Resilient + Regenerative Cities: 

*Designing for rising tides*

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We live here.
What do we know?

Earth is humans’ only known habitat
Earth has limited natural resources

What do we know?
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
What do we know?

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- Earth has limited natural resources
- All nations seek economic growth
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ANTHROPOCENE
It takes **1.7 Earths**
to support humanity’s demand on nature.
What are the inevitables?
What are the inevitables?

Global population are and will continue to grow
The global middle class is expanding

What are the inevitables?
What are the inevitables?

Economic growth is not slowing down
What are the inevitables?

Business as usual is leading us to an inevitable downfall
More people with more money = more consumption, more construction, more stuff, more waste
The global middle class is expanding

Economic growth is not slowing down

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Great news for the shipping industry!

Active Freight Pak
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.
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?
Arup, who are we?
Maritime Engineering
Maritime Design + Planning
Maritime Consulting
Resilience Consulting
Sustainable Development
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?
What do I know?
What do I know?

I am NOT an expert on shipping
What do I know?

I am NOT an Earth scientist
I AM an expert on cities + resilience
What do I know?

40% of population lives near coast
What do I know?

Arup builds ports + cities that connect
What do I know?

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Where + how do we choose to live?
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?
Climate Change + Sea Level Rise
Climate + SLR

- 9/10 items on our shelves are shipped ½ 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


- USA is top producer of waste [World Bank]
Infrastructure

- Over 105 bridge collapses since 2000 [various]

- Leaky water pipes cost $14B annually [World Bank]
What trends will be driving change?
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 H20
- Looking to 2100
- Innovating various solutions to plan for future
  - Floating pavilions
  - Water squares
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
AI + Machine Learning
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
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.
Energy
Knowledge

Dumbo
Planetary Boundaries
A safe operating space for humanity

- Climate change
- Biosphere integrity
- Novel entities
  - Genetic diversity
  - Global ecosystem functions
- Freshwater use
- Biogeochemical flows
- Nitrogen
- Phosphorus
- Ocean acidification
- Atmospheric aerosol loading
- Stratospheric ozone depletion
- Land use change
- Water use

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

What world would you like to live in?
When boats are 100% renewable?
A transport system that generates more energy than it uses?
An autonomous port that optimizes efficiencies?
Where all packaging materials are compostable?
When the oceans are clean?
How will our future systems look?
Re-think how + where we live

How will our future systems look?
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Re-think how we consume
Re-think our economic models

How will our future systems look?
Re-think our distribution process

How will our future systems look?
How will our future systems look?

Re-think our transportation systems
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
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?
How do we change the future?

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

brian david johnson
We change the story.
Thank you!

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