

# **SUSTAINABLE and LIVEABLE INTELLIGENT BUILDINGS**

■ **CIB TG 88 JUNE 29 2021**

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# CIB W098 Roadmap

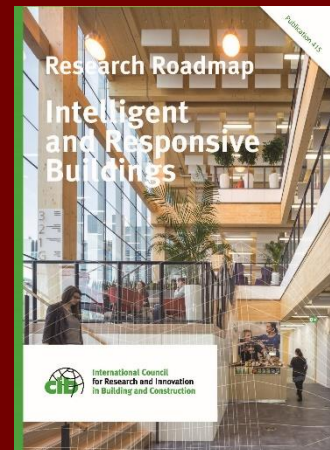
- Framework
- Future of Intelligent Buildings - KPIs
- Health and Wellbeing Oriented Indoor Built Environment for Future Intelligent Buildings
- Technology Aware Workplaces
- Daylight in Intelligent Sustainable Architecture
- Intelligent Infrastructure

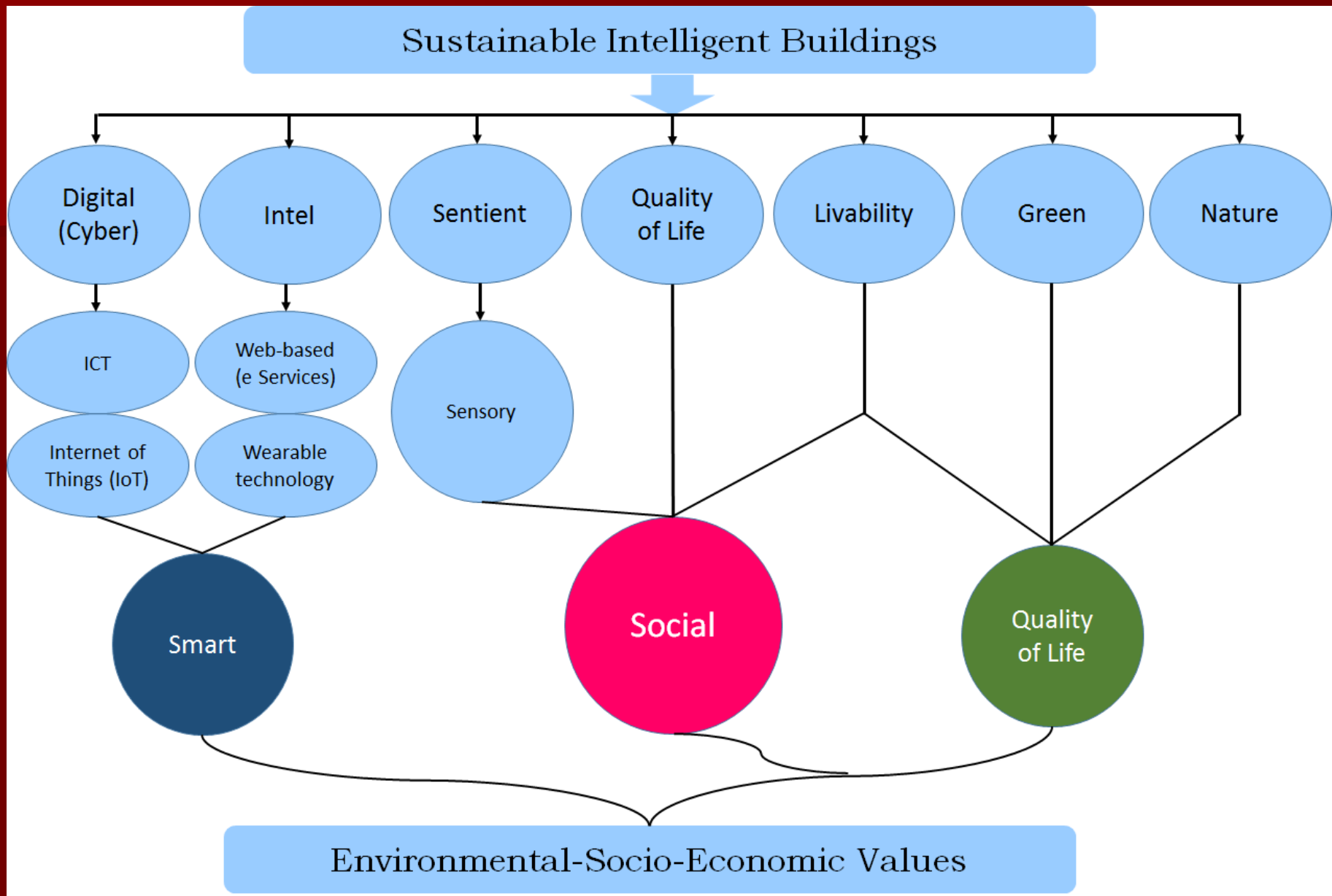


# CIB W098 Roadmap

- Sustainable Urban Transportation in Intelligent Cities
- Keeping Abreast with Technology
- Digital Futures
- Upskilling for Technology Enhanced Collaborative Working
- Wellbeing Homes
- Bioelectromagnetic Design

[https://site.cibworld.nl/dl/publications/CIB\\_415\\_W098\\_RR.pdf](https://site.cibworld.nl/dl/publications/CIB_415_W098_RR.pdf)





Key constituents of Intelligent Buildings (Clements-Croome 2013, p. 289)

# Atomistic Technical and Holistic Socio-technical Approaches to the Built Environment (based on Munro 2011)

	Atomistic	Holistic
<b>Nature</b>	<ul style="list-style-type: none"><li>• Narrow: concentrates on individual elements</li></ul>	<ul style="list-style-type: none"><li>• Broad: elements seen as inter-related; interoperability important</li></ul>
<b>Perspective</b>	<ul style="list-style-type: none"><li>• Individual systems in isolation</li><li>• Single discipline outlook</li></ul>	<ul style="list-style-type: none"><li>• Whole system</li><li>• Interdisciplinary and transdisciplinary outlook</li></ul>
<b>Cause and Effect</b>	<ul style="list-style-type: none"><li>• Looking only at immediate effects</li><li>• Short chains of causality</li></ul>	<ul style="list-style-type: none"><li>• Separated in space and time</li><li>• Long chains of causality, ripple effects, unintended consequences, feedback effects</li></ul>

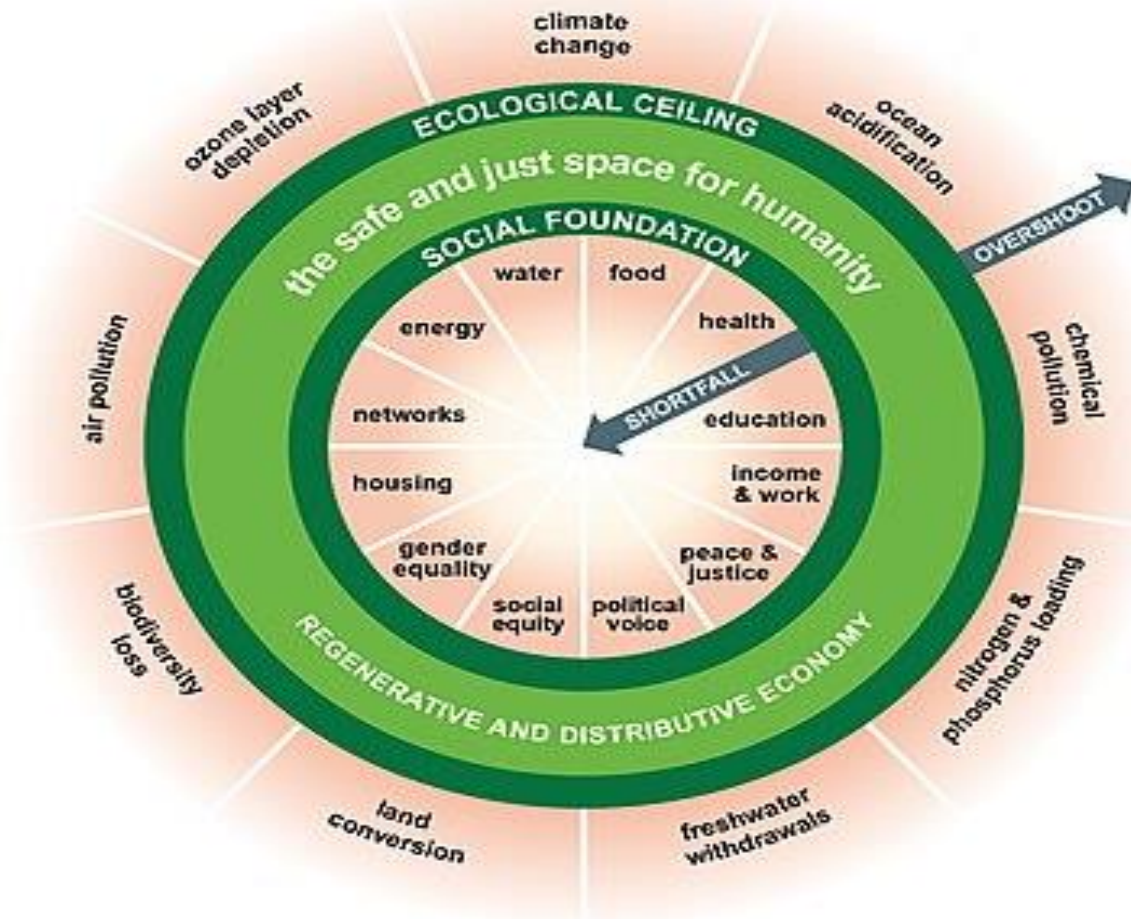
# Atomistic Technical and Holistic Socio-technical Approaches to the Built Environment (based on Munro 2011)

<b>Style of Recommendations</b>	<ul style="list-style-type: none"> <li>• Technocratic</li> <li>• Regulation and compliance</li> </ul>	<ul style="list-style-type: none"> <li>• Socio-technical</li> <li>• Beyond regulations</li> </ul>
<b>Results (observed and sought)</b>	<ul style="list-style-type: none"> <li>• Narrow range of responses to user's needs</li> <li>• Defensive management of risk</li> <li>• Command and control management; frameworks and procedures; squeezing out professional discretion and creativity</li> <li>• Compliance culture</li> <li>• Focus on standardised processes, frameworks and procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Flexible responses to meeting user's needs</li> <li>• Acceptance of irreducible risk</li> <li>• Supportive management encouraging creativity, discovery and enterprise</li> <li>• Comprehensive feedback</li> <li>• Focus on building users their needs with pathways giving high value outcomes such as good well-being and high productivity</li> </ul>

# DECISION-MAKING

- Use **SOCIAL VALUE**
- **Doughnut Economics by Kate Raworth**
- **Transdisciplinary approach**
- **Decrease Silos: increase Connectivity**
- **Educate for Integration not Fragmentation**

# Doughnut Economics (Raworth)





# Raworth's 7 Ways to Think

- Go beyond GDP
- See Big Picture
- Nurture Human Nature
- Systems Thinking
- Inclusive Design for All
- Circular Economy Regenerate Reuse
- Question the Limits of Growth

# CONCLUSIONS

- Lessons from Nature and Vernacular Architecture
- Buildings are for People in terms of function, sensory delight , health and wellbeing
- Designing, constructing and operating buildings and the behaviour of people within them influence Climate Change significantly
- Technology can help enable effective performance
- Holistic systemic decision-making is key; new mindsets needed e.g Doughnut Economics

# **CONTRASTING CASE STUDIES**

# **Jean-Marie Tjibaou Cultural Centre in Noumea**





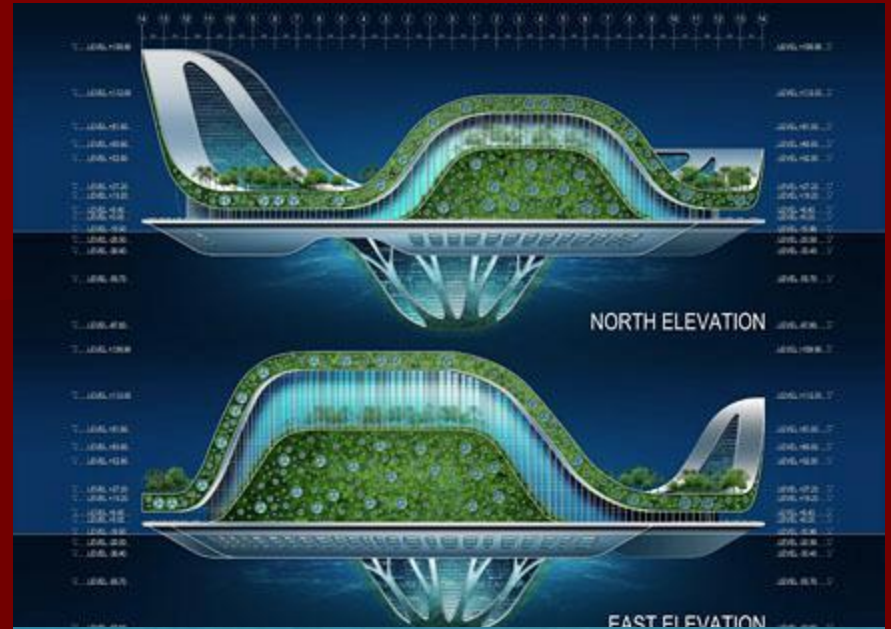
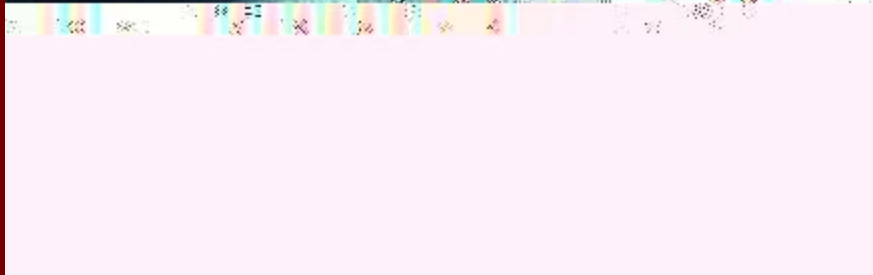
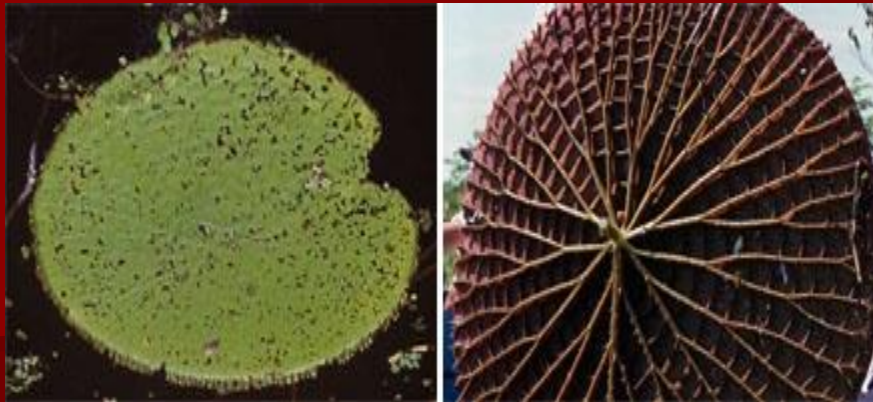






# Green Mega City: Lily pads by Vincent Callebaut





These Lilypads are constructed with a titanium dioxide skin to absorb CO<sub>2</sub>

# Green Mega City: Lilypads by Vincent Callebaut

- Titanium Dioxide skin to absorb CO<sub>2</sub>
- 2 seater electric pod cars
- Biodiesel/electric buses guided by embedded road magnets
- Footstep energy
- Wind turbines using air movement
- Hydrogen from an Algae Park
- Tidal power from wind from passing car
- Solar energy from paint containing solar nanoparticles

# **Green Mega City: Lily pads by Vincent Callebaut**

- Solar energy from paint containing solar nanoparticles
- Clear water from desalination
- Robotic maintenance
- Bubble Houses
- Phase change materials give temperature regulation
- Hydroponic farms
- Plant water from sewage filtered via zebra mussels
- 10 storey concrete tower with embedded photovoltaics
- Geothermal wells for heating/cooling

***WHAT WE CALL THE  
BEGINNING IS OFTEN THE END***

***AND TO MAKE AN END IS TO  
MAKE A BEGINNING***

***THE END IS WHERE WE START  
FROM***