Welcome to the *Climate-Safe Infrastructure* Webinar Series

Supporting AB2800 and the Work of California’s Climate-Safe Infrastructure Working Group

May 17, 2018 | 12-1pm
Hosts

Juliette Finzi Hart | USGS
Co-Facilitator of CSIWG’s work
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Susanne Moser Research & Consulting
Co-Facilitator of CSIWG’s work
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AB 2800 (Quirk): Purpose

Examine how to integrate scientific data concerning projected climate change impacts into state infrastructure engineering, including oversight, investment, design, and construction.
AB 2800 (Quirk):
Scope of Assessment and Recommendations

The working group shall consider and investigate, at a minimum, the following issues:

(1) informational and institutional barriers to integrating climate change into infrastructure design.

(2) critical information needs of engineers.

(3) selection of appropriate engineering designs for different climate scenarios.
The *Climate-Safe Infrastructure* Webinar Series

**Purpose**
- Hear from others elsewhere with relevant experience and expertise.
- Hear from CSIWG members.
- Educate and engage with interested stakeholders on climate change and infrastructure issues.

**Sample of Webinar Topics**
- What climate science can offer
- Various sectoral perspectives
- Processes of changing engineering standards and guidelines
- Holistic infrastructure planning and management
- Financing climate-safe infrastructure
- And others...
Building the Right Project: An Engineer’s Perspective on Infrastructure Adaptation to Extreme Weather Events

Dr. Cris B. Liban, P.E., ENV SP, UCS Science Network, UCS | May 16, 2018, 3:20 PM EDT

MAY 14, 2018
Infrastructure Helps Us, But Who’s Helping Infrastructure?

Posted by Annika Deurlington
A Couple of Housekeeping Items

• Please type your questions for presenters into the chat box

• We will try to answer as many as possible after the presentations

• Answers to remaining questions will be posted on the website
Financing the Future: Challenges & Opportunities in the Building Sector

Andreas Georgoulias
Research Director
Harvard University Zofnass Program for Sustainable Infrastructure

Shalini Vajjhala
Founder & CEO
re:focus partners

David Dodd
Chairman & President
International Resilience Center
OECD WORKSHOP ON DATA COLLECTION FOR LONG-TERM INVESTMENT

Infrastructure Financing I: Innovative Instruments, Approaches and Partnerships

Dr. Andreas Georgoulías
May 17, 2018
The Envision Rating System
The Envision Rating System

A set of 64 **quantitative and qualitative indicators** that identify and measure critical sustainability issues and provide recommendations for improvement.
The Envision Rating System

**SANTO ANTONIO HYDROPOWER PLANT**
**PLANTA HIDROELÉCTRICA SANTO ANTONIO**

**PURPOSE**

- QL1.1 Improve Community Quality of Life
  - QL1.1 Mejorar la Calidad de Vida de la Comunidad
- QL1.2 Stimulate Sustainable Growth & Development
  - QL1.2 Estimular el desarrollo y el crecimiento sostenible
- QL1.3 Develop Local Skills And Capabilities
  - QL1.3 Desarrollar Capacidades y Habilidades Locales

**COMMUNITY**

- QL2.1 Enhance Public Health And Safety
  - QL2.1 Mejorar la Salud Pública y la Seguridad
- QL2.2 Minimize Noise And Vibration
  - QL2.2 Minimizar ruidos y vibraciones
- QL2.3 Minimize Light Pollution
  - QL2.3 Minimizar Contaminación Luminica
- QL2.4 Improve Community Mobility And Access
  - QL2.4 Mejorar el acceso y la movilidad de la Comunidad
- QL2.5 Encourage Alternative Modes Of Transportation
  - QL2.5 Fomentar modos alternativos de transporte
- QL2.6 Improve Site Accessibility, Safety & Wayfinding
  - QL2.6 Mejorar la accesibilidad, seguridad y señalización

**WELLBEING**

- QL3.1 Preserve Historic And Cultural Resources
  - QL3.1 Preservar los recursos históricos y culturales
- QL3.2 Preserve Views And Local Character
  - QL3.2 Preservar las vistas y el carácter local
- QL3.3 Enhance Public Space
  - QL3.3 Mejorar el espacio público

- QL0.0 Innovate Or Exceed Credit Requirements
  - QL0.0 Créditos innovadores o que excedan los requerimientos

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**Envision Assessment**

[Diagram showing assessment results]
A case study: one need, three alternatives

Alternative I:
- Business-as-usual, capex X

Alternative II:
- Capex 1.8X, lower opex

Alternative III:
- Capex 1.6X, lower opex

Which one to choose??
Step 1: apply Envision
Step 2: apply the Zofnass Economic Tool

- Revenues
- Operating costs
- Financing costs
- Taxation costs

Profit/ (Loss)

Project basic cash flow

Project cash benefits
- Revenue growth
- Lower operating costs
- Lower cost of financing
- Access to subsidies

Value creation

Project non-cash benefits
- Lower risks
- Stakeholder approval
- Employee productivity
- Corporate image

Value creation

Society cash benefits
- New jobs
- Increased spending
- Gov revenue growth
- Other benefits

Value creation

Society non-cash benefits
- Education
- Health
- Environment
- Biodiversity

Value creation
Step 3: Quantify impacts
Step 3: Quantify impacts

- Tax base increase from construction jobs
- Construction noise and vibration impacts
- Waste management impacts
- Construction job spillover benefits (shadow wage)
- Embodied energy impacts from construction materials
- Project impact on greenfields
Step 4: Examine the Life-Cycle of Impacts
Step 5: Compare alternatives and decide
THANK YOU

FOR MORE INFORMATION
www.zofnass.org

Dr. Andreas Georgoulias
ageorgou@post.harvard.edu
Capturing Value for Resilient Infrastructure Project Finance

Shalini Vajjhala
Climate-Safe Infrastructure Working Group
[Webinar]
March 17, 2018
Drivers for Linking Resilience & Insurance

Image credit: weather.gov
A lot of infrastructure is designed to reduce risk

- Public sector assets & services are safer
- AND insurance companies lose less money when public & private policy holders are better protected

We developed Resilience Bonds as one way of ensuring the financial value created by these public investments returns to the public sector
Three Entry Points for Cities & Utilities

- **Peril/Liability**: growing risks & expected losses
  - New Orleans Levee Systems
  - Thames Barrier (London)

- **Insurance**: required coverage or compliance
  - New York MTA (2013)
  - Amtrak (2015)

- **Project**: planned resilience projects
  - Planned Upgrade/Required Recertification
  - New Construction
How Resilience Bonds Work

Property Insurance Co.

Cat Coverage

Policy Holder

Catastrophe Bond Investors

Insurance Policy

Property Insurance Co.
How Resilience Bonds Work

Public Works Project

- Project Funding
- Project Benefits

Policy Holder

- Insurance Policy

Cat Coverage

- Property Insurance Co.

Catastrophe Bond Investors
How Resilience Bonds Work

Property Insurance Co.

Cat Coverage

Catastrophe Bond Investors

Resilience Project

Policy Holder

Avoided Losses

Project Funding

Project Benefits

Insurance Policy
How Resilience Bonds Work

Resilience Project

- Project Funding
- Project Benefits

Policy Holder

- Insurance Policy

Cat Coverage

- Reduced Premiums
- Reduced Risk to Principal

Property Insurance Co.

Catastrophe Bond Investors

- Avoided Losses
- Project Rebate
Benefits of Resilience Bonds

1. Fill Project Funding Gaps
   - Rebates can be securitized to cover up-front budget shortfalls or fund future project phases
   - Savings can cover O&M costs or addt’l insurance

2. Help Meet Insurance Compliance Obligations
   - Existing federal disaster assistance requirements
   - Potential new req’s (i.e. FEMA Disaster Deductible)

3. Enhance Project Design Integrity
   - Create additional financial benefits, where catastrophe protections also reduce chronic risks
4 Ways We Create Opportunities for Financing Protection

1. Finding the ‘Biggest Losers’: Who is currently losing money or facing a near-term shortfall without a specific resilience investment?


3. Fostering Flexibility: Linking revenue & non-revenue generating projects and services.

Questions? Read more at: www.refocuspartners.com/rebound/

Reports

Resilient infrastructure finance is complex. The benefits of projects, like seawalls and green flood management systems, are often diffuse and realized far into the future. Read our RE:bound reports below to learn more about how Resilience Bonds can help communities bridge the gap between infrastructure and insurance, and explore our Sponsorship Flowchart to see if a Resilience Bond is a good fit for your needs.

Leveraging Catastrophe Bonds as a Mechanism for Resilient Infrastructure Project Finance →

A Guide for Public-Sector Resilience Bond Sponsorship →
Building Resilience Through Public Private Partnerships

Presented to the AB2800 Climate-Safe Infrastructure Webinar

May 17, 2018

Presented by IRC--The International Resilience Center (www.ipprrc.org)
The Cost of Not Investing in Resilience is Huge

• “With the total of last year’s disasters costing nearly the same as Denmark’s gross domestic product, which the World Bank tallied at $306.9 billion in 2016, we cannot simply react to disasters anymore, but embrace a world proactively built to mitigate and withstand the changes in our climate….without the assurances of evidence-based research to guide the design, creation, and impact of new infrastructure, there is little hope for a sustainable future anywhere.”
  --”Staggering Costs: The Economics of Sustainable Infrastructure” by Michelle Wyman, Executive Director, U.S. National Council for Science and the Environment

• A small investment may produce significant returns for both public and private sectors through reduced loss and suffering
Resilience-Focused Public Private Partnerships

• Example: New Orleans Iconic Art-Deco “Big Charity” Public Hospital

• Massive 1.2mm sq. ft. public hospital--flooded, condemned

• Federal and State governments could not afford the added investment needed to produce resilient facilities, specifically a new super-resilient emergency facility

• Of the 1,170 deaths from Katrina, estimated 520 were in acute medical care prior to the storm

• Construction of new, 450-bed facility with extremely resilient emergency care facility-$1.1b

• Non-profit health foundation partnered in building, operation

<table>
<thead>
<tr>
<th>Source</th>
<th>Funding</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>$642m</td>
<td>Public Health</td>
</tr>
<tr>
<td>State</td>
<td>$279m</td>
<td>State University Medical School</td>
</tr>
<tr>
<td>Private</td>
<td>$143m</td>
<td>Management</td>
</tr>
</tbody>
</table>
Other examples of PPP for Resilient Infrastructure

1. Indian Ocean Tsunami (2004)—two companies, CH2M Hill and ARUP Group, raised $80,000 and $370,000 respectively internally in a show of goodwill, leading to the following:
   - CH2M Hill was granted concession to construct water treatment plants in Sri Lanka and Indonesia in partnership with GE, ongoing services to the Sri Lanka Tsunami Reconstruction Program, and construction of two water treatment plants in Maldives
   - ARUP received several contracts for technical advisory services

2. Japan East Coast Earthquake and Tsunami (2011)—Japan fully embraced PPP as a way to both more effectively rebuild and lessen “force majeure”—unforeseeable circumstances that prevent someone from fulfilling a contract. Full report is available for free download:
### Japan’s Methodology—Transfer of Disaster Risk

#### Transfer of Natural Disaster Risks in PPP Projects, by Project and Payment Type

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Natural Disaster Risks</th>
<th>Force Majeure</th>
<th>Private</th>
<th>Public</th>
</tr>
</thead>
</table>
| **BTO** (availability payment) | ![Diagram](image) | - Samples of force majeure are identified.  
- Force majeure risk will be mainly borne by the public. | | |
| **BOT** (availability payment) | ![Diagram](image) | - Provides more clarity on definition of force majeure than the above.  
- Private party owns facilities and bear a part of natural disaster risks in some cases. | | |
| **BOT** (user payment and high profitability) | ![Diagram](image) | - Force majeure risks will be borne by the private party under a project with high profitability. | | |

**Note:** BOT = build-operate-transfer. BTO = build-transfer-operate. PPP = public-private partnership. “Availability payment” refers to government payment of unitary charges to operators. “User payment” refers to payment to operators from user fees.
<table>
<thead>
<tr>
<th>Disaster type</th>
<th>Events for which additional costs are borne by the public sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Earthquake</strong></td>
<td>• Damage based on normal social conventions</td>
</tr>
<tr>
<td><strong>Heavy rain</strong></td>
<td>• Maximum rainfall of 80 millimeters or more in 24 hours</td>
</tr>
<tr>
<td></td>
<td>• Even if the rainfall is below the above standard, it is considered heavy rain if the hourly rainfall is significant (20 millimeters or more), provided that the hourly rainfall is observed at the nearest weather observation station (managed by the public corporation) from the damaged place.</td>
</tr>
<tr>
<td><strong>Storm</strong></td>
<td>• Maximum wind speed of 15 meters per second or more (average in 10 minutes)</td>
</tr>
<tr>
<td><strong>High tide, storm surge, tsunami</strong></td>
<td>• Extraordinarily high tide, storm surge, or tsunami caused by a storm or its aftermath with relatively nonminor damage</td>
</tr>
</tbody>
</table>

The public sector shall bear the cost if the concessionaire cannot foresee or cannot be reasonably expected to establish measures to prevent additional costs. More precisely, additional costs resulting from natural disasters that fall under force majeure would be borne by the public sector if (a) the disaster recovery project is in accordance with the National Government Defrayment Act for Reconstruction of Disaster Stricken Public Facilities, and (b) the public sector agrees that there were no reasonable measures that the concessionaire could have taken to prevent the additional costs from being incurred because the event was unforeseeable.

*Source: Contract documents, Aichi Toll Road Project.*
## Proposed Framework - Resilient PPPs - World Bank

<table>
<thead>
<tr>
<th>Area</th>
<th>International Organization</th>
<th>Awarding Authority</th>
<th>Private Sector</th>
</tr>
</thead>
</table>
| **Policy and Legal Framework** | • Foster political will on resilience  
• Bolster DRM and resilience in PPP technical assistance  
• Encourage emphasis on climate risk in public investment management frameworks  
• Strengthen country’s capacity to make robust decisions in face of uncertainties | • Introduce flexibility into existing PPP policy frameworks to enable integration of resilience  
• Level the playing field on disaster risk and resilience in PPP procurement  
• Review language of PPP contracts | • Promote awareness of climate and disaster risk in insurance  
• Support to improve disaster resilience by advisers |
| **Project Preparation and Structuring** | • Bolster climate risk and resilience in PPP technical assistance  
• Strengthen country’s capacity to make robust decisions in face of uncertainties  
• Leverage climate finance and financial risk mitigation instruments | • Incorporate climate and disaster resilience in project preparation and transaction structures  
• Level the playing field on climate risk and resilience in PPP procurement | • Shareholders: Understand implications of natural disaster for investment performance  
• Insurers: Promote awareness of climate risk in insurance  
• Advisers: Develop capacity on climate resilience by advisers |
| **Procurement**        | • Leverage climate finance and financial risk mitigation instruments | • Incorporate climate and disaster resilience  | • Insurers: Promote awareness of climate risk in insurance  
• Advisers: Develop capacity on resilience |
| **Implementation**     |                                                                                         | • Harness private sector DRM expertise                                           | • Project company: Incorporate resilience measures through project life cycle |
| **Risk Transfer and financing** | • Leverage climate finance and financial risk mitigation instruments |                                                                                   | • Lenders: Incorporate DRM and resilience in lending criteria and loan covenants |
Australia’s TISN-CIR: Programmatic Best Practice

Building PPP for Resilience at a National Scale

- Trusted Information Sharing Network for Critical Infrastructure Resilience
- Serves as a prime mechanism to develop a partnership approach between business and government for more resilient critical infrastructure, as a shared responsibility
- Builds relationships and trust between federal/state/local governments, NGOs, universities, and businesses
- Focuses on policies to encourage formation of partnerships for more resilient infrastructure, focusing on interdependence, common needs
- Implemented policy changes to allow flows of critical information
- Can facilitate horizontal (B to B, interagency) and vertical (business to government-featuring a direct line to the Australian AG) connections
THANK YOU!

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Financing the Future: Challenges & Opportunities in the Building Sector

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Thank you!

• The *Climate-Safe Infrastructure* Webinar Series continues at least through July 2018

• Upcoming webinars:
  • Financing the Future – Parts 2 and 3 (end of May / early June)

• Track webinars and progress of CSIWG at: [http://resources.ca.gov/climate/climate-safe-infrastructure-working-group/](http://resources.ca.gov/climate/climate-safe-infrastructure-working-group/)

• Questions: Joey Wall - [Joseph.Wall@resources.ca.gov](mailto:Joseph.Wall@resources.ca.gov)