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Center for Buildings, Infrastructure and Public Space

Social Housing and Open Space

Advisory Board Presentation

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Primary Objectives

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MAIN OBJECTIVE

Enhance sustainability and tenant benefits of NYCHA Social Housing while developing a viable framework for long-term maintenance.

Plan to incorporate recycled materials and open spaces into social housing. Also, develop healthy financing plans while searching for policies to best search low-income resident needs.

NYCHA

Serves over 360,000 residents across about 177,569 apartments

NEW YORK CITY HOUSING AUTHORITY

KEY PROBLEMS

- Lack of city funds
- Unsustainable Conditions

NYCHA 2.0

- Established during De Blasio administration
- 10-year plan to repair $24B worth of vital needs
- Renovate 175,000 units

Recycled Materials 1

Provide guidelines to make housing more sustainable and affordable by reusing demolished materials. Reduce the carbon footprint and decrease landfill waste.

Recycled Aggregate Concrete (RAC)
Saved at least 3,000 tons of natural resources from quarries

Waste-Based Bricks
~25% energy reduction with potential life cycle of 100 years

Open Space 2

Community Space

Gardens and recreational spaces serve to bring together both residents and outside groups.

Miscellaneous Benefits

Improve well-being and health of residents as well as the immediate natural environment.

CHALLENGES

- Land Use Conflict
- Economic Pressures
- Public Opinion
- Gov. Policies

Finances 3

Step 01
Find current financial models used to make housing affordable.

Step 02
Make sure that strategies align with sustainability goals.

- Government-Owned PPP
- Building Integrated Agriculture
- Private Financed Urban Greening
- Incentivize Private Contributions

Policies and Implementation 4

Key Social Housing Policies

- Resident Involvement
- Accessibility
- Development and Modernization
- Section 8. Housing Choice Voucher

Examine social housing policies of other countries (ex: India) and incorporate policies to best benefit the interests of low-income New Yorkers.

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ADVANCING EMBODIED CARBON REDUCTION IN AIRPORTS AND SEAPORTS

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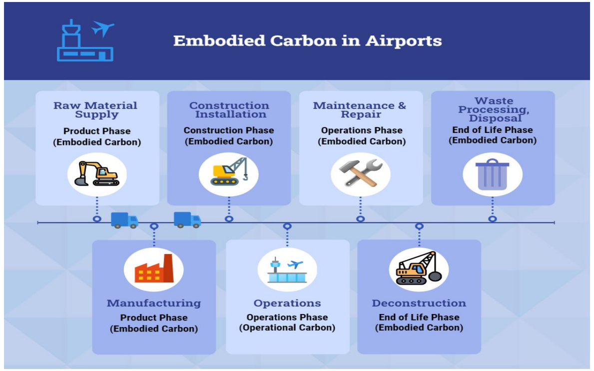
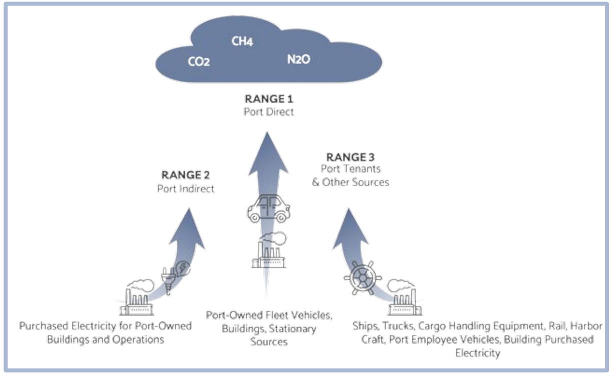
AIRPORTS

SEAPORTS



COMMON GOALS

- Develop a Framework through Extensive Research
- Promote Cross-Disciplinary collaboration
- Forge a collaborative partnership
- Align with Existing Carbon Reduction Initiatives



EC DISTRIBUTION IN LIFE CYCLE

PRODUCTION
65-85 % of total embodied carbon emissions

CONSTRUCTION
6-10% of total embodied carbon emissions

MAINTENANCE
8-15% of total embodied carbon emissions

END OF LIFE CYCLE
3-15% of total embodied carbon emissions

TOOLS FOR EC MEASUREMENTS

IATA & ATKINS TOOLKIT
The digital toolkit will deliver embodied carbon benchmarking for the three key airport asset types of terminal buildings, runways and multi-storey car parks.

BEACON - THORNTON TOMASETTI
Beacon is an easy-to-use embodied-carbon measurement tool, that helps in making informed design decisions that result in more sustainable and efficient structures.

ERMs FOR SHIPS IN PORTS

LNG
Potential for **23.8%-25.9%** carbon emission reduction compared to traditional fuels.

BIOFUELS
Emission reductions between **25.0%-84.0%** compared to marine diesel.

HYDROGEN
Nearly zero emissions & Potential for **up to 40%** CO_2 emission reduction.

AMMONIA
Non-carbon fuel with potential mixing capabilities.

ERMs FOR PORT LAND AREA

OPERATIONAL & CARGO MEASURES
Revise operational practices for ER
Innovate in land transportation within the port
Implement cargo pollution control strategies

EQUIPEMENT MEASURES
Implement Information and Smart Systems
Adopt energy-efficient equipment
Prioritize clean energy sources
Boost energy efficiency in operations

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ADVANCING EMBODIED CARBON REDUCTION IN HIGHWAYS & BRIDGES

DATE – 10/10/2023

CIENE9101- CIVIL ENGINEERING RESEARCH

https://images.app.goo.gl/c71tU4ibU494L24S7

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HIGHWAYS AND BRIDGES

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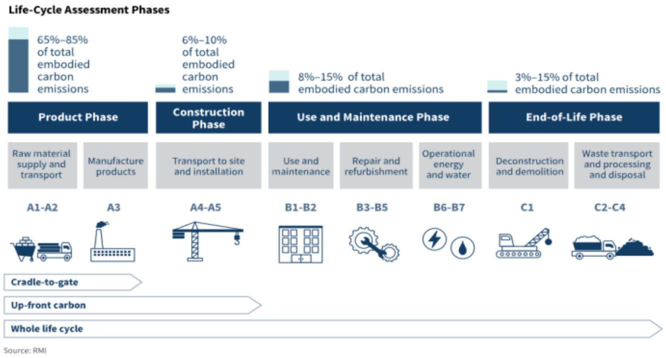
HIGHWAYS & BRIDGES

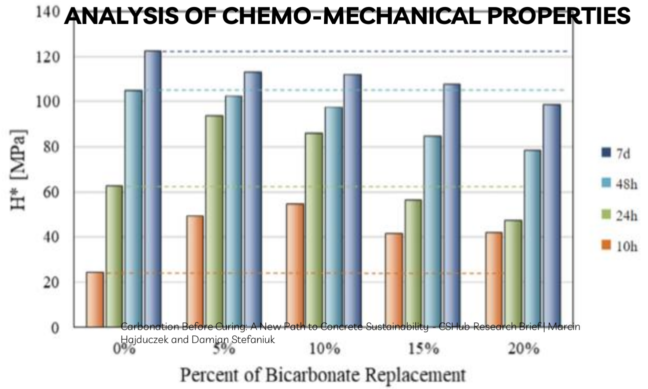


TOOLS TO MEASURE EMBODIED CARBON

GreenDOT (USA)

asPECT (UK)

ANALYSIS OF CHEMO-MECHANICAL PROPERTIES



Carbonation Before Curing: A New Path to Concrete Sustainability – CSHub Research Brief | Marcin Hajduczek and Damian Stefaniuk

INFRA 2050 INITIATIVE

To achieve net zero embodied carbon structures by 2050 by providing the structural engineering community with the resources and guidance they need to make this goal a reality.

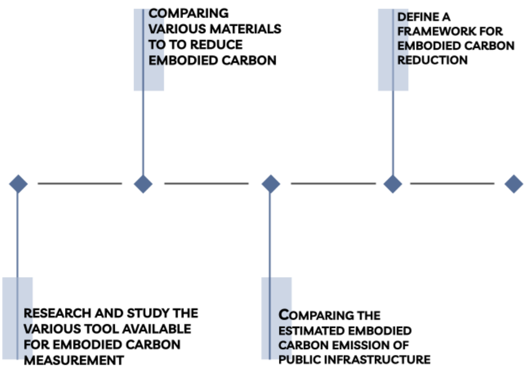
CARBON LEADERSHIP FORUM

The Carbon Leadership Forum accelerates the transformation of the building sector to radically reduce the greenhouse gas emissions attributed to materials (also known as embodied carbon) used in buildings and infrastructure.[2]

CARBON LEADERSHIP FORUM'S CHALLENGE AND INFRA2050 INITIATIVE

KG C02 EMBODIED PER 100 METRIC TONS	
MATERIAL	KG CO2
Concrete Panels	15,484
Asphalt	9,181
Cement Treated Aggregate	9,407
Base Aggregate	1,204

FUTURE GOALS OF THE RESEARCH



AUGEO:

Bridge Resilience Framework

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Figure: Brooklyn Bridge.

AUGEO: BRIGDE RESIELENCE FRAMEWORK

OBJECTIVE

Develop a user-centric framework, merging real-time disaster data with structural modeling to enhance bridge resilience, aligning with CBIPS's infrastructural innovation goals.

CLIMATE CHANGE:

Climate change intensifies natural disaster magnitudes. This exacerbation strains infrastructure resilience, urging advanced vulnerability and risk assessments to devise fortified engineering solutions.

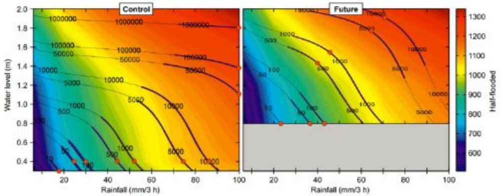


Figure 1: Risk Calculations for Control (Left) and Future (Right) Scenarios.

AGING INFRASTRUCTURE:

Aging infrastructure intensifies natural disaster repercussions due to outdated design standards, deteriorated materials, and lack of modern resilience measures. These factors collectively compromise structural integrity, escalate repair and recovery costs, and pose heightened safety risks.

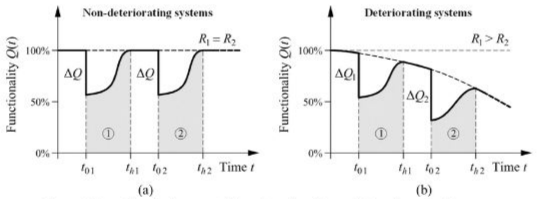


Figure 2: Functionality Losses of Non-Deteriorating and Deteriorating Systems.

HAZARD

NATURAL DISASTERS:

Earthquakes:
- Ground shaking, trembling.
- Significant ground displacement.

Fire:
- Rapid oxidation process.
- Compromise structural integrity.

Wind:
- Rapid air motion.
- High-intensity winds.

Floods:
- Overflow of water.
- Erode land, damage structures.

VULNERABILITY

EFFECTS ON BRIDGES:

Earthquakes:
- Geotechnical Failure.
- Structural Resonance.

Fire:
- Thermal Misalignment.
- Member Loss.

Wind:
- Aeroelastic Flutter.
- Vortex-Induced Vibrations.

Floods:
- Scouring.
- Hydrodynamic Loading.

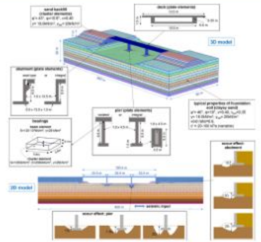


Figure 3: 3D and 2D FEM Model of and Scouring Bridge.

RISK

RESILIENCE ENGINEERING:

Risk:
- Risk is a function of hazard and vulnerability. The correlation between the two provides a qualitative risk matrix.

Hazard:
- Evaluates the potential natural disasters (e.g., earthquakes, fires, winds, floods), considering frequency, intensity, and potential impact.

Vulnerability:
- Evaluates bridge's susceptibility to the identified hazards, taking into account factors in design, materials, location, and construction quality.

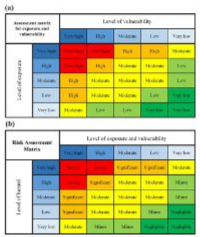
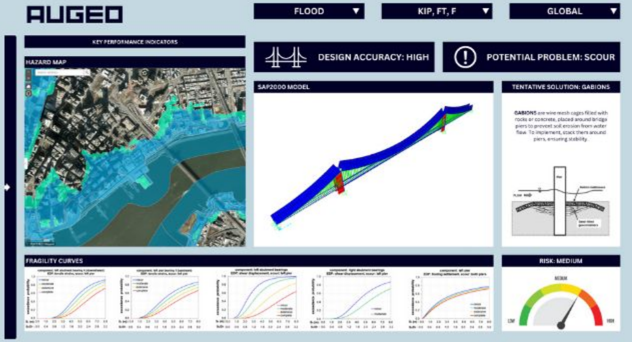


Figure 4: Risk Assessment Matrix.

FRAMEWORK

- REAL-TIME DATA INTEGRATION
- BRIDGE TYPE SUITABILITY
- STRUCTURAL ANALYTICAL FEEDBACK
- PROBLEM IDENTIFICATION
- QUALITATIVE RISK ASSESSMENT
- DESIGN IMPROVEMENTS



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