SAVE:
Data, Information & Viz Tools

Ruth Falconer, Daniel Gilmour, John Isaacs and David Blackwood

SAVE Concept

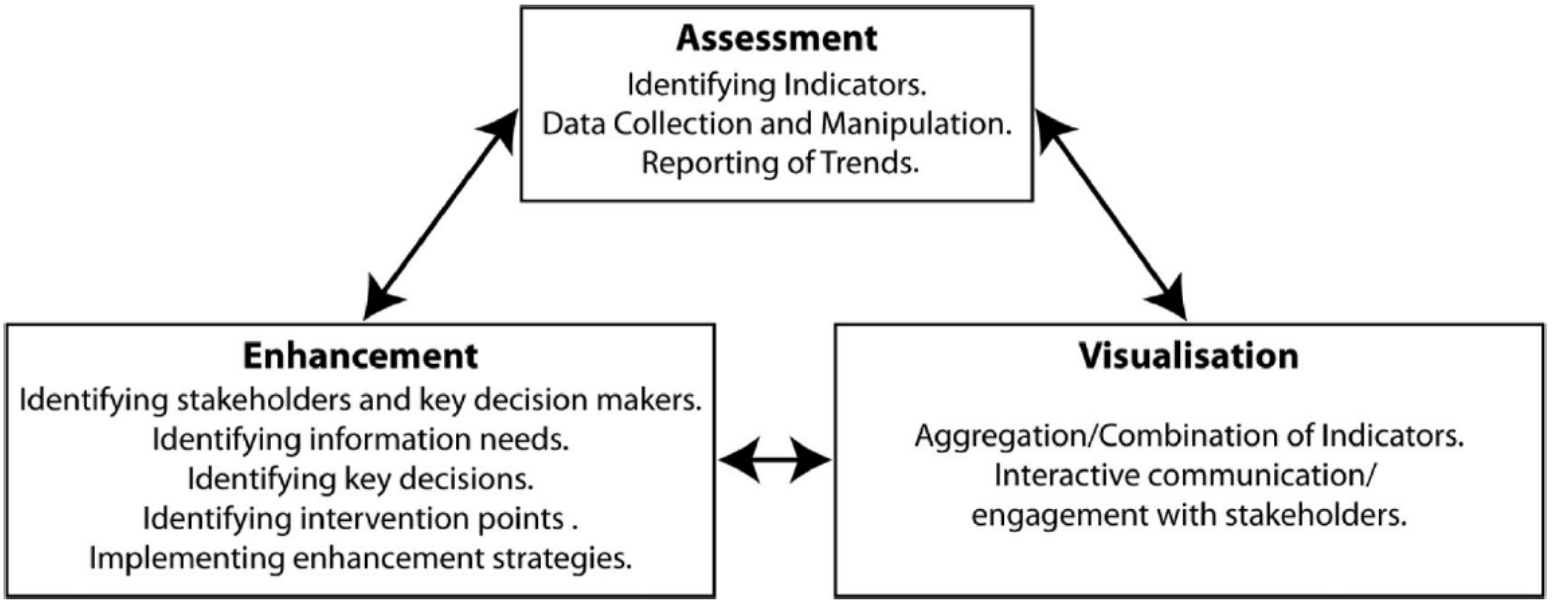


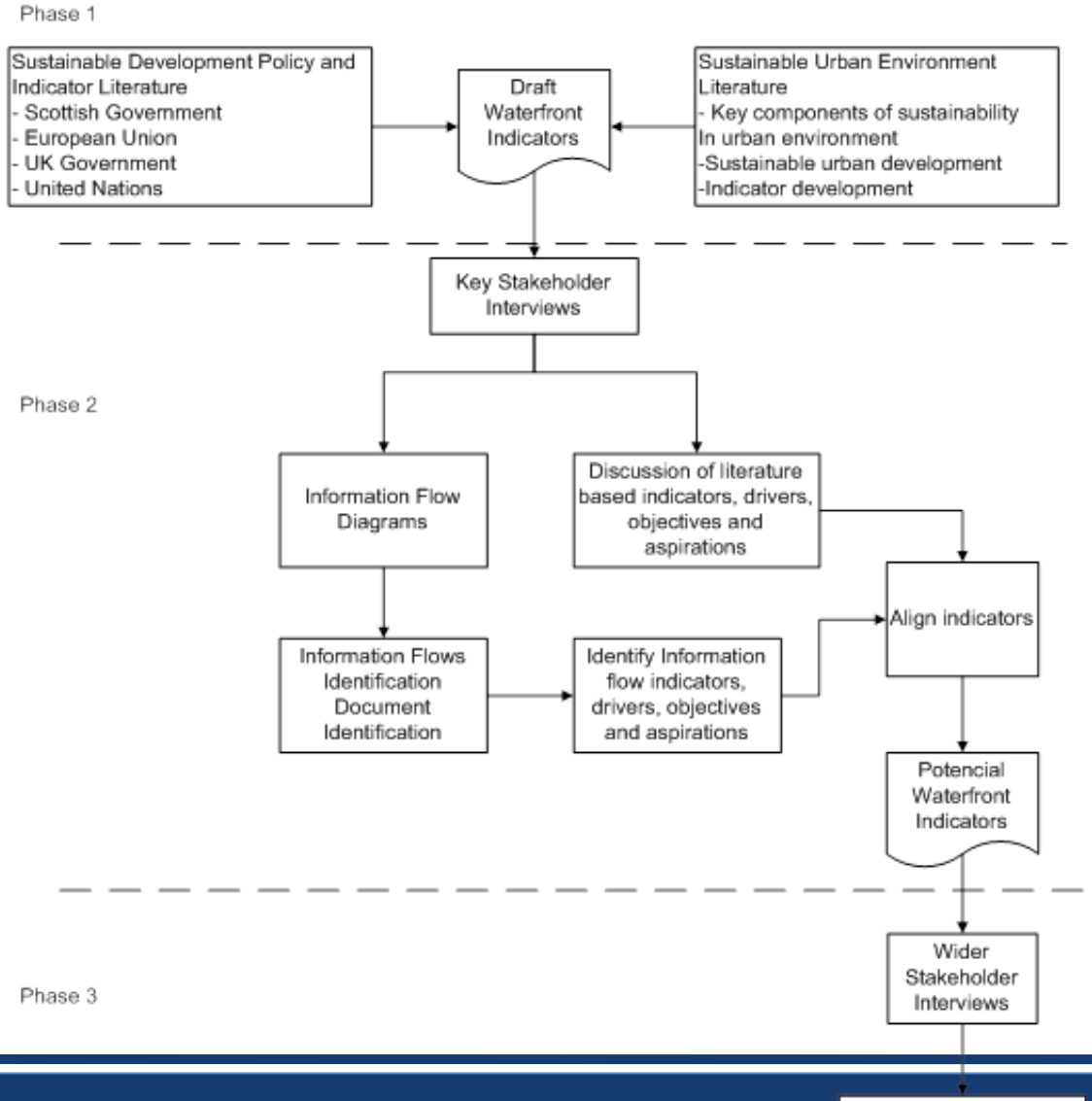
Figure 1. The SAVE (sustainability assessment, visualisation, and enhancement) framework.

Sustainable Development in Practice

- Sustainable Development must be:
  - environmentally friendly
  - socially acceptable and
  - financially viable

- Although the concept and principles may be simple, how can it be measured, communicated and put into action?

Indicator Selection



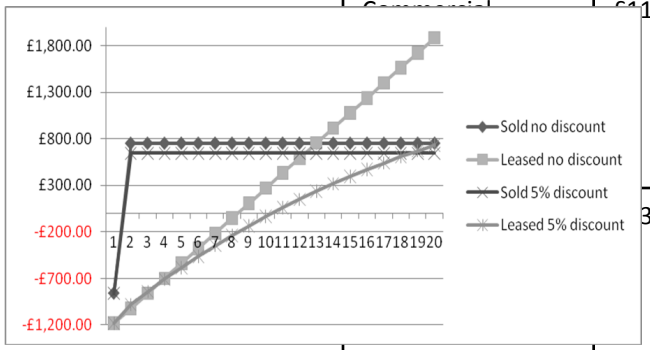
Sustainable Development: Assessment Benchmark Indicators

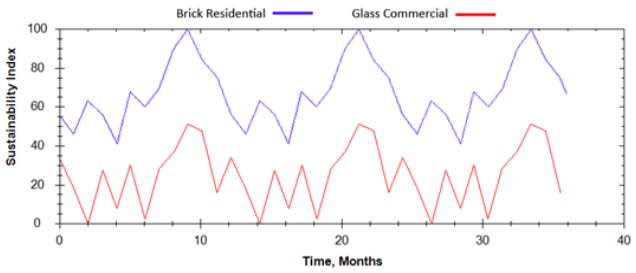
Category		Benchmark indicators	Definition of indicator	Units	Baseline Data	Desired direction/ Target	Source	Single Outcome Agreement
Economic	1a	Demographics*	Population retention	Population number	142, 170	UP	DCC	SOA Strategic Context
	1b	Retention of skills base	Graduate retention rate	Graduate population	33 %	Up	SET	National Outcome 1
	1c	Knowledge based employment	Knowledge based economy	Number of jobs	23,319	Up	Economic Development DCC/SET	National Outcome 1 Indicator
	1d	Employment*	Employment rates	% Population	71%	Up	Economic Development DCC	National Outcome 2 Indicator
	1e	Capacity to stimulate investment*	Total inward investment	£ Inward investment	0	Up	Economic Development DCC/SET	National Outcome 2
	1f	Tourism	Tourists visiting city centre locations	Number	58,872/60,639	Up	Discovery /Sensation	
	1g	Regeneration	Increased property value	% Increase	0	Up	DCC/SET	
	1h	Job creation	Number of jobs created	Number	0	UP	DCC/SET	National Outcome 2
	1i	Economic output*	Economic output	GVA per Head	£14584	Up	SET	National outcome 1 & 2

Example Urban Sustainability Indicators

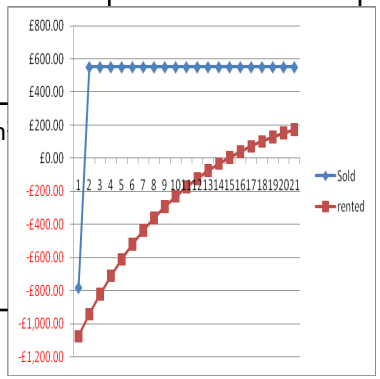
- Energy efficiency
- Noise pollution
- Economic output
- Employment
- Acceptability
- Housing Provision

Building type	Capital Cost	Sale / Rental Value
Residential	£861.11 m^2	Sale £1614.59 m^2
Commercial	£1184.03 m^2	Rent £161.46 m^2 per month
	345.03 m^2	Rent £161.46 m^2 per month





21 m



$$\textit{Total noise level} = 10\log_{10}\left[\sum_{1}^{n}\left[Antilog_{10}\left(\frac{L_n}{10}\right)\right]dB(A)\right]$$

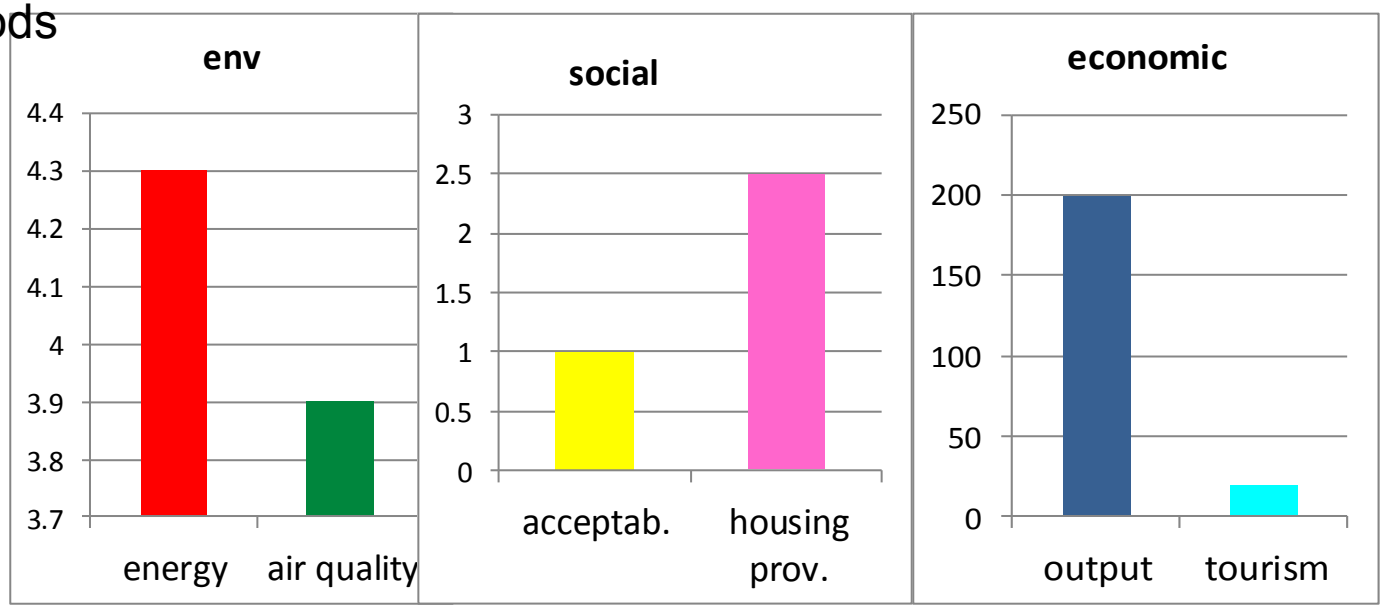
Deriving the Sustainability Index

aggregation

Weighting, multicriteria methods

Identification of component indicators and measurements

Identification of dimensions



Environ mental

Social

Economic

Sustainability Concept

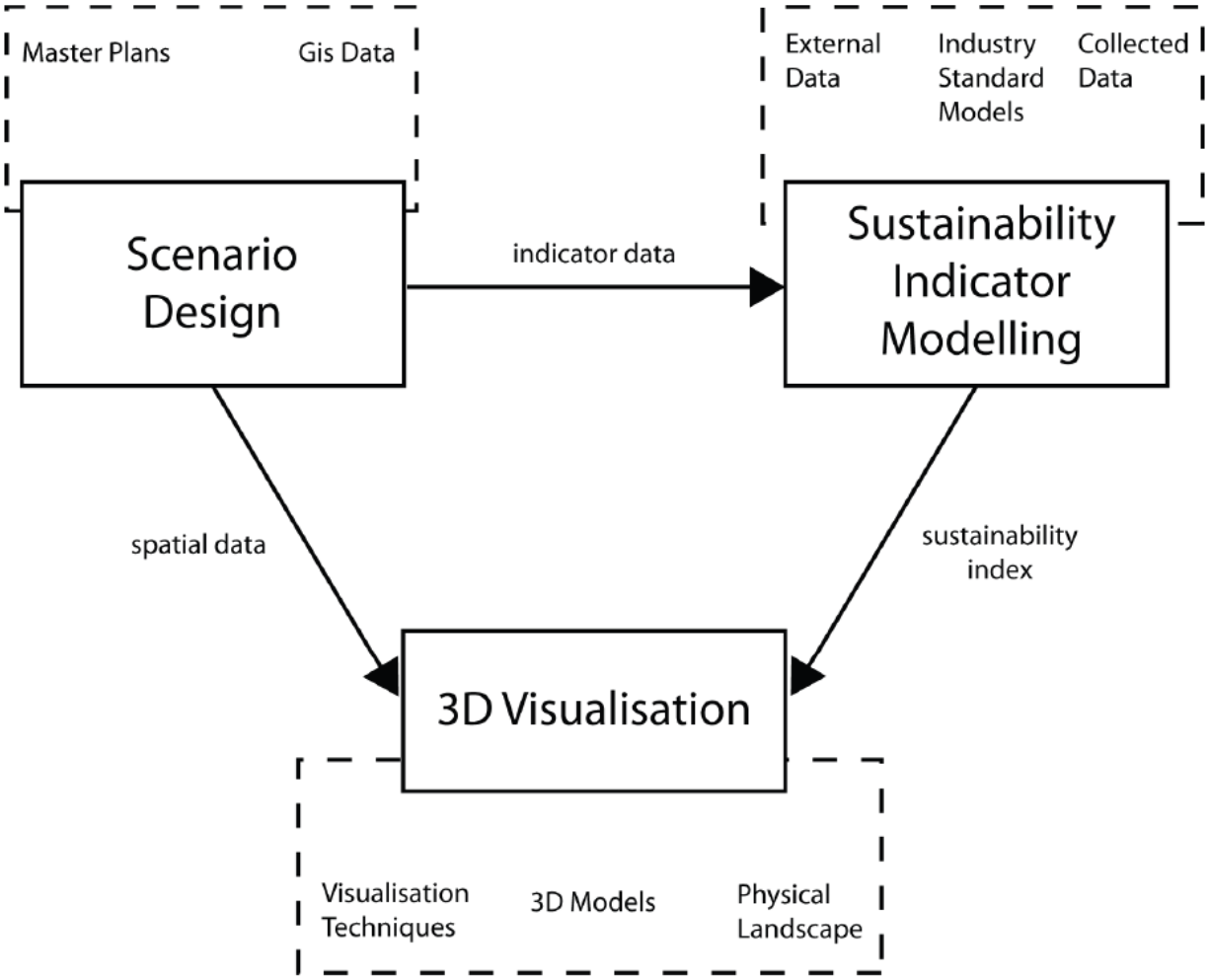
Visualisation

- Sustainability indicators change through space & time
  - Many indicators (model parameters etc.) to visualise
  - Overlay on geographical context (3D geometry)

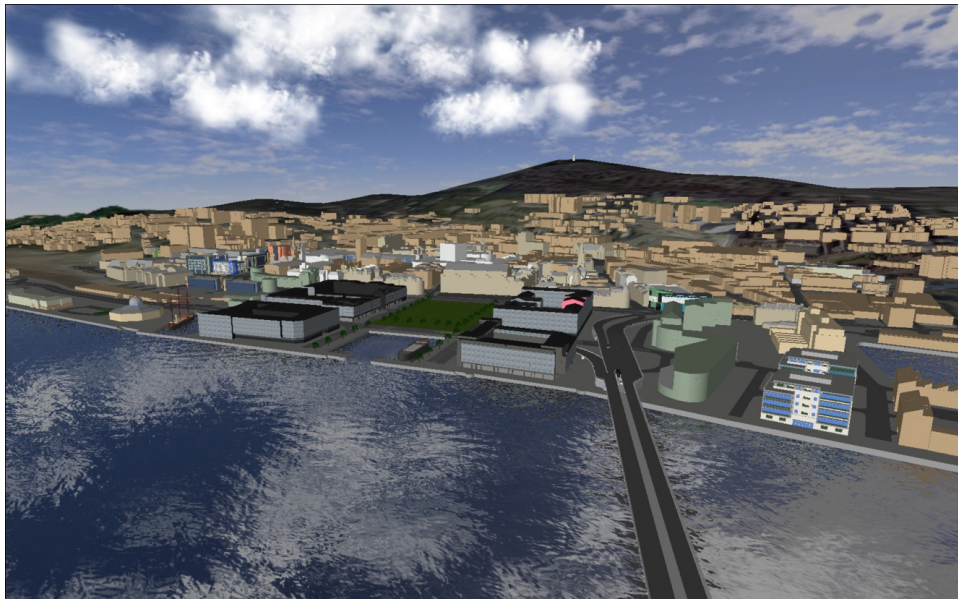
- Humans better at spotting patterns in high dimensional multivariate datasets than computer algorithms, it can then be verified by statistics

- Present this information in a meaningful way

SCity VT


Master Plans
Gis Data
External Data
Industry Standard Models
Collected Data
Scenario Design
indicator data
Sustainability Indicator Modelling
spatial data
sustainability index
3D Visualisation
Visualisation Techniques
3D Models
Physical Landscape

Urban Sustainability - Visualisation of physical landscape



- SCity VT – modelling and visualisation framework reads in and parses:
  - DEM data
  - Sketch-up models
  - More detailed architectural models (+ textures)
- Communicate how the development will appear

Blend

Sustainability Measure:

Environmental, Social and Economic Models
weighted and prioritised via ANP

Single Colour Map:

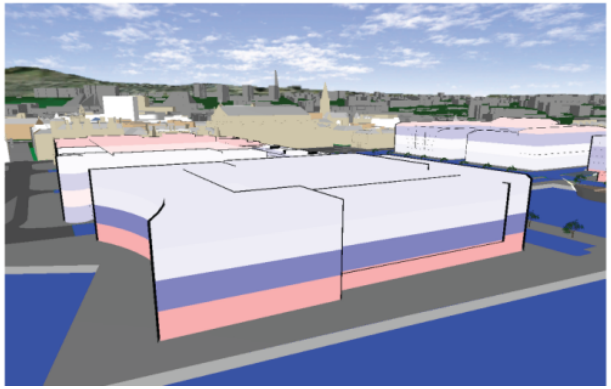
Sustainability measure normilised
and combined onto a single scale

Red — Blue

Low Sustainability — High Sustainability

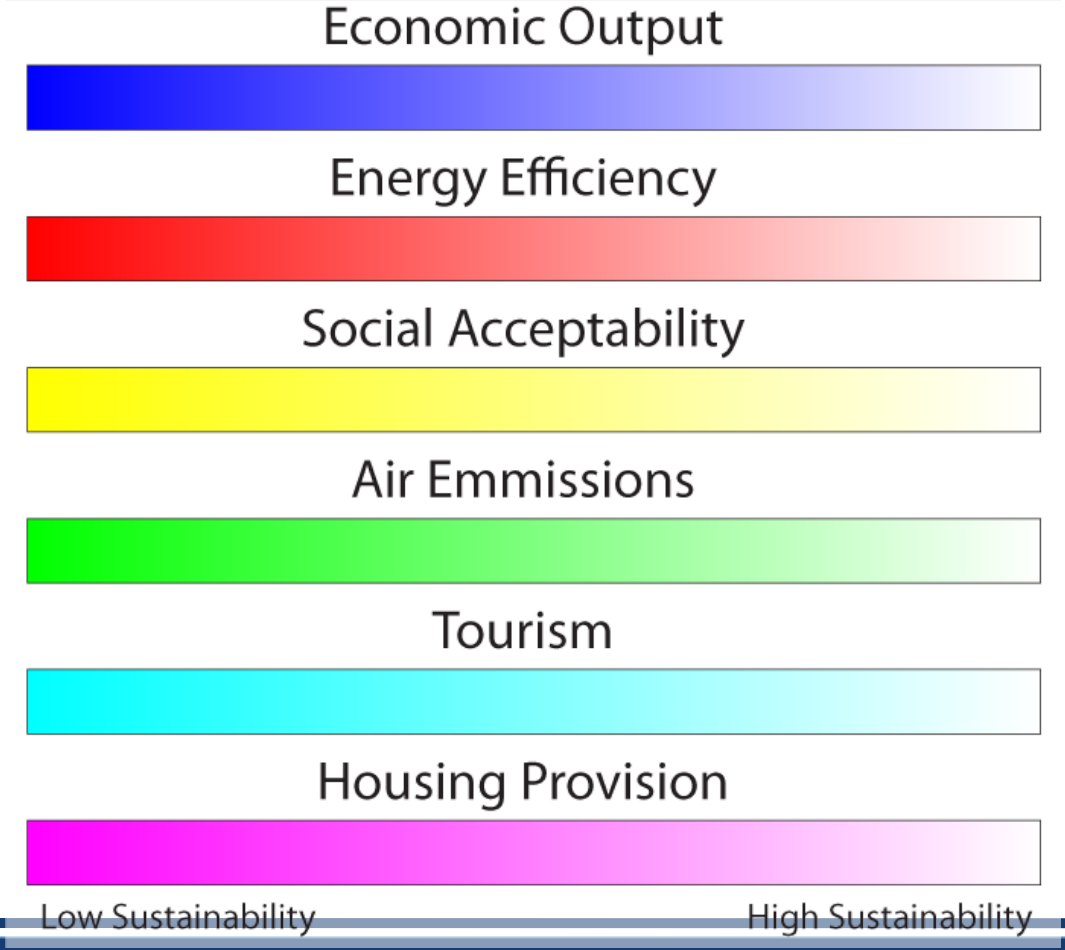
3D Visualisation:

Final weave applied to each floor of the structure



Visualisation of indicators II
Weave

- No aggregation of indicators
- Keep the separate data values



Weave

Sustainability Measure:

Environmental, Social and Economic Models weighted and prioritised via ANP

Multiple Colour Maps:

Sustainability measure for each indicator normilised and mapped onto its own scale

Economic Output

Blue — Low Sustainability … High Sustainability

Energy Efficiency

Red — Low Sustainability … High Sustainability

Social Acceptability

Yellow — Low Sustainability … High Sustainability

Air Emmissions

Green — Low Sustainability … High Sustainability

Tourism

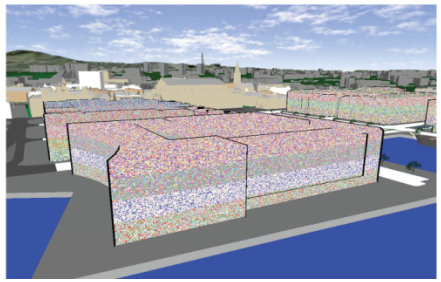
Cyan — Low Sustainability … High Sustainability

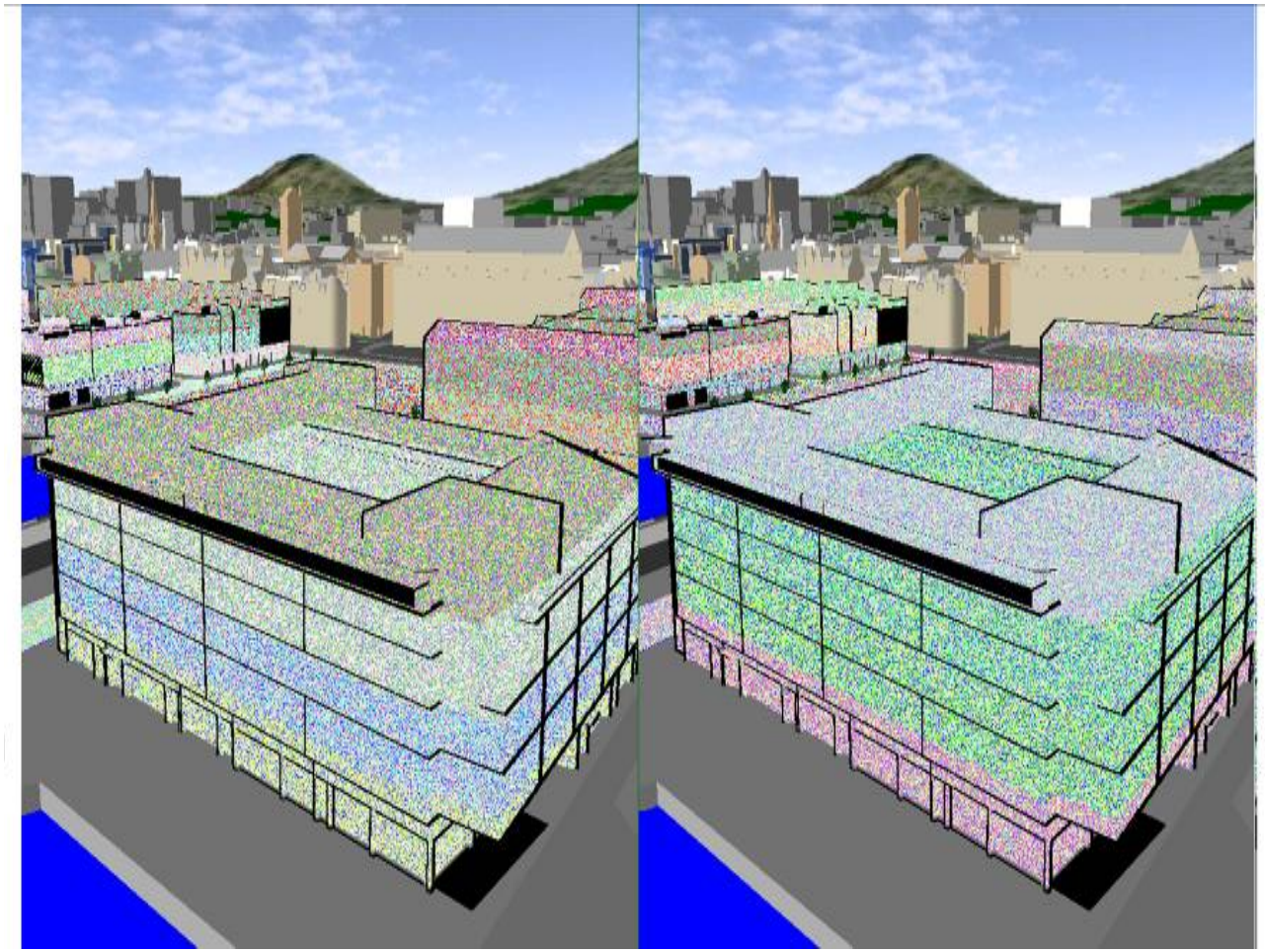
Housing Provision

Magenta — Low Sustainability … High Sustainability

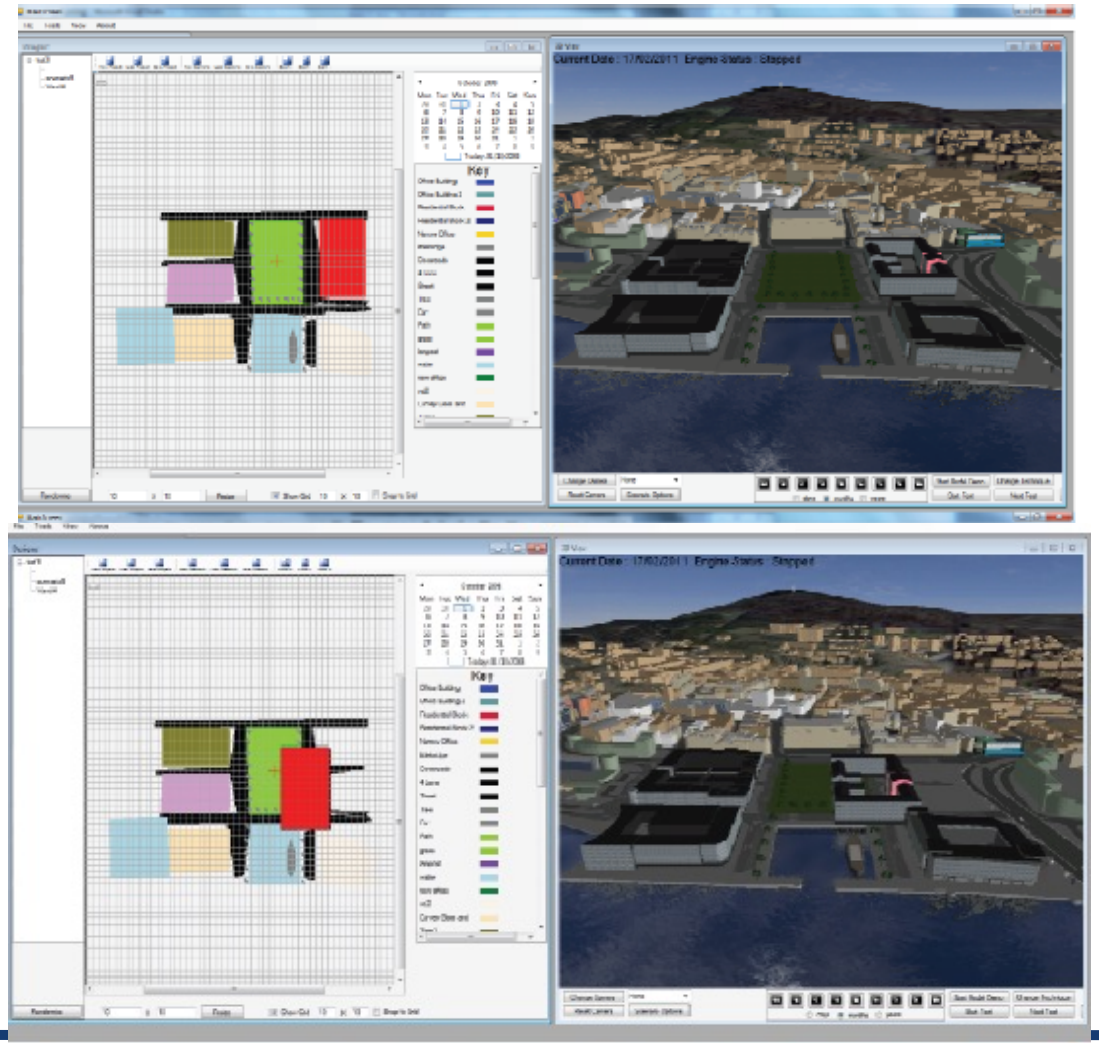
3D Visualisation:

Colours combined to create a weave which is applied to each floor of the structure

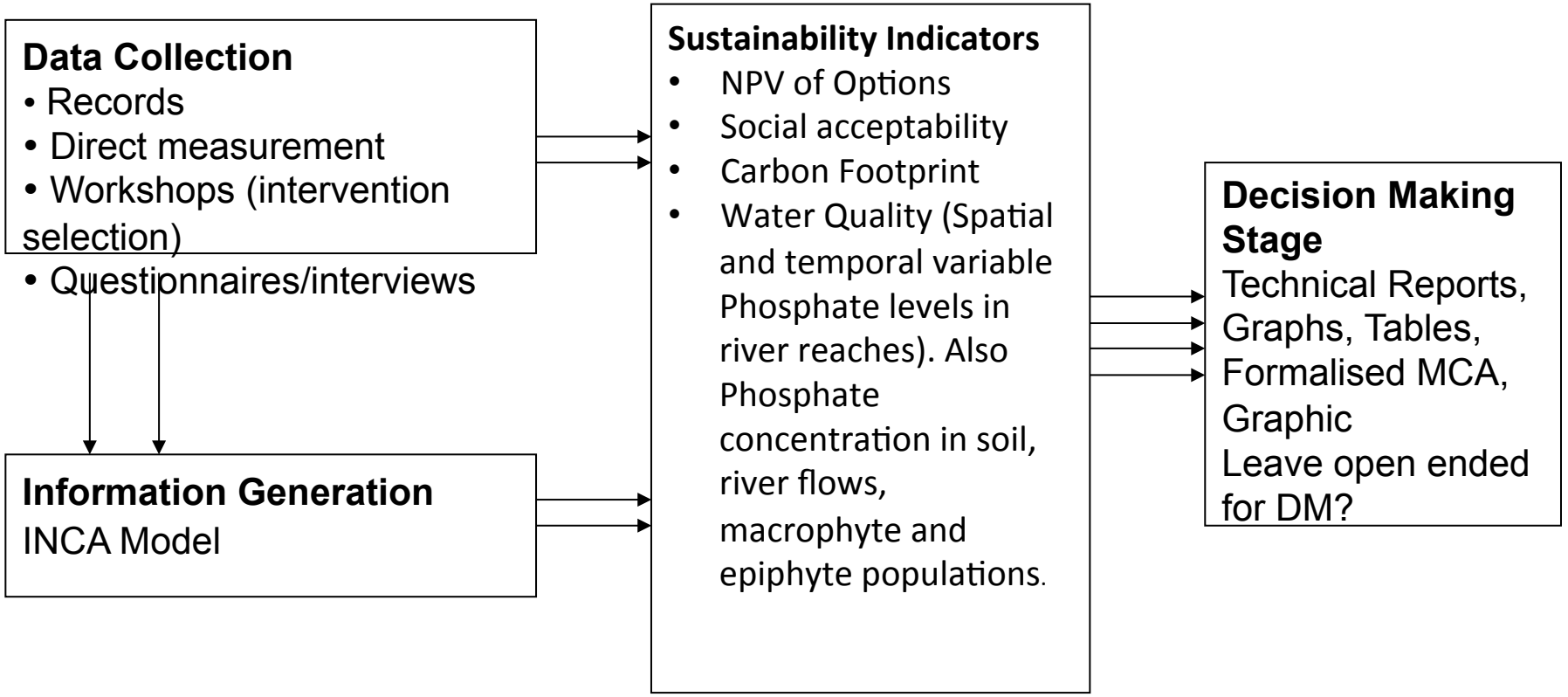




Real-time Updates



Management of Phosphates in Water Systems



Phiz

Wensum Catchment Visualisation

Created for UKWIR Phosphate Lifecycle Management project
by University of Abertay Dundee.
Contact: j.isaacs@abertay.ac.uk

Acknowledgements:
Lead Consultant Sean Comber (Atkins Global)
INCA model data provided by Paul Whitehead (University of Oxford)

Determining water sector links to support decision making

Research Aims

- How to determine and communicate the scope and scale of the water sector in Scotland?
- Show, in manner that can be easily understood by a wide range of stakeholders, how the different parts of the sector link together.
- The maps will be used in the decision making process that influence, manage and control Scotland's water resources to enable their full and sustainable use.

Research Findings

- Maps proved useful in converting qualitative and quantitative data into a form that can be readily interpreted by a range of stakeholders
- Client was easily able to extract meaning from the maps:
  - Demonstrates Strength, breadth of a growing sector"
  - "Used to investigate distribution and connection of physical assets"
  - "Helps direct resources to build a resilient water supply and demand "
  - Dynamic maps can be used to manage investment and show shifting trends and transitions in the sector e.g. decrease in concrete and construction companies and increase in the scientific and sensor technology.

Information Visualisation