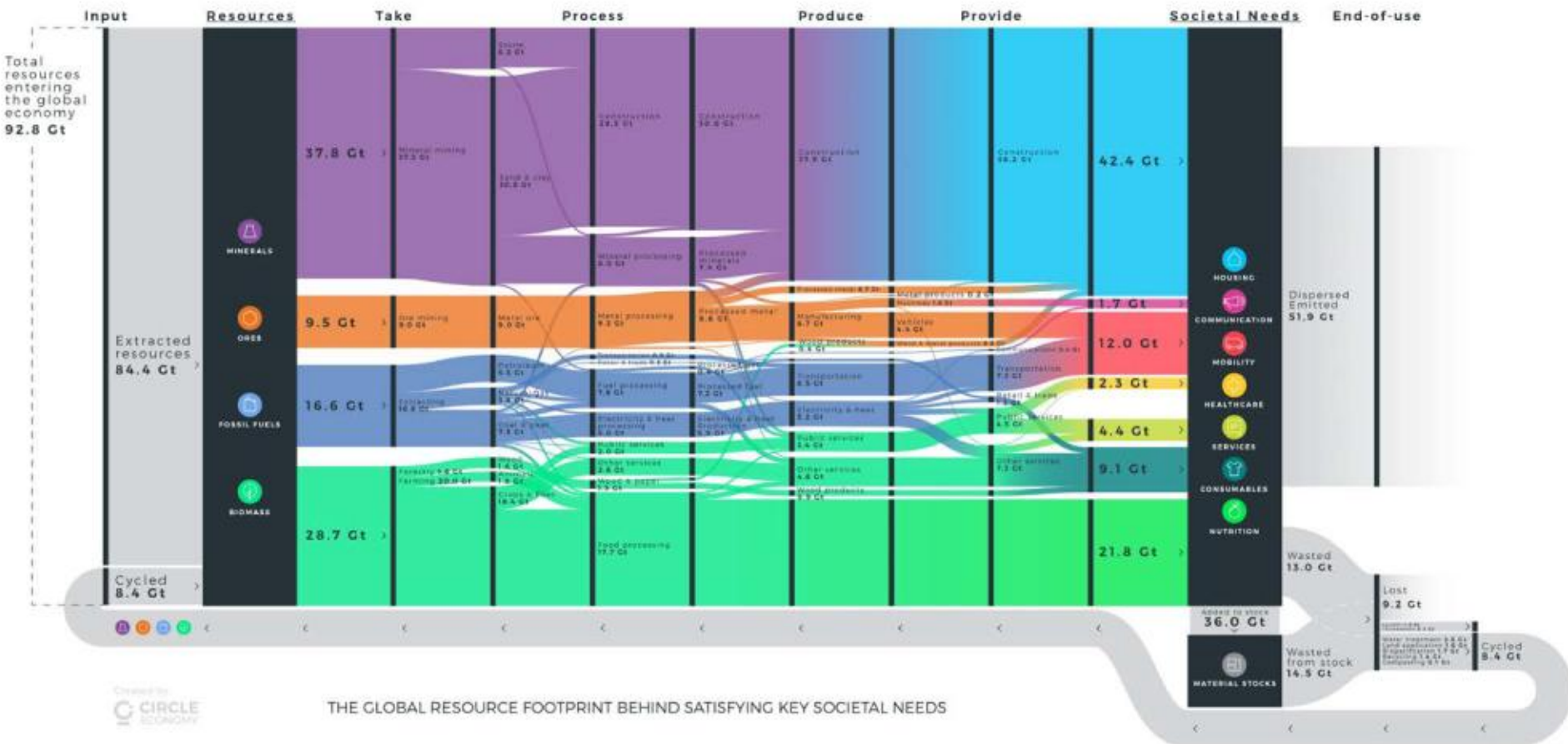




# But we manage our materials badly

## GLOBAL RESOURCE FLOWS AND STOCKS

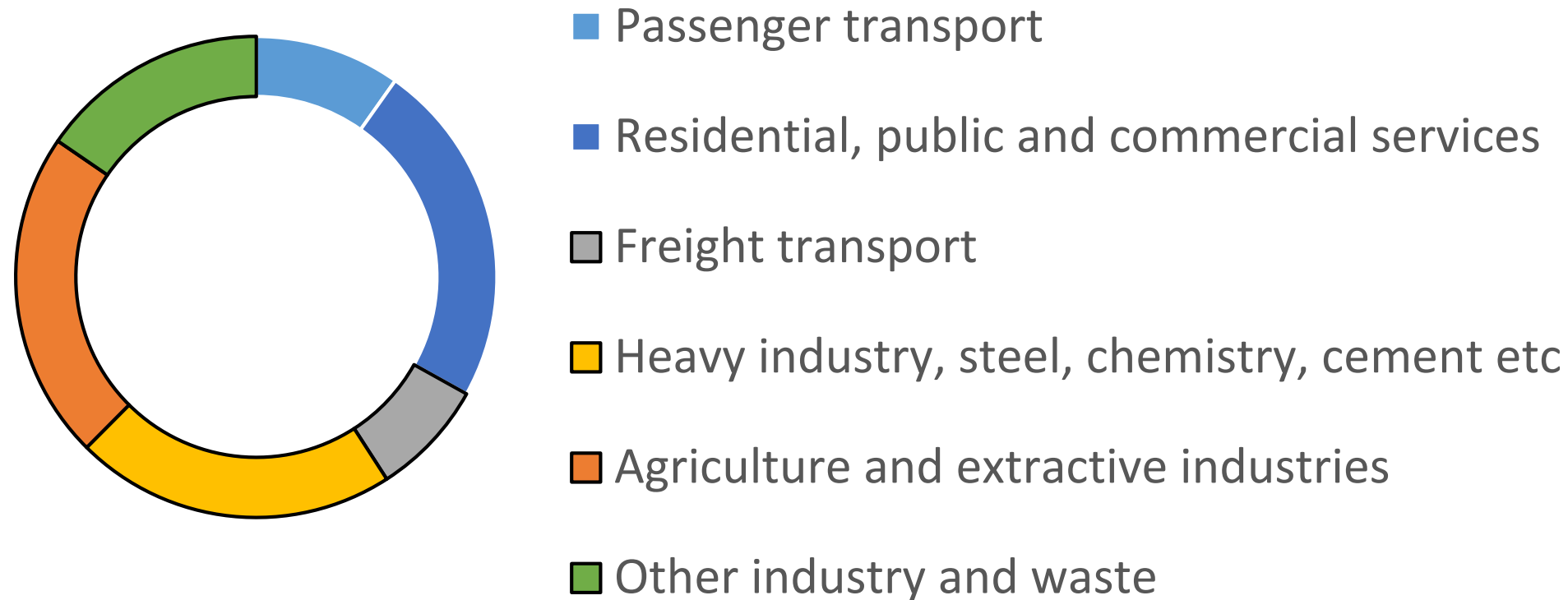








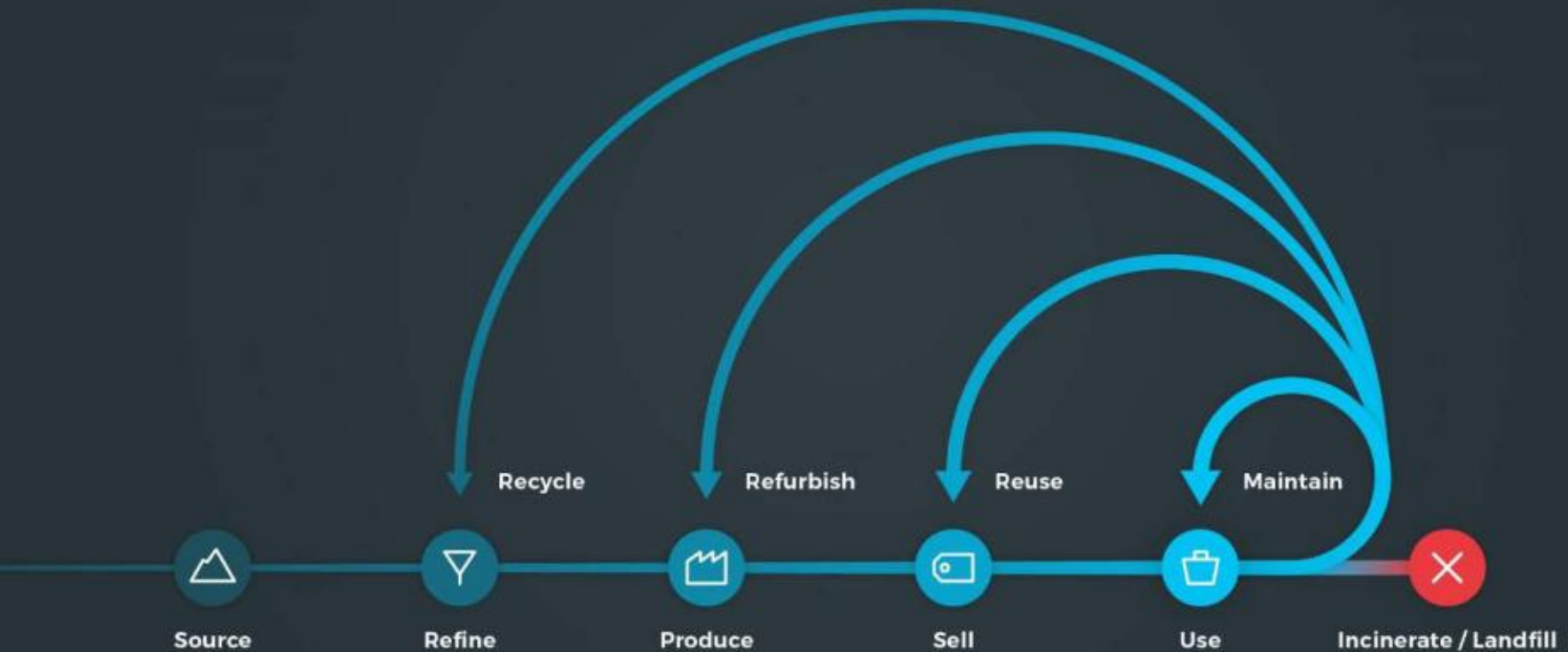
# 67% of GHG is from material management



The background of the slide is a photograph of a modern, multi-story apartment building with a grid-like facade of windows. The building has sections of light yellow and light blue. In the foreground, a tree with dark branches and clusters of bright red berries is visible. A semi-transparent dark blue horizontal band is overlaid across the middle of the image, containing the title text.

# New approaches to urban mitigation action

# In a circular economy, materials and resources are effectively used to their fullest potential



# A circular economy includes both material & systemic elements



**Prioritise**  
regenerative  
resources



**Design**  
for the  
future



**Preserve**  
& extend what's  
already made



**Rethink**  
the business  
model



**Incorporate**  
digital  
technology



**Use**  
waste as  
a resource



**Collaborate**  
to create  
joint value



# Finding systemic mitigation options requires mapping the full metabolism of a country, city or industrial cluster

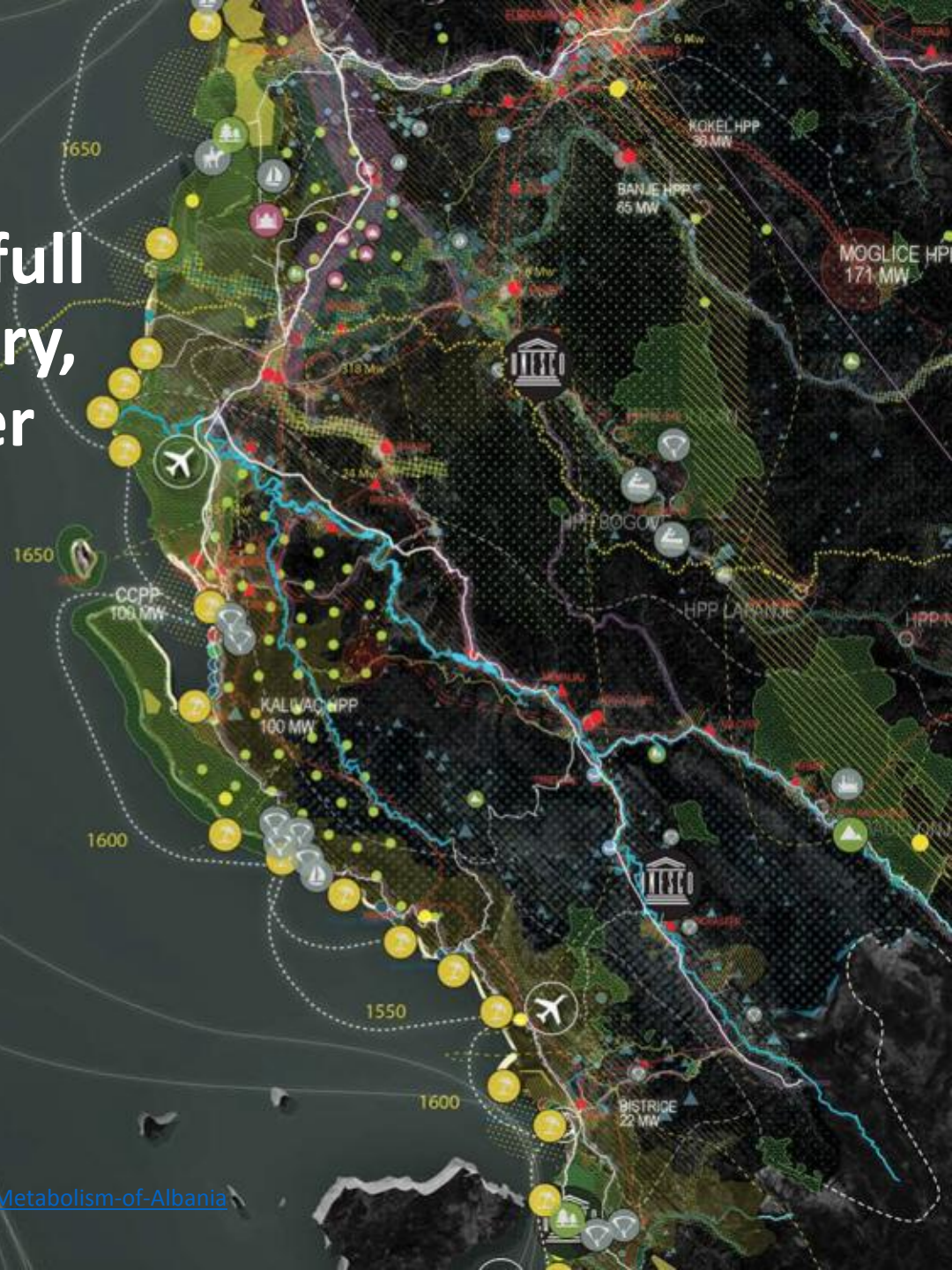
The metabolism of Albania, mapping flows of:

1. Food
2. Water
3. Energy
4. Tourists

**FABRICations.**

50 km

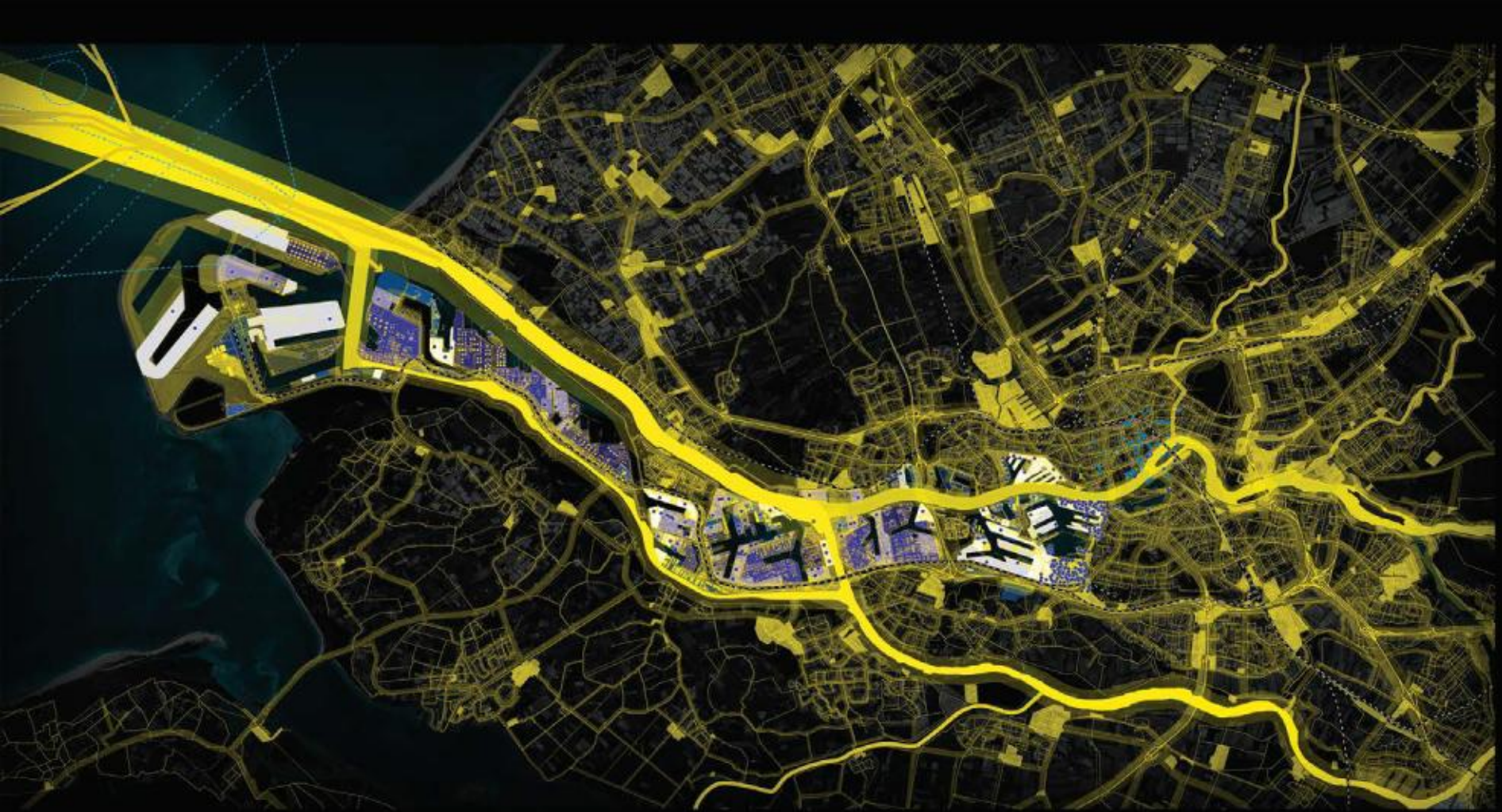
Source: [FABRIC](http://FABRIC), see also: [www.behance.net/gallery/40339307/The-Metabolism-of-Albania](http://www.behance.net/gallery/40339307/The-Metabolism-of-Albania)







# Rotterdam: Material Flow Analysis





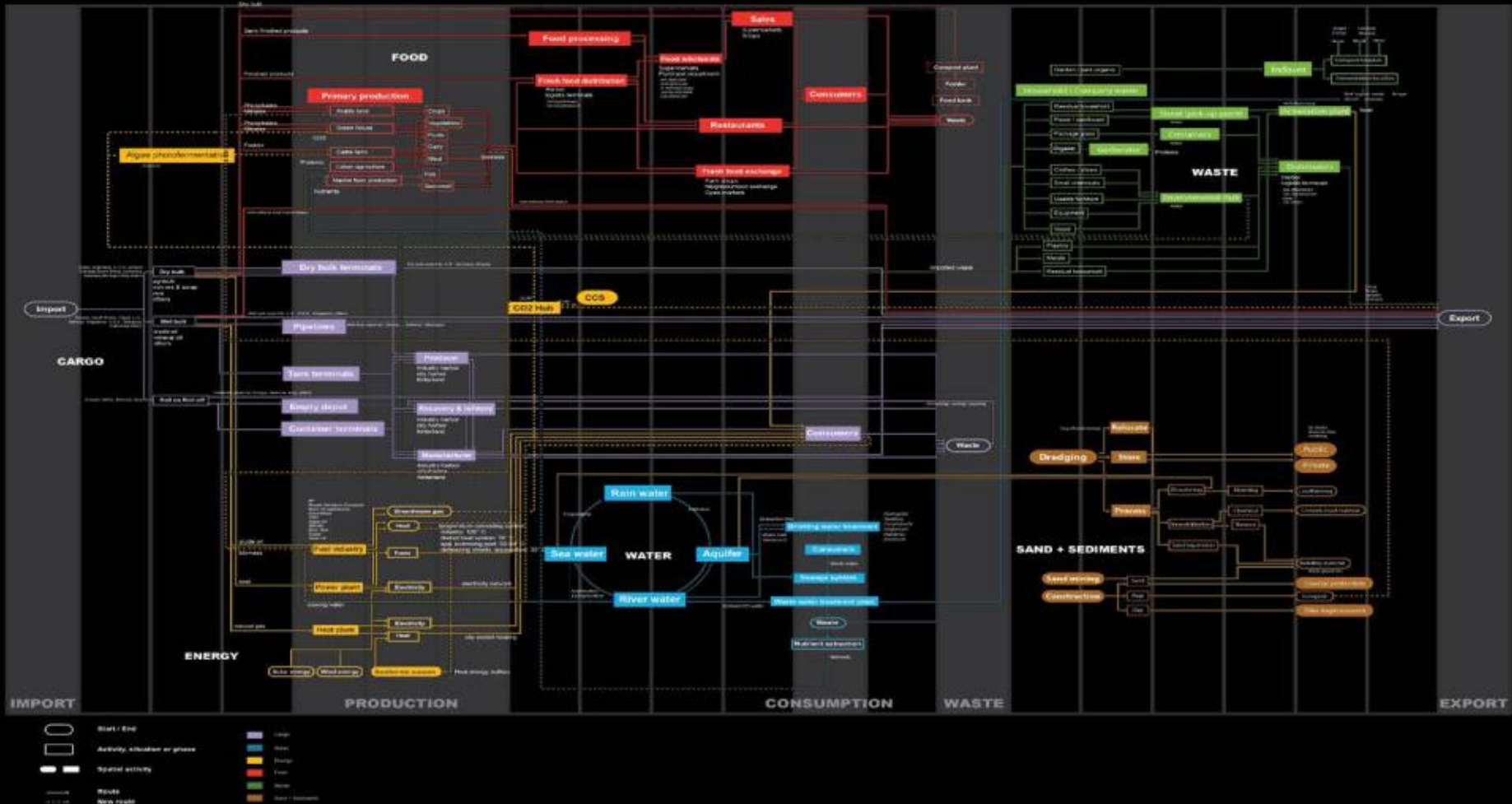


# Rotterdam: food and nutrients





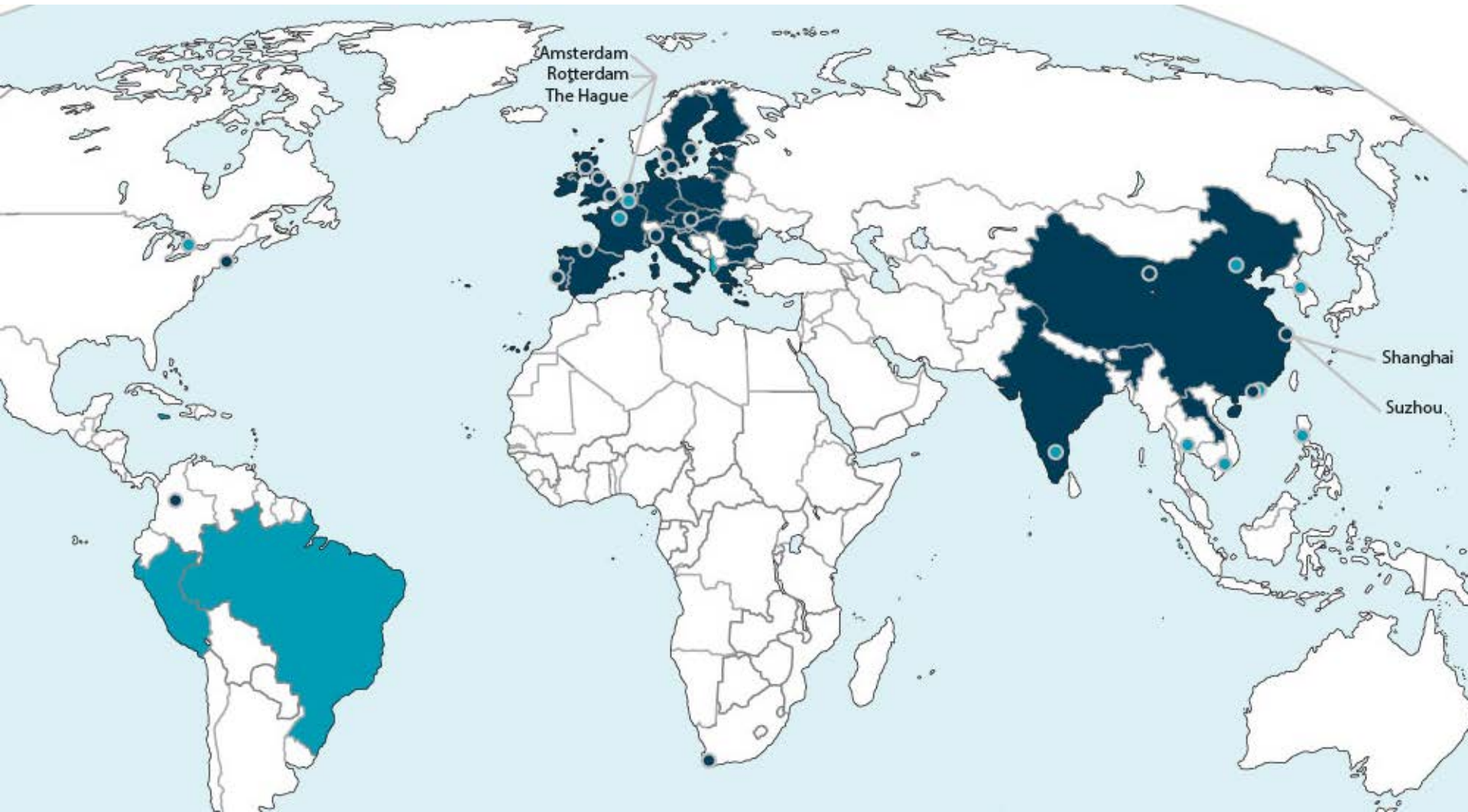
# Rotterdam: mapping urban waste







# Metabolic analysis undertaken worldwide



Source: [Shifting Paradigms/Circle Economy](http://www.shiftingparadigms.nl/projects/looking-beyond-borders-the-circular-economy-pathway-for-pursuing-1-5c/) (2018), Looking beyond borders, available at:  
<http://www.shiftingparadigms.nl/projects/looking-beyond-borders-the-circular-economy-pathway-for-pursuing-1-5c/>

# Cross Laminated Timber as substitute for reinforced concrete: cities and infrastructure as carbon stock

The cement industry accounts for 5% of global CO<sub>2</sub> emissions

Concrete is the 2<sup>nd</sup> most consumed substance after water

Right: a nine story building using 950m<sup>3</sup> of wood. Its carbon footprint compared to concrete and steel is -1080 tCO<sub>2</sub>e



# Circular economy offers Lao PDR an alternative development perspective which steps away from devastating resource extraction and its short-term rents

## Mapping stocks and flows of:

- Agriculture and forestry
- Energy
- Metals
- Tourism

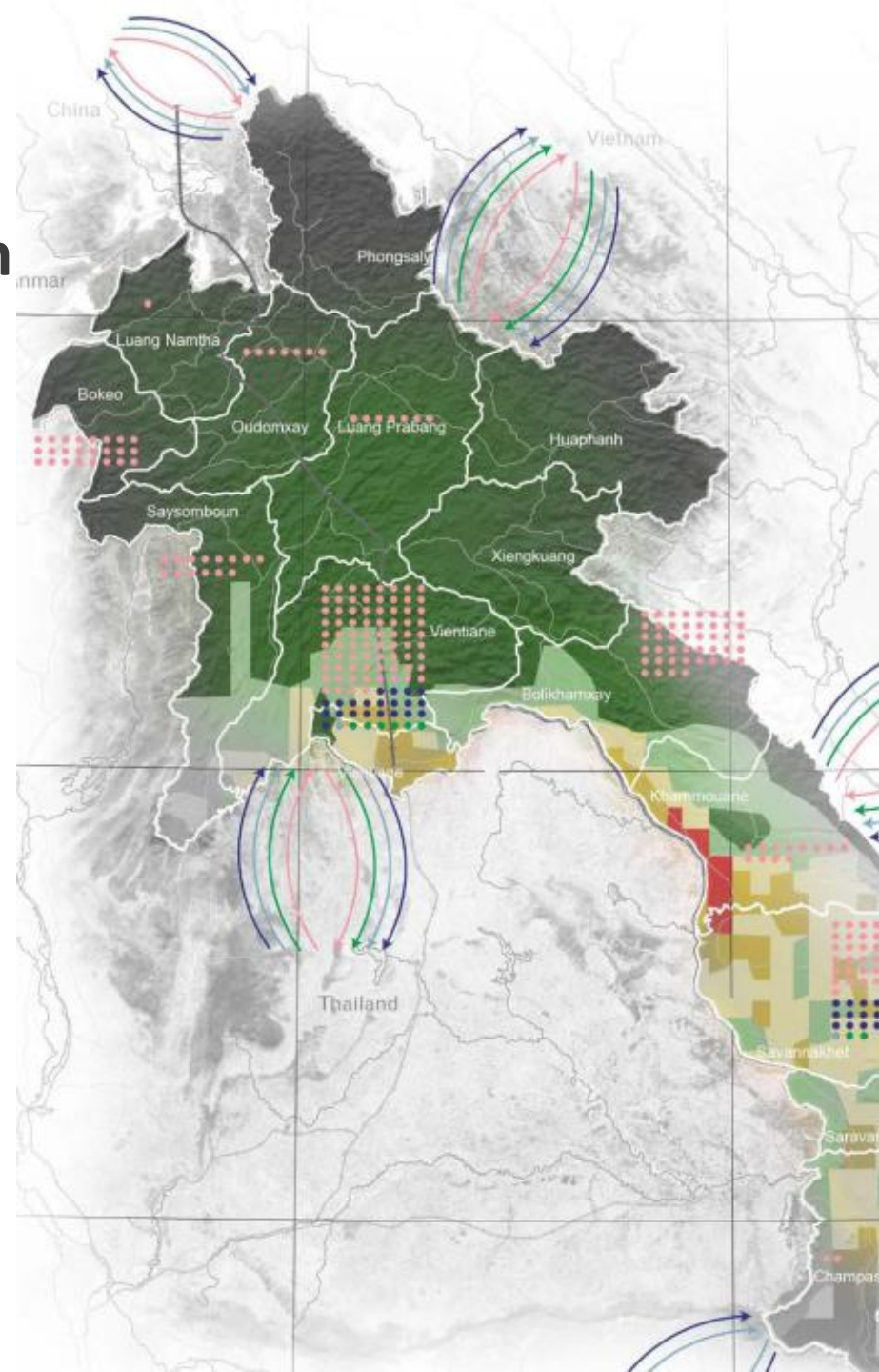
## Opportunities

- Aquaculture in hydropower reservoirs
- Cross laminated timber
- Vehicle remanufacturing

Initiative with



Source: J.A.Hoogzaad et al, Circular economy strategies for Lao PDR





# Defining a vision for a low-carbon and circular future, tapping into the potential of underused assets

**An impression of algae farming on hydropower reservoirs to produce valuable bio-based materials and clean surface water**

Initiative with



Source: J.A.Hoogzaad et al, (unpublished draft), Circular economy strategies for Lao PDR



**And showing the implications of substituting imported enforced concrete with domestic wood**



**An impression of wood-based construction in the tourism sector of Lao PDR.**







## Up next: Circular economy scan for Almaty Oblast in Kazakhstan



The background of the slide is a photograph of a building facade. It features a series of teal-colored columns with white decorative capitals. To the left, there are balconies with concrete railings and some plants. A person is visible leaning out from a window on the right side. A semi-transparent dark blue horizontal band is overlaid across the middle of the image, containing the text.

# Summary and discussion



# Main messages

- 67% of GHG emissions are related to resource management:
  - Understand the full material 'metabolism' of your city
  - Apply circular economy principles as a mitigation strategy.
- Opportunity to connect circular economy strategies with climate metrics for both energy and material efficiency.
- Identify mitigation options accross:
  - Sector boundaries
  - Factory, city or national boundaries
- Target the causes of GHG emissions, rather than only the sources



# Low-carbon, circular development for liveable cities

For more information:

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+31 6 414 70 191

[www.shiftingparadigms.nl](http://www.shiftingparadigms.nl)





# Other sources of information

## Climate finance

- [www.carbontracker.org](http://www.carbontracker.org)
- [www.climatefundsupdate.org](http://www.climatefundsupdate.org)
- [www.ndcpartnership.org/initiatives-navigator](http://www.ndcpartnership.org/initiatives-navigator)
- <http://climatefinancelab.org>
- [www.citiesclimatefinance.org/](http://www.citiesclimatefinance.org/)
- [www.c40.org/ending-climate-change-begins-in-the-city](http://www.c40.org/ending-climate-change-begins-in-the-city)

## Circular economy and metabolic approaches in cities/regions

- [www.shiftingparadigms.nl/projects/the-circularity-gap-report/](http://www.shiftingparadigms.nl/projects/the-circularity-gap-report/)
- [www.shiftingparadigms.nl/projects/a-circular-economy-quick-scan-to-improve-resource-efficiency-in-lao-pdr/](http://www.shiftingparadigms.nl/projects/a-circular-economy-quick-scan-to-improve-resource-efficiency-in-lao-pdr/)
- <http://www.shiftingparadigms.nl/projects/looking-beyond-borders-the-circular-economy-pathway-for-pursuing-1-5c/>
- [www.shiftingparadigms.nl/projects/policy-dinner-the-circular-economy-pathway-for-pursuing-1-5c/](http://www.shiftingparadigms.nl/projects/policy-dinner-the-circular-economy-pathway-for-pursuing-1-5c/)
- [www.circle-economy.com/cities/](http://www.circle-economy.com/cities/)
- [http://iabr.nl/media/document/original/urban metabolism rotterdam.pdf](http://iabr.nl/media/document/original/urban_metabolism_rotterdam.pdf)