



5th Western Australian State

COASTAL CONFERENCE 2009

*Whose Coast Is It?
adapting for the future*

1B:
Coastal
Vulnerability:
1.30–2.00pm
Thursday 8th
October 2009
Sirius Room

Climate change and coastal inundation —A compelling view, of the dollar value of the impact of sea level rise and storm surge events, through Eonfusion a powerful interactive 4D data integration, analysis and visualization tool

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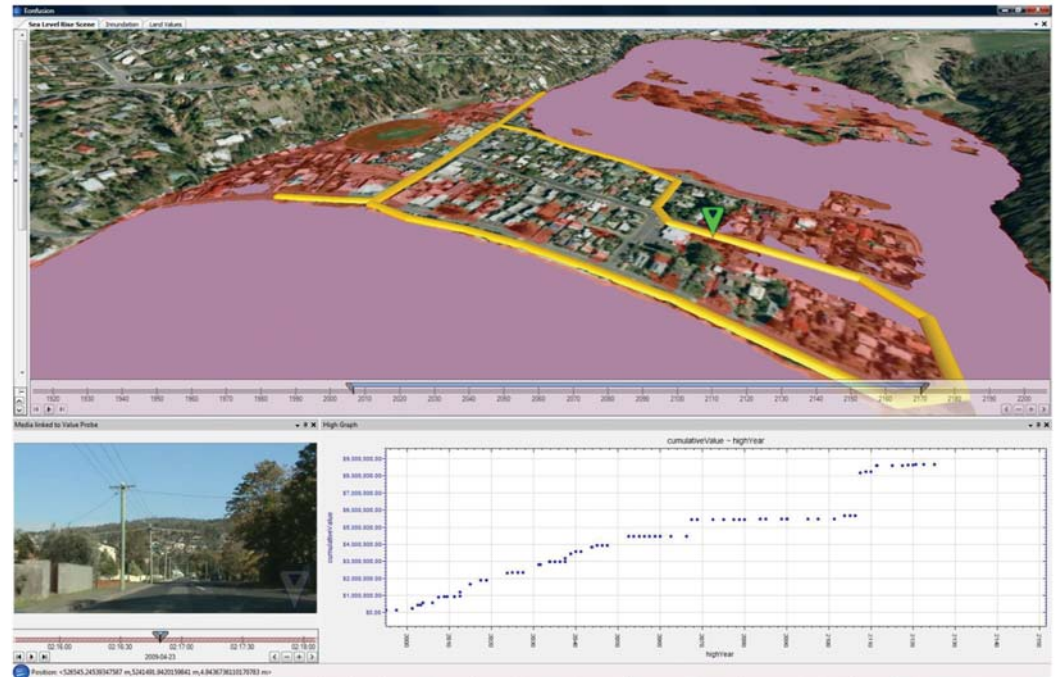
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Introduction

Nearly one third of the world's population live in coastal areas, and ten of the fifteen most populous cities in the world lie on a coast. Inhabitants of the Low Elevation Coastal Zone (LECZ)—defined as the contiguous area along the coast that is less than 10 meters above sea level—make up 10% of the world's population and 13% of the world's urban population. Sea level rise, coastal inundation and associated shoreline retreat have emerged as one of the primary threats to these populations and the resources located near the coastal fringe.

To meet the needs of Governments, planners and managers, researchers are continually faced with the challenge of integrating large volumes of complex environmental and spatial-temporal data. Typically the spatial and temporal components of data sets are under-utilized because methods for effectively handling these data have not been available. Eonfusion is a new four-dimensional (4D) visualization and analysis software package which significantly enhances the ease with which researchers can now integrate and explore complex spatially and temporally variant data. In this paper using a coastal suburb of Hobart as an example, we developed several models to predict the impact of rising sea levels on low-lying coastal areas.

Figure 1. (Top) Shows inundation level as a function of time, time of interest is set interactively through the time slider; Lower left) video street transect data located by moving probe within the scene above; Lower right) graph cumulative value of impact as a function of time also linked to the time slider



The inundation spatially modeled as a function of time enabled the visualization of sea level rise scenarios to assess the extent and impact of inundation. This highlights the visualization, interpretation and communication power of Eonfusion's 4D capability. The model was produced using publically available LIDAR data, obtained from the Antarctic and Climate Ecosystems CRC—Climate Futures Project, and sea level scenarios published by the Intergovernmental Panel on Climate Change (IPCC).

The second model integrated geomorphic coastal vulnerability mapping (data provided by Geoscience Australia) and the IPCC sea level scenarios to examine the impact of rising sea levels to the erosion of coastal areas. This highlights the analytical power of Eonfusion, through the efficient integration of inundation and vulnerability models to demonstrate the universal application of the software to the field of climate change research.

A third model fused the cadastral layer and a simple property valuation model to complete the scenario, thus demonstrating a powerful pathway for the estimation and visualization of the impact of these climate change events.

Data sets include:

- Sea level rise scenarios from IPCC stage 4.
- Lidar from Climate futures project—vector point cloud.
- Cadastral Parcels and Value Indicative.
- Storm Surges from CSIRO.
- Vulnerability Mapping—Chris Sharples/Geoscience Australia.

Processing steps:

- Generation of 3D terrain model from lidar data.
- Offset Australian Height Data (AHD) discrepancy.
- Integrate IPCC sea level rises and storm surges into Sea level rise timeseries.
- Identification of sinks using Eonfusion API application.
- Calculate inundation levels and tipping points at which sinks get filled.
- Fuse Cadastre and value model with 3D surface—value decreases as % of title flooded.
- Air-photo drape.
- Set up visualization scene with integrated graph for all scenarios.

Results

The outcomes from this work include the identification of powerful and efficient pathways through the employment of new visualization and spatial-temporal analysis tools for:

- Dynamic scenario based modeling for assessing cost and environmental impacts from climate change.
- The provision of a mechanism enabling the visualization of the complex spatial and temporal patterns from a wide range of data derived both empirically and from models. This enables key stakeholders to rapidly assess scenarios and their likely impacts.
- Modeling of this type could be used in a number of areas including fire, flood, tsunami.