

Rhys Roth, Director  
Center for Sustainable Infrastructure  
at The Evergreen State College



Infrastructure Assistance Coordinating Council  
2014 Conference

### Infrastructure = Boring!? ...but SO Important!



- ▶ Economic Development
  - ▶ Environment
    - ▶ Quality of Life
      - Vital services for local businesses
      - Affordable for residents and business
      - Job creator
      - Spur real estate investment



### We are going to spend staggering sums

...in the coming decades to keep our transportation, energy, water, and waste systems in working order.



- ▶ Globally, \$57 trillion will be required for infrastructure by 2030 just to keep up with GDP growth -- McKinsey and Company
- ▶ Along the Pacific Coast, \$1 trillion needed in the next 30 years -- CH2M Hill

These are the vital circulatory systems of our society!

### Our Infrastructure Deficit



1. Capital funding is lagging to restore aging facilities, and to accommodate growth.
  - ▶ Traditional state and federal funding sources have shrunk.
    - ▶ [Check out AWC's new video!](#)
2. Budgets for O&M are under serious strain as systems age and costs escalate.
  - ▶ Maintenance deferred is 2-4x more expensive

### Innovation Required!



"We're making decisions today that we'll live with for 50 years. We can't keep doing things the way we always have."  
-- Peter Binney, 2011 winner of the ASCE President's Medal.



The purpose of the Center for Sustainable Infrastructure:  
*Advance a new sustainable infrastructure paradigm and practice in the Pacific Northwest, and help Washington and Oregon become nationally-recognized innovators in sustainable infrastructure solutions.*

### Interview 70 Thought Leaders and Innovators



- ▶ From Washington, Oregon and British Columbia
- ▶ Span the water-related, energy, transportation and waste sectors, plus cross-cutting experts.

**Special report coming in early November:** Inspiration and guidance for current and future infrastructure leaders, policymakers, and change agents.



### Go for the Triple Crown: Fiscally Sound, Resilient, and Sustainable

The best infrastructure solutions do these simultaneously:

- ▶ **affordability** for residents and businesses, for the long-term
- ▶ **superior environmental performance**
- ▶ **resilience** in the face of major disruptive events

And the Fourth Crown:

- ▶ **multiple community-wide benefits** - economic, health, social, and environmental



### Consider Broader Alternatives and Encourage Silo-Busting

- ▶ Smart investors seriously consider alternatives as part of their due diligence.
- ▶ Before committing real money to business-as-usual infrastructure projects and programs:
  - ▶ Invite innovative ideas
  - ▶ Thoroughly compare options to find the most cost-effective over the lifecycle with the most community-wide benefits
- ▶ Silos in our communities' infrastructure: Streets and bridges, electricity, natural gas and heating services, water supply, sewers and stormwater, and waste recycling and recovery.
- ▶ Consider these systems as parts of a larger interacting whole to find valuable synergies -- for example, waste from one system can become a resource for another.



### Build a Better Business Case

- ▶ Measure full benefits and costs, and to do it on a life-cycle basis.
- ▶ Within the department silo, to government more broadly, and to the community.
  - ▶ Smart investments will save money, manage risk, and accrue benefits across departments, and serve broader community goals.



### Choose for a Changing World

- ▶ Infrastructure decision-makers must increasingly be future-casters.
- ▶ It's vital to build infrastructure systems well-adapted to our changing world
  - technology revolutions
  - major environmental stresses
  - shifting demographics, living patterns and changing lifestyles of the next generation



### Get Smart

- ▶ Today people carry devices packing information, communications, and monitoring capabilities unimaginable a generation ago.
- ▶ Advanced technologies are transforming many industries.
- ▶ Infrastructure managers, tapping private sector expertise, could achieve radical cost efficiencies and service gains.



### Build Community Prosperity

- ▶ Infrastructure is a job generator and vital to local business and economic vitality.
- ▶ Integrate the community's strategies for infrastructure and economic development
  - Opportunity to in-source infrastructure jobs and lift up segments of the community too often left out.
- ▶ Higher education can build the critical pipeline of local talent
  - The infrastructure workforce is graying!



**Bottom Line: We've Gotta Make Infrastructure Sexy!**

- ▶ Traditional funding sources are drying up
- ▶ The public is largely oblivious
- ▶ The workforce is aging

We need to:

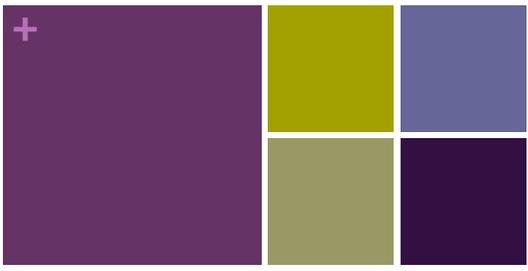
- ▶ Galvanize the public
- ▶ Make this a winning issue for elected officials
- ▶ Inspire a new generation to get into the field



**Stay Tuned!**  
For more information, contact...

Rhys Roth, Director  
Center for Sustainable Infrastructure  
[rothr@evergreen.edu](mailto:rothr@evergreen.edu); 360.867.6906





**Sustainable Infrastructure**

STEVE MODDEMEYER | COLLINSWOERMAN  
smoddemeyer@collinswoerman.com



**+ Values**

- Grit
- Determination
- Hope
- Innocence



3



**Values**

The framework for community identity



Photo by: amy hess

**+ Value: Resilience**

- To adapt
- To evolve
- To incorporate new technology
- To incorporate new advancements

6

**+ Value: To Thrive**

- Through good times
- Through tough times
- For a long time

**+ Value: Leverage every dollar to achieve more value**

- Nobody has money to waste
- Need every investment to create
  - Economic value
  - Community value
  - Environmental value

**+ 1. Integration**

It takes more effort

- We're trained in silos and implement in silos

It creates more value

- Every move builds on the last



**+ 2. Broader alternatives**

- Are we LEAVING MONEY ON THE TABLE because of we don't look broadly enough at alternatives?
- Can we GET MORE VALUE per dollar spent?

13

## + 2. Broader alternatives

Assemble a team of “T-shaped” individuals as advisors

- Experts in each field who are also naturally open to new ideas
  - 5% of any silo
  - Busiest people around

Have them review and critique projects before they are submitted for budgeting

- Help project managers to explore new alternatives
- Help identify plausible new technologies
- Get specific about risk and risk cost



15

POWER Engineering

Home | Boilers | Coal | Gas | Renewables | Nuclear | Onsite Power | O&M | Emissions | Business

Home | The Nature Conservancy and CH2M HILL Team Up in Groundbreaking Effort to Integrate Natural and Conventional Infrastructure

### The Nature Conservancy and CH2M HILL Team Up in Groundbreaking Effort to Integrate Natural and Conventional Infrastructure

09/16/2014

ARLINGTON, VA—(Marketwire - Sep 16, 2014) - CH2M HILL and The Nature Conservancy announced a new five-year collaboration to bring innovative and integrated engineering and environmental solutions into the global marketplace.

"The planet faces powerful systemic challenges that together, we are well-positioned to address," said Kacky Andrews, Director of Conservation Programs North America at The Nature Conservancy. "Both natural ecosystems and human-made infrastructure, require creative new solutions to address the intertwined and increasing challenges of a rising and urbanizing population, overtaxed natural resources and a changing climate."

"Evaluating the capabilities and benefits of natural infrastructure -- such as reefs, wetlands and urban green spaces -- alongside built structures, such as breakwaters, seawalls and levees -- can offer engineers, planners and communities the broadest possible menu of options in any given place," said Elisa Speranza, CH2M HILL's executive sponsor for the collaboration. "It's all about achieving the most efficient, flexible and cost-effective blend of solutions for communities."

ftaennet.com/home/1191948291954/Right/ItemWeb/ItemWeb\_PE\_xL1/FLSM\_PE\_551\_130218.grf.html/77736376456517466134414354626e





### +3. Scale

- Blend old and new with nested semi-autonomous
  - Buildings
  - Neighborhoods
  - Cities

+

Luckily, we can get better at this through

1. training
2. pre-design workshops,
3. technical assistance,
- and 4. loans directed toward sustainable infrastructure plans and projects

+

## Questions/Comments?

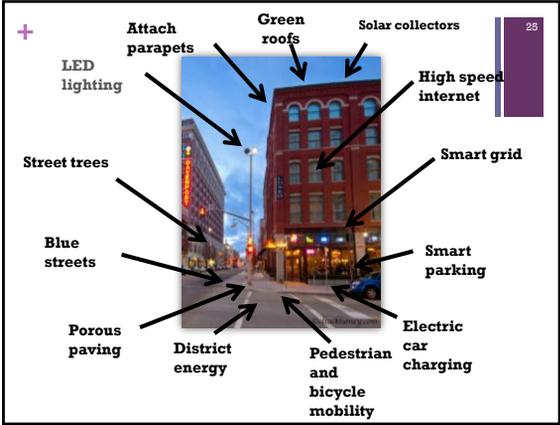
COLLINS  
WOERMAN

Thank you!

STEVE MODDEMEYER | COLLINSWOERMAN  
smoddemeyer@collinswoerman.com

+

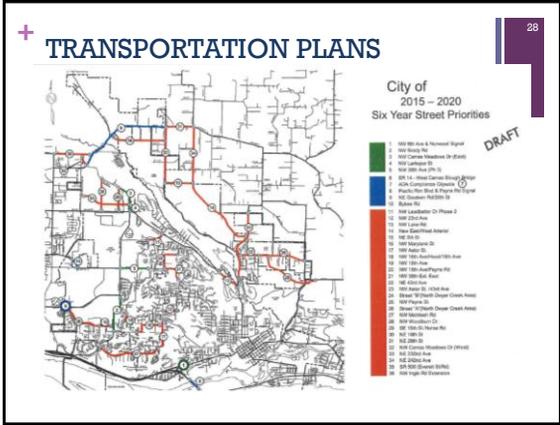
## How do our existing cities adapt to change?



### DECISION-MAKER'S CRITERIA WHEN EVALUATING PLANS AND PROJECTS

- Will it be the same or better levels of service for the same or less cost?
- Are we maximizing value for the whole community?
- Did we
  - Compare technologies across silos?
  - Compare labor vs. capital?
  - Centralized vs. decentralized?
- Are we increasing our capacity to adapt to all kinds of change?

### Other examples



### TRANSPORTATION PLANS

- How can we get most value for the spending we must do?
  - Can transportation improvements also
    - Enhance internet connectivity?
    - Increase open space?
    - Facilitate district energy systems?
    - Create more jobs?
    - Increase flood capacity?



**+ OPEN SPACE PLANS** 31

- Can open space plans also
  - Provide flood storage capacity?
  - Hazard recovery zones?
  - Provide urban food gardens?
  - Facilitate district energy systems?
  - Link with affordable housing developments?

**+ WHAT DOES IT LOOK LIKE?** 32

**NEW BUILDINGS AND REDEVELOPMENT**

- Use renewable resources
  - Sun
  - Rain
  - Soils
  - Food
  - Shade
  - Vegetation
  - Wind
  - Evaporation
- Close loops
  - Air to air heat exchangers
  - Geo-exchange heat/cool
- Smart systems
  - Real time monitoring
  - Feedback loops





**+ WHAT DOES IT LOOK LIKE?** 33

**NEIGHBORHOODS**

- Link together green semi-autonomous buildings
  - Feedback loops
- District energy using renewable energy/water
  - Local Food/Farmer's markets
  - Integrate stormwater plantings
  - Design places that people love and will care for over time
- Install smart systems
  - Sun
  - Rain
  - Soils
  - Shade
  - Vegetation
  - Real time monitoring



**+ “The United States should design infrastructure investments in service of the next economy, not the current or prior one.”** 34

KKR May 2014

10/1/14

**UTILITY PLANS**

**N/NE 80<sup>th</sup> Street Feeder Main Rehab**

Problem:  
From a 1994 Study on water feeder mains, this project was identified as a high priority pipe for rehabilitation due to the number and frequency of leaks from ongoing failures at the joints. The project proposed to slipline (insert smaller pipe into the existing one) approximately 9,000 linear feet of existing pipe on N/NE 80th Street at a cost of about \$4 million.

Seattle Public Utilities

35

**UTILITY PLANS**

**N/NE 80<sup>th</sup> Street Feeder Main Rehab**

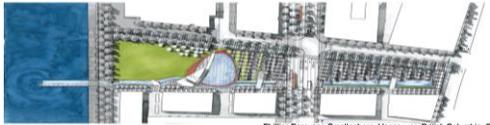
New Solution:  
Although the historical number of leaks on this pipeline was high (26), the frequency was actually fairly low (approx. 1 per year). The business case analyzed the continued cost of repairs – about \$20,000 per year – versus the annualized cost of rehabilitation. The economics showed that it was far more cost effective to spend \$20k per year on repairs than move forward with a \$4M construction project. The analysis was conducted on a triple bottom line basis, wherein impacts to customers of the annual leak repair and the impact to customers of the rehabilitation project were taken into consideration. This is a case where the status quo option was recommended, where in the past, we may have replaced the asset before the optimal economic life was attained.

Seattle Public Utilities

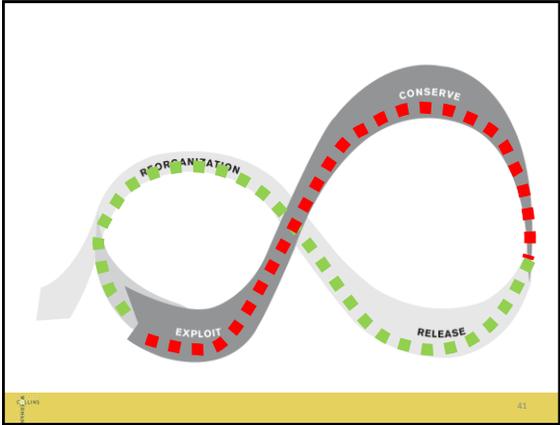
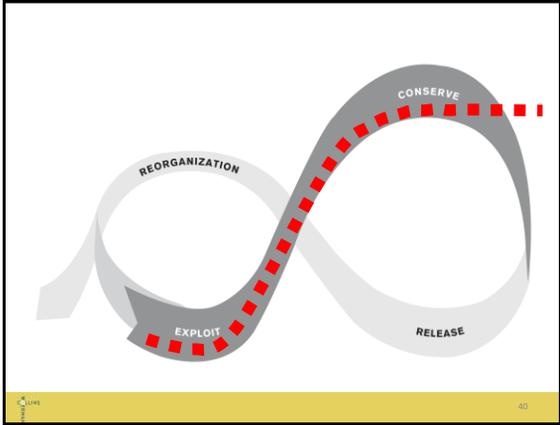
36

### SHERBOURNE COMMON, TORONTO

- Stormwater control
- Stormwater treatment
- Park

Philips Farevaag Smallerberg, Vancouver, British Columbia, Canada



### IMPLEMENTATION OF SUSTAINABLE INFRASTRUCTURE

Manage all public urban lands as integrated land holding that

- Provides mobility
- Open space
- Recreation
- Habitat
- Aesthetic beauty

Use asset management and triple bottom line accounting to compare alternatives

