IUWM Financial + Economic Module

Simulation Game

Introduction Round 1
Welcome!

...to the expert session of Bay City’s Water Management Investment Program
Bay City – a growing city in the delta

Lake & Ponds

wastewater treatment plan

River

Bay & Marshes
Bay City is facing problems with regard to urban development and wastewater discharge into the bay. These issues include:

1. Increasing urbanization
2. Under-capacity of WWTP
3. Population growth

As a result, there are negative impacts on:

1. Water quality degradation
2. Ecosystem damages

Which further affect:

1. Recreation
2. Tourism
3. Property value

Under-capacity of WWTP and increasing urbanization contribute to wastewater discharge into the bay, leading to water quality degradation and ecosystem damages, which in turn affect recreation, tourism, and property value.
Your task and your budget

• Your responsibility:
  the water management investment program

• Your budget (based on results of a revenue study):
  • Annual revenue stream of $1 million over the coming 30 years (from levies/taxes)
  • Available for investments in capacity expansion of the WWTP

• Your task:
  Determine the optimal solution for the wastewater problem
Alternatives and choices

• The working group responsible for developing alternative technical investment programs came up with three technically feasible alternatives

• We now need an assessment of these alternatives from an economic and financial perspective
Round 1: how to

- Description of case, alternatives & economic analysis
- XL tool: one per table
- Results on the scoring sheet: one per table

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<thead>
<tr>
<th>IUWM Simulation Game</th>
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<tr>
<td>No SWM</td>
<td>Alternative 0</td>
<td>Alternative 1</td>
<td>Alternative 2</td>
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<td>COST</td>
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<td>Line Item</td>
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<td>C&amp;M costs as % of investment costs</td>
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<td>FUNDING</td>
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<td>Annual Water Treatment Fees</td>
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<td>BENEFITS</td>
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<td>Annual Benefit WWT</td>
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<td>Annual Social/Economic (Bay activities)</td>
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<td>OUTPUT</td>
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<td>Financial Net Present Value (NPV)</td>
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<td>Costs (NPV)</td>
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<td>Financial Result (NPV)</td>
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<td>Economic Benfits (eNPV)</td>
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<td>Economic Result (eNPV)</td>
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Simulation Game

Round 1 – Results
Results

Alternative 0
NPV: 4.569
eNPV: 0

Alternative 2
NPV: 1.894
eNPV: 1.304

Alternative 1
NPV: -345
eNPV: 1.542
Lessons learned

✓ Financial feasibility is not just about investment costs, but also about life cycle costs, as well as revenues.

✓ The “without project” alternative is not just “doing nothing”, often some action is required in a situation with autonomous growth (population, economy)

✓ The economically optimal solution is not always the same as the financially optimal solution, but economic result can be a justification for government contribution, which then improves financial feasibility.
In real life...

✓ ...there is uncertainty about pretty much all parameters in financial and economic feasibility analyses.

✓ ...several factors – especially benefits – cannot be quantified or monetized, but are still relevant in decision making.

✓ ...this typically leads to ranges of monetized outcomes and qualitative discussions of additional considerations.
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Simulation Game

Introduction Round 2
Welcome!

...to the 2\textsuperscript{nd} expert session of Bay City’s Water Management Investment Program
Bay City is facing problems with regard to urban development and wastewater

- Increasing urbanization
- Under-capacity of WWTP
- Population growth

wastewater discharge into bay → Water quality degradation

- Ecosystem damages

Recreation → Tourism → Property value
Bay City is also facing problems with regard to **groundwater**

- Increasing urbanization
- Increasing water demand
  - Over-abstraction groundwater
- Lowering groundwater table
  - Reduced river flows (climate change)
  - Ground water quality (salty)
- Water supply cost
- Property value
- Population growth
- Lowering groundwater table
  - Land subsidence + flood damage
Bay City is also facing problems with regard to **stormwater**

- System overflow discharge
- Pollution of rivers and lakes
  - Tourism + recreation
  - Public health risk
  - Urban flooding

- Climate change-heavy rainfalls
- Insufficient drainage system
Your task and your budget

• Your **task**, again:
  Determine the optimal solution for the wastewater problem but now also integrating stormwater and groundwater issues

• Your **budget**, again:
  Annual revenue stream of $1 million over the coming 30 years (from levies/taxes)

• **New approach**: pursue an **integrated approach** by:
  • Considering other urban water challenges
  • Seeking input from stakeholders!
Stakeholders

Three main stakeholders were identified:
1. the Bay City water utility,
2. the regional blue-green infrastructure program, and
3. ABCD, a major developer in the region.

Potential advantages of stakeholder engagement:
- New alternatives / solutions
- Better solutions due to integrated approach
- Additional funding

Potential disadvantage of stakeholder engagement:
- More effort/ time required: transaction costs
Round 2: how to

- Description of case, alternatives & economic analysis
- XL tool: one per table
- Results on the scoring sheet: one per table
IUWM Financial + Economic Module

Simulation Game

Round 2 – Results
Results

- **Alternative 0**
  - NPV: 4.569
  - eNPV: 0

- **Alternative 1**
  - NPV: -345
  - eNPV: 1.542

- **Alternative 2**
  - NPV: 1.894
  - eNPV: 1.304

- **Alternative 3**
  - NPV: 920
  - eNPV: 3.287
Lessons learned

✓ Understanding the water system is crucial in understanding the true benefits and costs of urban water investments
  ✓ Understanding the cause-effect relations of the problem
  ✓ Understanding the effect of the intervention(s)

✓ Understanding and engaging stakeholders/beneficiaries can help in the identification of different funding sources

✓ Starting from one urban water challenge and widening the scope to others is an effective approach to IUWM
In depth discussion

✓ Why would real life be even more complicated?
✓ What is your experience with ‘transaction costs’?
✓ What could have been other integrated solutions?
✓ What demand management solutions, behavioral interventions and other non-hard-infrastructure measures contribute to overcoming water management challenges?
✓ What other stakeholder groups would be relevant?
✓ How can economic benefits be turned in financial revenues?