Capabilities and Limitations

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Study Components

- System Conceptualisation
- Prepare Behavioural Statements
- Mathematical Formalisation – Boolean
- Develop System Simulation
- Explore System Interface Options
- Management Questions
- Pilot Testing
- Peer Review

Management Questions

- EMPHASYS guidance
- Consultation
- Pilot testing
  - emergent properties of an estuary;
  - sensitivities of an estuary to change;
  - constraints on the evolution of the estuary.

Consultation

- **General legislative questions**:
  - How will legislative measures impact on existing uses and activities?
  - What impact will there be on estuary morphology as a result?
- **Specific questions relating to climate change**:
  - How will climate change affect forcing factors?
  - How will climate change affect existing uses and activities?
  - How will climate change affect the individual estuary components?
- **Specific management questions on activity and legislation**:
  - How will an activity affect the ecological status of an estuary?
  - How will an activity affect sedimentation patterns / habitats?
  - How will an activity affect flood risk?
  - What will the cumulative impacts be of activities within the estuary?

Management Questions

- EMPHASYS guidance
- Consultation
- Pilot testing
  - emergent properties of an estuary;
  - sensitivities of an estuary to change;
  - constraints on the evolution of the estuary.

Capabilities

- Captures characteristic behaviour
- Can be formulated at any desired scale
- Database of UK estuaries
- Framework for estuary behaviour statements > reference source
- Rules compiled for 7 generic UK types
- Predictive system based tool
- Means to promote systems based knowledge and understanding

Limitations

- Like all models EstSim is an abstraction
- For this exploratory research the abstraction is at a relatively high level
- The rules formalise geomorphological knowledge – hence subjective
- Limited testing of
  - Rule formulation
  - Chosen abstraction against other possible representations

Alternative Approaches

- Boolean approach
- Network Dynamics (loop analysis)
- ASMITA (Aggregated Scale Morphological Interaction between Tidal basin and Adjacent coast)
- Real estuaries too complex to be fully described by any of these methods
- Due to differences+limited understanding > 3 methods are complementary

Alternative Approaches

	Boolean	Network	ASMITA
Input	Qualitative	Quantitative ?	Quantitative
Output	Qualitative	Quantitative ?	Quantitative
Behaviour	•Depends on functions •Discrete •Always stable	•Depends on network •Discrete or continuous	•Empirical equilibrium eqn •Continuous
Application	Exploring end states	Still to be tested	Volume/area response to change

Conclusions

- Exciting development of system approach
- Only just beginning to reveal potential
- Essentially still a research tool
- Requires specialist knowledge to set up tool for a specific estuary
- Should allow formulation of geomorphological knowledge to be represented and tested
- May well be options to combine with more quantitative techniques (loop analysis and ASMITA in particular)