"Research methodology in the sciences and agricultural economics"
Piacenza, June 5th 2013

Habitat Banking: valuation aspects and development of environmental compensation tools
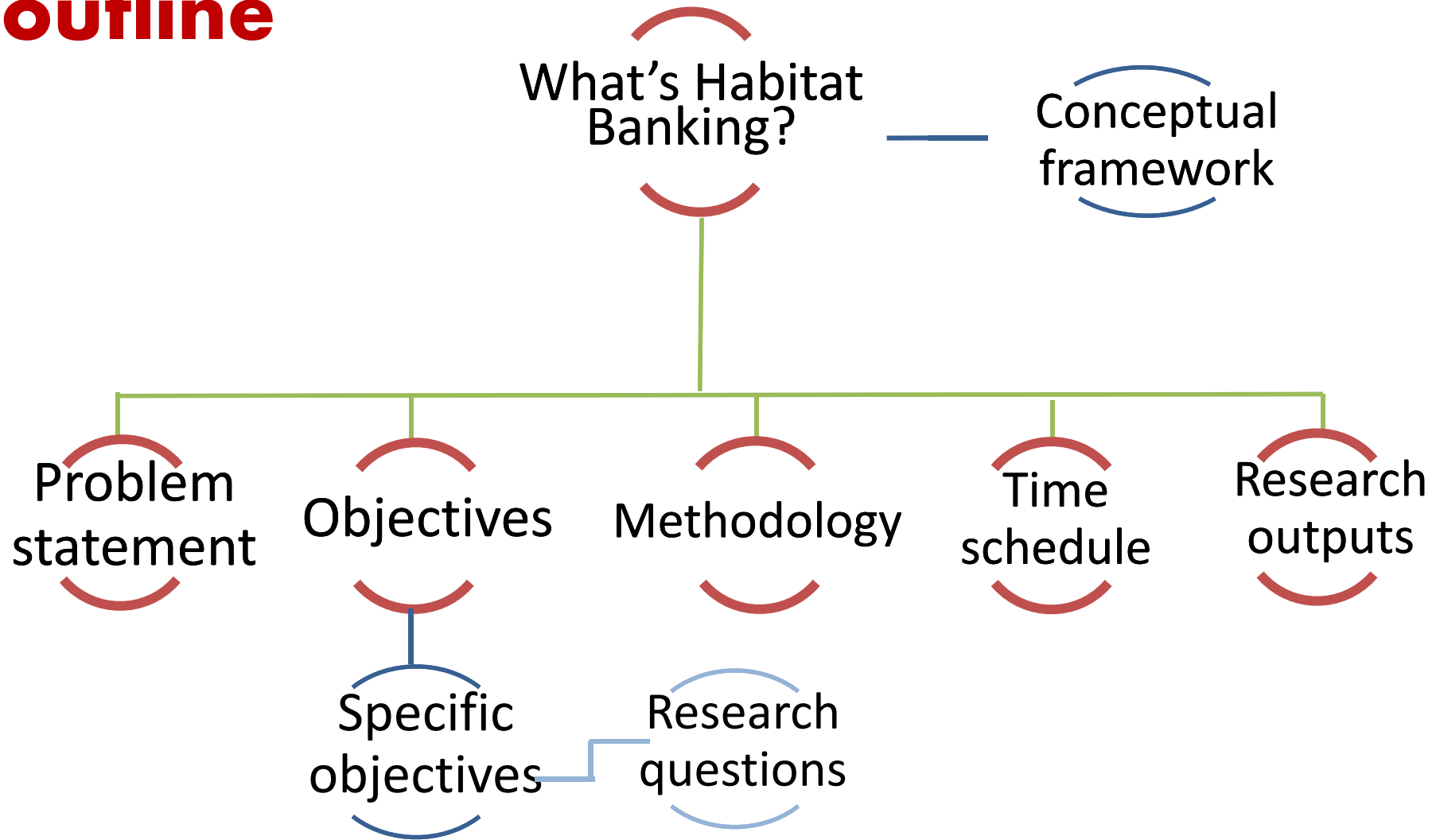
Ariadna Chavarria Resendez
Ph.D. Student
University of Padova
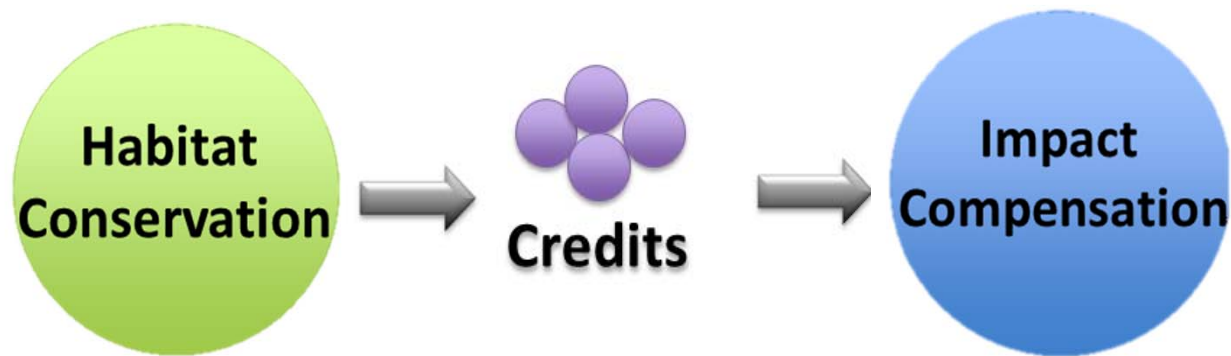
ariadna.chavarriaresendez@studenti.unipd.it

Presentation outline

What's Habitat Banking? — Conceptual framework

Problem statement

Objectives

Specific objectives — Research questions

Methodology

Time schedule

Research outputs

HABITAT BANKING

Developed in California USA in the 1980's, Habitat banking is an novel form of environmental compensation inspired in PES.

It is a **market-based** scheme that implements in advance **complementary/compensatory remediation** measures to offset environmental impacts derived from development projects in a cost-efficient way while achieving ecological benefits.

Habitat Conservation → Credits → Impact Compensation

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What kind of development projects?

Europe   European Liability Directive- ELD 2004/35/CE
Environmental Impact Assessment Directive- 2011/92/EU
Habitat Directive 92/43/ECC and Bird Directvive 2009/147/EC

- Crude oil refineries
- Waste disposal installations
- Gas pipelines
- Intensive livestock
- Food, rubber, textil and paper industries
- Mines

- Intensive fish farms
- Large pig and poultry units
- Hydroelectric instalations
- Metal processing
- Tourist development
- Railways
- Roads

http://www.planningni.gov.uk/index/advice/advice_leaflets/leaflet05/leaflet05_development_types.htm

Conceptual framework

When the residual unavoidable negative impacts from development cannot be avoided, minimized or mitigated through the primary on-site restoration.
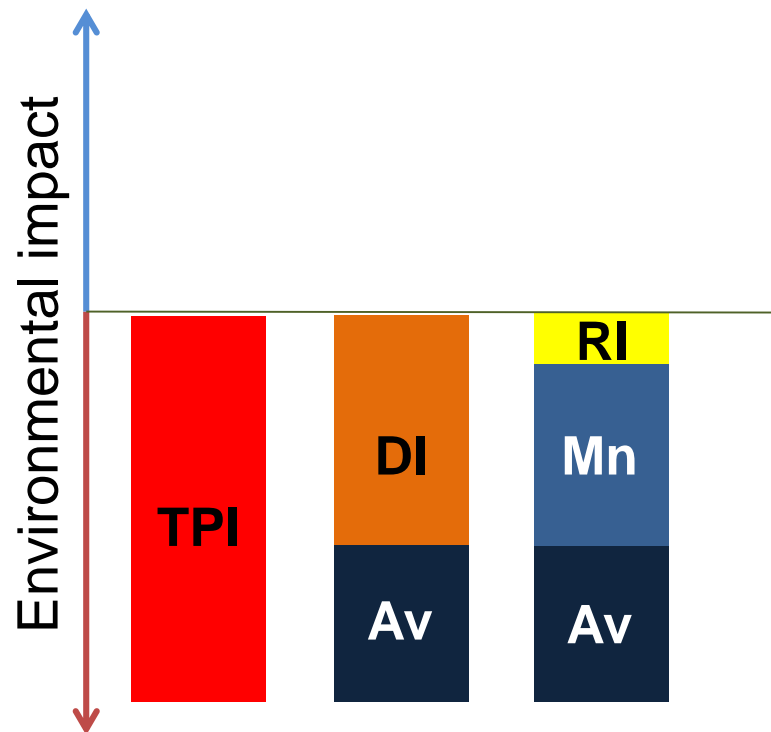
Development project impact:

- TPI, total predicted impact
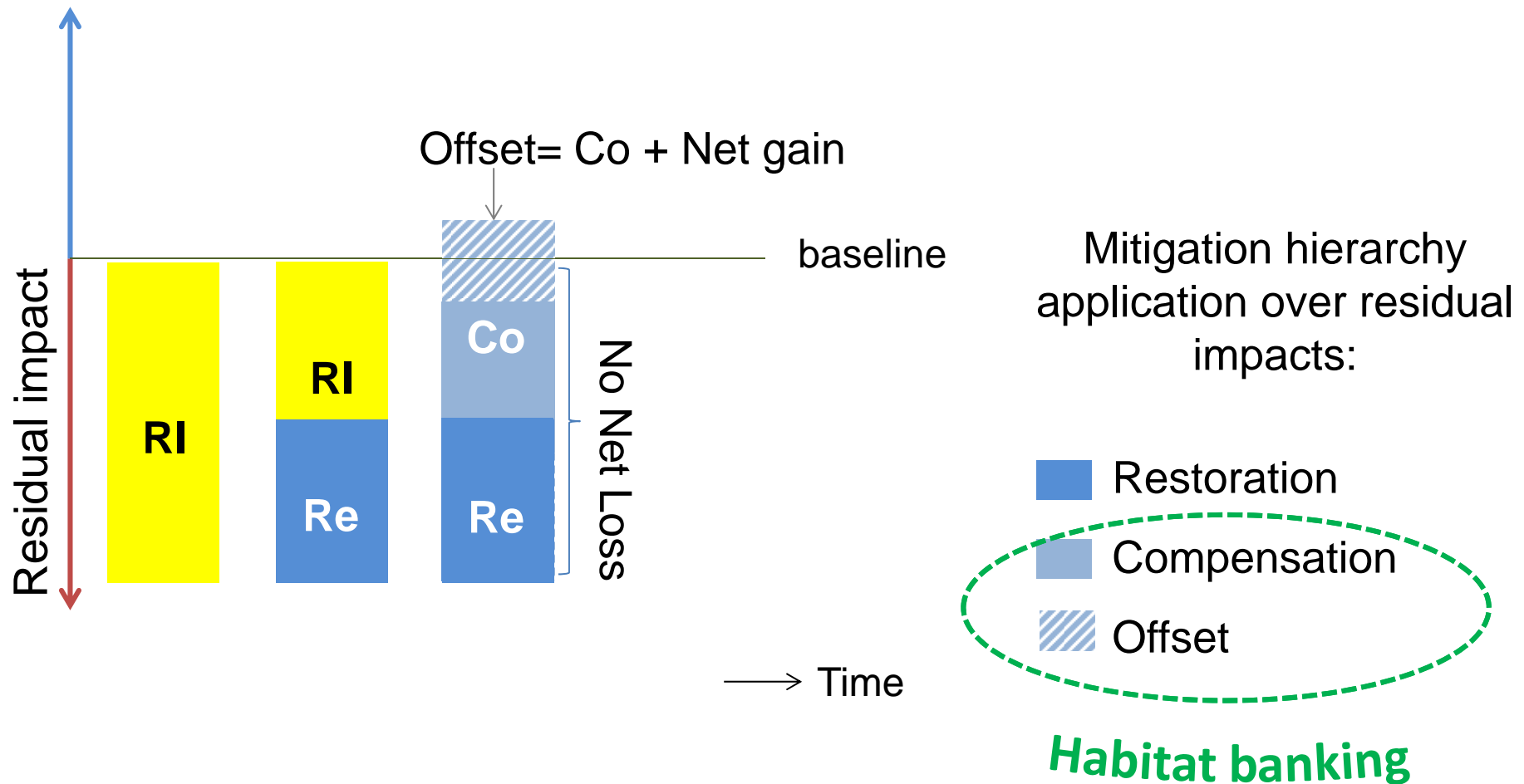- DI, decreased impact
- RI, residual impact

Mitigation hierarchy:

- Avoidance
- Minimization

Conceptual framework

Offset= Co + Net gain

baseline

Residual impact

RI

RI

Co

Re

Re

No Net Loss

Time

Mitigation hierarchy application over residual impacts:

Restoration

Compensation

Offset

Habitat banking

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Status of world's biodiversity market
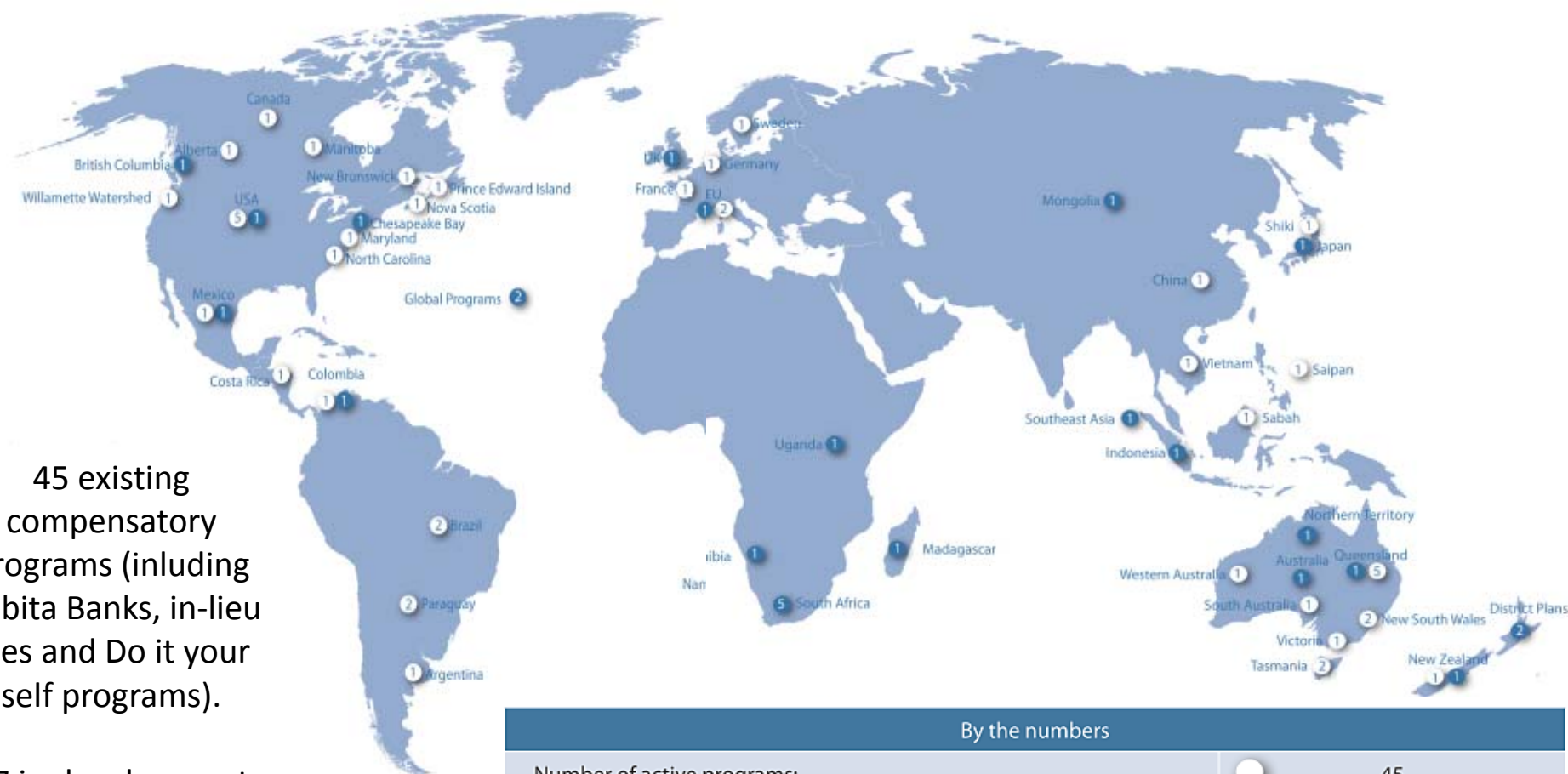
45 existing compensatory programs (inluding Habita Banks, in-lieu fees and Do it your self programs).

27 in development stage

By the numbers		
Number of active programs:	○	45
Number of programs in development:	●	27
Total known global payments per annum:		USD 2.4-4.0 billion
Land area protected or restored per annum:		>187,000 hectares

State of Biodiversity Markets. *Geography*, *40*(8), 19 September 2011. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:State+of+Biodiversity+Markets#0

Conceptual framework

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PROBLEM STATEMENT

Complementary/compensatory compensation measures have been widely used in USA and Australia within a market-based scheme for compensation of the residual impacts of development projects. In the European Union directives and legislation exists but no tradable compensation measurements are been implemented so far since there is still the need to find a suitable habitat equivalence method to valuate the losses (ecologically and economically) and a formal market-based mechanism to formalize the supply and demand of such measures.

RESEARCH OBJECTIVES

A. Identify and/or develop a suitable valuation method (value-based and/or resource-based) for assessing the environmental losses considering the ecosystem's scale and change pace and the society's preferences over the natural resources.

Research questions

A.1. How the socioeconomic and cultural values can be integrated to the habitat banking mechanisms?

A.2. How to assess the value of biodiversity and ecosystem services before the development plan generates an environmental cost?

A.3. To what extent are biodiversity values transferrable and substitutable?

A4. What kind of indicators can incorporate the social preferences to the ecological metrics for creating an integral unit of tradable habitat credits?

PhD Objectives

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B. Provide a comprehensive analysis of the habitat bank's market-based mechanism, its design, implementation, credits generation and trade and permanence, in order to contribute for developing a habitat banking compensation system in Italy.

Research questions

B.1. How the habitat credits are generated and delivered?

B.2. What areas are more likely to create more ecological and economical effective habitat banks?

B.3. What tools can be used to design mechanisms that allow spatial and time changes in conservation status while maintaining the biodiversity capital-asset unchanged?

PhD Objectives

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METHODOLOGY

A. Assessing habitat economic value

Environmental valuation methods

- Resource-based methods: **Habitat Equivalence Analysis, HEA** (NOAA, 2006) for assessing the environmental losses considering the level of environmental services provided, area extension, and discount rate.

$$P = J * \frac{V_j}{V_P} * \frac{\sum_{t=0}^{N+1}\left[(1+r)^{C-t} * \frac{b^j - 0.5\left(x_{t-1}^j + x_t^j\right)}{b^j}\right] + \left[\left(\frac{b^j - x_{t=N+1}^j}{b^j}\right) * \frac{1}{r} * (1+r)^{C-(N+1)}\right]}{\sum_{t=I}^{M+1}\left[(1+r)^{C-t} * \frac{0.5\left(x_{t-1}^P + x_t^P\right) - b^P}{b^j}\right] + \left[\left(\frac{x_{t=M+1}^P - b^P}{b^j}\right) * \frac{1}{r} * (1+r)^{C-(M+1)}\right]}$$

Some limitations:

Hepburn C., 2007- **Social discount rate**

Dunford et *al*., 2004- **Value equivalency** between injured and compensatory services

J, is the number of the injured area (e.g. ha, acres)
V_j, is the annual unit value of the services provided by the damaged resource
P, is the number of compensatory/complementary units (in the unit of discounted service-area-year)
r, is the social discount rate
b, is the baseline level of services provided by the injured (j) or compensatory/complementary (p) resource
x, is the level of services provided per unit by the injured (j) or compensatory/complementary (p) resource at time t
N, time when compensation maximum services, I, is the time when. starts to give services;
M, compensation reaches full maturity.

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- Resource-based methods: **Habitat Evaluation Procedure, HEP** (USFWS, 1980) for assessing the environmental compensation needed in ex-ante and off-site to environmental damages. Considering only ecological features-species proxies- of the injures and compensatory site.

$$ZC = -A\left[\frac{\sum_{i=1}^{n} I_i}{\sum_{i=1}^{n} M_i}\right]$$

where

A	size of candidate compensation study area,
M_i	habitat units gained through compensation for a target species i,
I_i	habitat unit losses for the same species i,
n	total number of identified species.

Some limitations:
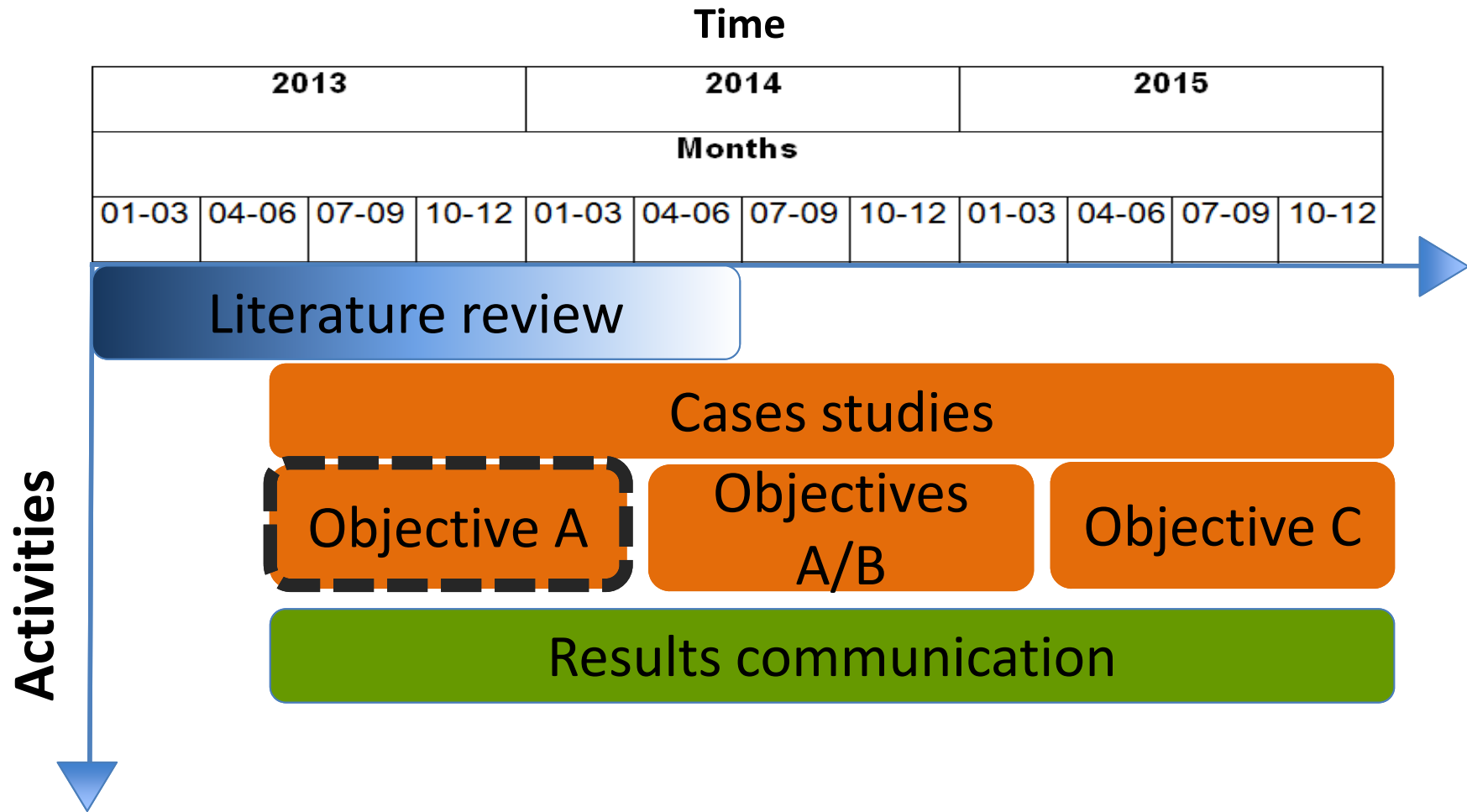
Hepburn C., 2007- **Social discount rate**

Dunford et *al*., 2004- **Value equivalency** between injured and compensatory services.

Methodology

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B. Developing a market-based scheme for a habitat banking

- **Payment for Ecosystem services:** creating a demand and supply of complementary/compensatory remediation measures.

Additionality, conditionality, transaction costs, equity …

PES

Habitat Banking

Market-based mechanism (quantity based)

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TIME SCHEDULE

RESEARCH OUTPUTS

Regarding specific objective A and related research questions.

Poster presentation (AIEAA Conference 6-7 June 2013):

Habitat banking: a solution to compensate development projects?

Empirical case study to explore the applicability of the resource-based valuation method Habitat Equivalence Procedure (HEP) to scale suitable complementary and compensatory remediation measures, and to calculate the credits generated by such projects.

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**Thank you
for your attention**