This project has been assisted by the New South Wales Government, through its Climate Action Grants Program.

Outline

- Sea level rise and beaches
- Selecting adaptation options
- Sydney Beaches Valuation Project
- Need for visitor estimates
- How to estimate beach visitation
- Ongoing work

Climate change and the coast

18-59cm rise by 2099 (IPCC 2007)

- Ice sheets, regional variation...91cm(+)?
- Inundation, shoreline recession, ecological impacts
- Higher temperatures

Sea level rise and beaches

- Inundation is a major focus of the media
- Interaction with existing vulnerabilities more important for many areas
- Before the houses get flooded, what happens if beaches disappear?

Source: Sydney Morning Herald

Adaptation options:
Understanding tradeoffs

- Do nothing, retreat, adapt, protect
- What will different alternatives mean in environmental, social and economic terms?

Sydney Beaches Valuation Project

Determine the existing use and non-use values of selected ocean and estuarine beaches in Sydney

- Manly Ocean Beach
- Collaroy-Narrabeen
- Dangar Island and Brooklyn Baths

Using a range of methods, designed for transferability

Provide information to be used in the decisions about how to respond to climate change impacts
Sydney Beaches Valuation Project

• Partnership between the Sydney Coastal Councils Group and UNSW
• PhD project – valuation to be completed in 2009

• Range of methods:
  - Hedonic Pricing Method – property market impacts
  - Travel Cost Method – recreation value
  - Contingent Valuation (WTP) – cultural/social value
  - Choice Modelling – community preferences
  - Benefit Transfer – ecological values

Travel Cost Method

• Ask people where they came from, how they travelled, and how long they stay
• Travel costs and time costs gives a minimum estimate of value they expect to get from the trip

Contingent Valuation

• Present hypothetical future states
• Ask people how much they are WTP
• Captures non-use values

Survey administration

• Joint estimation: Travel costs and Contingent Valuation (WTP)
• Designed to use handheld computer onsite and for internet surveys
• Skip logic – conditional on previous responses: more efficient
e.g. visitors who walked to the beach not asked about parking fees

Shameless plug

Online survey: CVM and TCM
Accessible from SCCG website:
http://sydneycoastalcouncils.com.au

How does beach visitation become important?

• Surveys give us an idea of the average travel costs and average willingness to pay to prevent erosion
• Total loss/gain is what is most relevant to policy decisions:
  WTP/TC multiplied by relevant population

Need an estimate of beach visitation!
‘Value’ of visitation estimates

- Useful in economic valuation
- Plan lifeguard services:
  - paid council services
  - shifts and rosters
- Emergency planning – tsunami response
- Plan public transport services

Estimating beach visitation

- Very challenging!
- Complex environments: many access points, variable in size
- Lifesaver estimates
- Aerial photographs
- Onsite photographs – fixed or observers
- Observations
- Proxy methods: parking or entrance fees

Lifesaver estimates

- Not always collected
- Less reliable at higher densities
- When beaches are crowded, lifesavers are busy

Photography

- Aerial photography allows for capturing the entire beach area
- Researchers taking photographs at ground level; people not always in same place
- Tradeoffs between the field-of-view and image clarity

Proxy methods

- Best in places with restricted access, e.g. NP
- Public transport ticket sales and numbers
- Parking fees and fines
- Vehicle counts

Difficult to separate out beach visits:

- Multiple use tickets, multiple purpose trips
- Parking permits and free parking areas
- Many access points

CoastalCOMS

- Coastal Conditions Monitoring System
- Uses surf camera network of Coastalwatch
- Range of different modules: beach state, wave height, boat usage etc.
CoastalCOMS - beach usage

- System developed by Griffith University, GCCC and Coastalwatch
- Overcomes issues with low image quality
- Identifies person and non-person objects

Factors in visitation

- Beach width (tide as proxy)
- Congestion/density
- Wave height and orientation
- Wind speed and direction
- Time of day, and week
- Temperature
- Cloud cover and rainfall
- Surf reports?

Visitor Count!

Object Detection and Classification

- Raw image
- Converted grayscale image
- Enhanced image
- Background extraction

Feature extraction
- Object detection and segmentation
- Artificial neural network

Visitor numbers

Air temperature

Beach width

Wave height

Some expected relationships

Current work: Predicting the future

- Improving on the guesses:
  “It will be hotter, so more people will come.”
  OR
  “The beach will be smaller, no room for me”

- Use relationship between visitation and other variables to look at future visitation
  \[ V = \alpha + \beta_{\text{Temp}} + \beta_{\text{WaveHt}} + \beta_{\text{WindSpd}} \]
  e.g. if the number of days over 25 degrees goes up by 10%, what is the likely increase in beach visitation?

Theory under investigation…

- Predictions for SLR by 2050 are in the order of 30-50cms
- Average daily tidal range for Sydney is around 90cm
- Is it possible to use this to generate a model of future beach visitation, relative to beach width?

STAY TUNED!

Contact details

Dave Anning
School of BEES
University of New South Wales
Sydney 2052
Email: david.anning@student.unsw.edu.au
Benefit transfer

- Uses values from previous studies
- Two sites: study and policy
- Function or unit transfer

![Image of coral reef]

Choice method

- Asked to choose between bundles of goods
- Eg. Cars: size, colour, transmission, price
- Can be simply ordinal, or include price as variable
- Closer to real purchase decisions
- If there is sufficient information about the environment, can combine with travel cost method (Englin, forestry characteristics)

![Image of choice method example]

Figure 1: Example of a choice set used in the choice-modelling framework.