



# Designing Frameworks to Deliver Unknown Information to support MBIs *"Environmental Metrics"*

Mark Eigenraam

Department of Primary Industries  
Economics and Policy Research Branch  
Victoria, Australia

# Design Criteria

- ◆ Synergies
- ◆ Repeatability
- ◆ Actions and outcomes
- ◆ Communications
- ◆ Contract design
- ◆ Uncertainty
- ◆ Time and space

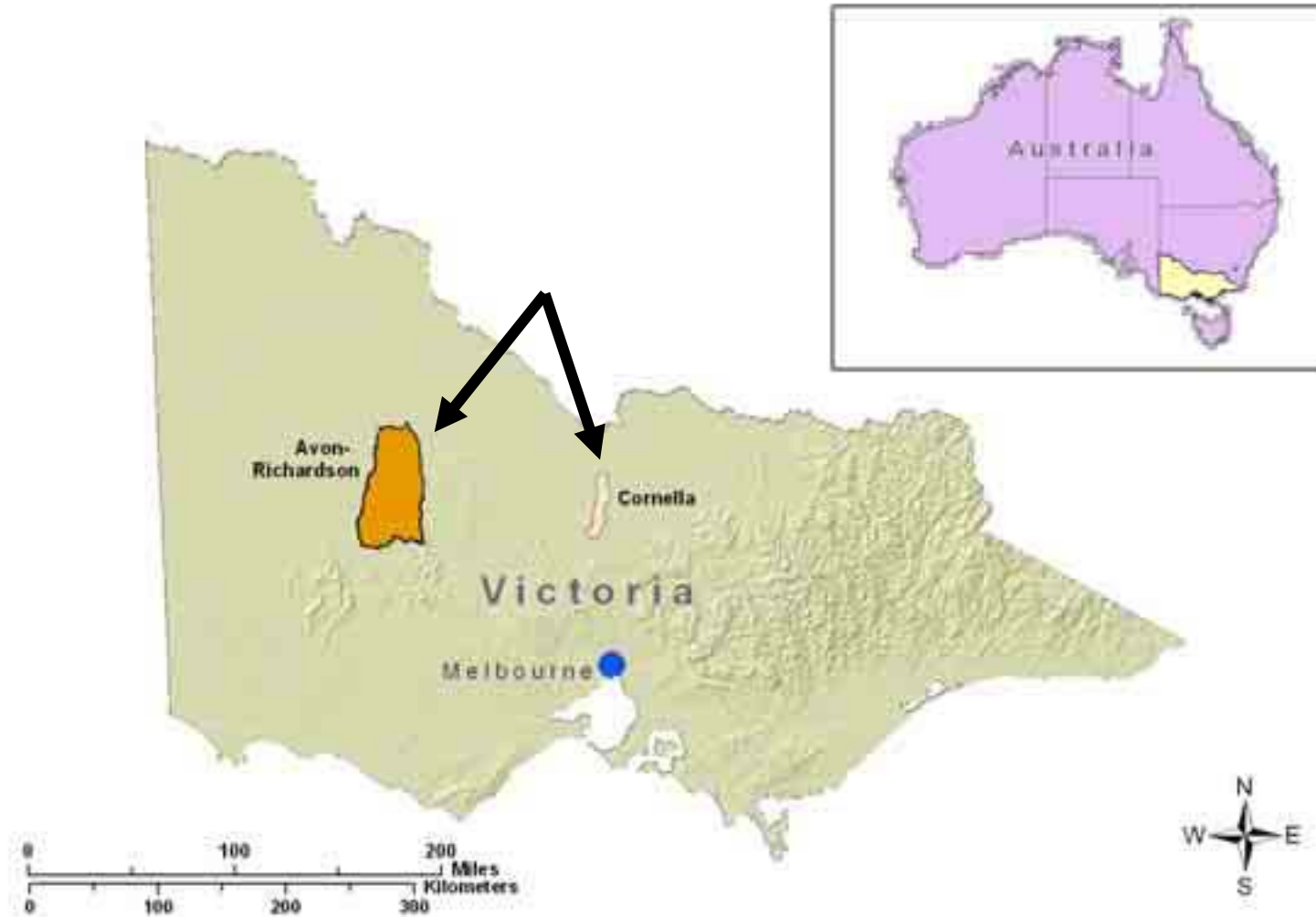
## Auctions & Ecological Goods and Services (EGS)

- ◆ *BushTender*
  - single dimension (terrestrial biodiversity) auction created the supply side of the market
  - demonstrated the capacity for cost savings
- ◆ Growing recognition there are linkages between environmental outcomes
  - joint production
  - Avoidance of undesirable outcomes (revegetation & water harvesting)
- ◆ Reveal missing/unknown information
  - Systems to support the application of new mechanisms
  - Replicable measures of environmental outcome/s

# EcoTender

- ◆ Auction for multiple ecological goods and services
  - aquatic function, Terrestrial biodiversity, saline land, carbon
- ◆ Exploit joint production of environmental goods - reduce costs
- ◆ Reduce transaction costs - farmer interface, EGS estimation
- ◆ Reveal unknown information
  - Develop and apply an approach to estimating environmental outcomes as a result of landuse change
  - *Non-Point environmental production function*

# EcoTender Catchment Locations



# Modelling Approaches

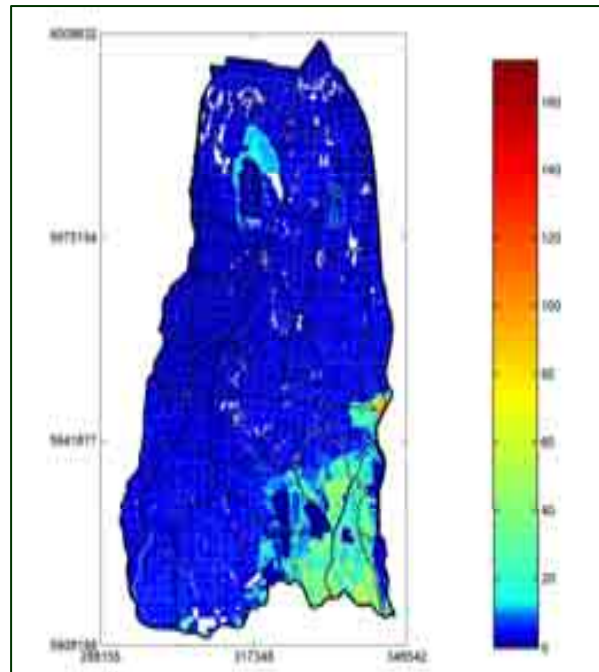
- ◆ Statistical methods
  - Observational data, no physical processes
- ◆ Economic Models
  - Profit maximisation with environmental outcomes/impacts attached
- ◆ Conceptual
  - Lumped characterisation of physical processes
- ◆ Simulation models
  - Physics based, mathematical
  - Plant, animal, hydrological processes
  - Time and space
- ◆ Variants.....

# Catchment Modelling Framework

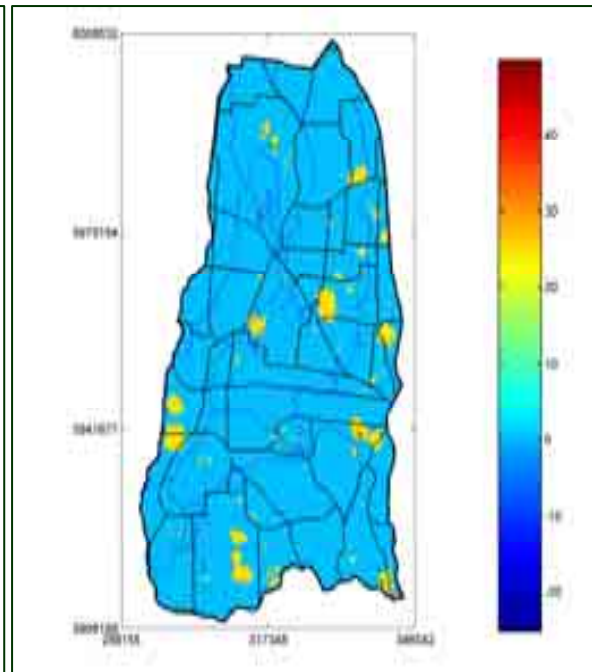
- ◆ Spatially explicit farming system models connected to a fully distributed 3D groundwater model
  - operates @ 50\*50 metre resolution
  - Catchment areas 371,000 ha & 47,000 ha
- ◆ Explicit relationships between landuse (cropping, grazing, forestry, other) and the environment
  - explicit representation of plant, land and water processes
  - links site with offsite impacts (farm to catchment)
  - site and spatially accessible data for interrogation
- ◆ Eco-System algorithms
  - landscape context (current)
  - spatial preference (future)

## Heterogeneous impacts

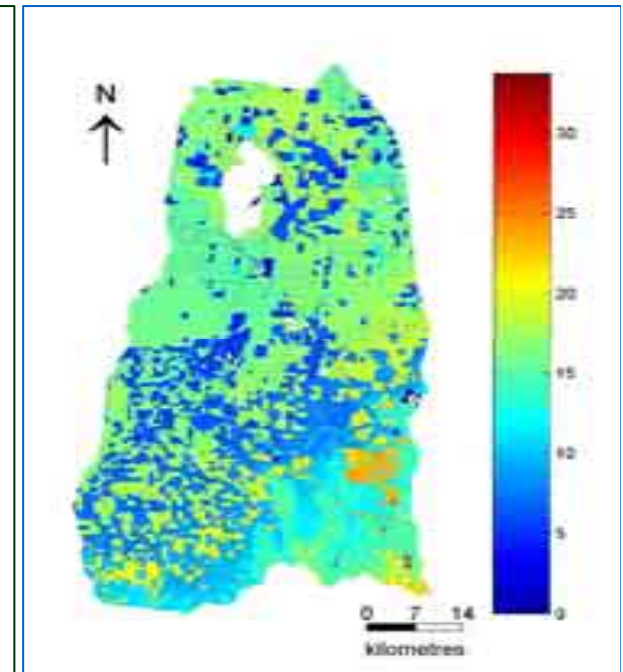
Stream Flow



Salinity

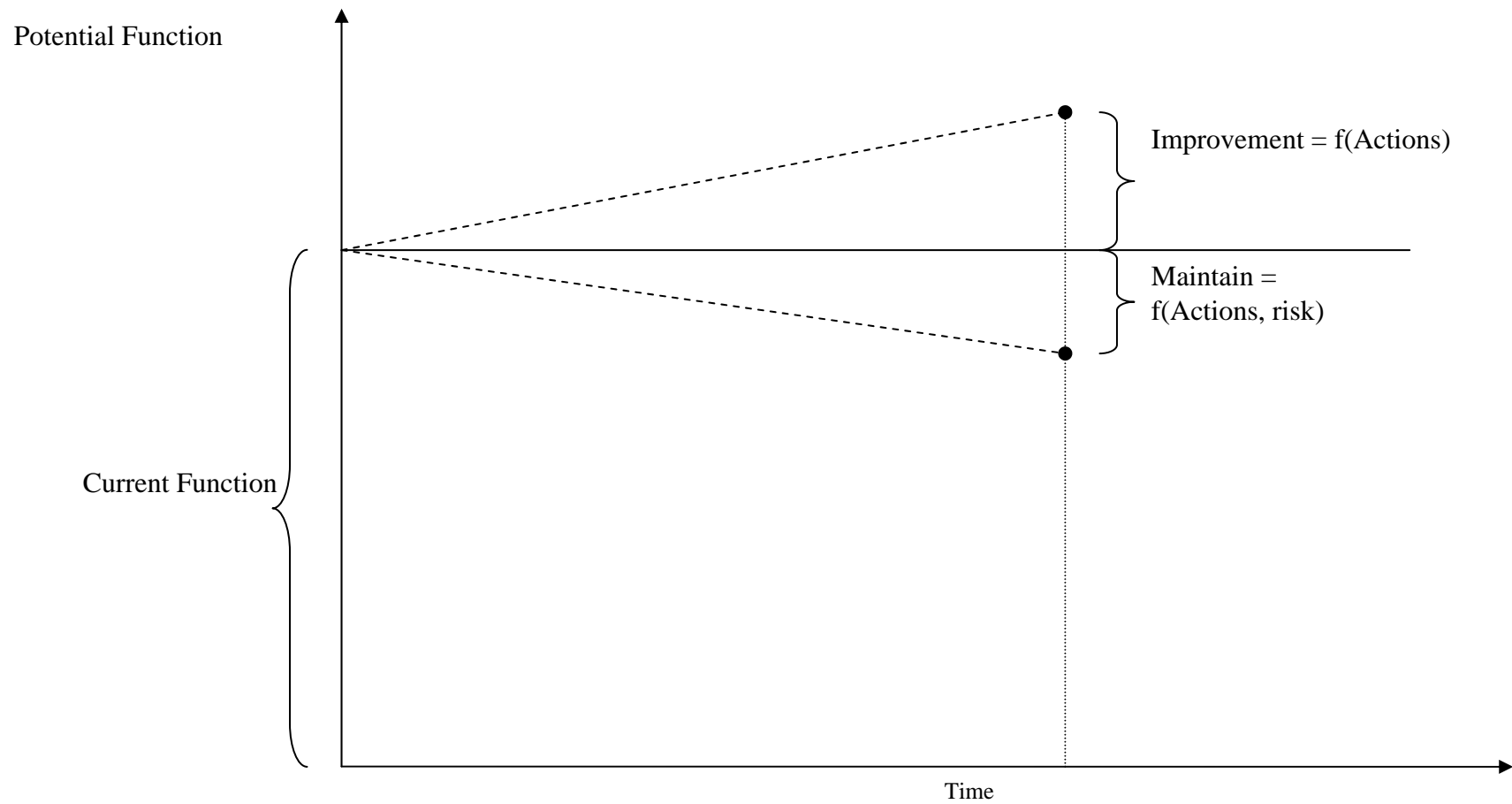


Carbon



Source: Eigenraam et al (2005)

# Ecological Function

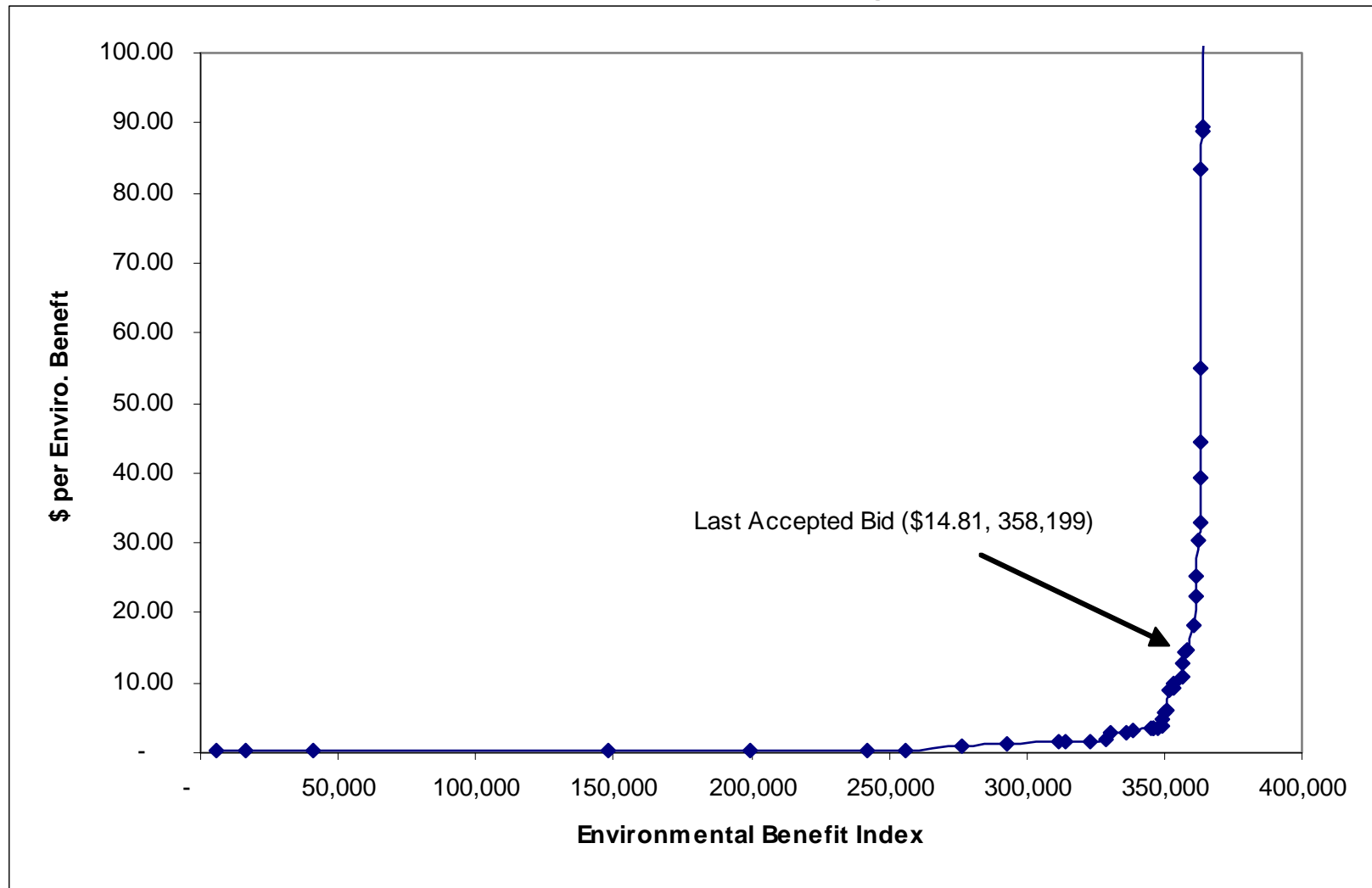


<b>EGS Attribute</b>	<b>Change in function</b>	<b>Desirable change</b>
Terrestrial biodiversity	$\Delta$ habitat score (habitat maintained or improved / ha)	increase
Aquatic function	$\Delta$ water "quality" (in tonnes of soil / ha arriving at stream) $\Delta$ water quantity (in mm of water / ha arriving at stream)	decrease
Saline land	$\Delta$ saline land (in ha with groundwater < 2m)	decrease
Carbon sequestration	$\Delta$ carbon seq. (in tonnes / ha)	increase

## Baseline – reference point

Environmental good/service	Change compared with pre-European landscape (%)
Stream flow	+75%
Area with ground water < 0.8m	+104%
Habitat	-96%

# EcoTender – Supply Curve



# Observations

- ◆ Low cost approach to estimating EGS
  - environmental outcomes can be assessed in the field
- ◆ Joint production
  - 73% of sites generate 2 or more environmental outcomes
- ◆ Cost effective
  - Recognises the heterogenous character of farmers (cost, spatial)
- ◆ Site based metrics for investment
  - recharge for saline land (27%)

# Observations

- ◆ *The CMF provides:*
  - *government with a replicable transparent evidence-based approach to the procurement of environment outcomes.*
  - *environmental programs with the capacity to be more cost effective*
  - *for the opportunity to explore/test alternative approaches to the procurement of EGS (off-sets, cap and trade, auctions)*

# Landholder Contract Map



# Landholder Contract Map

