

CH2MHILL®

Investing in Green and Sustainable Infrastructure



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CH2M HILL is a global leader

in full-service consulting, design, design-build, operations, and program management services.

We help our clients build a better and more sustainable world in the areas of:

Helping clients save more than 8.3 million kilowatt hours of electricity, 310,000 therms of gas and 36.3 million gallons of water annually

In the Western U.S alone, we have reused 2.1 billion gallons of water at treatment facilities through operations

Environmental

Water

Energy

Facilities

Resources

Transportation

CH2M HILL: Selected Methods Systems and Technologies

- Sustainability Information Port™ (SI Port)
- CH2M HILL Materials and Subcontracts Management System (CMAS)
- Sustainability Assessment Framework™ (SAF)
Provide quantitative and qualitative scores for all of the recognized sustainability factors for a project
- Greenroads™ Rating System
Transportation Rating System
- Envision™ Rating System
Green Infrastructure Rating System
- Smart Growth and Environmental Innovations:
Contract with EPA to help US communities develop holistic smart growth tools to move toward a more balanced and sustainable community

CH2M HILL: Selected Clients and Projects



- **Dow Chemical**
Groundwater and Effluent Management using Renewable Energy
- **Lancaster, PA**
Green Infrastructure Plan
- **Cincinnati, Ohio**
Integrated Wet Weather Planning Program Development and Implementation
- **US Department of Defense**
Strategic Sustainability Performance Planning
- **City of Philadelphia, PA**
Green City, Clean Waters

Utilize skills and knowledge to invest in green and sustainable infrastructure

US Market Demand for Green Infrastructure

\$72 trillion worth of free goods and services provided by the natural living infrastructure, state and local governments

White House Executive Order 13514 - *Federal Leadership in Environmental, Energy and Economic Performance* which directs agencies to meet a number of energy, water and waste reduction targets

Over **30 infrastructure funds** ready to invest in the U.S. market with a levered purchasing power of approximately **\$475 billion**

Large market in the United States for green and sustainable infrastructure

Why are Investors Interested in Green Infrastructure?

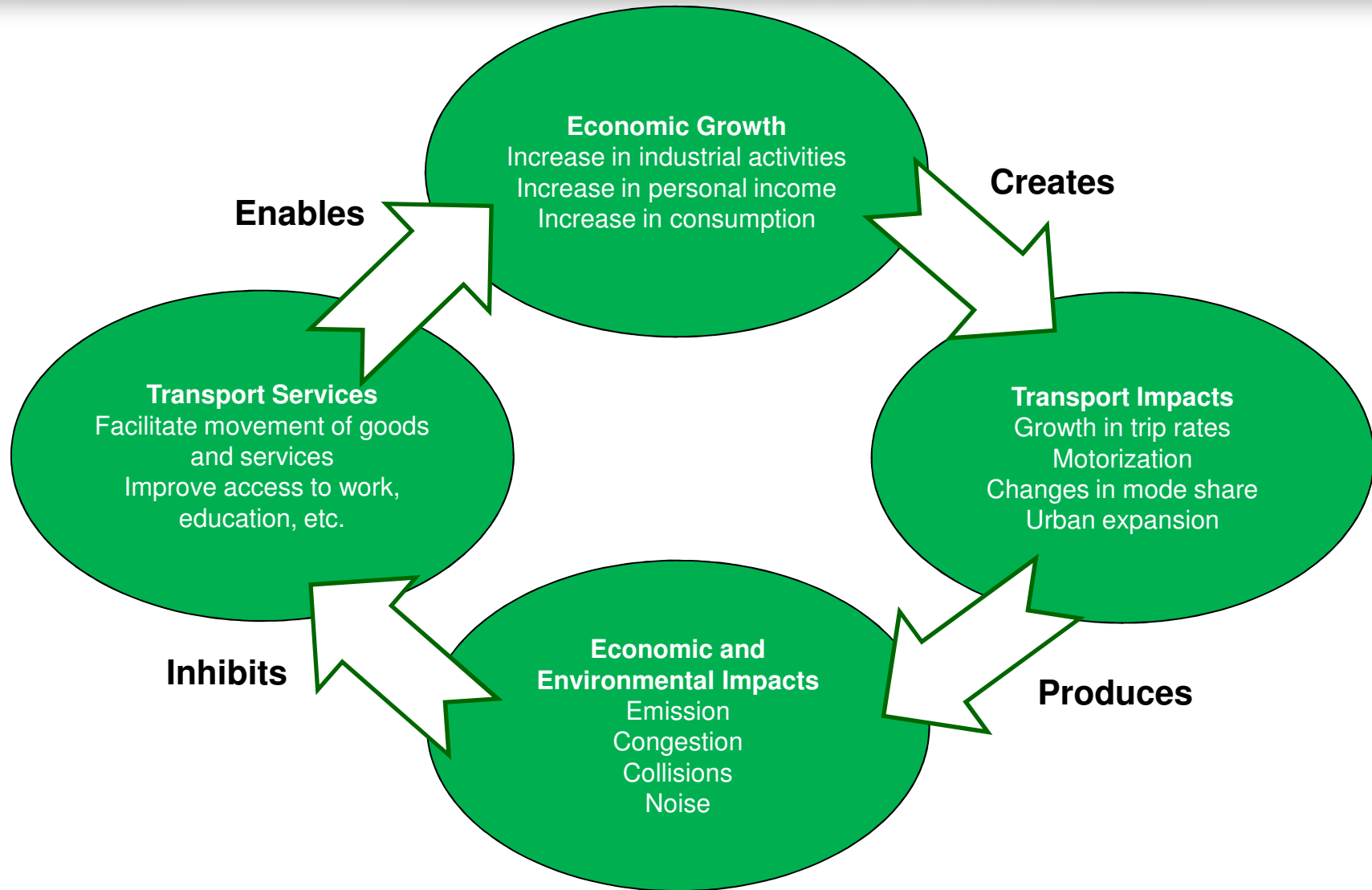
What are the problems with our current infrastructure?

- Droughts
- Water shortages
- Extreme flooding and flood damage
- Collapsing bridges
- Traffic
- Extended Urban Sprawl
- High energy cost

What are the benefits of green infrastructure?

- Holistic approach to remediation
- Beautification of neighborhoods
 - Reduction of energy use
 - Cleaning of air systems
 - Increase in health living
 - Job Creation
 - Flood alleviation
 - Quality of place
- Economic Benefits

Infrastructure is fundamental to economic growth – Green approaches can make it more affordable



Patterns: Advent of Green Infrastructure

Evolution of Green Buildings 1999 – nearing maturity

Green buildings adapted to technical demands

Architects adapted to green buildings

Higher initial costs, lower life cycle costs

Early investors, exceptional market insight

Evolution of Green Infrastructure 2006 – exiting initial acceptance

Green infrastructure adapted to technical demands

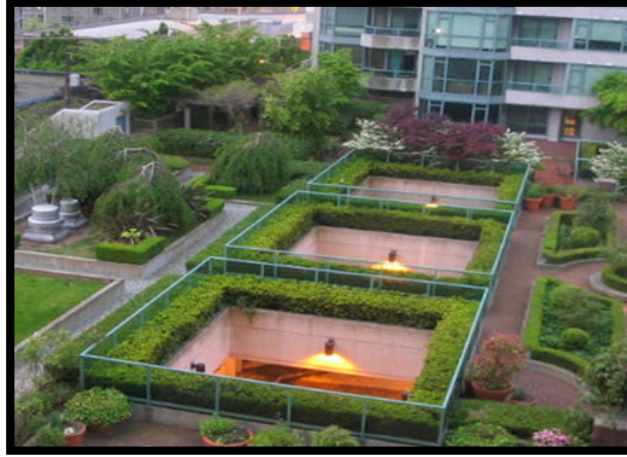
Engineers adapted to green buildings

Lower initial costs, lower life cycle costs

Early investors, exceptional market insight

The development of green and sustainable infrastructure (GSI) parallels the development of green and sustainable buildings in several ways

Green Infrastructure Technologies – *Need to become a common language*



Bio-Swales

Blue Roofs

Constructed Treatment Wetlands

Coral Reefs

Wastewater Treatment

Green Roofs

Mangroves

Composting

Oyster Walls

Permeable Pavement

Rain Gardens

Vegetative Landfill Covers

Sustainable Street Design

Energy Strategies

Green Infrastructure Services Create Added Value

Integrating readily implementable green infrastructure projects and programs can help address these types of challenges very well:

- Sewer Overflow
- Severe Wet-Weather
- Stormwater Management
- Flood Control Programs
- Community beautification

Watershed Management and water shortages

Coastal Resilient and Protection for mitigation and adaptation

Environmental cost benefit analysis services

Third Party Project Financing Interest

CH2M HILL has completed over 200 GI projects ranging from feasibility studies to planning and permitting, design, construction and O&M

City of Cincinnati, Ohio

Integrated Wet Weather Planning Program Development and Implementation Services

Technologies Used:

- Bioswales
- Green Roofs
- Reforestation
- Native Vegetation
- Pervious Pavement

Main Functions:

- Water Management
- Flood Control
- Social Attributes

Cost Benefits:

- Green stormwater infrastructure is anticipated to have lower capital costs, lower maintenance requirements and cost, improve water quality and enhance healthy community living



City of Cincinnati, Ohio

LENS Screening and Benchmarking Assessment

Screening and Benchmarking system to promote integrated planning.

Evaluation of green and gray infrastructure for wet weather improvement program using principles of **sustainability**



Howard Beach, Queens Report

The Natural Conservancy, along with CH2M HILL and Davey Resource Group, released a report outlining the risks, infrastructure alternatives and financing options for Howard Beach, Queens in response to Superstorm Sandy

The **key findings** included:

Howard Beach **faces significant flood risks** which could result in damages ranging from \$30 million to \$494 million. A rise in sea level of 32 inches will double the losses to \$1 billion in a 100 year period

Preliminary research showed a **integrated green and grey infrastructure plan could cost-effectively reduce flood risks**

Opportunities exist to spread the **cost among private and public entities** that would greatly benefit from **increased resilience**

Howard Beach, Queens Report – It’s a balance of grey and green – for now

Alternative 1: “Natural infrastructure only”



Capital Cost: \$40 M
 Annual O&M: \$373 K
 1-in-100 yr. damage: \$465 M
 Avoided damage: \$29 M
 Annual Ecosystem Services Benefit: \$172 K
 B/C Ratio: **0.73**

Elements: +14' NAVD berms, restored marsh, and ribbed mussel hard toe in Spring Creek Park; rock groin at Charles Memorial Park; breakwater at entrance to Shellbank Basin.

Alternative 2: “Wetlands”



Capital Cost: \$88 M
 Annual O&M: \$772 K
 1-in-100 yr. damage: \$462 M
 Avoided damage: \$32 M
 Annual Ecosystem Services Benefit: \$279 K
 B/C Ratio: **0.36**

Elements: +14' NAVD berms, restored marsh, and ribbed mussel hard toe in Spring Creek Park; restored and new marsh in Jamaica Bay.

Alternative 3: “Hybrid with removable walls”



Capital Cost: \$249 M
 Annual O&M: \$913 K
 1-in-100 yr. damage: \$146 M
 Avoided damage: \$348 M
 Annual Ecosystem Services Benefit: \$662 K
 B/C Ratio: **1.39**

Elements: +14' NAVD berms, restored marsh, and ribbed mussel hard toe in Spring Creek Park; berm and rock groins at Charles Memorial Park; removable flood walls along Crossbay Boulevard, Shellbank Basin, west side of Hawtree Basin, and portions of the Belt Parkway.

Alternative 4: “Hybrid with moveable gates”



Capital Cost: \$76 M
 Annual O&M: \$895 K
 1-in-100 yr. damage: \$28 M
 Avoided damage: \$466 M
 Annual Ecosystem Services Benefit: \$662 K
 B/C Ratio: **6.08**

Elements: +14' NAVD berms, restored marsh, and ribbed mussel hard toe in Spring Creek Park; berm and rock groins at Charles Memorial Park; moveable flood gates at entrances to Shellbank and Hawtree basins; berm at parkland in Hamilton Beach.

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Confidential Client: Puerto Rico

Groundwater and Effluent Management using Renewable Energy

Technologies Used:

- Solar Powered Groundwater Treatment

Main Functions:

- Water Management
- Waste Production and treatment
- Energy Consumption
- GHG emissions
- Renewable energy

Cost Benefits:

Long term (≈ 8 years) cost payback for utilizing renewable energy over power from the grid for a 15 year designed operating life

Some Options for Infrastructure Funding

- Fee Based Credit System
- PACE: Property Assessed Clean Energy Programs
- Credit Enhancement
- **Public Private Partnerships**

Public-Private Partnerships

West Coast Infrastructure Exchange Partnership: CH2M HILL GSI venture partner, West Coast

- Identifying public project development and delivery methods that yield more measurable value for dollar
- Connecting the investors to opportunities
- Creating and advancing new mechanisms for project finance, including those that would attract private investors

Utilize financial investments to deliver adaptive and resilient infrastructure

Public-Private Partnerships

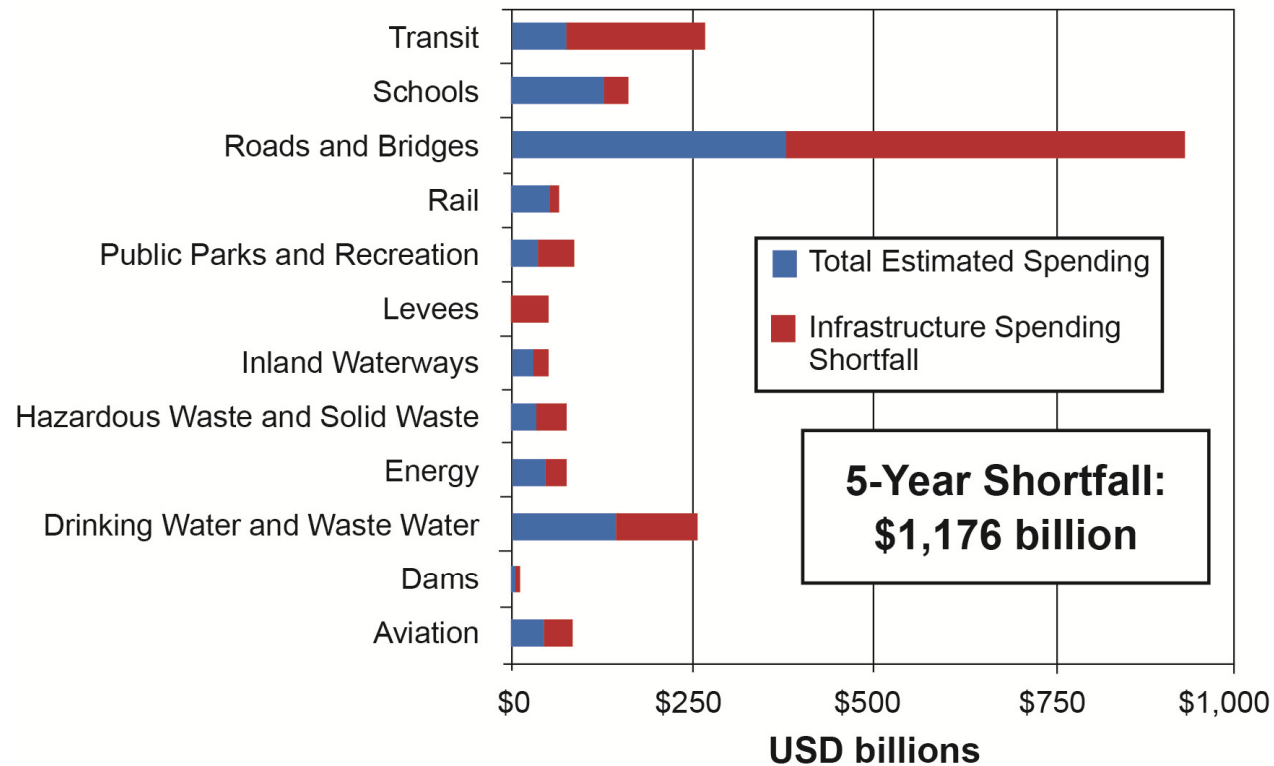
Green Path Partners: Joint venture between CH2M HILL and EKO Asset Managers, East Coast

- Integrate natural infrastructure into a traditional infrastructure approach
- Positive ecological impact with significant and demonstrable social and economic outcomes
- Afford an opportunity to use innovative financial structures, non-traditional impact investment capital, or both.

Utilize financial investments to deliver adaptive and resilient infrastructure

Public-Private Partnerships – *the Addressable Need*

5-Year Shortfall in Infrastructure Spending



Source: American Society of Civil Engineers

Public Private Partnerships supplement traditional financing models

Project Example: Philadelphia, P.A.

Philadelphia Water Department

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Green City, Clean Waters

Retrofit 10,000 impervious acres of public and private property to manage stormwater runoff within the next 25 years

The City of Philadelphia, P.A., in conjunction with EKO Asset Managers, recently established *Green City, Clean Waters* program

Fundamental Hurdle for Investors in Infrastructure?

PROBLEM: How best to monetize or assign value to the intangibles and make valid comparisons

SOLUTION: Envision™ Rating System

THE ENVISION™ RATING SYSTEM



Provide Investors with the missing link to economically, environmentally and socially assess natural capital

What is the Envision™ rating system?

1. Cost benefits over the life cycle of the project
2. Environmental benefits
3. Uses outcome based objectives
4. Reach higher levels of sustainability achievement

Provide Investors with the missing link to economically, environmentally and socially assess natural capital

What Types of Infrastructure Will Envision™ Rate?



ENERGY

Geothermal
Hydroelectric
Nuclear
Coal
Natural Gas
Oil/Refinery
Wind
Solar
Biomass



WATER

Potable water distribution
Capture/Storage
Water Reuse
Storm Water Management
Flood Control



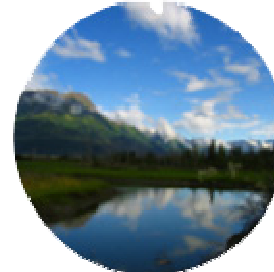
WASTE

Solid waste
Recycling
Hazardous Waste
Collection & Transfer



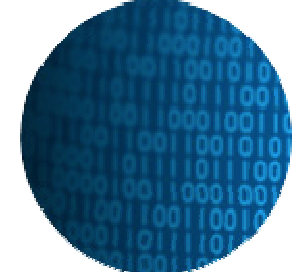
TRANSPORT

Airports
Roads
Highways
Bikes
Pedestrians
Railways
Public Transit
Ports
Waterways



LANDSCAPE

Public Realm
Parks
Ecosystem Services



INFORMATION

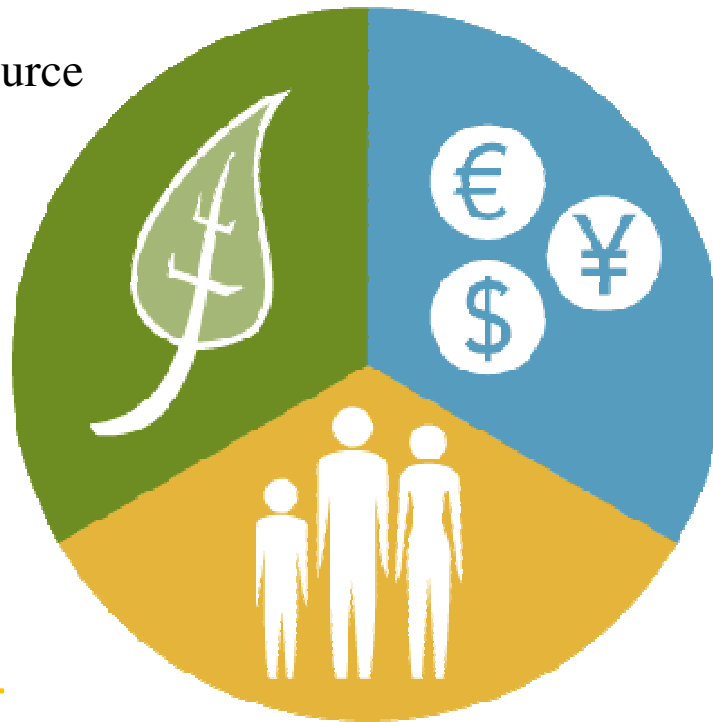
Telecommunications
Internet
Phones
Satellites
Data Centers
Sensors

CH2M HILL is a charter member and co-developer of Envision

Why do we need Green Infrastructure - Now?

ENVIRONMENT

- Minimize Impacts to Natural Environment
- Reduce Energy and Resource Consumption
- Reduce Waste



ECONOMIC

- Project Cost Savings
 - Return on Invest
- Economic Development
 - Support Job Growth

SOCIAL

- Enhance Community and Livability
- Enhance Public Safety, Health and Security
- Support Public Services and Adjacent Land Use

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