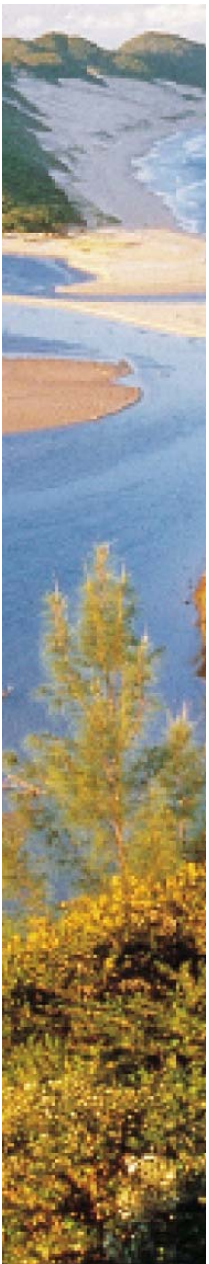**Natural Capital Accounting and Valuation of Ecosystem Services (NCA&VES) in South Africa**

Development of
pilot monetary ecosystem accounts
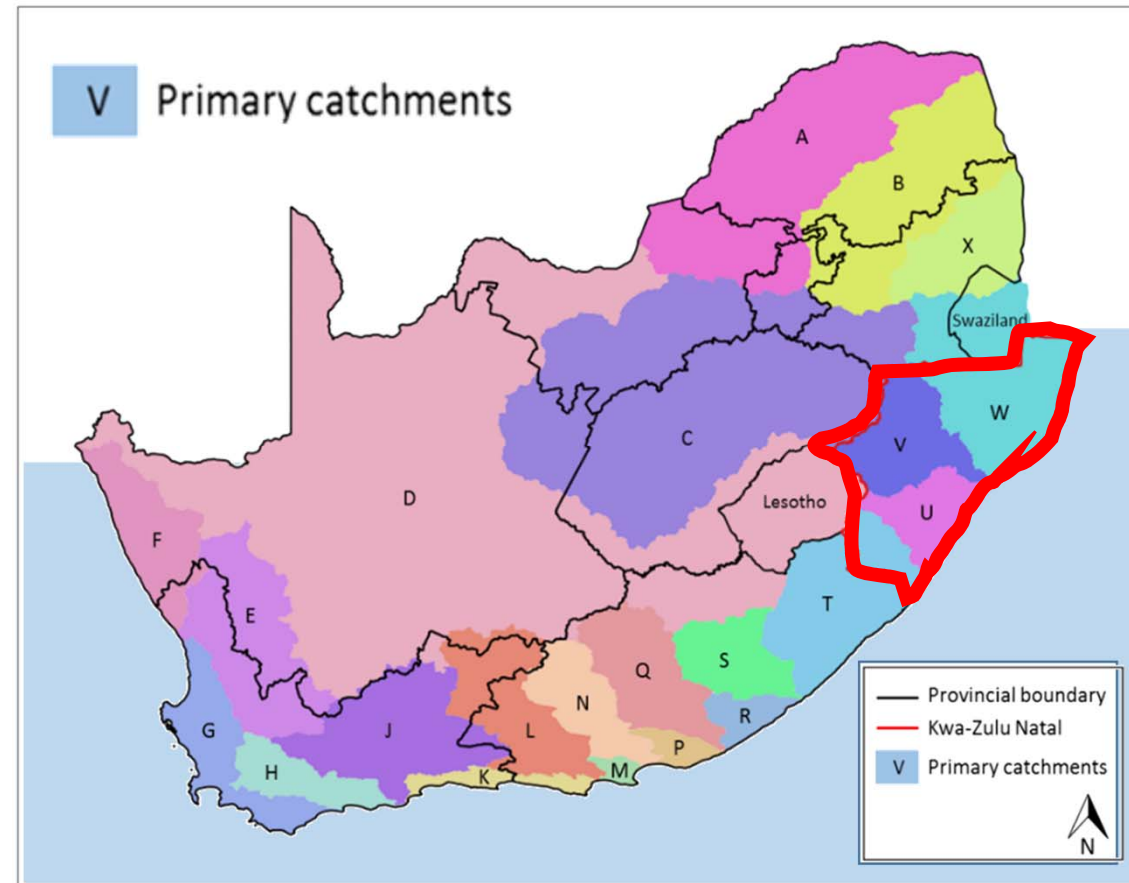for KwaZulu-Natal

Jane Turpie

Glen Cove, June 2019

Scope of the study

- Provincial scale
  - KwaZulu-Natal, inland
  - 92,000 km^2
  - Builds on earlier work
- 1990-2005-2011-2014
- Valuation of multiple ecosystem services
  - Annual flows, asset values
  - Summarise in accounting tables, show changes over time
- Scenario analysis

Valuation framework

- Values estimated in terms of **exchange value** as per SEEA-EEA Technical Recommendations

- Asset value per unit = NPV of the sum of expected future flows of all ecosystem services
  - Need simple, comparable, repeatable method
    - No time for complex projections, which will also be wrong and unlikely comparable due to different practitioners.
  - Will adjust for changes in stocks in situations of overexploitation
  - Likely to use 50 years at 3% social discount rate
  - Calculated at the level of BSU, summarised by ecosystem type

Ecosystem services included in KZN pilot

- **Provisioning** (Largely in SNA)
  - Harvested natural resources
  - Livestock production
  - Crops & plantation forestry

- **Cultural** (Partly in SNA boundary)
  - Experiential fulfilment associated with active or passive use
    - Tourism value
    - Property value

- **Regulating** (Outside SNA boundary)
  - Carbon sequestration

  - Flow regulation
  - Sediment retention
  - Water quality amelioration

  - Pollination (*intermediate*)
 - Nursery value (*intermediate*)

Provisioning services: overview

- Harvested natural resources
  - 10 groups of foods, raw materials, fuelwood
- Livestock production
  - Domestic livestock
  - Wildlife ranching
- Agriculture
  - Plantation forestry
  - Sugar
  - Orchards & vineyards
  - Irrigated crops
  - Dryland crops

- Estimate production from statistics, survey data
  - More challenging than expected!

- Map based on
  - land cover, condition,
  - land tenure, wildlife ranch map

- Value
  - Gross output – production costs

- 2011, then 2005

Provisioning services: Wild living resources

- HH **demand** for 10 groups of resources estimated for 4196 census sub-places, mapped to settlements
  - surveys 2009-12 (n=1600)
  - 2011 census data.

- For each group, **supply** (stocks and MSY) mapped to 13 **natural land cover** types based on literature

- Estimated **use** mapped to **vegetation** taking supply and distance into account

- **Value** based on prices and proportional input costs from local area literature

Still busy with mapping use

Fuelwood Use

m³/20m² pixel

High : 0.5

Low : 0
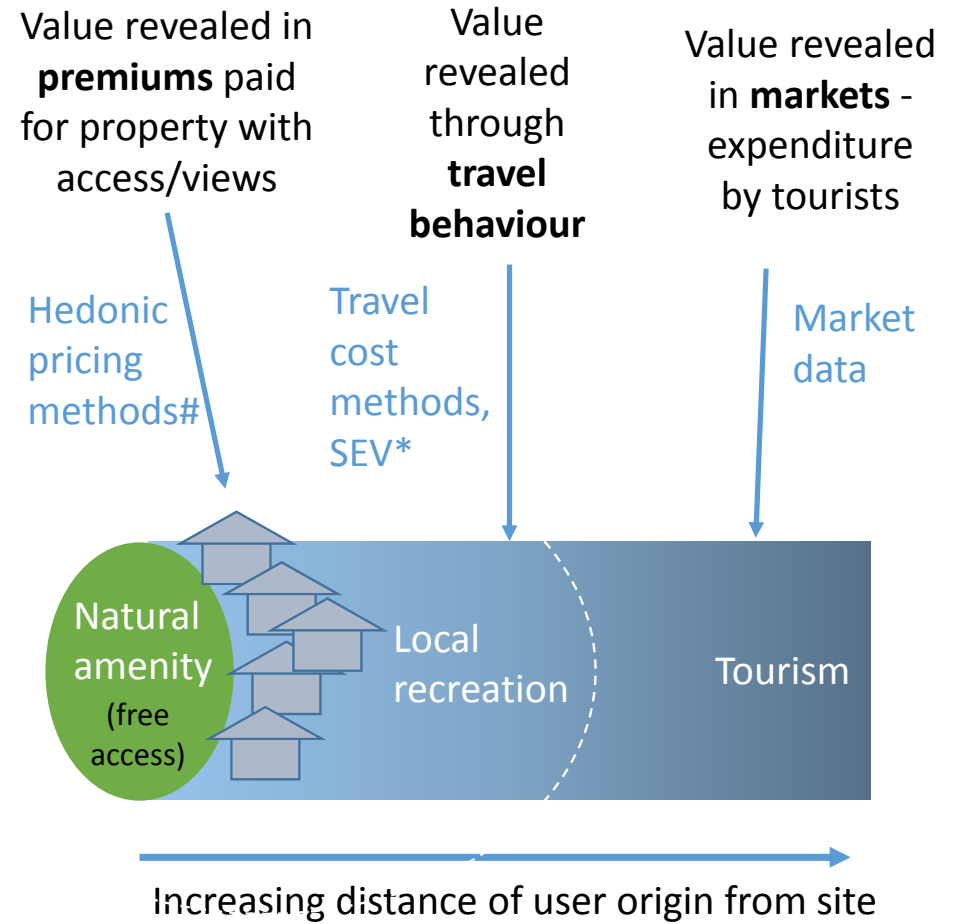
Legend

DistrictMunicipalities

Transformed
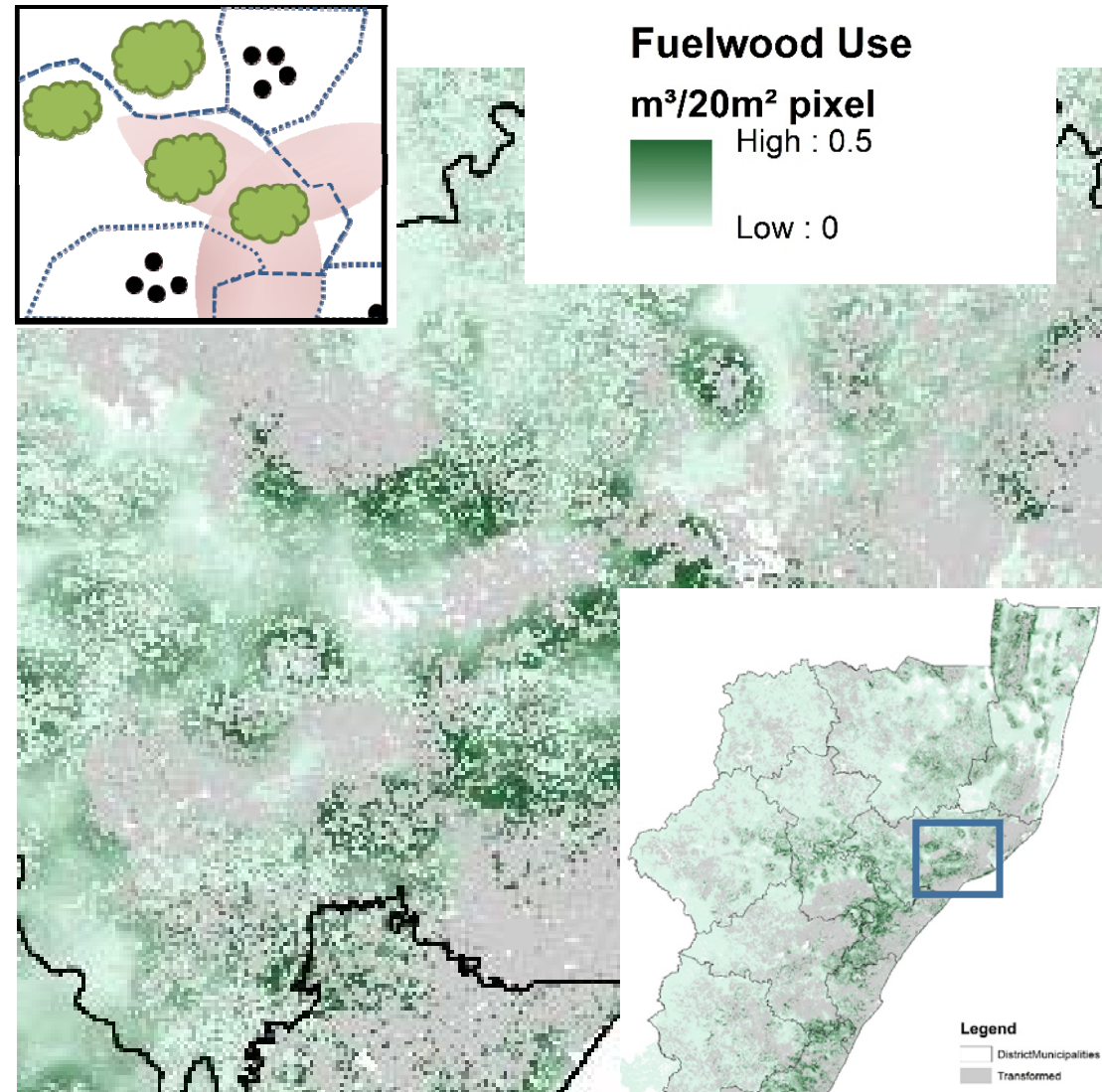
Provisioning services: Reared animal production

- Large areas of the province under domestic livestock or game farms

- Info patchy, collated produce density and output estimates at municipal level

- Value of ecosystem inputs determined using residual methods based on industry data

- Mapped to rangelands based on land cover data, game farm boundaries and mapped rangeland capacity

- Data
  - DAFF quarterly statistics at provincial level 1996-present
  - 2002, 2007 commercial agriculture census summarised at district level
  - Meissner et al. 2013 estimates of communal land stocks 2010
  - 2011 Agricultural Household Census, Ward level
  - NIDS data (2008, 2011, 2012, 2014, 2017)
  - KZN hh survey data from literature

Cultural services: overview

- Use values only
- Passive or active use value revealed in 3 main ways
  - different valuation methods
  - additive (need to value all 3)

- Tourism
  - Value of attractions from stats
  - Map from geotagged photos
- Local recreation
  - No data
- Property premiums
  - Hedonic study for main metro
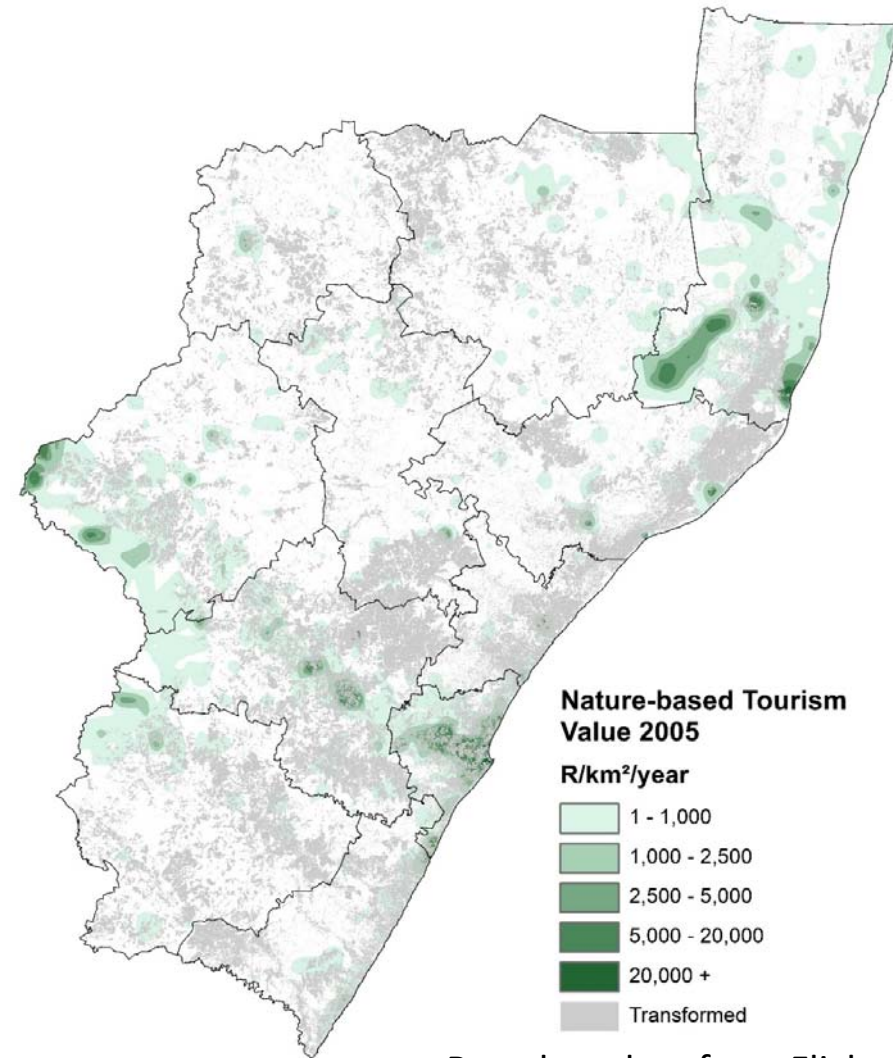 - Benefit transfer

Value revealed in **premiums** paid for property with access/views

Value revealed through **travel behaviour**

Value revealed in **markets** - expenditure by tourists

Hedonic pricing methods#

Travel cost methods, SEV*

Market data

Natural amenity (free access)

Local recreation

Tourism

Increasing distance of user origin from site

First stage for NCA
* For conversion to exchange value for NCA

# Cultural services: tourism value

- Total tourism value from province from official statistics
  - Direct value added

- Fraction attributed to <u>visiting attractions</u> (as opposed to family, shopping, business, etc), estimated based on tourism reports

- Attraction value mapped based on density of geo-tagged photographs uploaded to internet sites

Nature-based Tourism Value 2005

R/km²/year

- 1 - 1,000
- 1,000 - 2,500
- 2,500 - 5,000
- 5,000 - 20,000
- 20,000 +
- Transformed

Based on data from Flickr

Cultural services: contribution to property value

- Modelled based on detailed data for KZN's metro area (Durban)
  - Sale prices, characteristics & exact location of 16,000 properties
  - Neighbourhood & environmental variables from census, GIS, satellite data
  - Regression analysis, estimation of premiums at suburb level, assigned to local amenities
  - Expressed as value/ha/year for each type of open space in each suburb
- Extrapolated to rest of province based on relationship between average green space premiums and suburb income levels (census data)
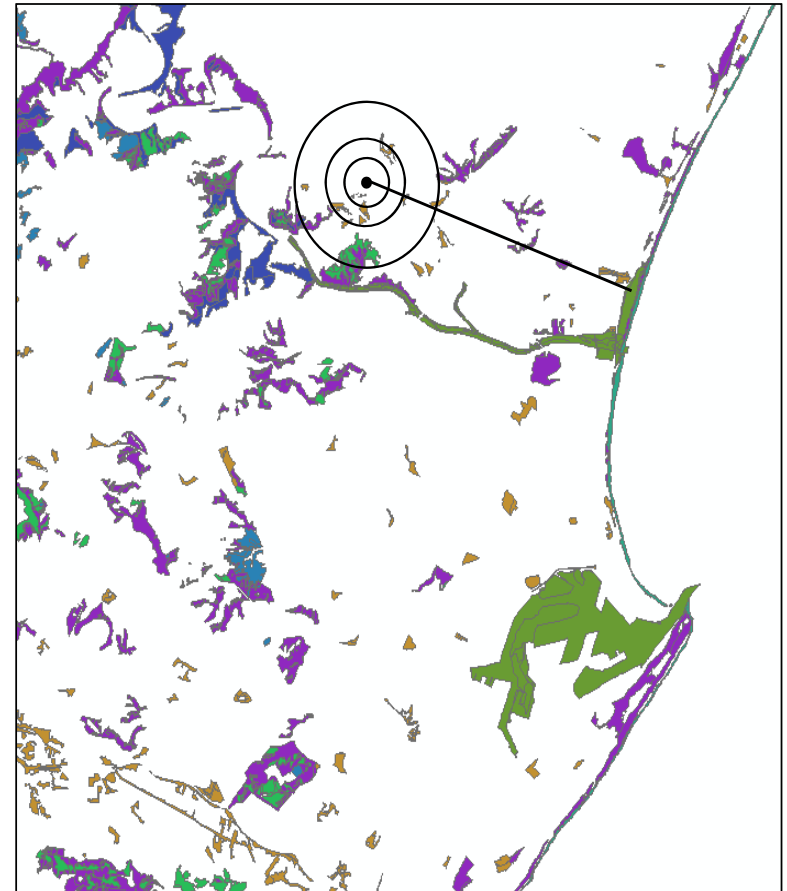
Regulating services: Carbon seq & storage

- Based on the National Carbon Sink Assessment

- Stock value in terms of SA share (0.35%) of global social cost of carbon (R/tonne)
  - Based on African share, relative vulnerability within Africa

- Map for 2011 and 2005 based on land cover
  - Important value will be change between time periods

Carbon Storage Value R/ha/yr

- 0 - 10
- 10 - 100
- 100 - 500
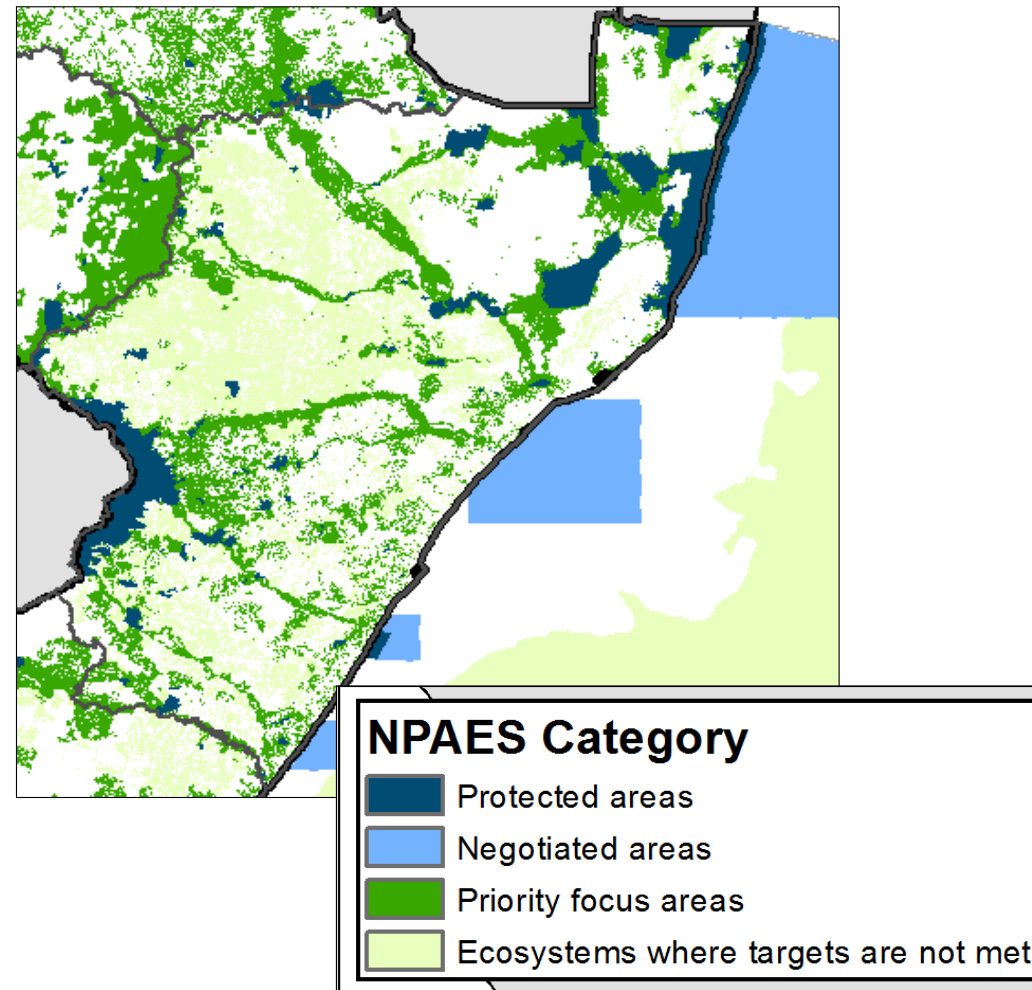- 500 - 1 000
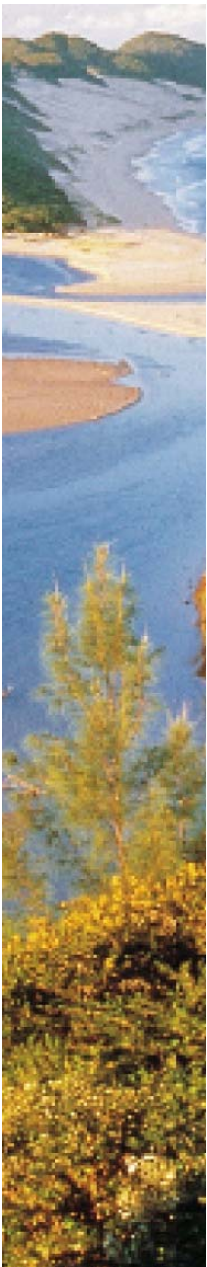- 1 000 +
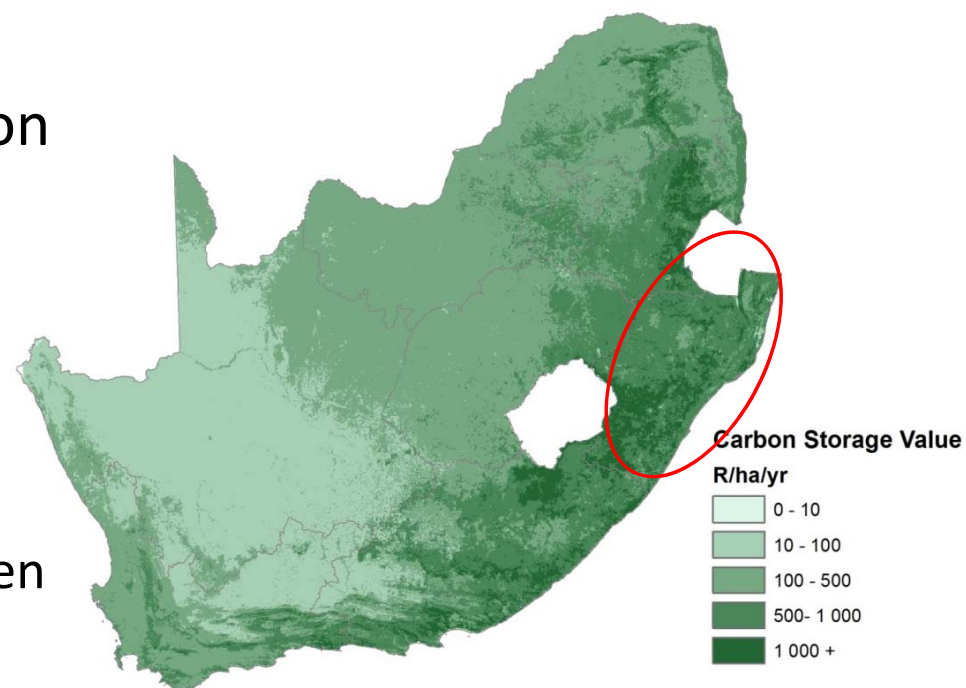
Hydro-regulating services: overview

- Flow regulation
  - Reduced need for storage for water supply
  - Reduced flood risk
- Sediment retention
  - Reduced sedimentation
- Water quality amelioration
  - Reduced water treatment costs

- Model flows, sediment using SWAT/InVEST
  - 2005, 2011 land cover
- Replacement costs (flows, sediment reg)
- Empirical valuation model (WQ)
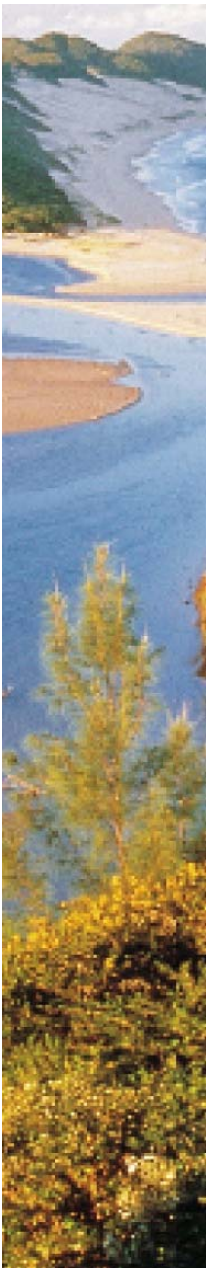 - Panel data from 25 plants, fixed effects
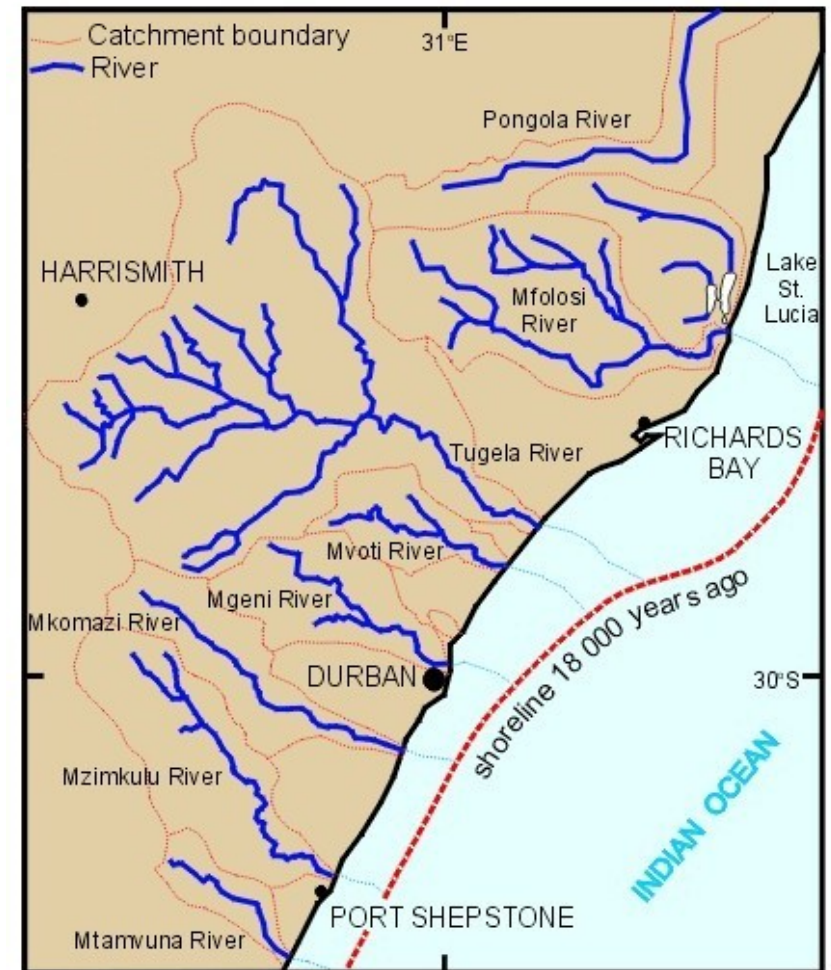
Scenario analysis (provisional)

- Business as usual
  - Requires projection of population, land use and ecosystem condition.

- Full implementation of protected area expansion plan
  - Improvements in condition
  - reduced access to resources

- Rangeland extension programme
  - Improved land cover and productivity

NPAES Category

- Protected areas
- Negotiated areas
- Priority focus areas
- Ecosystems where targets are not met

On to the Group Discussion…

Ecosystem service physical and monetary accounts

- 1. What is already taking place related to NCA in this theme?
- 2. What are the needs?
  - Who currently makes use of ecosystem service/ecosystem valuation studies?
  - Who else could potentially benefit? How, why?
  - What else is needed to advance this aspect of NCA
    - To fill gaps, increase capacity and consistency, collaboration etc
  - Of these what would we prioritise as top 3?
- 3. What are the recommended actions?
  - Meetings, research, clarifications, working groups to give guidance…
  - Can we ID some champions?