**TEXTE - PPT slides**

**1**

Francesca Visintin is researcher working at Ceta - Centre for theoretical and applied ecology of Gorizia in Italy.

She is going to present issues and results about:

A model of environmental accounting for the system of the natural protected areas in Friuli Venezia Giulia

**2**

In the Introduction I'm going to explain why and where the study was undertaken and what was the purpose

In the second section the methodology is outlined and the environmental accounting model is given taking care to illustrate how model was adjusted

In the third section the analysis of the results is provided and finally the fourth section concludes

**3**

Since 2007 the C.E.T.A. and the Friuli Venezia Giulia Region have collaborated in order to establish an environmental accounting model for the Regional Environmental Areas System (in Italian: Sistema Aree Regionali Ambientali – S.A.R.A.).

The increasing unavailability of public founds implies:

- Public decision makers should cut funds for protected areas. And many times they can't valuate the environmental, economic and social effectiveness of the fund reduction.
- On the other hand, policy-makers and decision-makers, stakeholders, and funding bodies are likely to seek information that can be used to improve resource allocation. Increased emphasis is in part due to changes in society, especially the increased demand for accountability, transparency, and demonstrable 'value for money'

The research on which this presentation reports investigated what, and how much value, the Regional Environmental Areas System (S.A.R.A.) was able to create from the money received from government and funding bodies.

In the presentation I would like to discuss how to:

- Account that economic value (that is the economic value of protected areas), in particular referring to the system of the natural protected areas in Friuli Venezia Giulia

- Account the economic management of protected areas
- Integrate in a common model the two previous accounting

For this purposes CETA developed the environmental accounting model, which I'm going to described in the following slides.

The project was realized in the name and on the behalf of the Autonomous Region of Friuli Venezia Giulia in the framework of the S.A.R.A. (Regional Environmental Areas System, in Italian - Sistema Aree Regionali Ambientali) Project, co-financed by the EU DOCUP Objective 2, 2000/2006 action 3.1.1.

**4**

The Regional Environmental Areas System (in Italian: Sistema Aree Regionali Ambientali – S.A.R.A.) is composed by:

- 2 Regional Parks
- 12 Regional Reserves
- 3 National Reserves
- 27 Biotopes

which cover 55.000 hectares corresponding to the 7% of the Friuli Venezia Giulia Region area.

In particular the model was applied in:

- one regional park
  - the Prealpi Giulie Regional Natural Park,
- two regional reserves:
  - Isonzo River Mouth Regional Natural Reserve
  - Cornino Lake Regional Natural Reserve

The first application of the model was realized in the last 2004 in the Miramare Natural Marine Reserve (Trieste, Italy)

**5**

The national accounting system depends directly on the economic system, that is on the economic theory.

Because of there are many economic theory, there are different national accounting system schemes, as you can see from the table.

Therefore at the end of the 1990s the United Nations, the European Commission, the International Monetary Fund, the Organization for Economic Co-operation and Development, and the World Bank undertook a review of the System of National Accounts (SNA) to integrate environmental accounting into economic accounting, the so called System for Integrated Environmental and Economic Accounting (commonly referred to as SEEA).

The SEEA (first column in the table) integrates economic and environmental information in a common framework permitting a consistent analysis of the contribution of the environment to the economy and of the impact of the economy on the environment.

**6**

The implementation of the environmental accounting model encountered some limitations:

- Scale limitation: the available environmental accounting models are effective on a macro scale (namely national scale), but inapplicable on a micro scale: the scale of natural protected areas
- Unit of measurement limitation: natural resource accounting model introduces a second restriction: the implementation of physical unit of measurement instead of monetary unit of measurement
- Finally we think that environmental accounting model fails if accounts only environmental costs and not environmental benefits that is the resources produced by the ecosystems

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In order to overcome these we developed an accounting framework for local protected areas

The environmental accounting framework includes:

- a natural capital dimension (natural stock account)
- and a flow dimension (natural flow account)

The model aimed at supplementing monetary accounting (based on cost and revenue) with environmental accounting reflecting both environmental cost and environmental revenue (environmental benefit)

Then the difference between economic and environmental costs and benefits assessed the value produced or consumed by the Reserve

Natural stock account should be set up based on long time series

Data refer to natural resources quality (namely species) and quantity (namely density)

Physical data on stocks are usually compiled by biologists

Natural flow account assessed physical flows between the biosphere and technosphere through the Biosphere-technosphere flow matrix

**8**

Natural-stock accounts should be set up based on a long time series.

Data should refer to natural resource quality, i.e. species, quantity, density.

**9**

A natural-flow account assesses physical flows between the bio-sphere and techno-sphere and is indicated as "Natural resources asset account".

The techno-sphere is defined as that part of the bio-sphere which is influenced and changed by human activity. In the techno-sphere humans, defined as "special" animals, are the makers and the users of resources.

The matrix defines four flows.

The first concerns a closed biological cycle, namely, materials flows among the sectors of the bio-sphere (for example, carbon and nitrogen cycles).

The second describes the materials flows provided by the bio-sphere to the techno-sphere.

The techno-sphere takes resources from the bio-sphere and after transforming them into goods, returns residuals to the biosphere, degrading the quality thereby of resources. This process describes the third flow, namely, the waste flows going from the techno-sphere to the bio-sphere. Water, air, and soil are modified and polluted.

The last flow describes what passes between economic sectors, also known as an input/output matrix. The environmental accounting in this project analyzed two of the four flows: the bio-sphere to techno-sphere flow, which assessed environmental benefits and economic revenue; and the techno-sphere to bio-sphere flow, which assessed environmental and monetary costs.

In the S.A.R.A. project we consider the following flows:

- Biosphere - technosphere, which assessed environmental benefits and economic revenues;
- Technosphere - biosphere, which assessed environmental costs and economic costs.

In order to go from the MACRO scale to the MICRO one we made some hypotheses

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The natural flow account of the Reserve takes into account costs and benefits

costs are:

- monetary: contained in the Reserve profit and loss account

- environmental: flows between the technosphere and the biosphere

and benefits are:

- monetary: revenues contained in the Reserve profit and loss account
- environmental: flows between the biosphere and the technosphere

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At the MACRO level, i.e the level of the national accounting, the biosphere-technosphere flow matrix breaks down technosphere into sectors (agriculture, industry, and so on)

At the MICRO level, i.e. at the level of the protected area, we broke down Reserve's sectors into the management goals:

1: Management

2: Sustainable valorisation

3: Administration

Each of these goals benefits from a flow of energy and matter from the biosphere and cause impacts and environmental costs related to:

- anthropic presence
- consumption of: raw materials, motor and heating fuel, electricity, water

Monetary costs had been reclassified according to the five management goals

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At the MACRO level, i.e. at national accounting level, the biosphere-technosphere flow matrix breaks down biosphere into air, water, soil, producers, consumers, decomposers and raw materials stocks

At the MICRO level,i.e. at the protected area level, we broke down the ecosystem of the protected area into functions of the Temperate forest and Grassland ecosystems and the following functions have been identified:

*Climate regulation*

*Soil formation*

*Biological control*

*Food production*

*Raw materials*

*Recreation*

*Cultural*

Like did for costs, monetary revenues had been reclassified according to the five goals departing from the income statement

Having defined technosphere sectors and biosphere categories it is now possible to construct the biosphere-technosphere input/output matrix for the protected area as illustrated in next slide

**13**

The matrix summarizes the model's framework and:

- monetary value of biosphere/technosphere flows is estimated by means of:
  - the estimate of monetary value of the Reserve's functions
- monetary value of technosphere/biosphere flows is estimated by means of:
  - the estimate of monetary value of the Reserve's environmental impact
  - monetary value of technosphere/technosphere flows is estimated by means of:
  - the reclassification of costs and revenues of the income statement

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From now on, I'm going to present you the results obtained applying the model to the Prealpi Giulie Regional Natural Park

This table shows the estimated environmental and monetary benefits of the Park

Each of these goals benefits from a flow of materials and energy from the bio-sphere.

In the particular the following are took into consideration:

● Anthropic presence

● Raw material use ● Consumption of fuel for motor vehicles

● Consumption of heating fuel

● Consumption of electricity

● Water consumption

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Referring to environmental benefits, protected area's ecosystem was selected, and the following functions have been identified for the temperate forest ecosystem:

- climate regulation,
- soil formation,
- biological control
- food production,
- raw materials,

- recreation,
- Cultural

For the grassland ecosystem we analyzed the following functions:

- climate regulation,
- Erosion control
- Soil formation
- Food production

For the *ice-rock* ecosystem, i.e. areas covered by snow, ice and rocks, the economic value of the services produced is assessed to be US$0 ha-1 anno-1 (Costanza et al., 1997).

**16**

Assigning a value to the environmental asset means giving an economic value to:

- Physic environment
- Vegetation
- Flora
- Fauna

Nevertheless this is not always feasible, therefore we introduced a qualitative analyses based on census of orders, families and series

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The aim of the quantitative analysis is to describe in numeric terms the park natural asset and if possible to assign it an economic and environmental value.

The vegetation both forest and grass have:

- A stock dimension: that means assess forest and grass asset at the "zero time"
- A flow dimension: that means assess the increment of forest and grass in terms of volume of biomasse produced during the year.

About flow dimension I'll refer in the next slides.

In this slide I'll show you the environmental benefits produced by the forest asset through:

  - The *climate regulation* function that means CO2 absorption
  - *Raw materials-timber* function that means the economic value of the timber sold

And in this slide I'll show you the environmental benefits produced by the grass asset through:

- The *climate regulation* function that means $CO_2$ absorption

Following this approach we assessed that the vegetation value of the Park is € 56.864.375.

**17 bis**

**Biomassa epigea e ipogea**

Per stimare lo **stock** di carbonio fissato nella biomassa forestale è necessario raccogliere i dati sulle superfici forestali e sulla biomassa epigea ad ettaro per ciascuna categoria forestale.

La relazione viene illustrata dalla seguente equazione:

dove:

C = stock di carbonio immagazzinato dalla biomassa (tC),

Supi = superficie occupata per categoria forestale (ha),

BTi = biomassa totale espressa in tonnellate di sostanza secca (t s.s. ha-1),

*i* = categoria forestale (*i* = 1 a *n*)

CFi = frazione di carbonio nella sostanza secca (tC (t s.s.)-1),

dove:

BEi = biomassa epigea per categoria forestale (m3 ha-1),

Ri = rapporto tra la biomassa epigea e ipogea per categoria forestale (t s.s. t s.s.-1),

BCEFi = fattore di conversione (dalle unità di volume alle unità di peso) e di espansione (dal commerciale al tal quale) della biomassa per convertire l'incremento netto annuo nello stock di legname commerciabile espresso in volumi in incremento della biomassa epigea (corteccia inclusa) espresso in tonnellate (t incremento epigeo (m3 incremento netto)-1).

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In this slide I'll show you some examples of the estimations we did.

For example in order to assess the environmental cost related to the consumption of motor fuel, we first checked the liter of diesel consumed in the year.

Then we converted the figure in the equivalent kilograms, because we know how many kilograms of $CO_2$ are related to one kilogram of diesel.

In this manner, we could assess how much $CO_2$ equivalent Kg we produced in the year (column 5).

Considering that the cost per kilogram of $CO_2$ emitted is 0,93 eurocents, an estimated value of € 40,29 can be allocated.

The I'll give you an example about environmental benefits assessment.
In the slide I'll show you how we assessed the food production.
Food production takes into consideration underbrush fruits harvesting and fishing. It has been estimated harvesting and by multiplying quantities by market value we obtained an estimate of the monetary value of the food production function

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In this slide I'll show you how we assessed the environmental benefits related to the climate regulation function, in particular the value of the flows of $CO_2$ absorbed during one year by the forest biomasse

**20**

And finally we reclassified the cost and revenues of the park authority following the model suggested by the Long Term Financial Plan, which was presented by the Conservation Finance Alliance together with the Nature Conservancy at the 5th World Parks Congress in Durban (South Africa) in September 2003

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In this last slide I'll show you the balance between the costs – both environmental and economic – and the benefits – both environmental and economic – produced during the year 2006.
From the table you can infer that the total economic benefit produced by the Park is € 7.021.155,29.

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Going to conclude
From a methodological perspective the model takes a few steps forward in the accounting framework by adapting macro to micro scale models and allowing not only environmental costs but also environmental benefits to be assessed
From an analytical perspective the Park environmental accounting shows net benefits of approximately 7 million of euros How can this result be interpreted?
Generally speaking, it can be said that the Park's development model is in line with sustainability on the contrary the balance would be negative

- The Park's natural capital policies fully achieve its objectives regarding sustainable development, protection and valorisation
- If we compare the net benefit figure with the public funding we can conclude that each euro the Park produce 7,37 euro of benefits

From a policy perspective the model developed for the Park provides indicators and descriptive statistics to monitor the interaction between the economy and the environment as well as serving as a tool for strategic planning and policy analysis in order to identify more sustainable development paths