Unleashing the Capital for a More Sustainable World

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Project Managers, Engineers & Architects – First In, Last Out

- AEC professionals are the ones who know the project, its risks and benefits.
- They are generating and storing information in the feasibility, planning and design stages and throughout the building life cycle. The information generated is supporting cost and risk management, construction, and facility operation.
- They are using a sustainability rating system and valuation framework to design-in and make the case for sustainable infrastructure.
Tools Being Used Now That Can Inform the CIIX and Build Trust for ESG Investors

- Building Information Modeling (BIM)
- Envision™ Rating System
- AutoCASE
BIM – Virtual Construction to Reduce Uncertainty, Simulate and Analyze Impacts
BIM - Optimize Design
BIM - Engage Stakeholders

Courtesy of Doyle Drive Project Team
Envision™ – A Standard for Sustainable Infrastructure
Envision™ – A Standard for Sustainable Infrastructure

- ISI was founded by the American Council of Engineering Companies (ACEC), the American Public Works Association (APWA), and the American Society of Civil Engineers (ASCE).
- Provides a holistic framework for evaluating and rating the community, environmental, and economic benefits of all types and sizes of infrastructure projects.
- It evaluates, grades, and gives recognition to sustainable infrastructure projects.
Tools to Plan, Manage & Verify are Rapidly Evolving
Subcategories of Infrastructure

- **energy**
  - geothermal
  - hydroelectric
  - nuclear
  - coal
  - natural gas
  - oil/refinery
  - wind
  - solar
  - biomass

- **water**
  - potable water distribution
  - capture/storage
  - water reuse
  - stormwater 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

BIM is used to plan, design, construct, operate and maintain water, wastewater, electricity, gas, refuse and communication utilities to roads, bridges and ports, from houses, apartments, schools and shops to offices, factories, warehouses, prisons, etc.
Integrated Sustainable Design Elements

- **Purpose, Community, Wellbeing**
- **Collaboration, Management, Plans**
- **Materials, Energy, Water**
- **Siting, Land & Water, Biodiversity**
- **Emission, Resilience**
AutoCASE Example – Tucson & Pima County Flood Control Stormwater Management
Project Background

- Collaboration between the City of Tucson, Pima County, Impact Infrastructure, Stantec, and Autodesk

- AutoCASE® for Stormwater:
  - On a commercial site
  - On a road project

- Automates TBL using:
  - Monte Carlo risk analysis
  - Multiple Account CBA
  - Linked to Envision
  - Embedded in planning & design process
Cloud-Based Feasibility/Early Planning
Stormwater Management Example – Monte Carlo with Multiple Accounts

This project has a positive Sustainable Net Present Value, or S-NPV, of $119,185,832. This means that after accounting for the time value of money, the project has a positive overall value to society. As with all financial projections, the value should be thought of as probabilities of outcomes rather than definitive project value. To help with this, AutoCASE provides a probability distribution showing potential project value. A chart showing this value can be seen right.

The chart shows two curves; the red curve is the Direct Financial NPV, while the green curve is the Sustainable NPV. The Direct Financial NPV only includes costs and benefits that involve real transfers of dollars. Examples include Capital Expenditures, Operations and Maintenance costs, Employee costs, Revenues generated, etc. The Sustainable NPV then includes all the costs and benefits to society and the environment. Examples include Reductions in Heat Mortality, Flood Risk Mitigation, Property Value Uplift, etc.

As can be seen in the chart above, there is a 95% probability that the Direct Financial NPV will be greater than $68,673,850, its expected value is approximately $46,158,679, and it is unlikely (less than 5%) to exceed $32,815,760. In comparison, the S-NPV is greater than the Direct Financial NPV, the S-NPV has a 95% probability of being greater than $139,658,791, its expected value is approximately $135,777,622, and it is unlikely (less than 5%) to exceed $134,252,451.

http://youtu.be/JEtGnkC41Yw
Plug-in Feature to Civil3D
Stormwater Management Example

- http://youtu.be/abMTTv1vXz4
AutoCASE in 3D

- http://youtu.be/-gQI1DPbrl4
Design and Analysis with AutoCASE

What’s in it for me?

- http://youtu.be/Y52WUA66yMU
CIIX – Standardized Valuation

- There is a standard that can be used (Multiple Account CBA with risk analysis) to provide standard metrics the impact investment community
- Automation of the standard can be done via BIM, Envision & AutoCASE
- Large scale deployment can be achieved through Autodesk
- Application of standard to projects can be done by professionals who know the project best – the AEC community
Business Case Evaluator

A Value and Risk Based Enhancement to Envision™
## Compare Design Alternatives

Tune Designs to Optimize Outcomes

**AutoCASE**

<table>
<thead>
<tr>
<th>Field</th>
<th>Measurement Unit</th>
<th>Most Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of Project</td>
<td>Acres</td>
<td>370</td>
</tr>
<tr>
<td>Total Number of New Trees Planted</td>
<td>Acres</td>
<td>40.0</td>
</tr>
<tr>
<td>Average Tree Diameter</td>
<td>Inches</td>
<td>12</td>
</tr>
<tr>
<td>Biostimulation Cells - Current</td>
<td>Acres</td>
<td>0.0</td>
</tr>
<tr>
<td>Biostimulation Cells - Planned</td>
<td>Acres</td>
<td>20.0</td>
</tr>
<tr>
<td>Dry Detention Pond or Basin - Current</td>
<td>Acres</td>
<td>0.0</td>
</tr>
<tr>
<td>Dry Detention Pond or Basin - Planned</td>
<td>Acres</td>
<td>0.0</td>
</tr>
<tr>
<td>Infiltration Basin - Current</td>
<td>Acres</td>
<td>0.0</td>
</tr>
<tr>
<td>Infiltration Basin - Planned</td>
<td>Acres</td>
<td>20.0</td>
</tr>
<tr>
<td>Infiltration Trenches - Current</td>
<td>Acres</td>
<td>0.0</td>
</tr>
<tr>
<td>Infiltration Trenches - Planned</td>
<td>Acres</td>
<td>0.0</td>
</tr>
</tbody>
</table>

This is the NET new number of trees planted. If trees are primarily being removed, this number may be negative.

**Total Number of New Trees Planted**

- **Low Value**: 40.0
- **Most Likely Value**: 40.0
- **High Value**: 40.0

**Distribution**: PERT
AutoCASE generates the raw data for several costs and benefits. By raw data, we mean the quantified values of costs and benefits that are un-monetized. This includes tons of emissions or sequestered Carbon Dioxide (CO2), Nitrogen Dioxide (NO2), Sulfur Dioxide (SO2), and particulate matter (PM-10). AutoCASE also can show the number of avoided premature deaths due to heat mortality. These values are displayed as cumulative impacts over time (e.g., cumulative avoided premature deaths over time). This data is also shown in a table, with columns showing the average annual impact (either reduced tons of emissions or avoided premature deaths) and the total project lifetime reduction. Both the table and the chart can be seen below.

4. Project Division of Costs and Benefits

5. Costs and Benefits Table
Uses Meta-Analysis for Environmental Benefits
CAD Data Refines Calculations
Simulates Outcomes

7. Value by Stakeholder

8. Envision Credit Categories
Monte Carlo Simulations
Risk Adjusted Business Cases

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