



Resilient + Regenerative Cities: *Designing for rising tides*

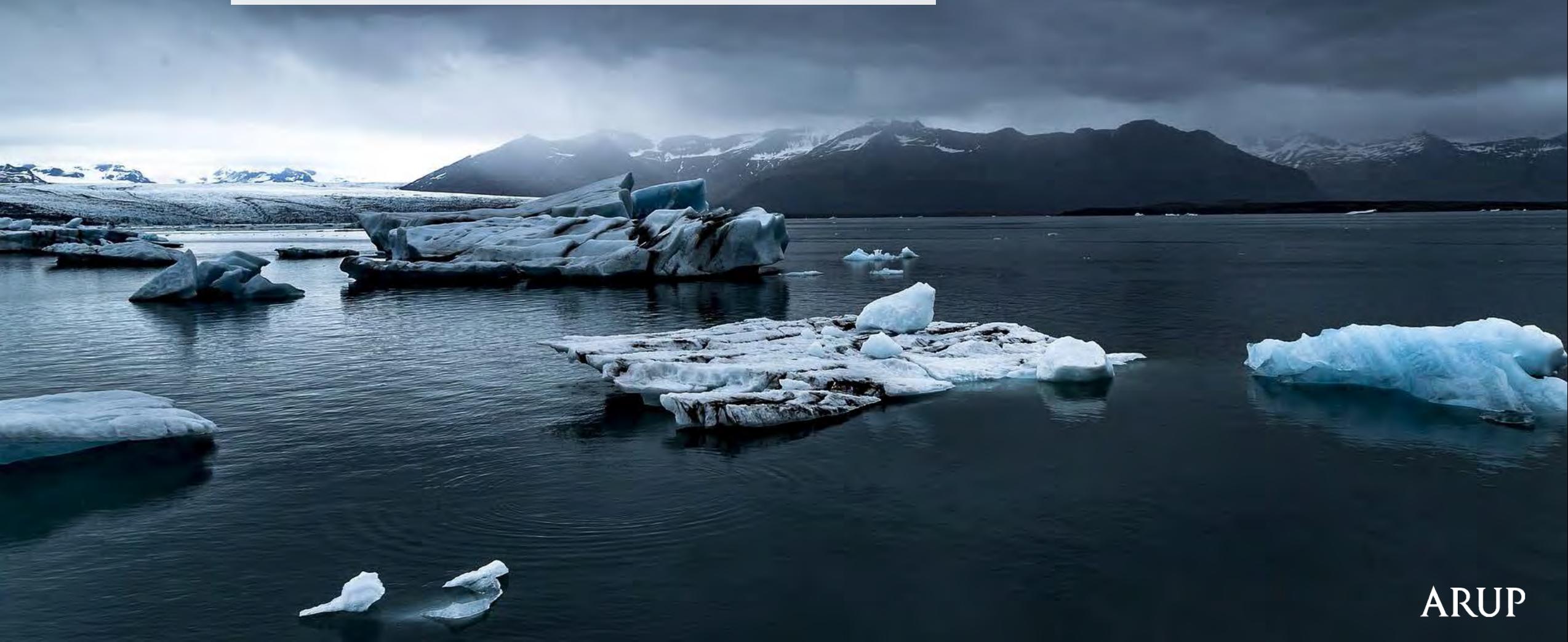
Jonelle Simunich
Senior Strategist | Arup Global Foresight, Research + Innovation

We live here.



What do we know?

Earth is humans' only known habitat



What do we know?

Earth has limited natural resources



What do we know?

All nations seek economic growth

What do we know?

Sea levels and temperatures are rising

What do we know?

Consumption generates waste

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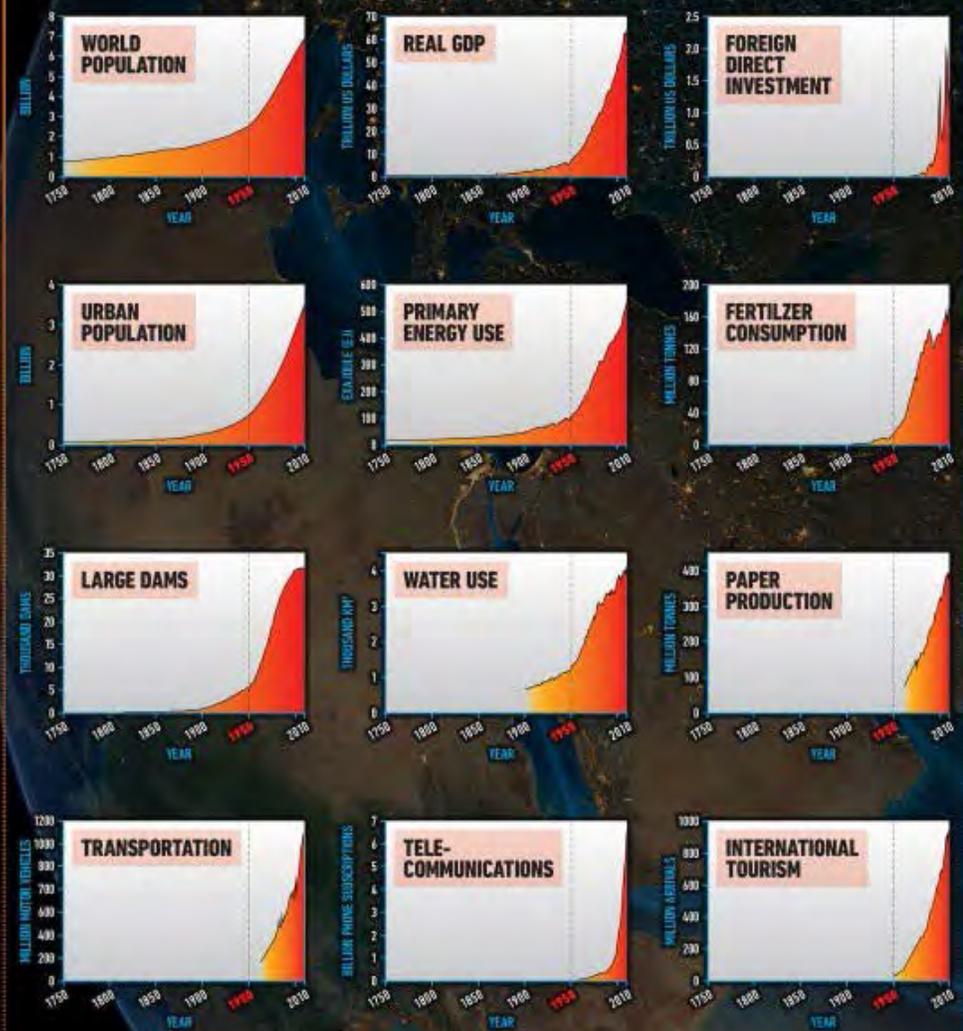
Consumption generates waste



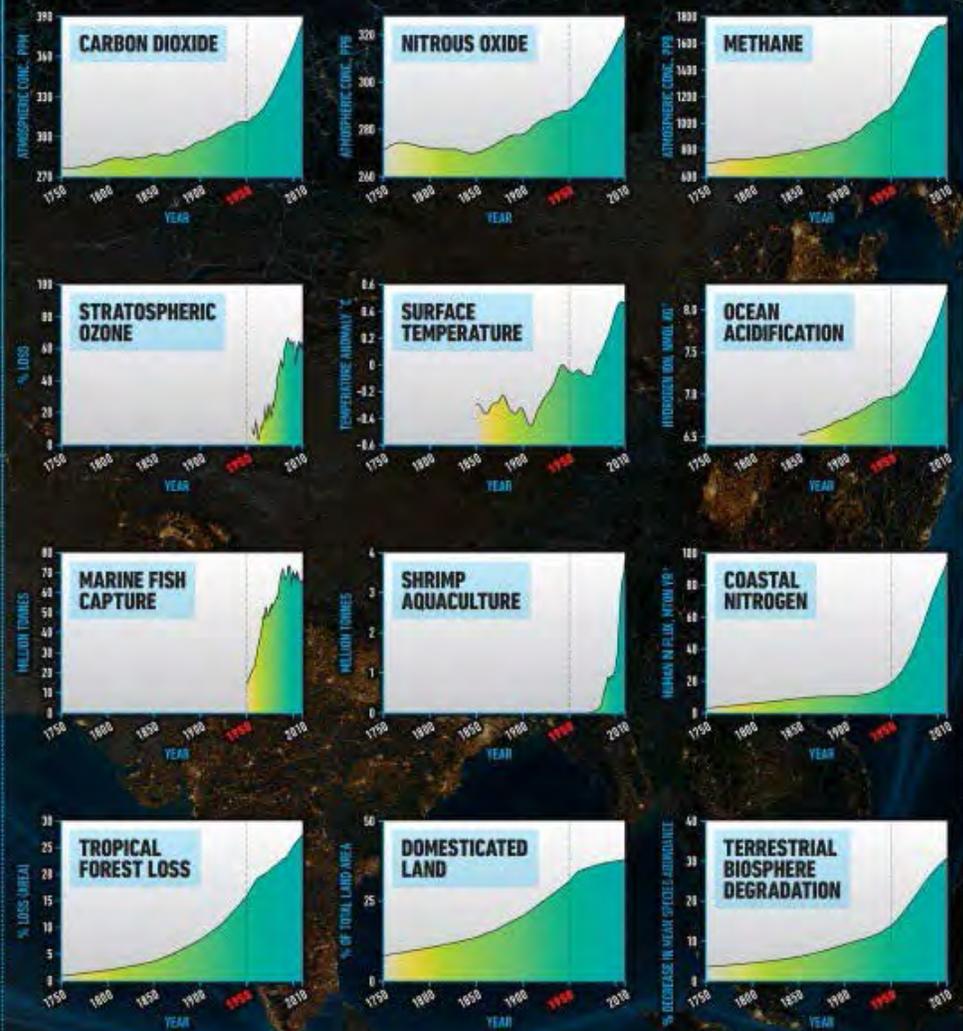
ANTHROPOCENE

THE GREAT ACCELERATION

SOCIO-ECONOMIC TRENDS



EARTH SYSTEM TRENDS



It takes **1.7 Earths**
to support humanity's demand on nature.



**EARTH
OVERSHOOT
DAY**

What are the inevitables?



What are the inevitables?

Global population are and will continue to grow



What are the inevitables?

The global middle class is expanding



What are the inevitables?

Economic growth is not slowing down

What are the inevitables?

Business as usual is leading us to an inevitable downfall

What are the inevitables?

**More people with more money = more consumption,
more construction, more stuff, more waste**

What are the inevitables?

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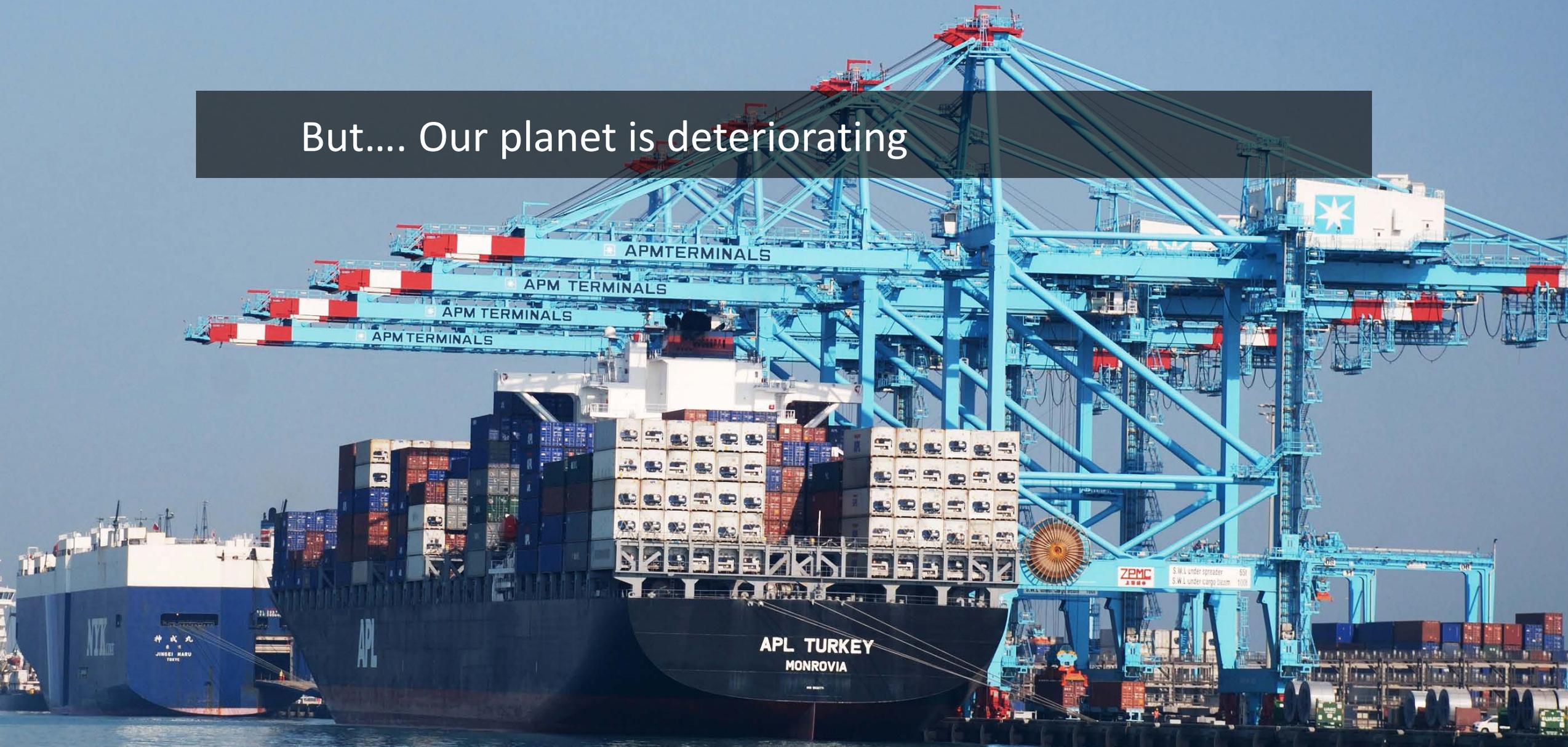
Business as usual is leading us to an inevitable downfall

**More people with more money = more consumption,
more construction, more stuff, more waste**

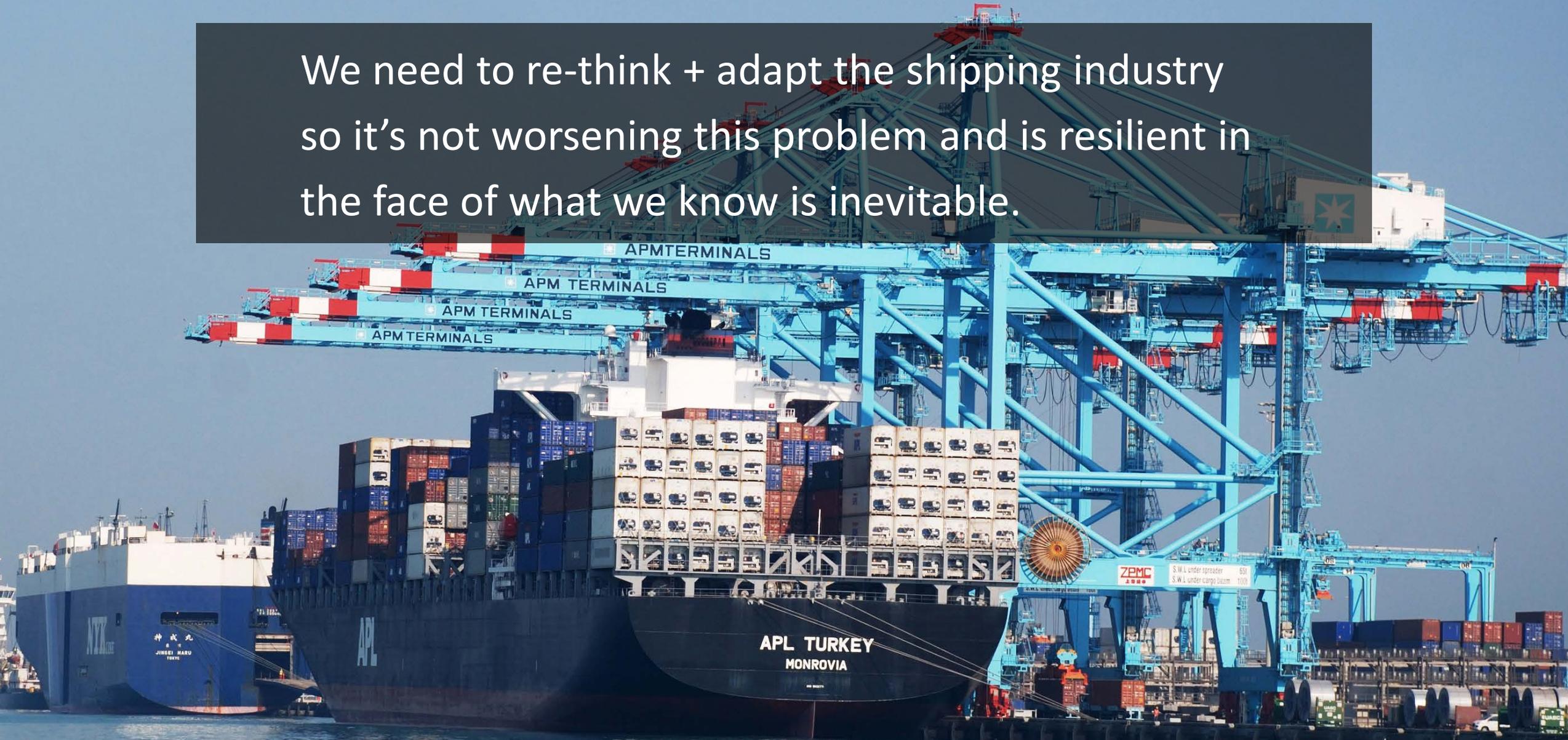
Great news for the shipping industry!

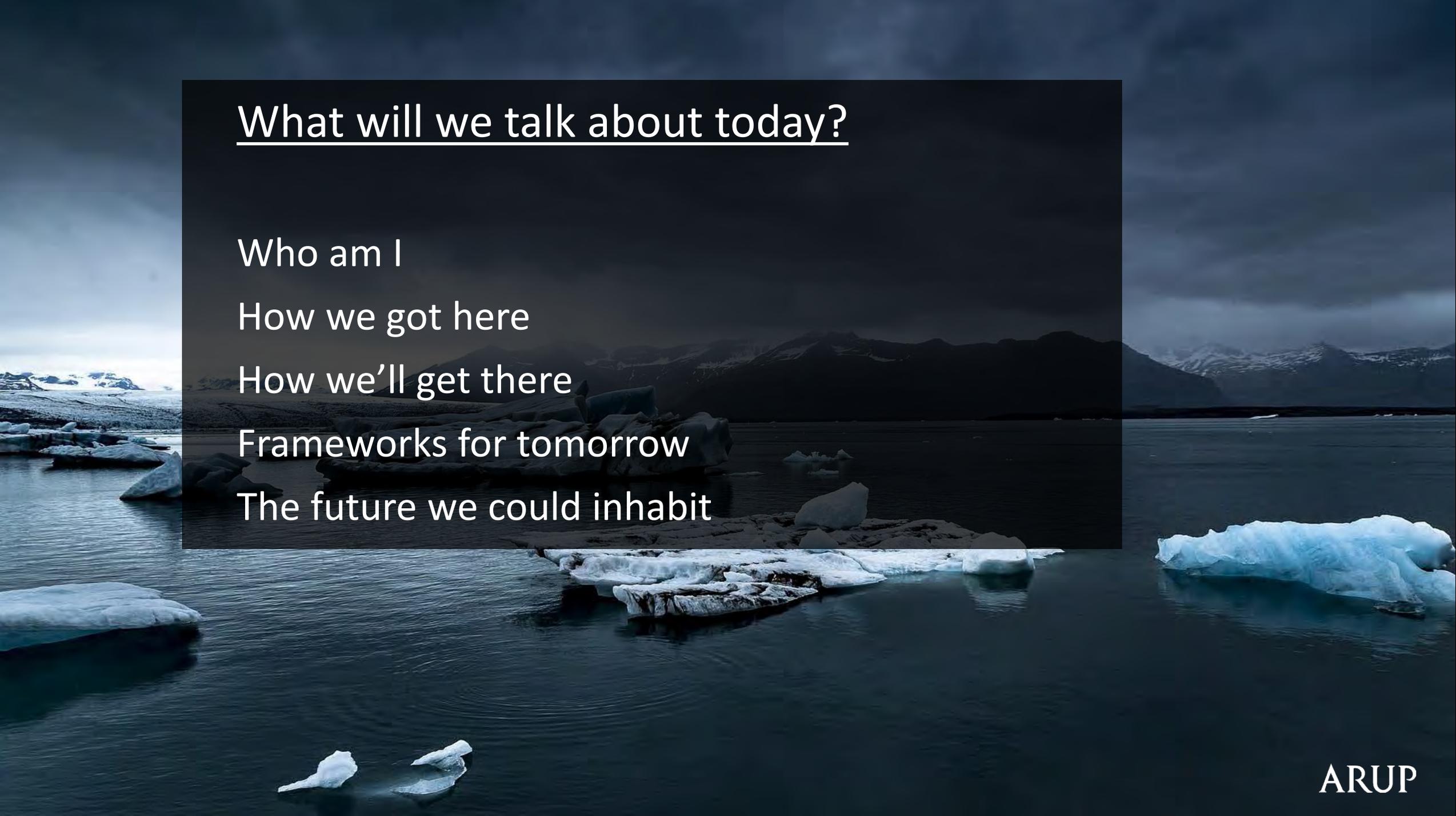


But... Our planet is deteriorating



We need to re-think + adapt the shipping industry so it's not worsening this problem and is resilient in the face of what we know is inevitable.



A dark, atmospheric landscape with icebergs in the water and mountains in the background. The scene is dimly lit, with a heavy, overcast sky. The water is dark, and the icebergs are a pale, almost white color. The mountains in the distance are dark and rugged, with some snow or ice visible on their peaks. The overall mood is somber and contemplative.

What will we talk about today?

Who am I

How we got here

How we'll get there

Frameworks for tomorrow

The future we could inhabit

Who am I?









KQED + SF Chronicle

ARUP



Marriott

ARUP



NCA

ARUP





Swift cars

ARUP





Wikipedi

ARUP



Arup, who are we?





Maritime Engineering
Maritime Design + Planning
Maritime Consulting
Resilience Consulting
Sustainable Development

Introduction to Arup

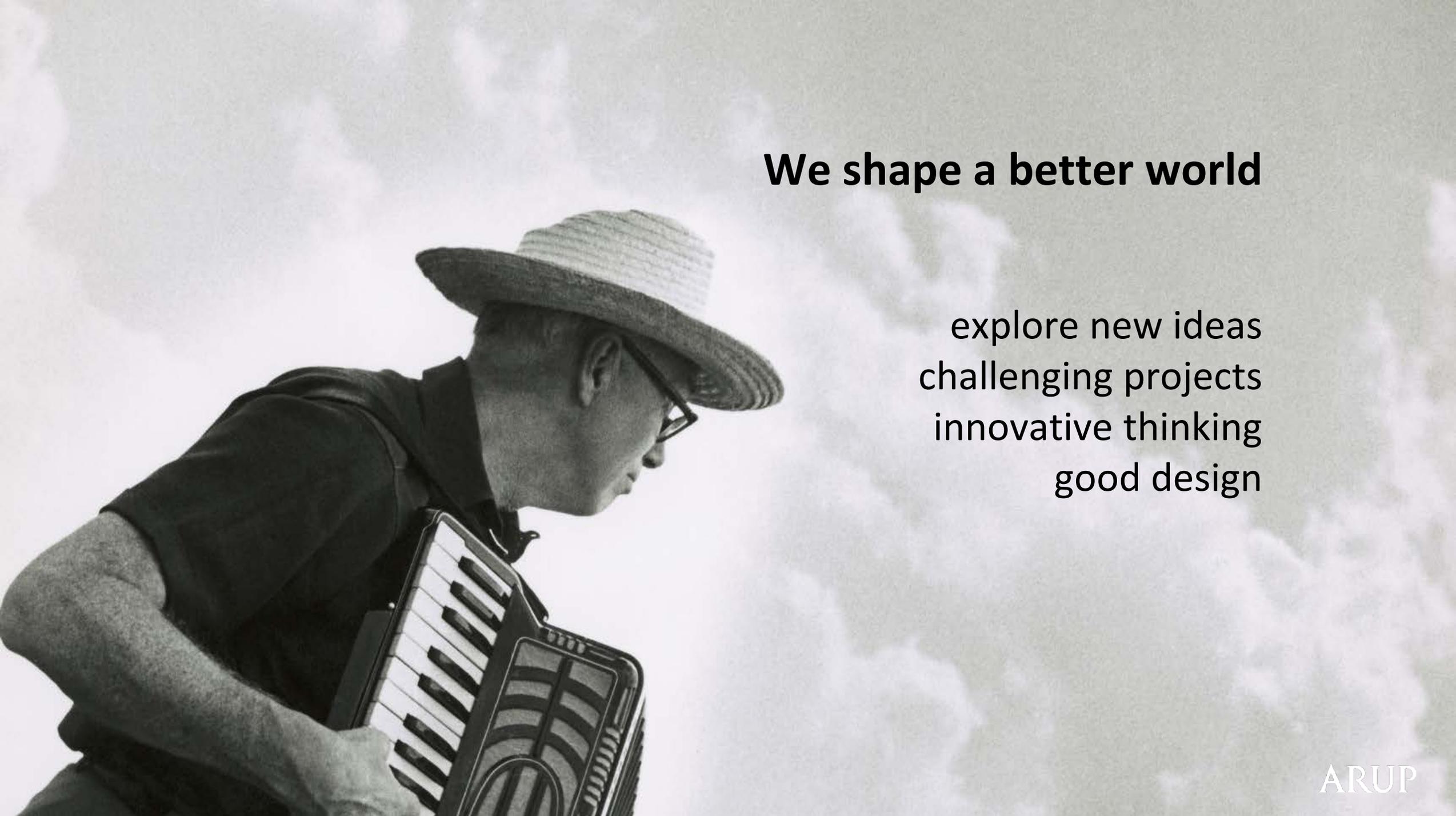
A global, integrated, multidisciplinary firm working together for our clients to tackle complex building, design and systems issues. Full service from concept through completion.

14,000+ engineers, designers, planners, management consultants + economists

90+ offices

34+ countries worldwide





We shape a better world

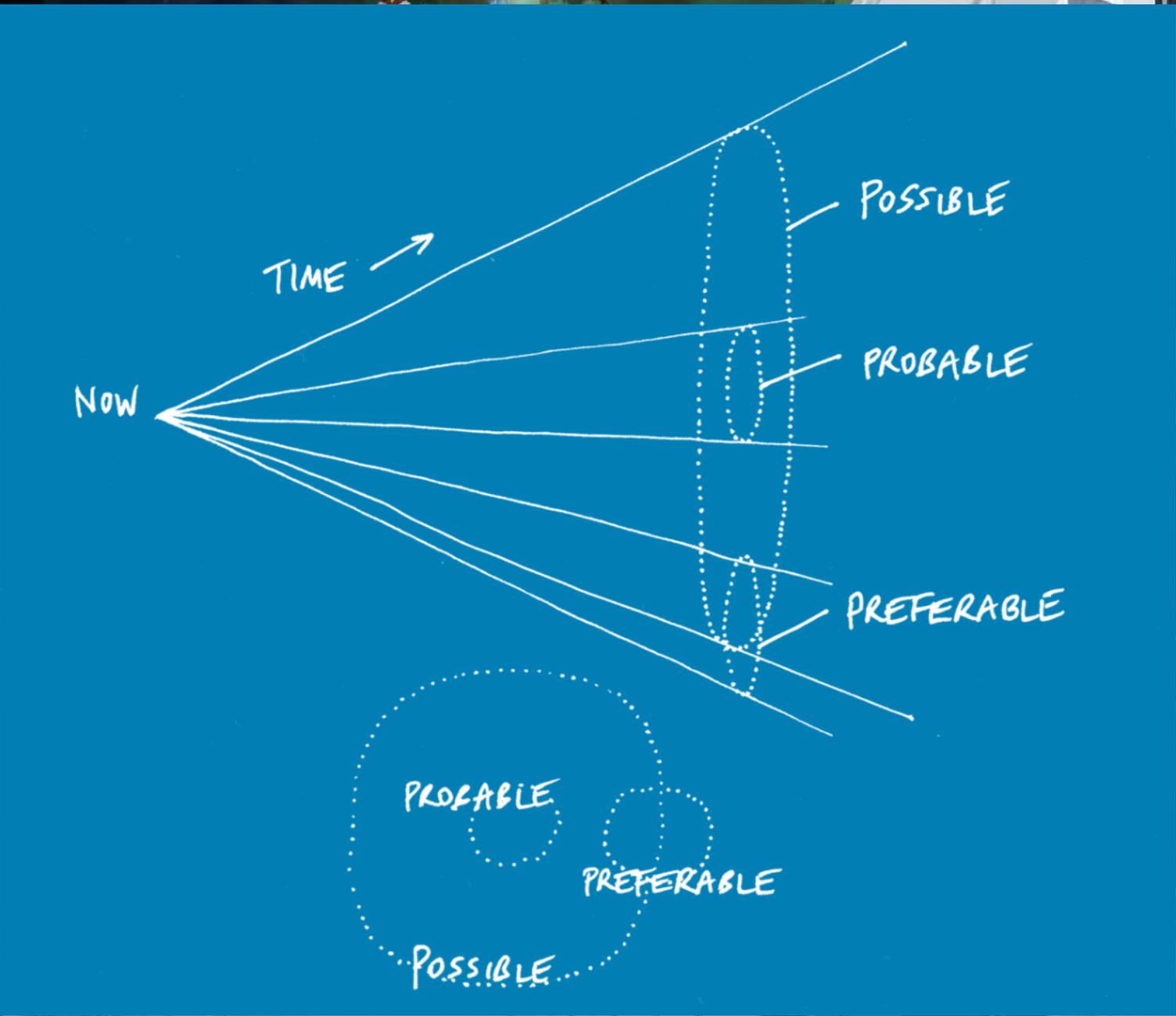
explore new ideas
challenging projects
innovative thinking
good design

What is my role?

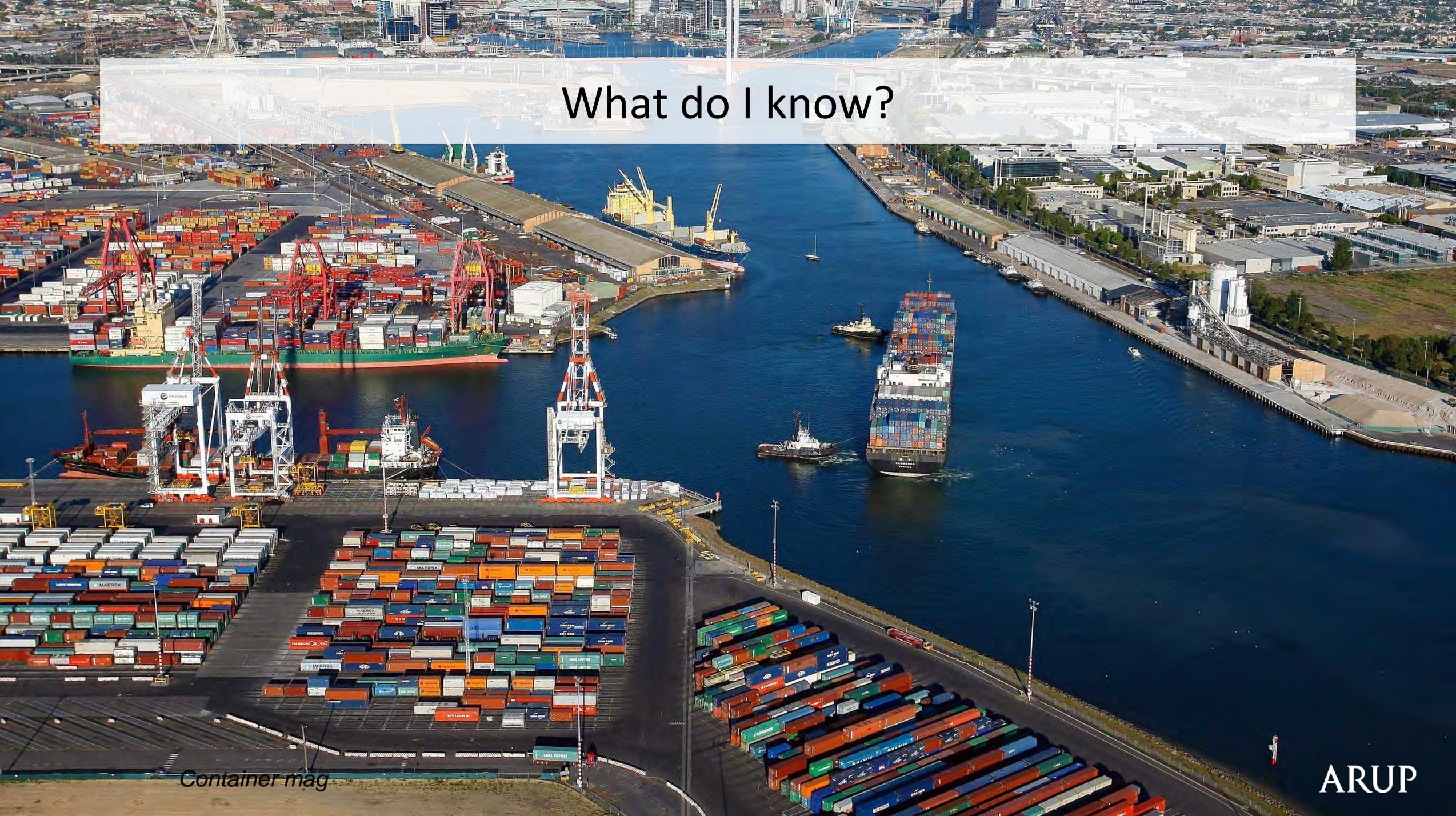




ARUP



What do I know?



Container mag

ARUP

An aerial photograph of a large port facility. In the foreground, there are extensive stacks of colorful shipping containers in various colors (blue, red, green, orange, white). Several large gantry cranes are positioned along the waterfront. In the middle ground, a large container ship is docked at a pier, and another large container ship is moving through the water. The background shows a city skyline with various buildings and a bridge. The text "What do I know?" is overlaid in a white box at the top, and "I am NOT an expert on shipping" is overlaid in a white box in the middle. The ARUP logo is in the bottom right corner, and "Container mag" is in the bottom left corner.

What do I know?

I am NOT an expert on shipping

An aerial photograph of a large port facility. In the foreground, there are extensive stacks of colorful shipping containers in various colors (blue, red, green, orange). Several large gantry cranes are positioned along the waterfront. In the middle ground, a large container ship is docked at a pier, and another is moving through the water. The background shows a city skyline with various buildings and a bridge over the water.

What do I know?

I am NOT an Earth scientist

An aerial photograph of a large port facility. The foreground is dominated by numerous stacks of colorful shipping containers in shades of blue, orange, and green. Several large gantry cranes are positioned along the waterfront. In the middle ground, a large container ship is docked at a pier, and another smaller vessel is visible in the water. The background shows a city skyline with various buildings and a bridge spanning across the water.

What do I know?

I AM an expert on cities + resilience

An aerial photograph of a large, active port. The foreground is dominated by numerous stacks of colorful shipping containers in shades of blue, orange, and green. Several large gantry cranes are positioned along the waterfront, with one in the process of loading or unloading a large container ship. The ship's deck is densely packed with containers. In the background, a city skyline is visible across a body of water, with various buildings and infrastructure. The overall scene depicts a major hub of international trade and logistics.

What do I know?

40% of population lives near coast

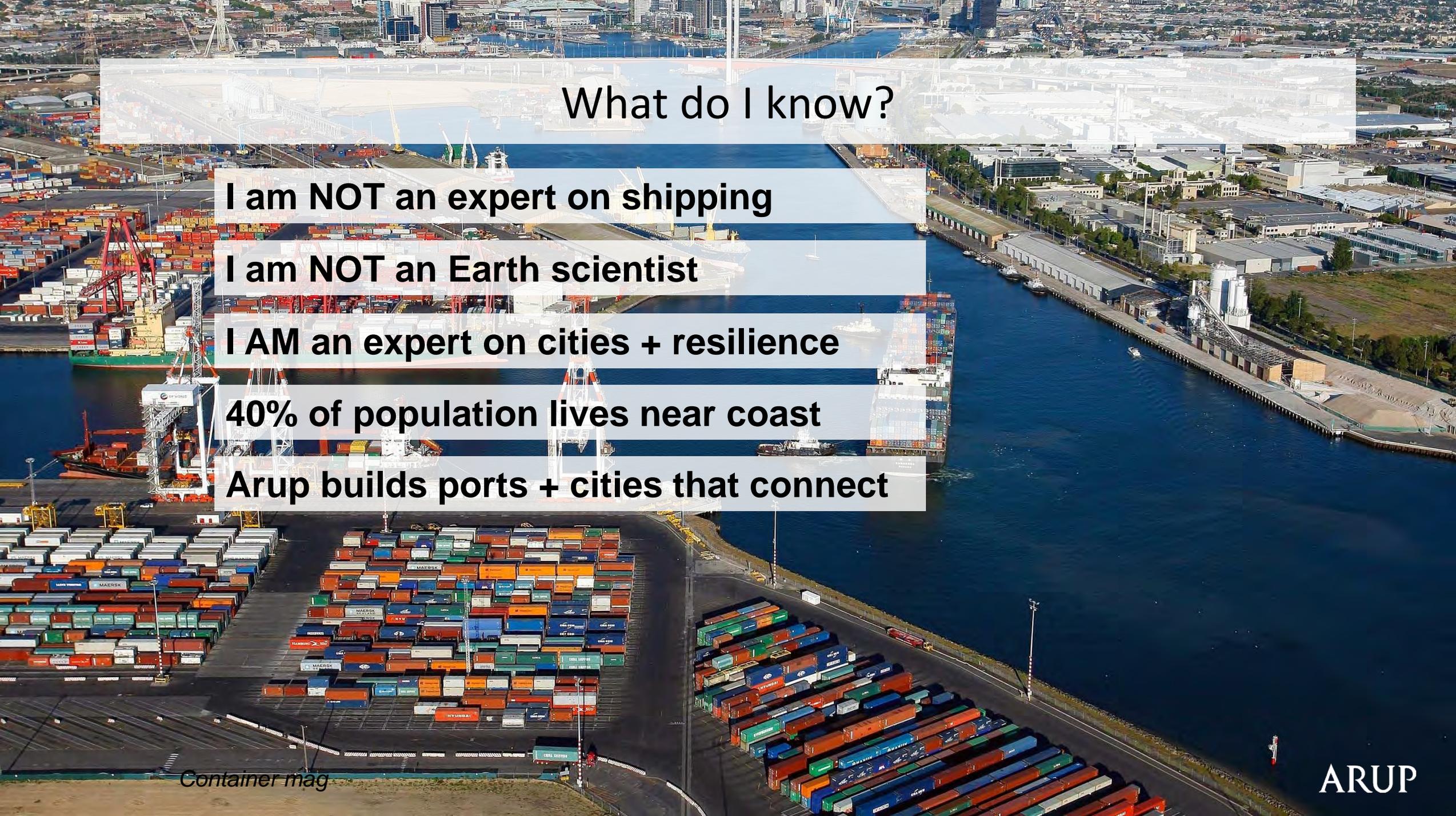


What do I know?

Arup builds ports + cities that connect

Container mag

ARUP

An aerial photograph of a large port facility. In the foreground, there are numerous stacks of colorful shipping containers (blue, orange, green, red) arranged in neat rows. Several large container ships are docked at the pier, with cranes visible. In the background, a city skyline with various buildings and a bridge is visible across a body of water.

What do I know?

I am NOT an expert on shipping

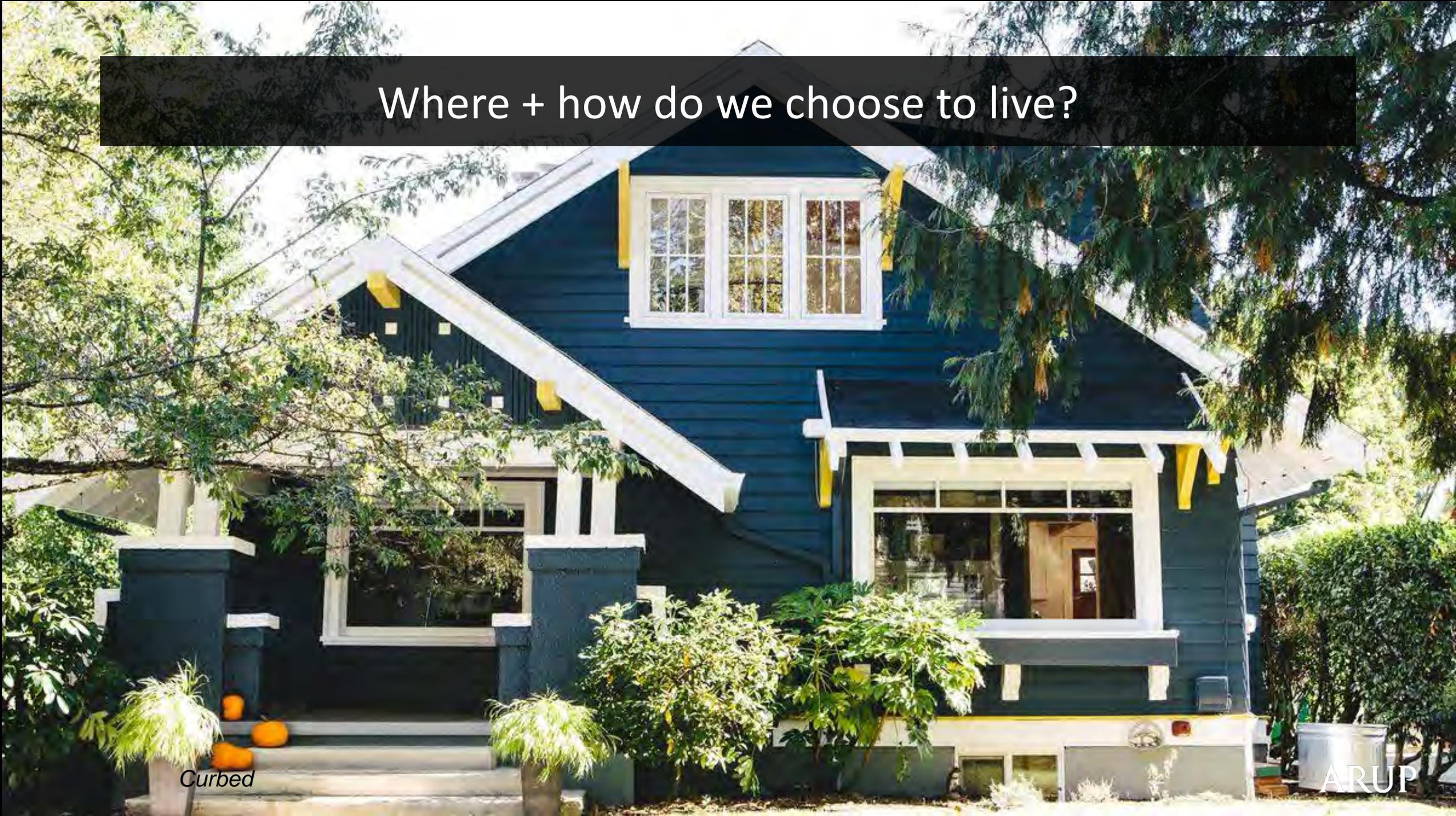
I am NOT an Earth scientist

I AM an expert on cities + resilience

40% of population lives near coast

Arup builds ports + cities that connect

Where + how do we choose to live?



Curbed

ARUP



Natural Environment

Built Environment





Natural + Built

- Interconnected Systems
- Built is reliant and constrained
- Nature rules all

How do we design with nature to ensure we are all collaborators of our future?

71 % of Earth is water!

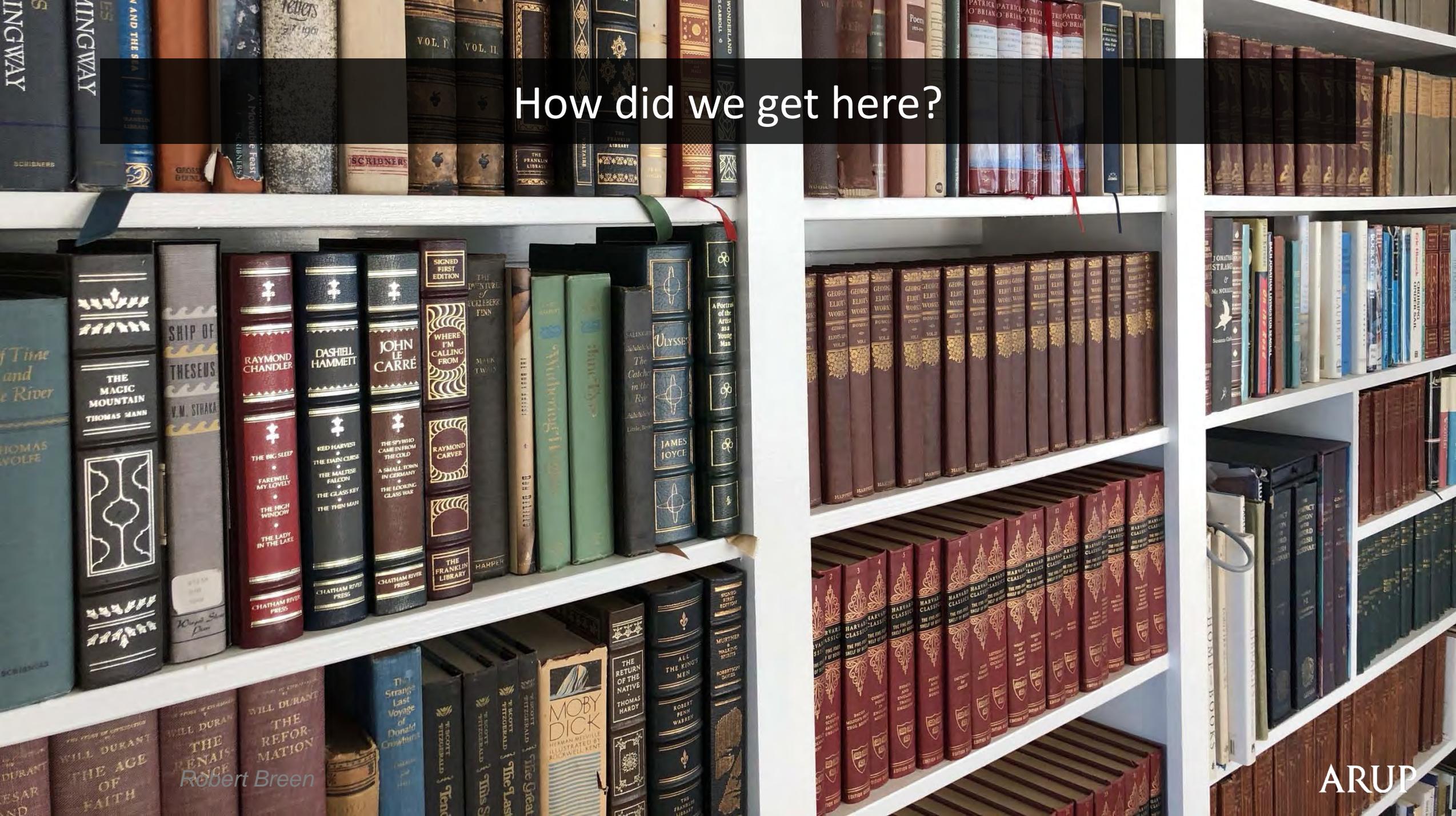


Boats, Ports + Shipping

- Connector
- Inhabit the space between
- Facilitate our global economy

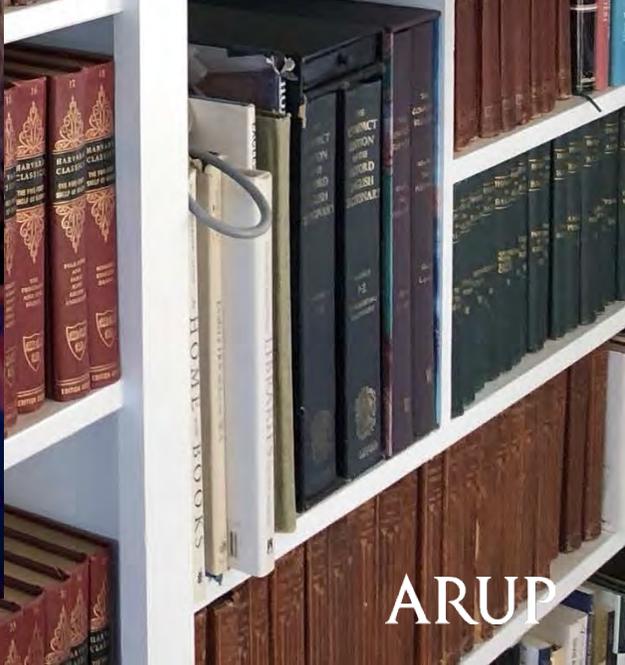


How did we get here?



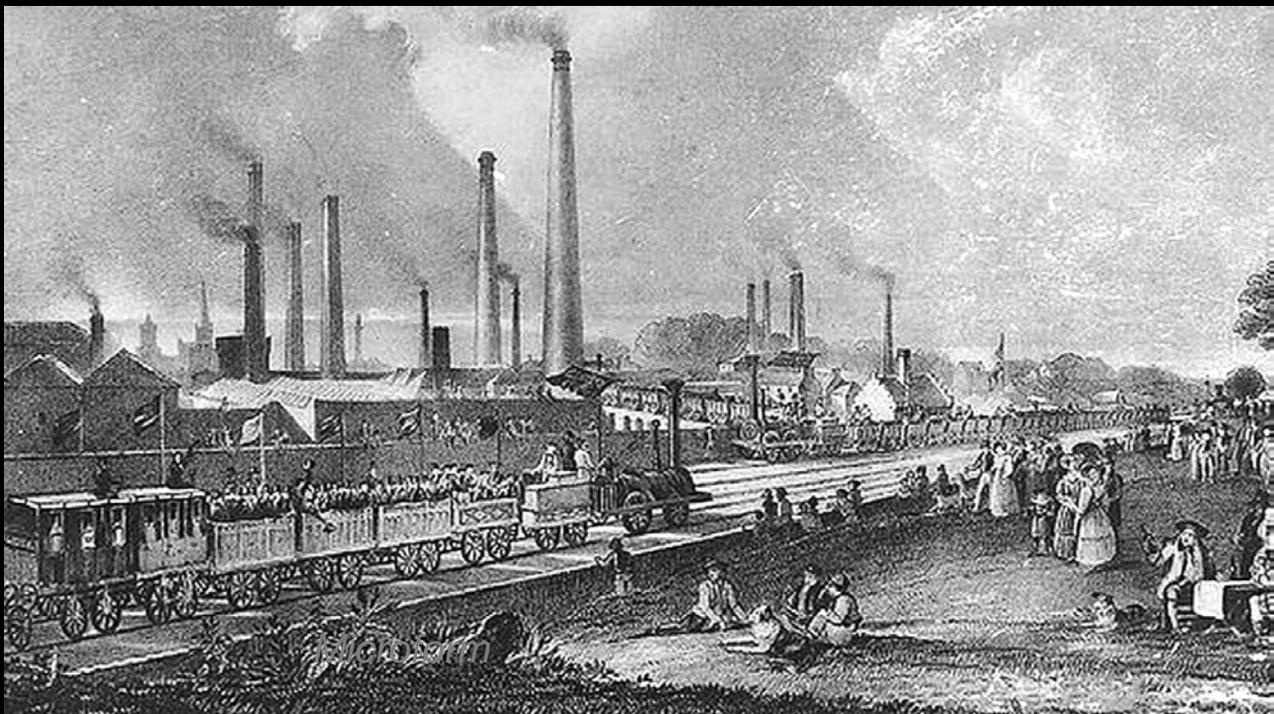
Robert Breen

ARUP





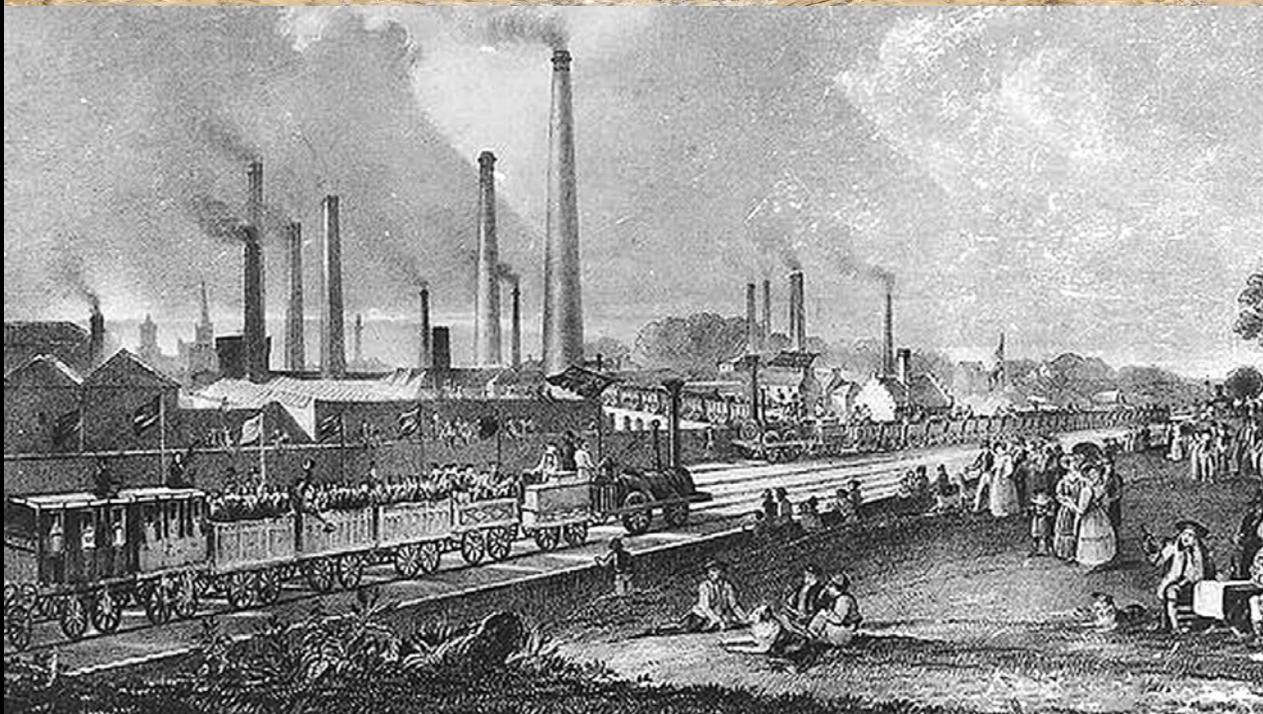




Travel and Leisure



ARUP



A photograph of a massive glacier wall meeting the ocean. The glacier is a deep blue color, with visible horizontal layers of sediment. At the base, a large plume of water and ice is splashing into the sea. The background shows dark, rocky mountains with patches of snow.

Climate Change + Sea Level Rise



Climate + SLR

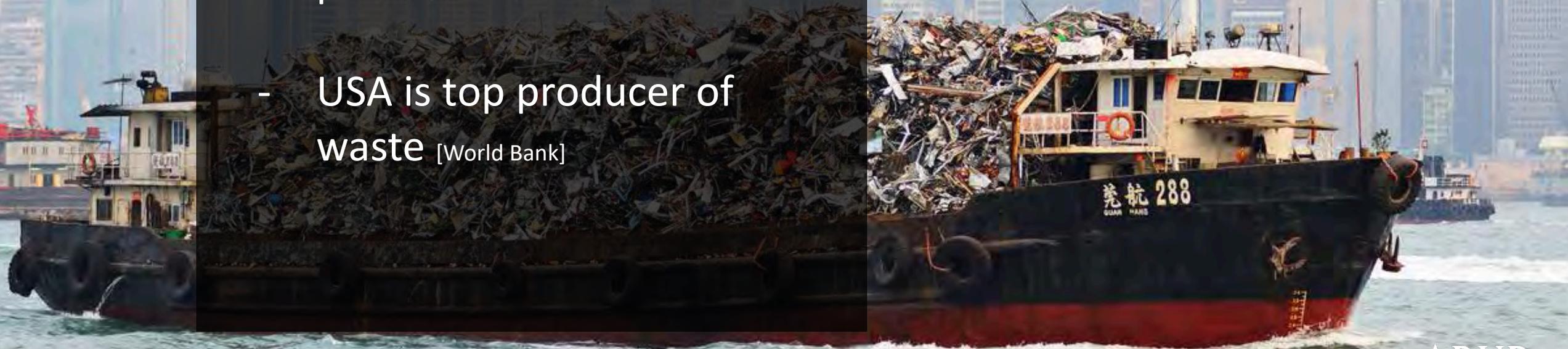
- 9/10 items on our shelves are shipped $\frac{1}{2}$ way round the world
- 1 cargo ship = 50M car emissions [Guardian]
- Arctic sea ice has diminished at 13.4% per decade [U.S GCRP]

Production + Consumption Process



Production + Consumption

- 1997-2017 China recycled 50% of global waste = 10,000 Olympic swimming pools [New York Times]
- USA is top producer of waste [World Bank]



Aging + New Infrastructure



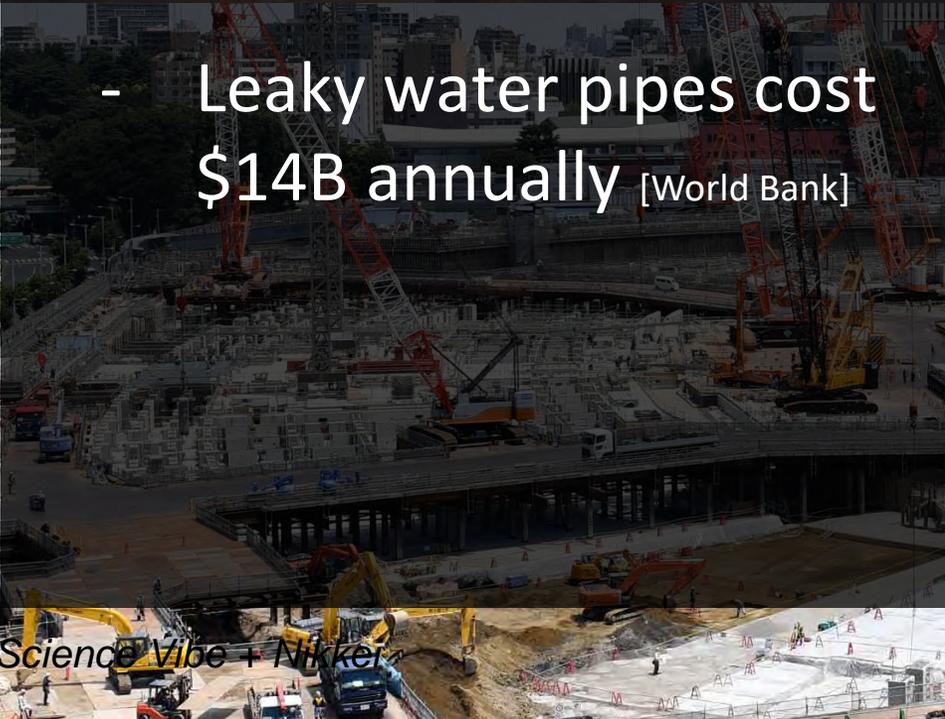
Science Vibe + Nikkei

ARUP

Infrastructure

- Over 105 bridge collapses since 2000
[various]

- Leaky water pipes cost \$14B annually [World Bank]



What trends will be driving change?

drivers of change
climate change

drivers of change
urbanisation

drivers of change
poverty

drivers of change
energy

drivers of change
oceans

drivers of change
water

Resilience + Long Term Thinking





As of 2016, 25 cities globally have committed 10% of their municipal budgets to developing resilience strategies benefitting over 37M people. [100 Resilient Cities]

Resilience + Long Term Thinking

Rotterdam, Netherlands

- Embracing H2O
- Looking to 2100
- Innovating various solutions to plan for future
 - Floating pavilions
 - Water squares



Jonathan Andrew Photography

Floating pavilions

ARUP



Global Monitoring + IoT



Monitoring + IoT

Intelligent Building Management,
Wanda; Beijing, China

- Sensor data + IoT optimizes performance
- Use on 16 properties
- 5.6M data point devices
- 50B items processed yearly

A white and black autonomous delivery robot with yellow accents is positioned on a city sidewalk. The robot has a rounded, boxy shape with a black top and white front. It has four wheels with yellow outlines. In the background, there is a city street with buildings, trees, and people. A semi-transparent black box with white text is overlaid on the image.

In 2016 global investment on AI and ML was between \$26-39B. By 2030, its estimated that AI will be a 15.7T opportunity.

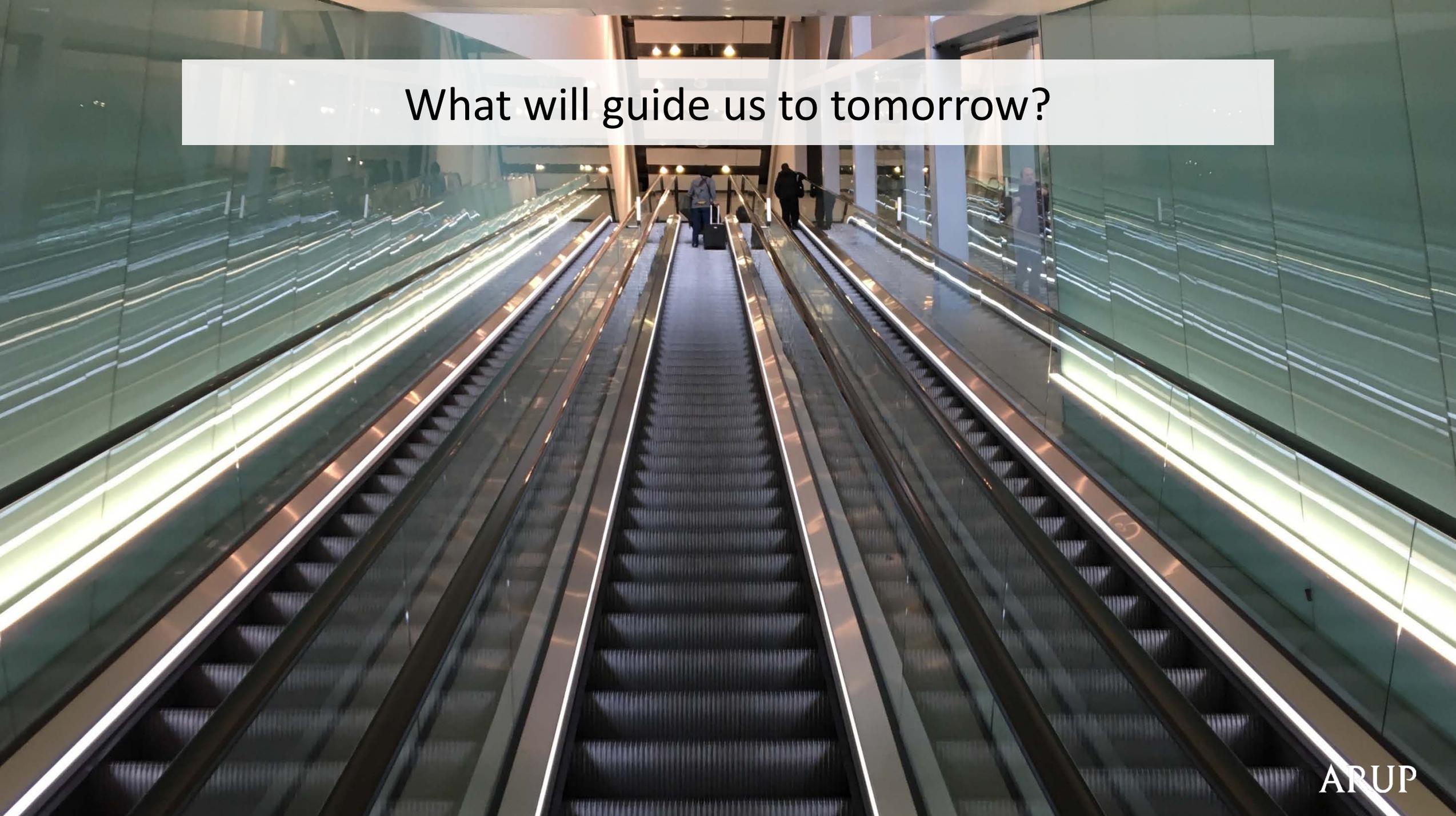
[McKinsey, UAE Gov]

AI + Machine Learning

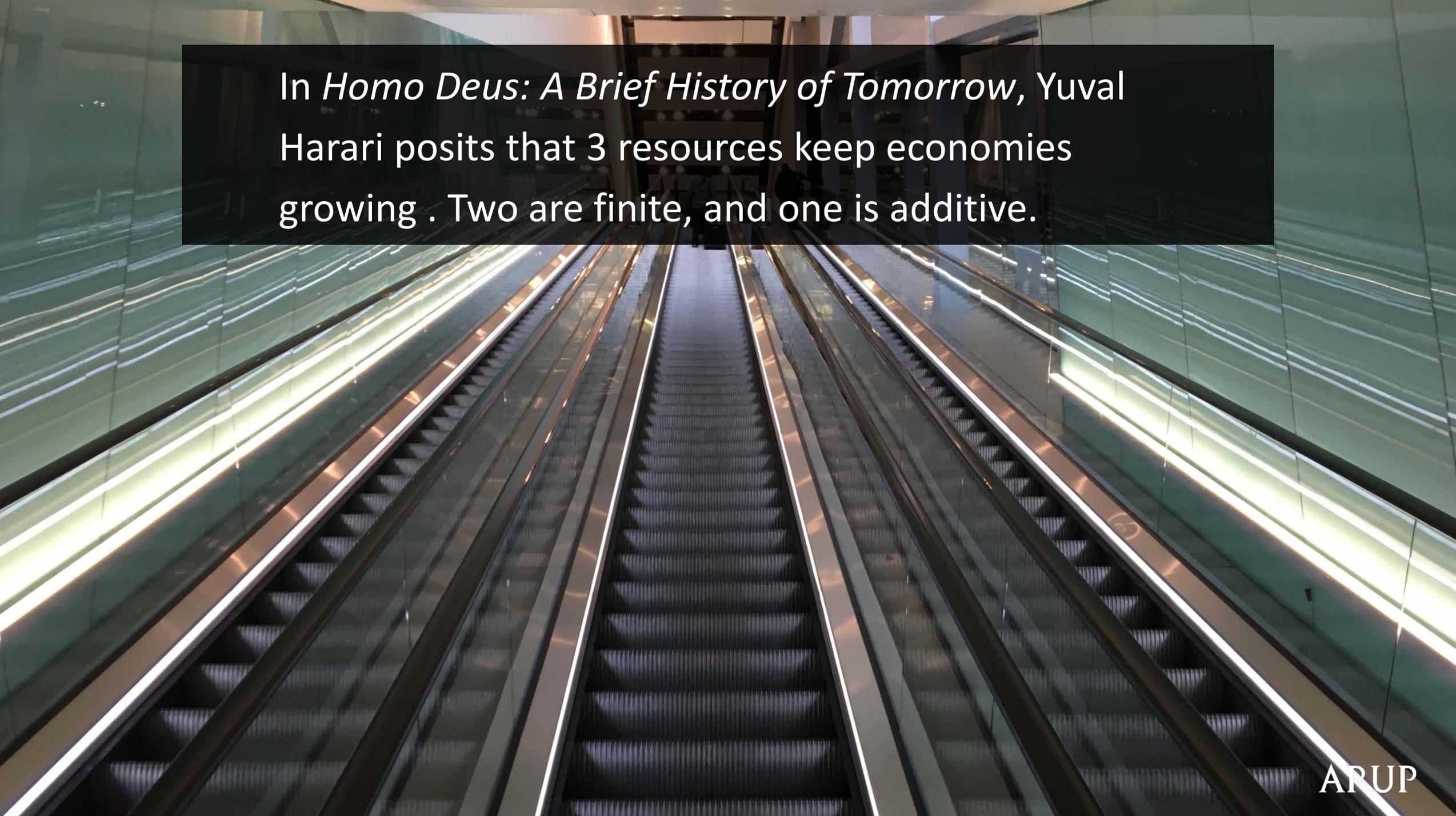
Chip the Chatbot + Alexa

Microsoft + City of Los Angeles

- City Hall Internet Personality (Chip)
- Uses AI to 'learn' + can curate answers
- 300+ questions a week
- Aided 97,000 businesses

A long, modern escalator in a transit hub, viewed from a low angle looking down the length of the stairs. The escalator has a dark, textured surface and is flanked by glass railings with integrated lighting. The background shows a brightly lit, modern interior with other people and structural elements.

What will guide us to tomorrow?



In *Homo Deus: A Brief History of Tomorrow*, Yuval Harari posits that 3 resources keep economies growing . Two are finite, and one is additive.



Raw Materials

Energy



Knowledge

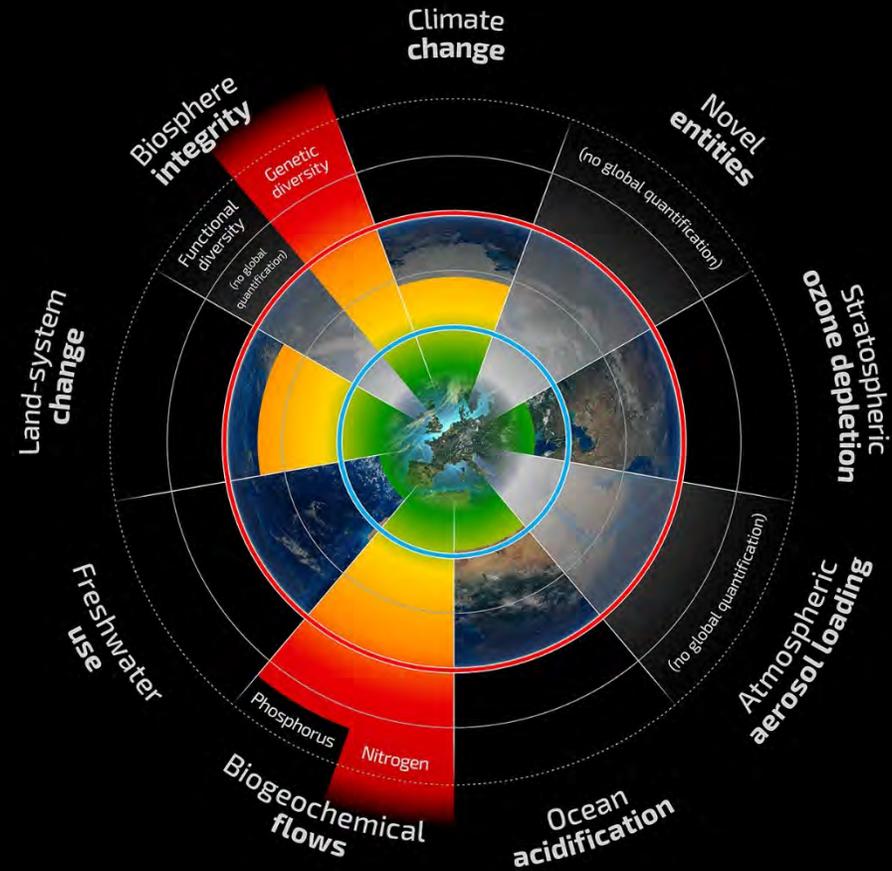


SUSTAINABLE DEVELOPMENT GOALS



Planetary Boundaries

A safe operating space for humanity



- Beyond zone of uncertainty (high risk)
- In zone of uncertainty (increasing risk)
- Below boundary (safe)
- Boundary not yet quantified

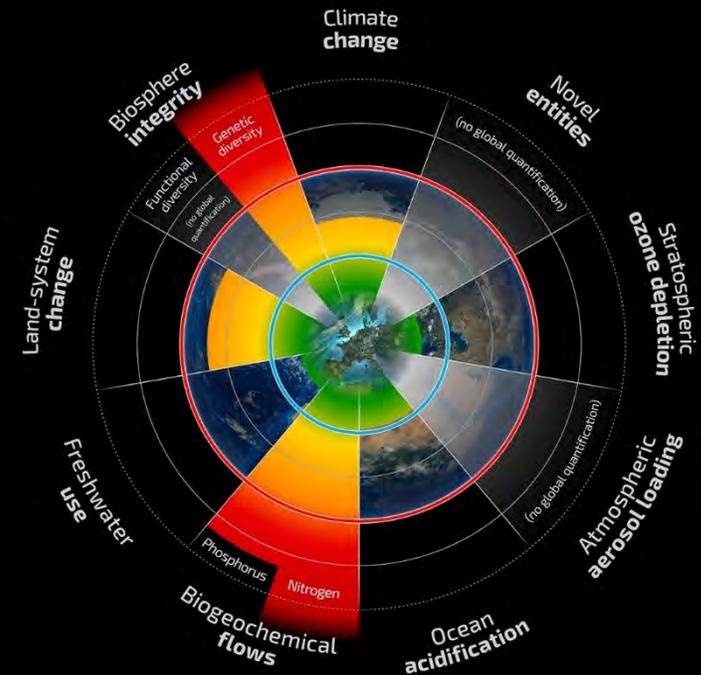
Source: Steffen et al. Planetary Boundaries: Guiding human development on a changing planet, *Science*, 16 January 2015.
Design: Globala

SUSTAINABLE DEVELOPMENT GOALS



Planetary Boundaries

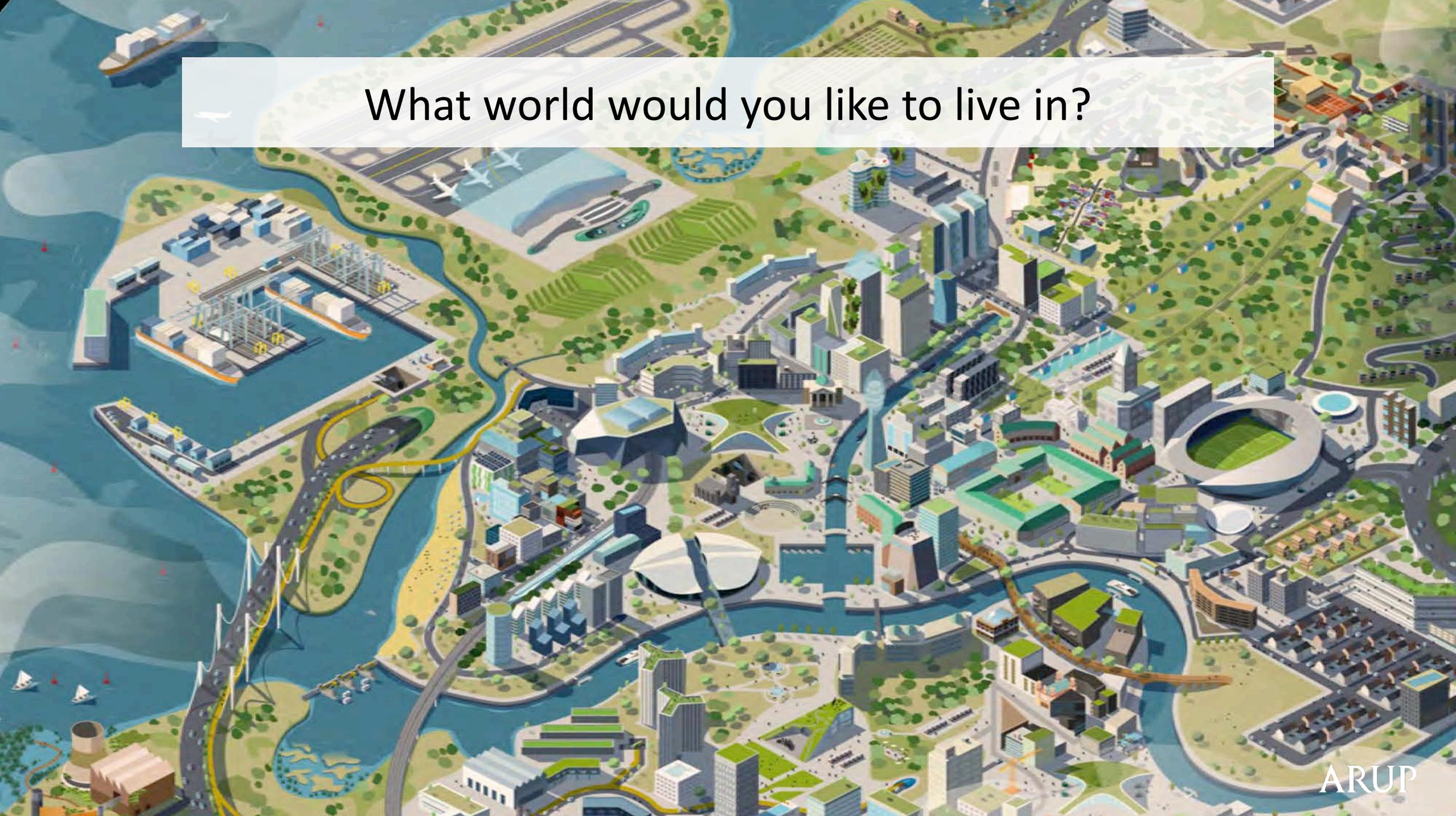
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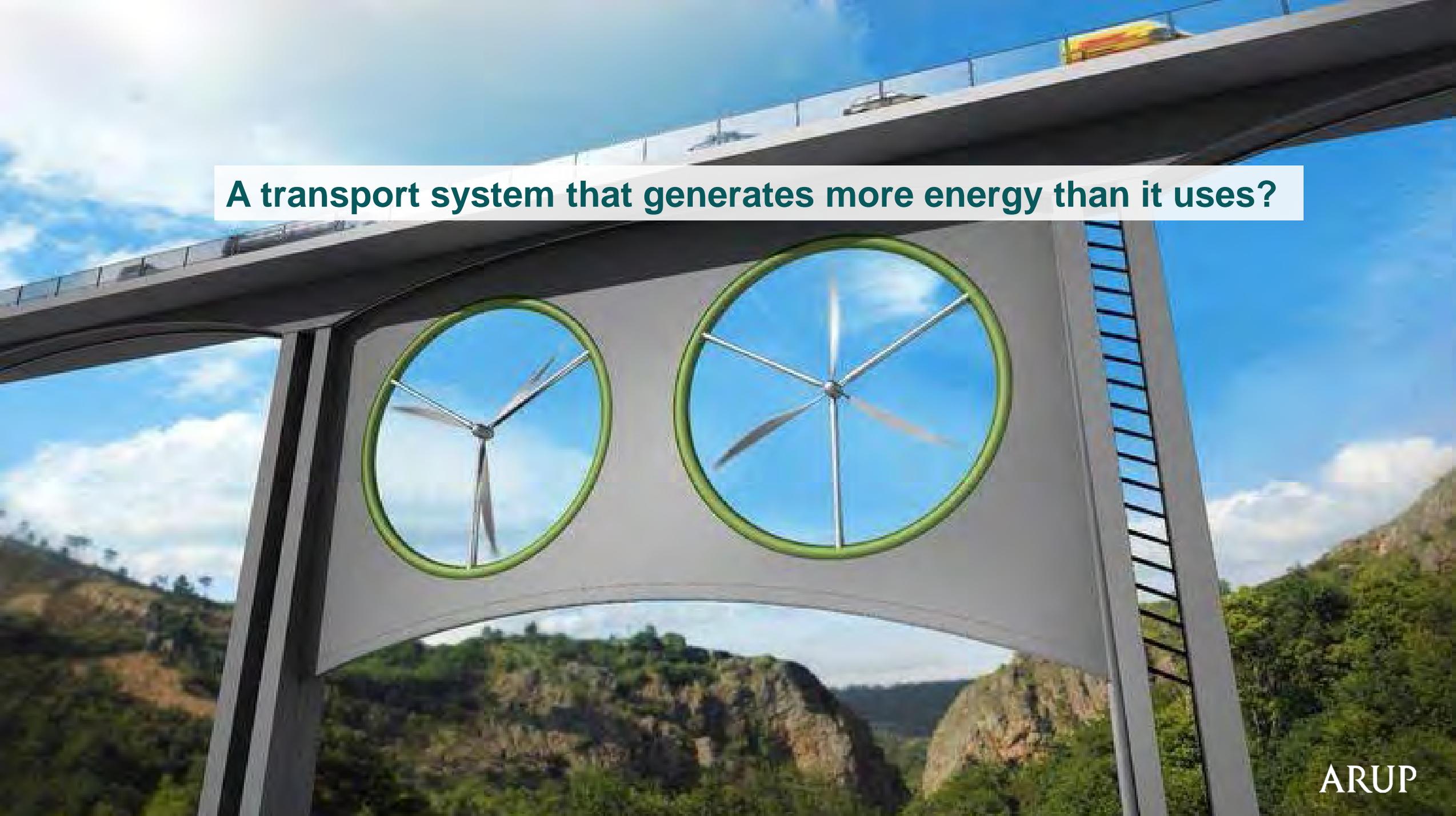
Source: Steffen et al. Planetary Boundaries: Guiding human development on a changing planet. Science, 16 January 2015.
Design: Global

What world would you like to live in?





When boats are 100% renewable?

A futuristic transport system is shown, featuring a grey, curved structure with two large, circular wind turbines integrated into its design. The turbines have three blades and are set against a blue sky with white clouds. In the background, a yellow train is visible on a track above the structure, and a lush, green valley with rocky hills is seen below. The overall scene suggests a sustainable and innovative mode of transportation.

A transport system that generates more energy than it uses?

An autonomous port that optimizes efficiencies?



An overhead view of a large room filled with hundreds of cardboard boxes of various sizes. Several people are scattered throughout the room, interacting with the boxes. A man in a red shirt and red hard hat is in the center, looking at a box. A young child is on the right, reaching for a box. A woman in a white shirt is in the bottom left, and another woman in a black patterned top is on the right. The boxes are stacked and scattered across the floor, creating a maze-like environment.

Where all packaging materials are compostable?

When the oceans are clean?



How will our future systems look?



An aerial, isometric-style illustration of a futuristic city. The city is built along a winding river. On the left, a large industrial or power plant complex is situated on a peninsula. The city features a mix of modern skyscrapers, colorful residential buildings, and green spaces with trees and parks. A prominent feature is a large, circular stadium or arena with a green field. The overall aesthetic is clean, modern, and integrated with nature. The sky is a light blue, and the water is a deep blue.

How will our future systems look?

Re-think how + where we live

An aerial, isometric-style illustration of a futuristic city. The city is built along a winding river. In the upper left, there is an airport with several airplanes on the tarmac. The city features a mix of modern skyscrapers, colorful residential buildings, and green spaces with trees and parks. A large, circular stadium with a green field is prominent on the right side. The overall aesthetic is clean, modern, and integrated with nature.

How will our future systems look?

Re-think how we consume

An aerial, isometric-style illustration of a futuristic city. The city is built along a winding river. In the upper left, there is an airport with several planes on the tarmac. The city features a mix of modern skyscrapers, residential blocks, and green spaces with trees and parks. A large stadium with a green field is visible on the right. The overall aesthetic is clean, modern, and integrated with nature.

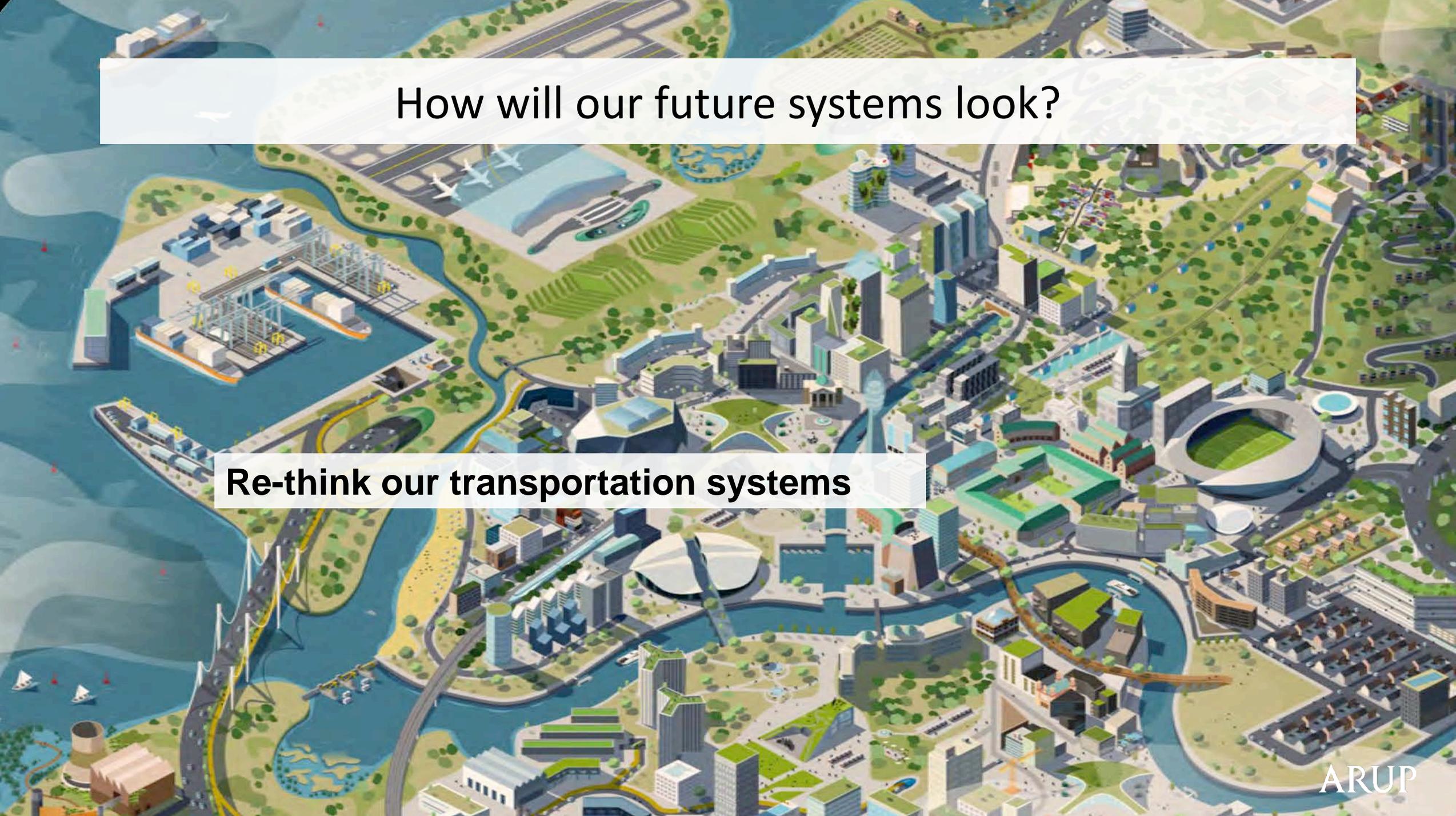
How will our future systems look?

Re-think our economic models

An aerial, isometric-style illustration of a futuristic city. The city is built along a winding river. In the upper left, there is an airport with several planes on the tarmac. To the left of the river, there are industrial or power plant structures. The city features a mix of modern skyscrapers, colorful residential buildings, and green spaces with trees. A large stadium with a green field is visible on the right side. The overall scene is vibrant and depicts a well-planned urban environment.

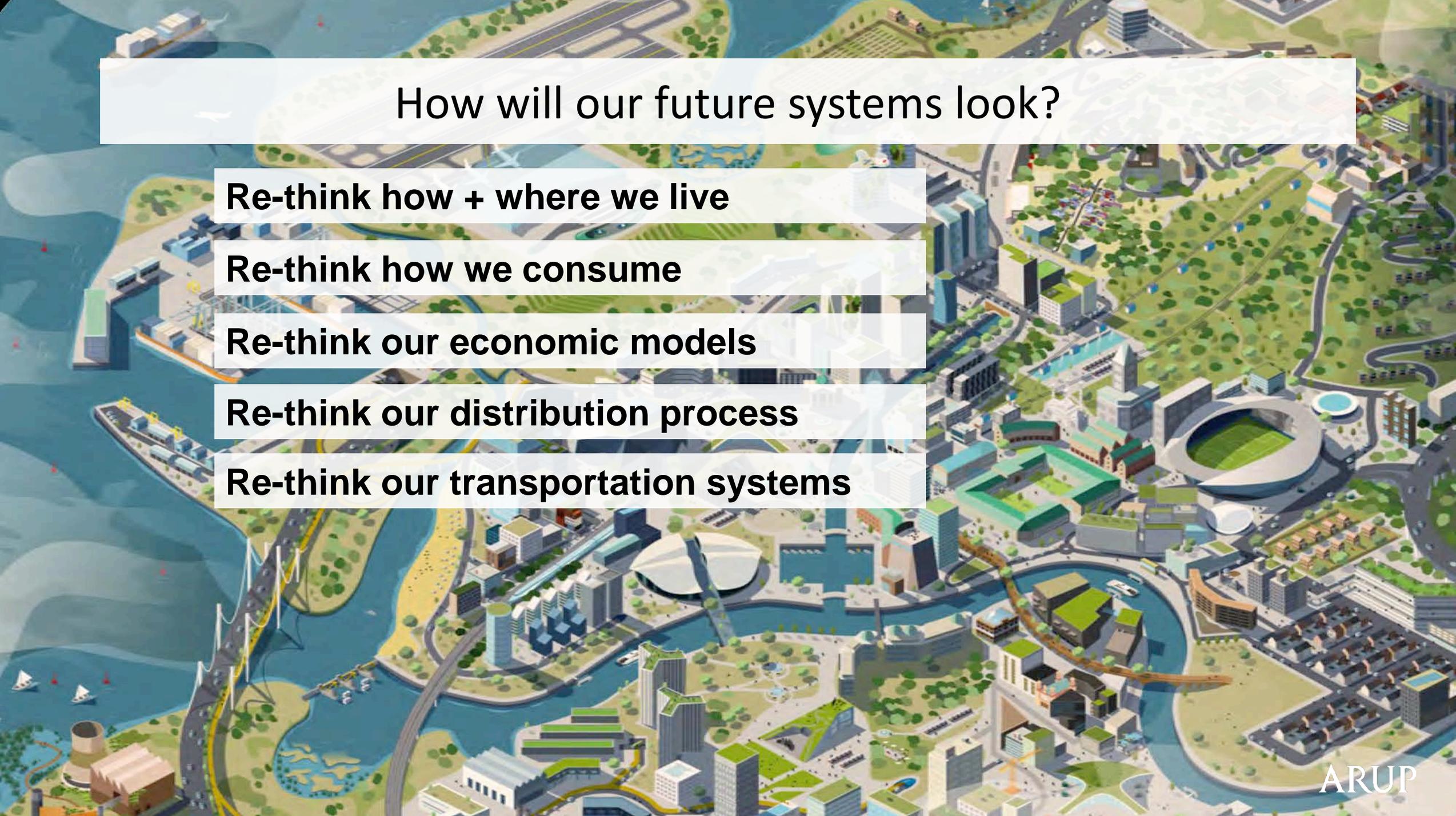
How will our future systems look?

Re-think our distribution process

An aerial, isometric illustration of a futuristic city. The city is built along a winding river. On the left, there's a port area with several large cargo ships docked at a pier. In the upper left, an airport is visible with several planes on the tarmac. The city itself is a mix of modern, multi-story buildings with green roofs and more traditional structures. There are parks, green spaces, and a large stadium-like structure on the right. The overall aesthetic is clean, modern, and integrated with nature.

How will our future systems look?

Re-think our transportation systems

An aerial, isometric-style illustration of a futuristic city. The city is built on a riverbank, with a large stadium and various modern buildings. A river flows through the city, and a bridge is visible. The overall scene is vibrant and detailed, showing a mix of urban development and green spaces.

How will our future systems look?

Re-think how + where we live

Re-think how we consume

Re-think our economic models

Re-think our distribution process

Re-think our transportation systems

An aerial, isometric-style illustration of a modern city. A river winds through the center, with a bridge crossing it. To the left, an airport runway and taxiway are visible. The city is filled with various buildings, including a large stadium, residential blocks, and commercial structures. Green spaces and parks are interspersed throughout the urban layout. A semi-transparent black banner is overlaid across the top center of the image.

Require both NEW and RE-DESIGNED systems

We are designers,
creators + inhabitants of
our future.

We have one planet
We have one shot
It will require ALL of us



How do we change the future?



BANKSY

How do we change the future?

**we change the story people tell
about themselves and the future
they will live in.**

brian david johnson



BANKSY

We change the story.



BANKSY

Thank you!

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