# Adapting Mediterranean forests to climate change - AGORA

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## Total Economic Value : The concept and its application to Mediterranean forest ecosystems

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1. Values and valuation

2. Data collection

3. Valuation methods

4. Application for selected Mediterranean countries

5. Conclusions

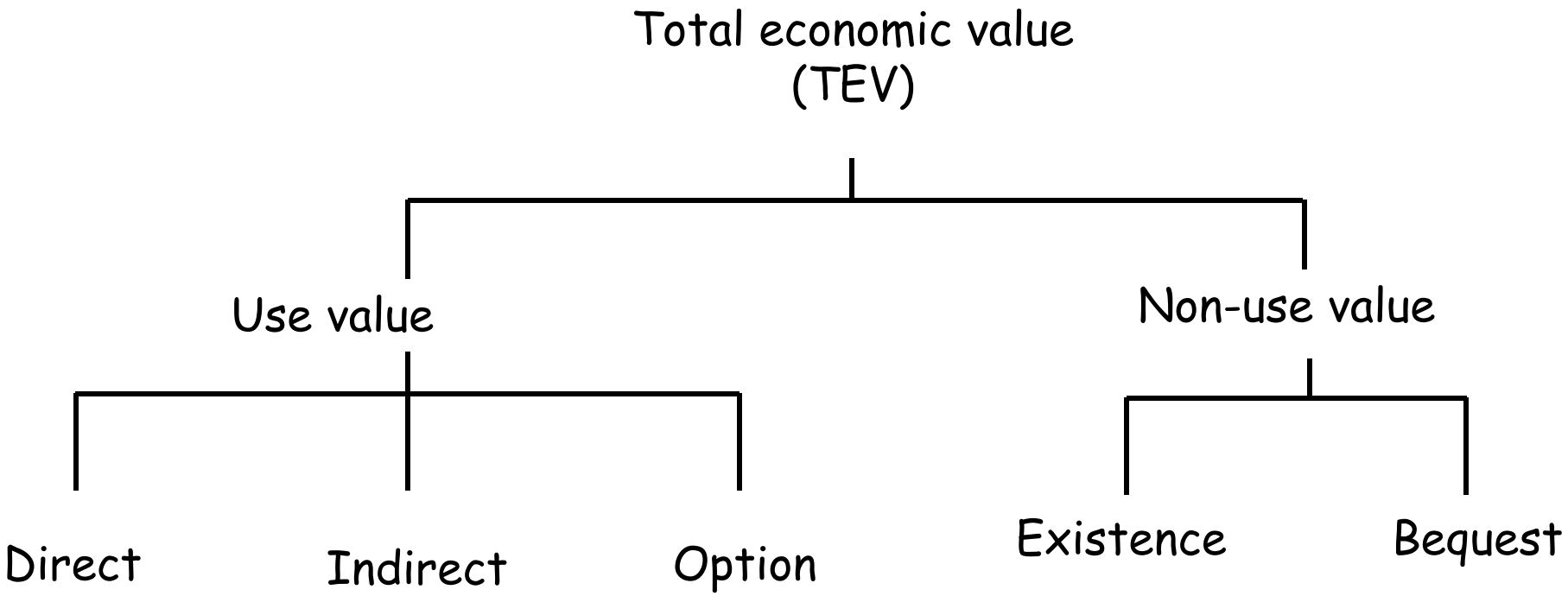
# Objectives of monetary valuation :

- Wide variety of products and services
- A need for compromises in order to maximize the TEV
- Valuation of the economic performance from a point of view of sustainable development
- Regulation of markets  by the internalization of external costs and benefits.
- Economic analysis of investments
- Evaluation of compensation, subsidy, etc… to assist the decision making process

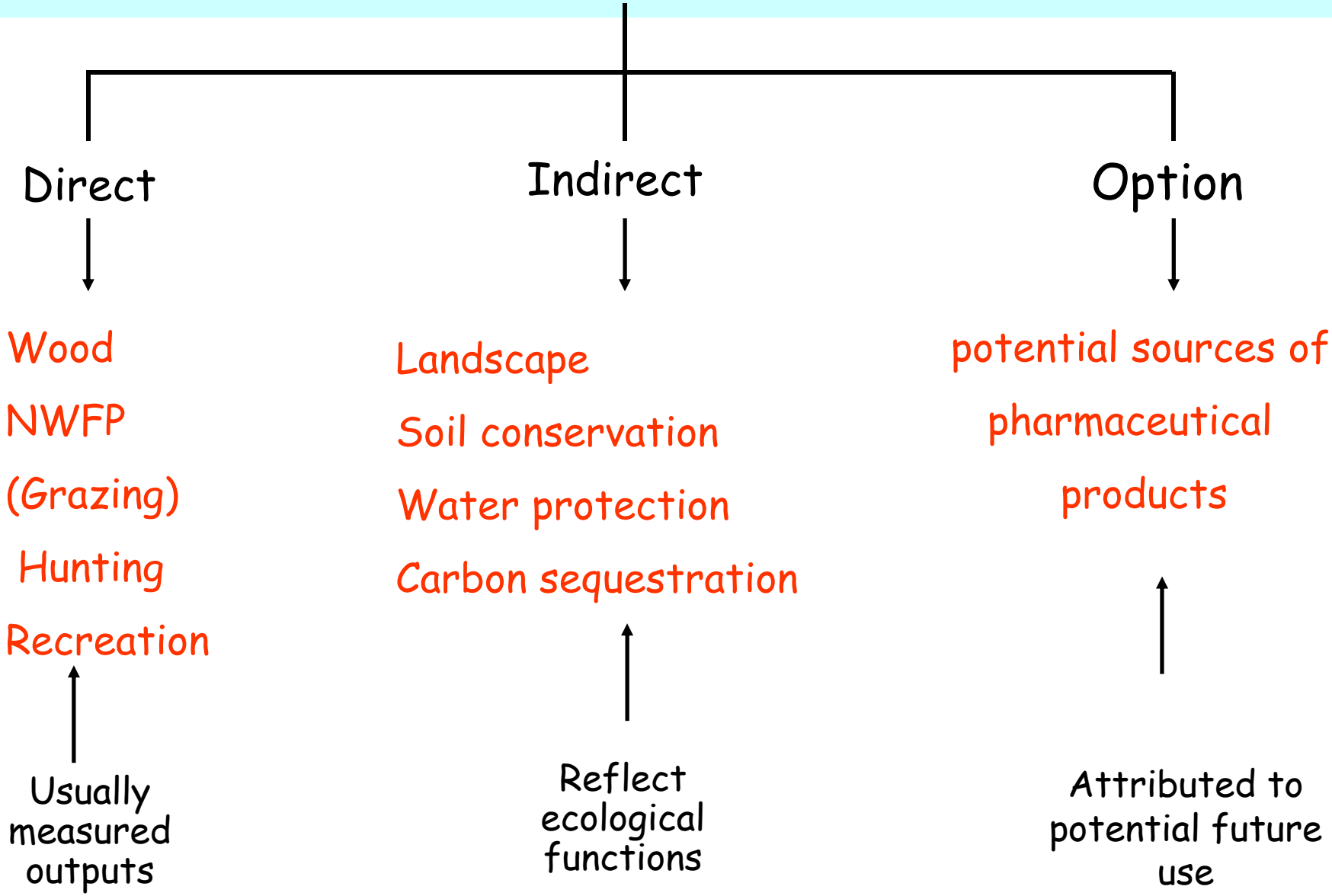
# Main valuation difficulties

- Non-marketed benefits / Externalities / Public Goods
- Related to market :
  - prices,
  - external effects of harvesting,
  - difference between private cost and social cost.
- Market imperfections caused by government interference :
  - Subsidies, taxes, and import protection may increase or decrease the intensity of use of natural resources

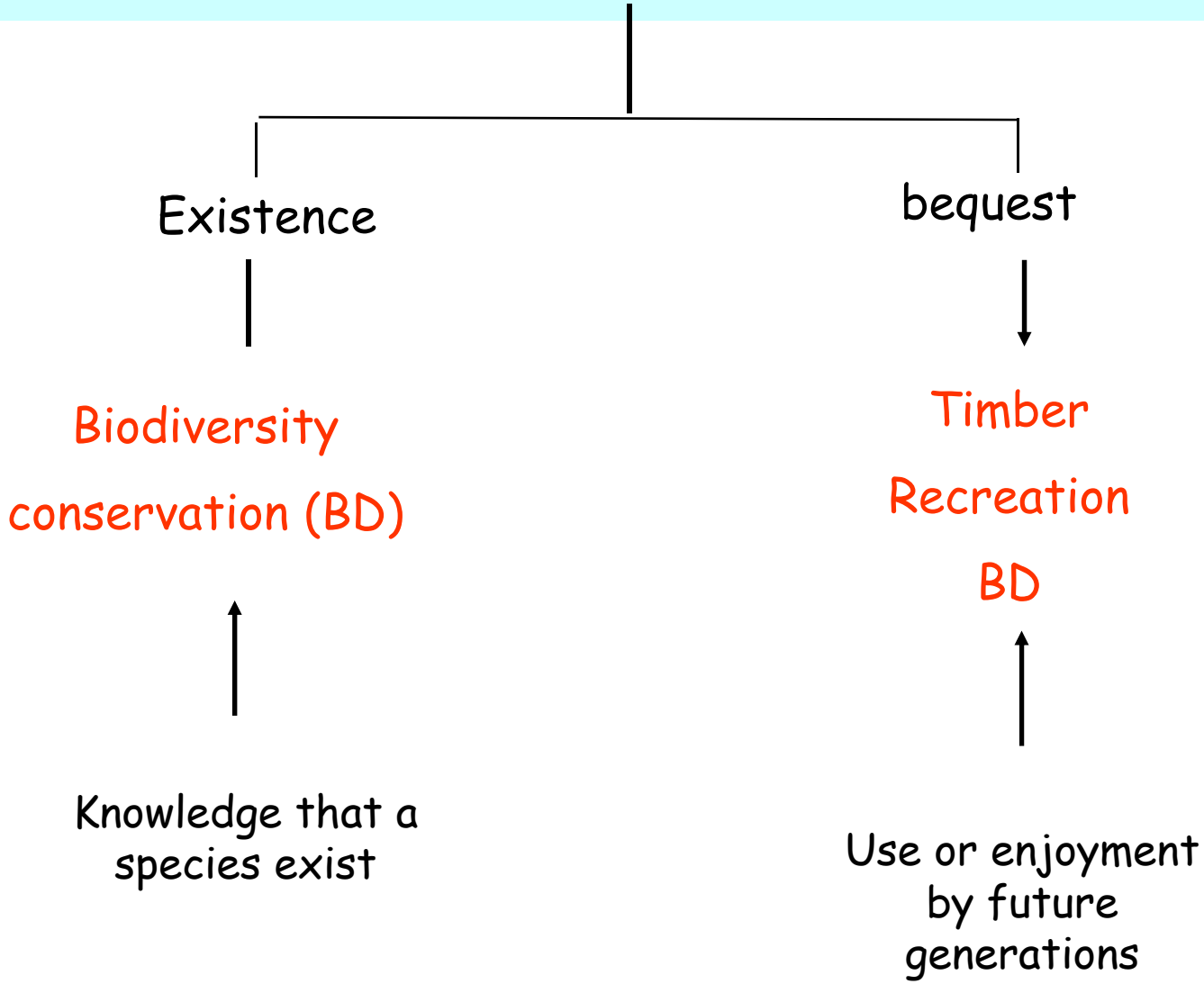
# Categories of economic values



# 1. Use Values


Direct
Indirect
Option
Wood
NWFP
(Grazing)
Hunting
Recreation
Landscape
Soil conservation
Water protection
Carbon sequestration
potential sources of pharmaceutical products
Usually measured outputs
Reflect ecological functions
Attributed to potential future use

# 2. Non-use values



# + Negative externalities (Degradation costs)

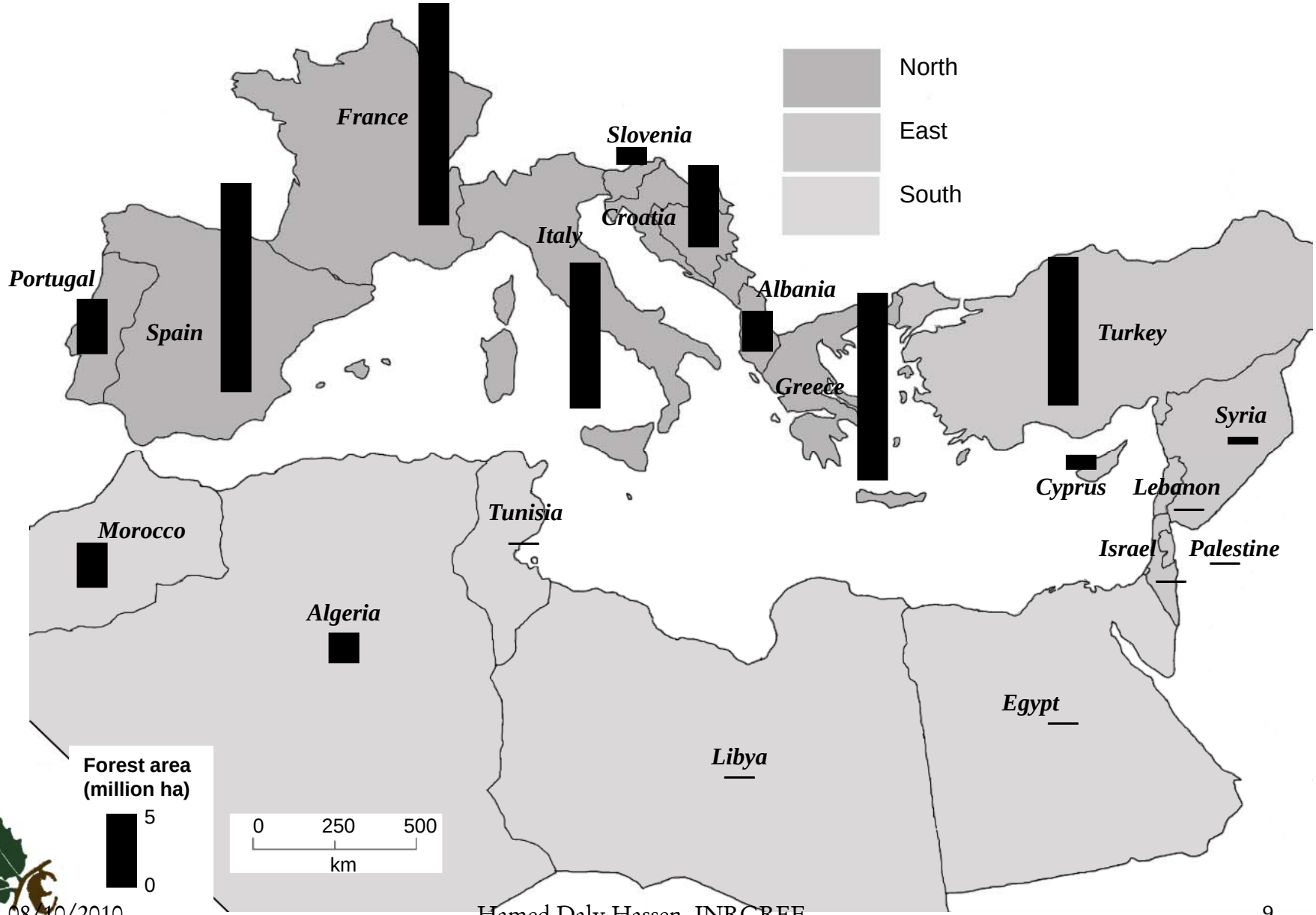
Damage due to forest fires → ALL TEV categories

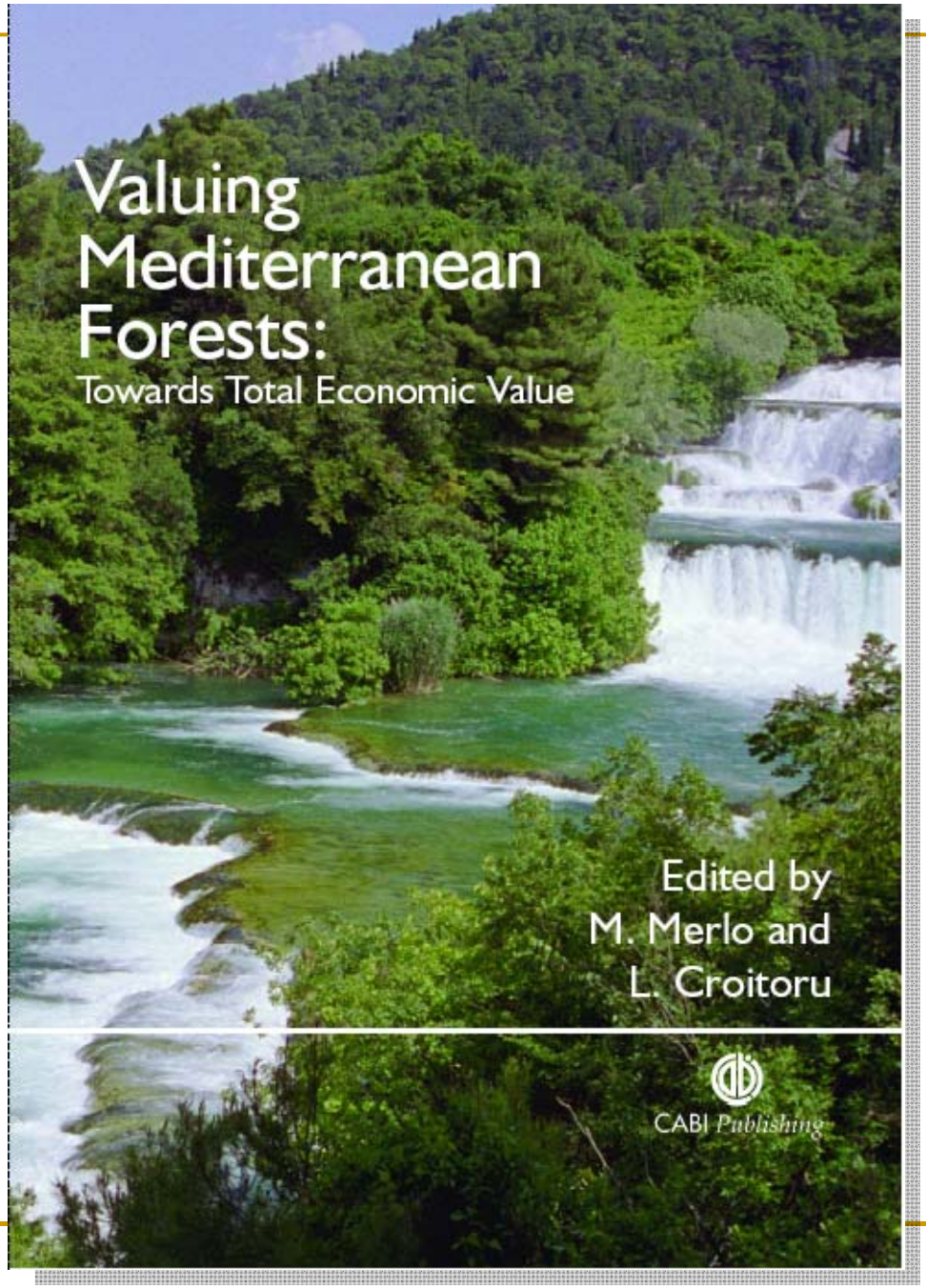
Erosion due to mismanagement (overgrazing, overlogging, etc) → Indirect use value

Floods, landslides, etc due to poor or no forest management → Indirect use value

Loss of biodiversity caused by forest plantations → Non-use value

# Valuation in 18 Mediterranean countries






http://www.cabi-publishing.org/Bookshop/NewTitles.asp

# 2. Data collection

. Identification of products, services and externalities of forests

- exhaustive list of forest products and services

. Forest valuation

- physical and monetary terms among different valuation methods
- annual flow of values at national level
- Use of most recent data available (2001)

. Availability of data

- official statistics
- Documented studies and research reports

# 3. Valuation methods

- **Market price** : commercial products.

- **Methods based on people's behavior** : reaction to environmental change.
  - **Revealed preference techniques** : consumers behavior measured by market : travel cost method, hedonic price method, changes in production (productivity and damage cost avoided).
  - **Stated preference techniques** : Contingent valuation method (CVM) through conduction of surveys

- **Cost-based methods : Replacement costs, defensive expenditures, opportunity cost of labor**

# Direct use values

1. Wood products : timber, fuelwood
2. Non wood products : cork, honey, acorns…
3. Grazing
4. Hunting
5. Recreation

# Wood products

- Quantities sold in the market

➢ **Market price**

Quantity harvested * stumpage price

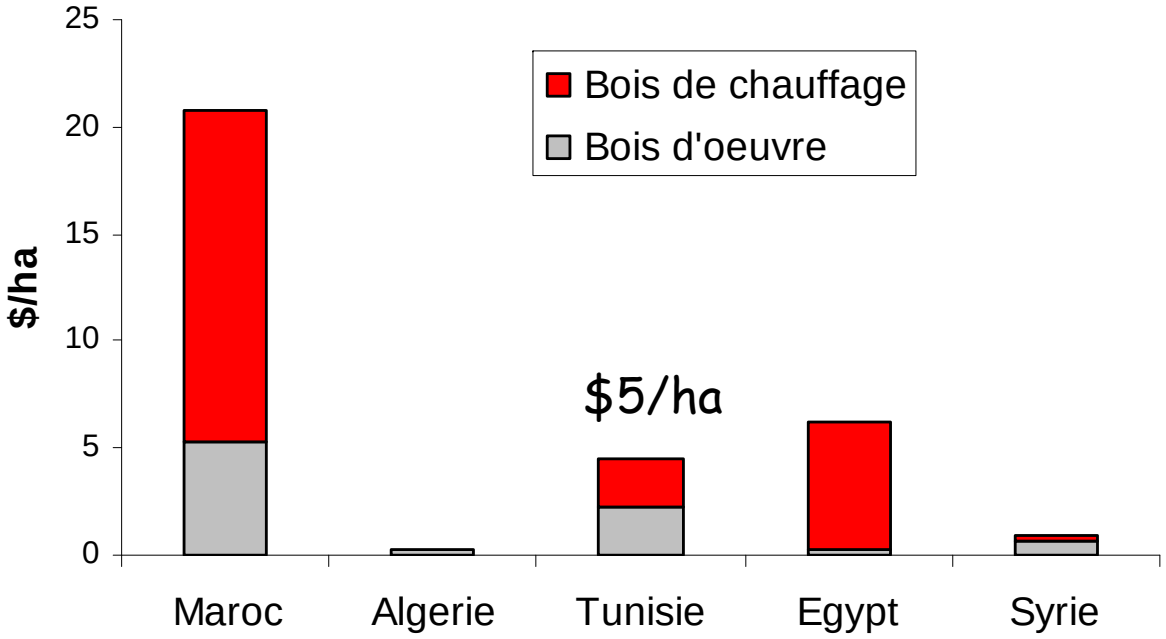
(Roadside price) → Overestimation!

➢ **Shadow price**

- Quantities collected at no charge, legally (usage rights) or illegally

➢ **Substitution price**

Quantity harvested * price in similar goods markets




**North Africa**

**$0-21/ha**

**~ $12/ha**

- Wood production is low in Mediterranean countries
- Fuelwood production :
  - Higher than timber: 80% of total in Tunisia, 95% in Morocco
  - Freely gathered fuelwood : important volume : legally (90% in Tunisia) and illegally (69% in Morocco).

# non-wood products

1. Sold quantities in the market when the price is known
2. Sold quantities in the market when the price is unknown
3. Unsold quantities = self-consumed

1. Sold quantities with known price → **Market price**

quantity x Producer price (in the forest)

Unavailable information : quantity exported x national price

↓ ↓

Imperfection underestimation Overestimation

## Cases 2 and 3: price unknown or inexistent

### ➢ Comparison of the associated benefits and costs

- Estimate the value of gathering NWFP for subsistence

  - production
  - Time needed for harvesting
  - Wage of labor required

  } Labor costs (LC)

  ➢ Cost of other raw material = Intermediate consumption (IC)

  ➢ Net benefit = Total output – LC- IC - Taxes

Ex. : Carobs in Lebanon (Sattout *et al.*, 2005)

= $1,200,000 (Revenue) - $560,000 (Labor costs (LC)) - $160,000 (Cost of raw material (IC))

## ➢ Pricing Substitute Goods

- It estimates the value of non market goods by using the market price of substitute goods

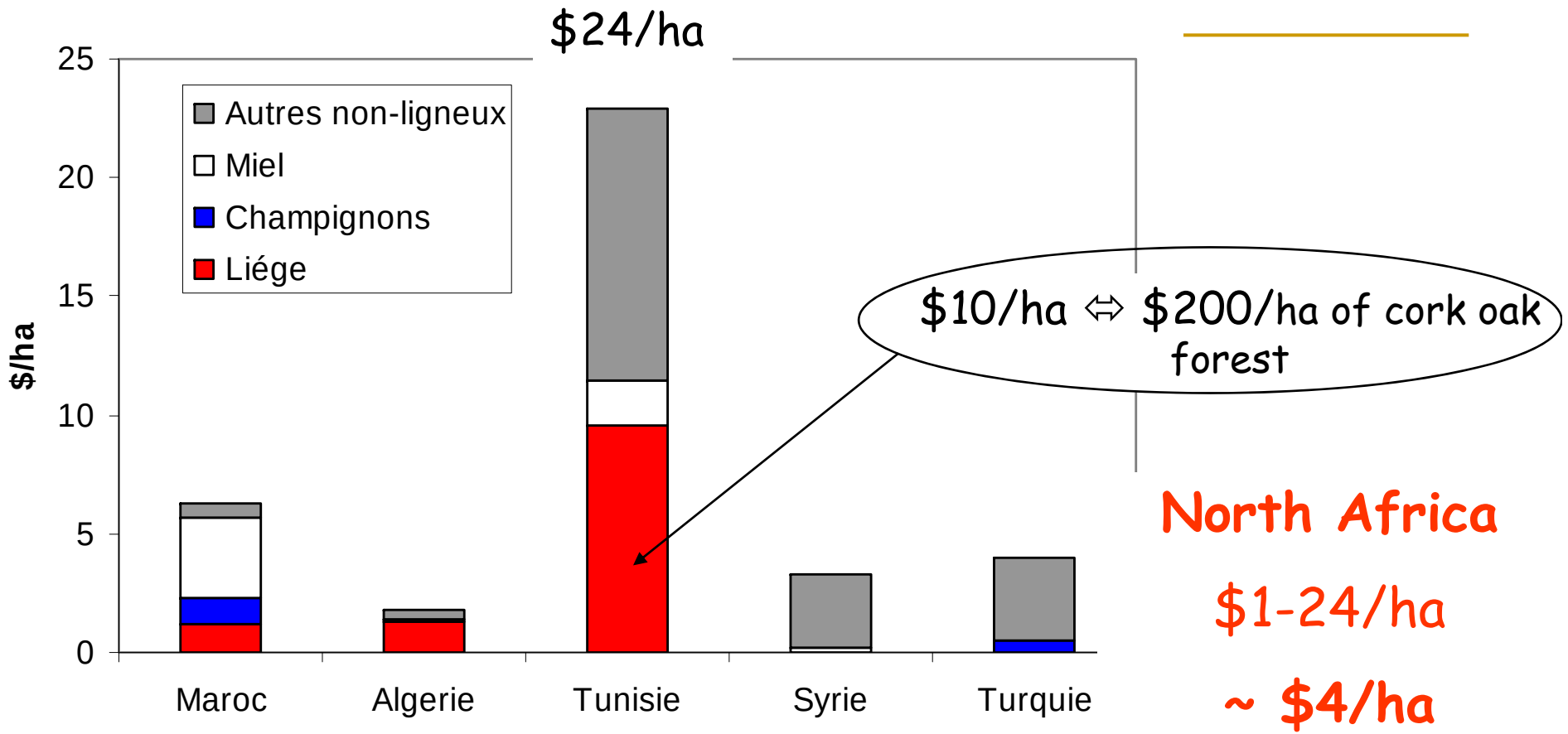
- The substitute good should be appropriately chosen

Ex.: Value of acorns of cork oak forest in Tunisia

| | | |
|---|---|---|
| - Quantity collected | = | 750 kg/ha of cork oak |
| - Surface area | = | 45,400 ha |
| - Nutritive content | = | 1 kg acorns ~ 0.9 kg of barley |
| - Price | = | $ 0.15/kg of barley |

| | | |
|---|---|---|
| Value | = | $ 5 million ~ $ 5/ha |

Based on Daly-Hassen and Ben Mansoura, 2005




- NWFP are much important than wood products
- The value of NWFP in Tunisia is much higher than in other countries ⇔ Data not always available, depending on country.
- In Tunisia, cork is the most valuable and marketable NWFP.

# Grazing

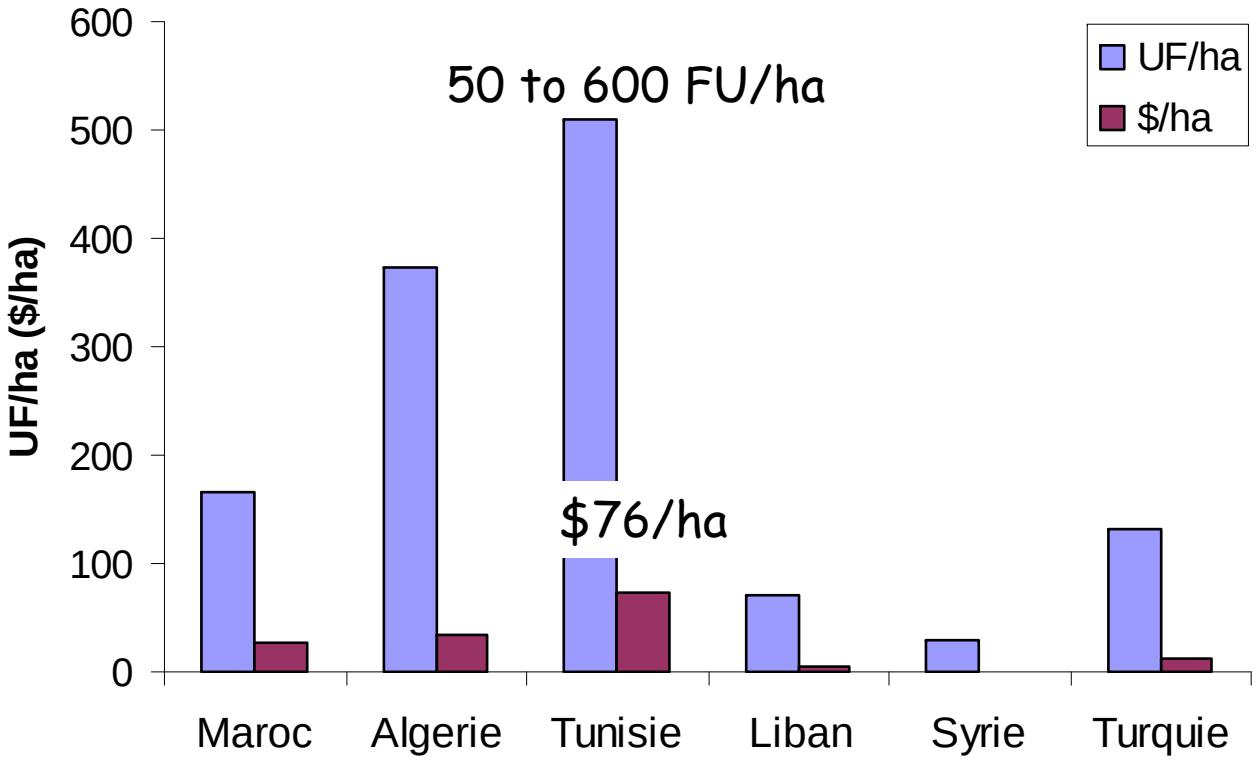
- Grazing is usually free or against symbolic price

➢ **Substitute goods pricing**

1. Quantity of grazing resources consumed is converted into forage units (FU)

2. Nutritive content : 1 FU ~ 1 kg of barley grain

3. Shadow price : $ 0.1-0.2/kg of barley




**North Africa**

$28-76/ha

**~$32/ha**

Overgrazing = > declining forage productivity, soil erosion

Trade-off betw. grazing use value and forest conservation

## 1. Contingent valuation

- Based on surveys

  - How much are you willing to pay for this service ?
  - How much are you willing to accept losing it ?

- Create an hypothetical market for an environmental service (recreation, hunting, biodiversity conservation …)

# 2. Travel cost method

- The visitors should support all transport costs and opportunity costs for time spent

- Construction of the demand function in order to estimate the consumer surplus

Large differences in consumer surplus between :

- protected areas :
    - 5.7€/ day-visit for Tunisia
    - 7.5 €/ day-visit for Lebanon
    - 14-15 €/ day-visit for Croatia
- and other sites : 2 to 2.5 €/ day-visit for Italy, Cyprus and Greece

# Hunting

- Actual payments (permits or license fees…)
- Travel cost method / CVM

Value is estimated to 215-250 /hunter in Croatia and Italy, using CVM

values are much lower, using permit prices :

- 20-60 E/hunter in Lebanon, Albania and Turkey
- 100-150 E/hunter in other countries

## Main direct use values

(Croitoru & Merlo, 2005)

- **Timber production**: for North Mediterranean countries overall
- **Exceptions**:
  - Portugal: cork
  - France (South): recreation
  - Albania and Greece: forage production

# Case of North Mediterranean countries

## Direct use values

**Rural outmigration**

- Rising labour costs of forest management
- Increasing risk of forest fires

- Less conflicts than in the South between forestry and farming and livestock land uses

# Indirect use values

1. Watershed protection

2. Carbon sequestration

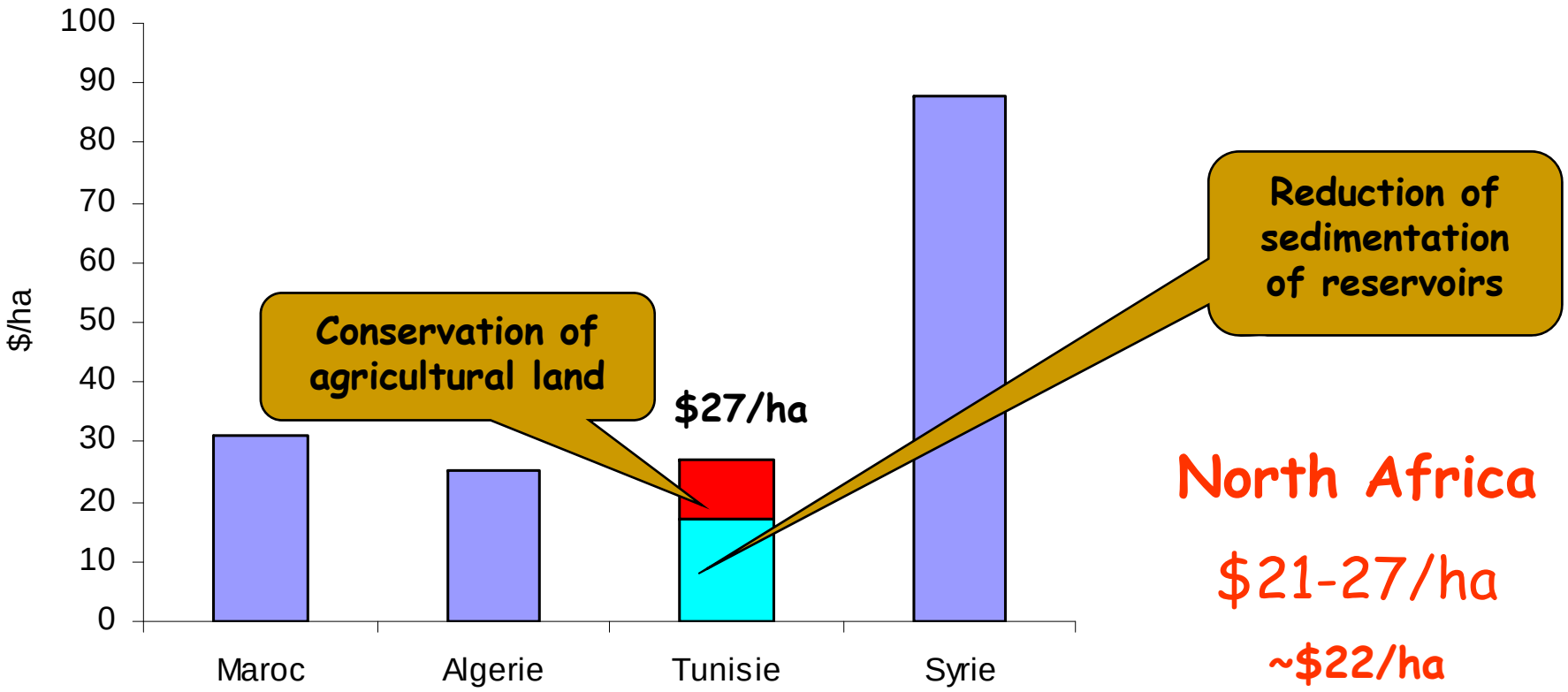
## Watershed protection

- Changes in production
- Establish a cause-effect relationship
- Estimate the induced change in the affected goods or services
- Use market prices to value the gain in production or the cost avoided

- **Productivity approach**
  - Forest exists : A
  - Forest doesn't exist : B
  - Difference : A-B

- But, soil erosion is a cumulative result, other factors affect it.

| Benefit | |
|---|---|
| Soil conservation | Loss of potential production in agriculture<br>Morocco, Tunisia |
| Reduction of sedimentation of dams and water reservoirs | additional costs incurred for replacing the capacity loss.<br>damage cost avoided<br>Tunisia, Croatia |
| Protection against erosion, etc | Defensive expenditures<br>Albania, France |




- The value is overestimated in Syria : public expenditures in soil conservation are deployed

- Watershed protection is the most important forest benefit, after grazing !

# Carbon Sequestration

- Annual increment – annual felling - natural losses

  Data about forest biomass (FAO, IPCC, UNFCCC)

- National conversion factors for transforming the volume into carbon

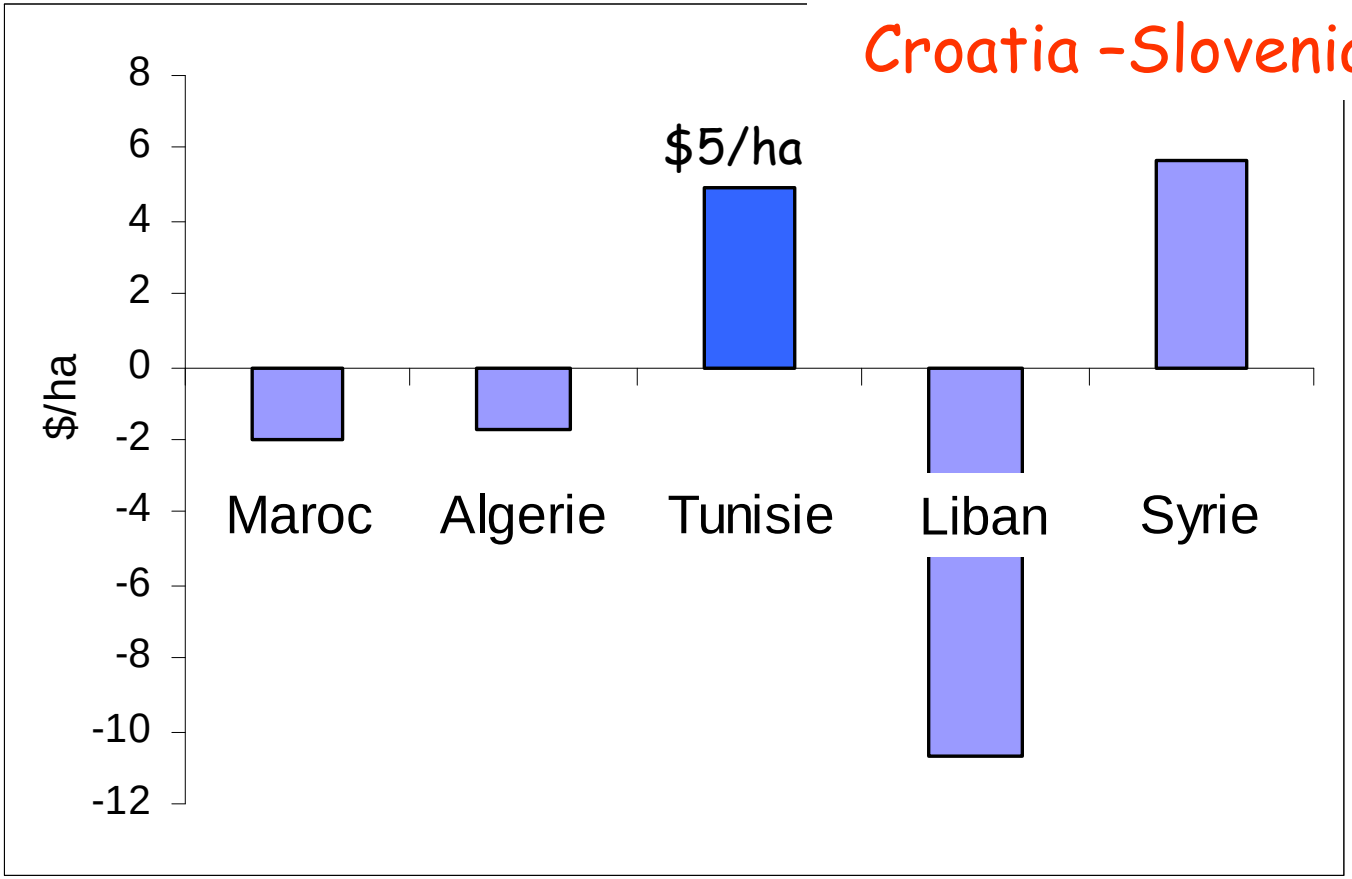
- Value of carbon stored :
  estimate the benefits of reducing carbon emissions

- Emerging market of carbon : $13/tC, $18/tC, $20/tC
  Frankhauser (1995)

**North Africa** -$2 to 5/ha

France : 15 € /ha

Croatia –Slovenia 21 €/ha



# Case of North Mediterranean countries

## Main indirect use / non use values

(Croitoru & Merlo, 2005)

**Water protection**

**Biodiversity**

# Option, bequest and existence values

1. Biodiversity conservation

2. Pharmaceutical products

# Biodiversity conservation

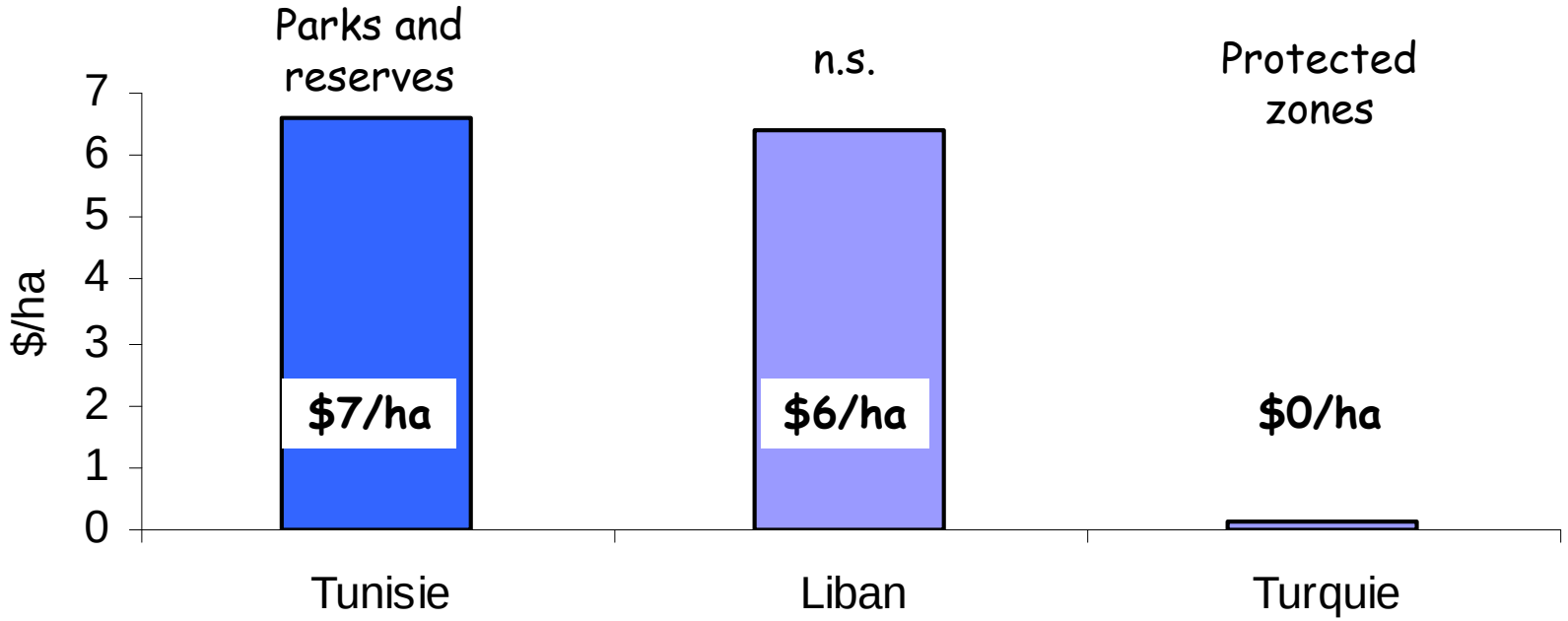
➢ Contingent valuation :

-Specific sites in N. Mediterranean countries

-Difficult to extrapolate

➢ Cost-based methods

- Some S. Mediterranean countries




- Public expenses for conservation : $7/ha for forests ⇔ $90/ha for parks
- The average value ($7/ha) is higher than that for wood products ($5/ha)

## Pharmaceutical Products

$Vp : (N \times p \times r \times a \times v)/H$

**Rent capture**

- N : Number of plant species in the forest
- p : the probability of a hit ($5 \times 10^{-4}$)
- r : the royalty rate (0.05)
- a : the appropriation rent or rent capture (0.1 ; 0.5 ; 1)
- v : the average value of drugs developed (US$/year) (0.39 M ; 1M ; 7M)
- H : surface of the forest area

- Turkey = > $5/ha

# Negatives externalities (costs of degradation)

- Cost-based methods = > Effective cost

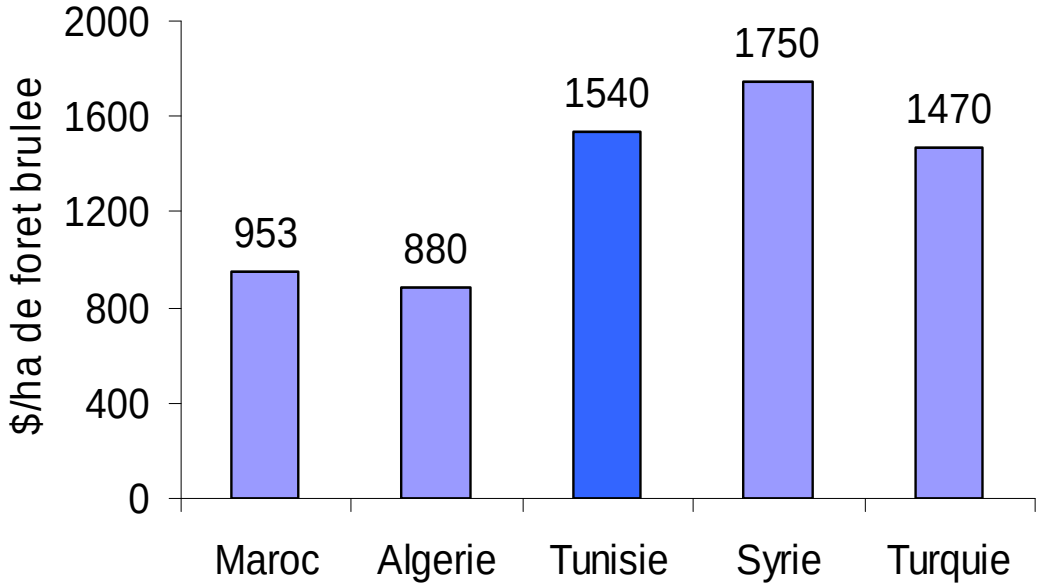
Forest fires

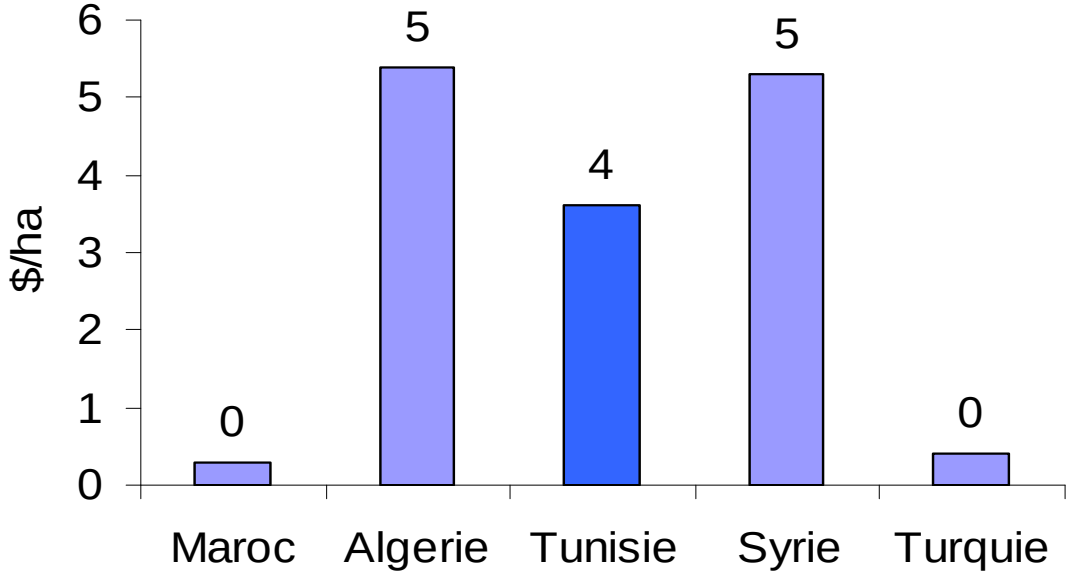
- Replacement costs (extinguishing fire fees, clearing, plantation costs, etc…)

- Value of losses (VL) : Wood products, NWFP, etc…

VL = Surface of burnt area x average value of benefits x estimated rate of damage

$880-1700/ha of burnt area




$0-5/ha of forest

# Illegal acts

- Real costs : value of fees paid for illegal acts

  - Imprecision :

    - based on fixed fees ;
    - many illegal acts go unreported ;
    - some illegal acts cause no damage

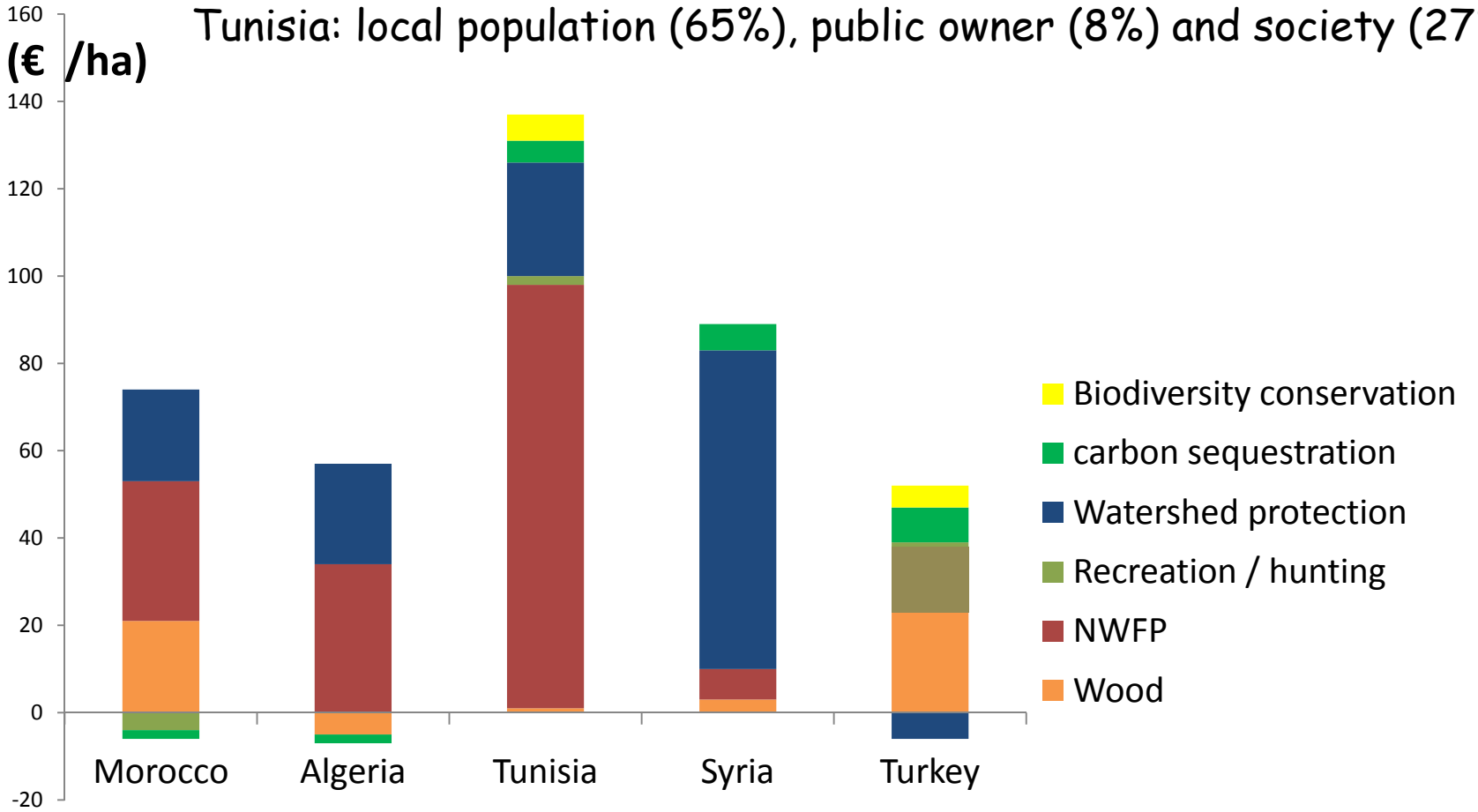
Tunisia, Lebanon, Cyprus, Greece…

$0.3-0.7/ha of forests

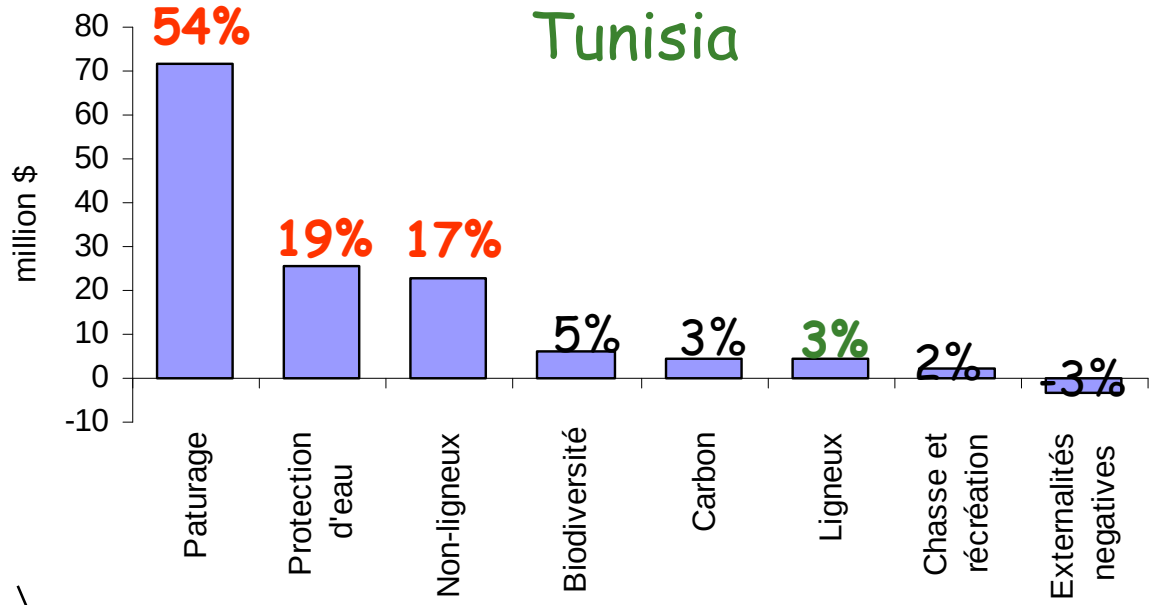
# Total economic value estimates

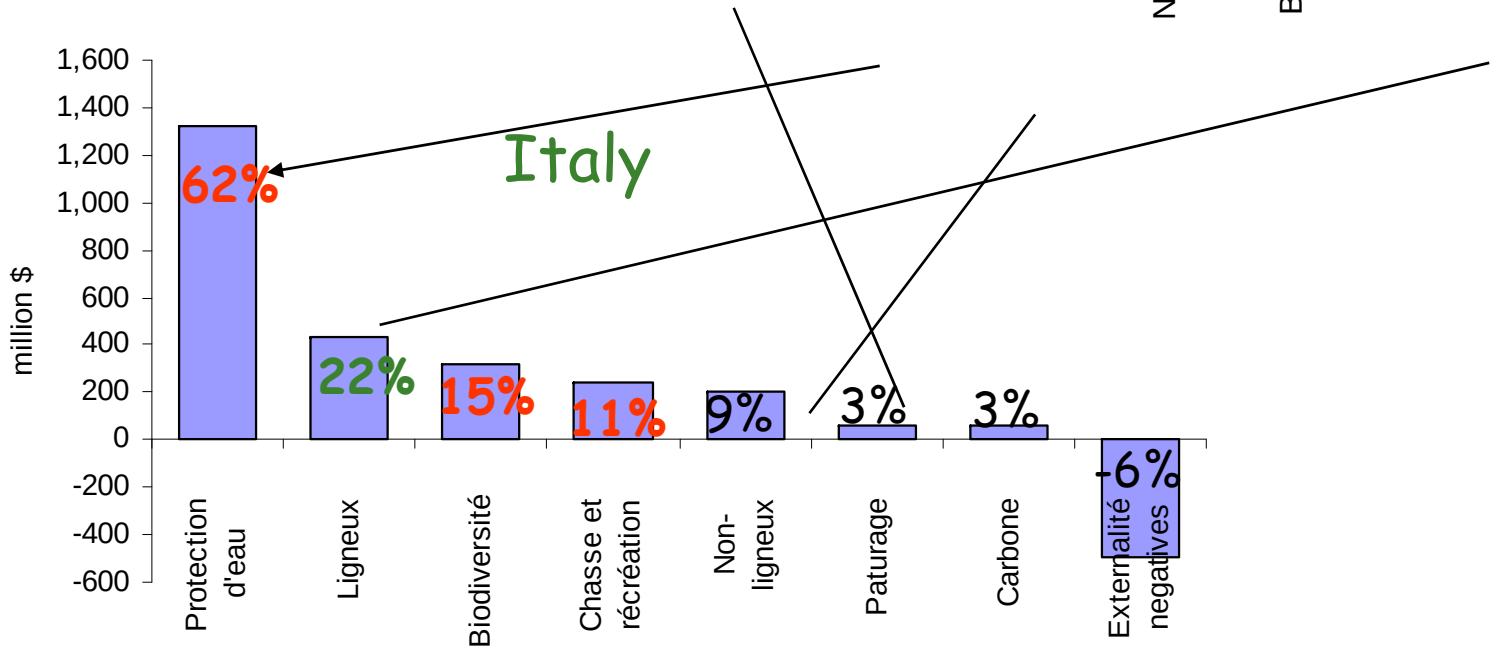
Distribution of benefits depending on use rights and their nature

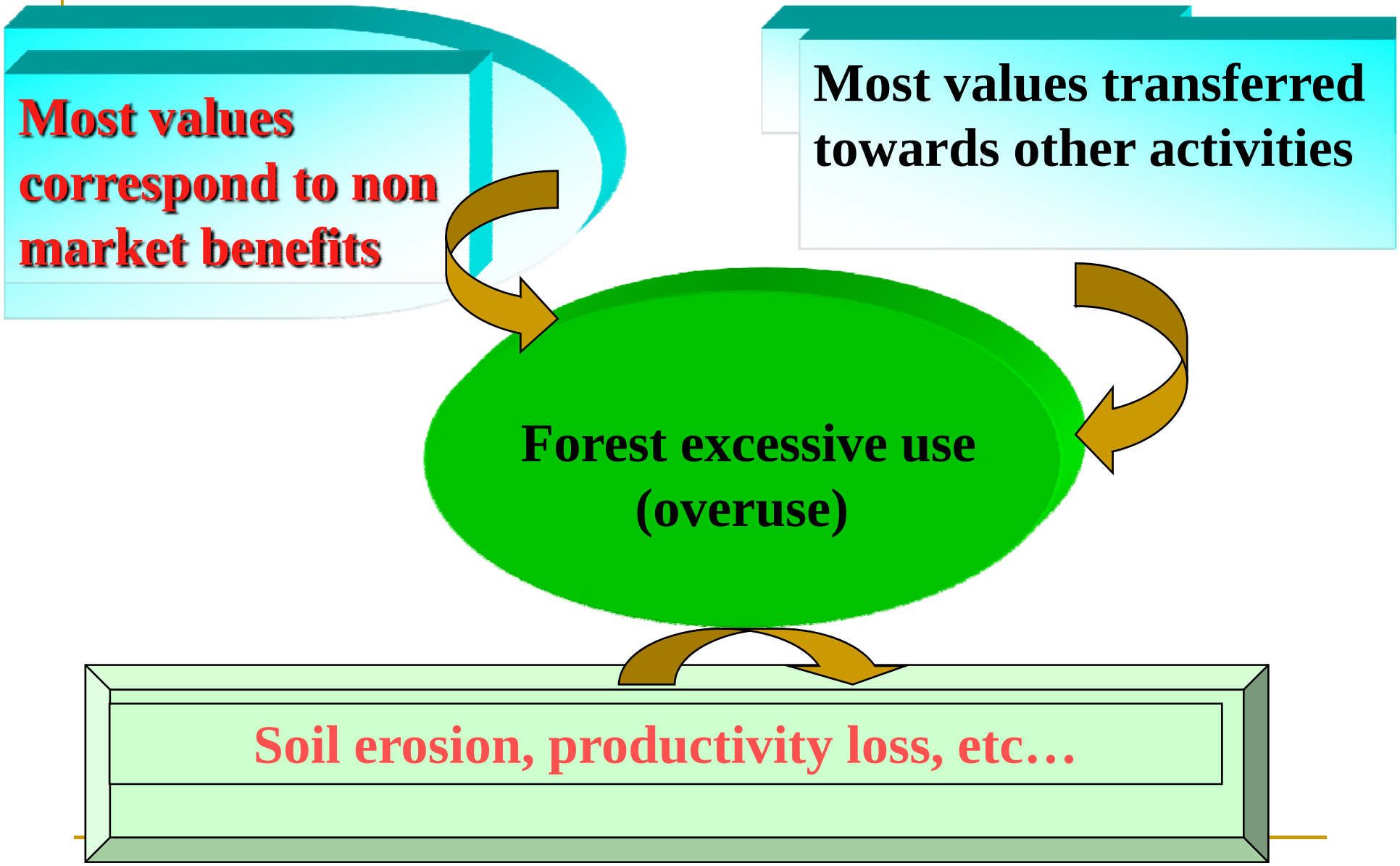
Tunisia: local population (65%), public owner (8%) and society (27%)



# Main components of TEV

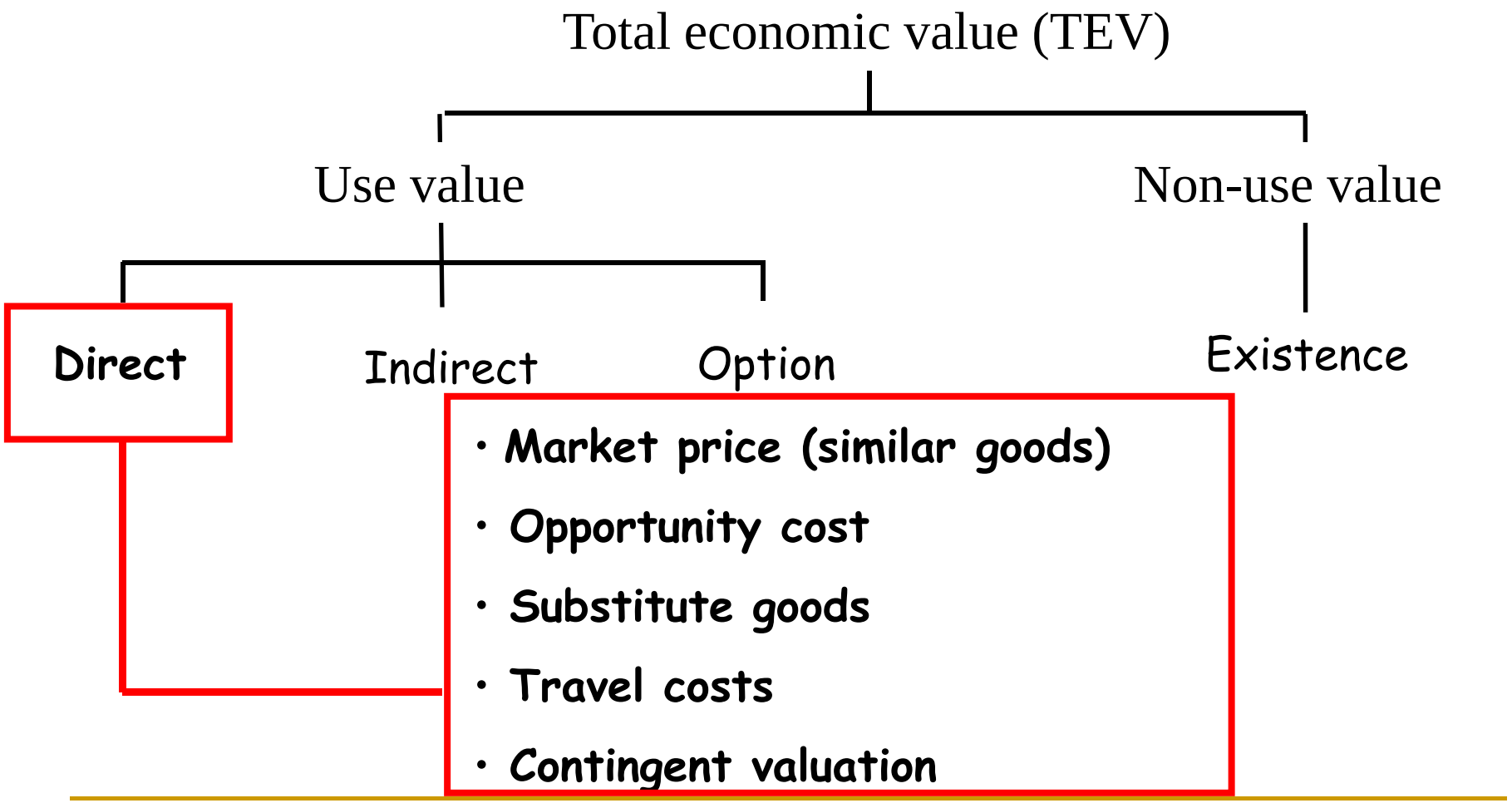


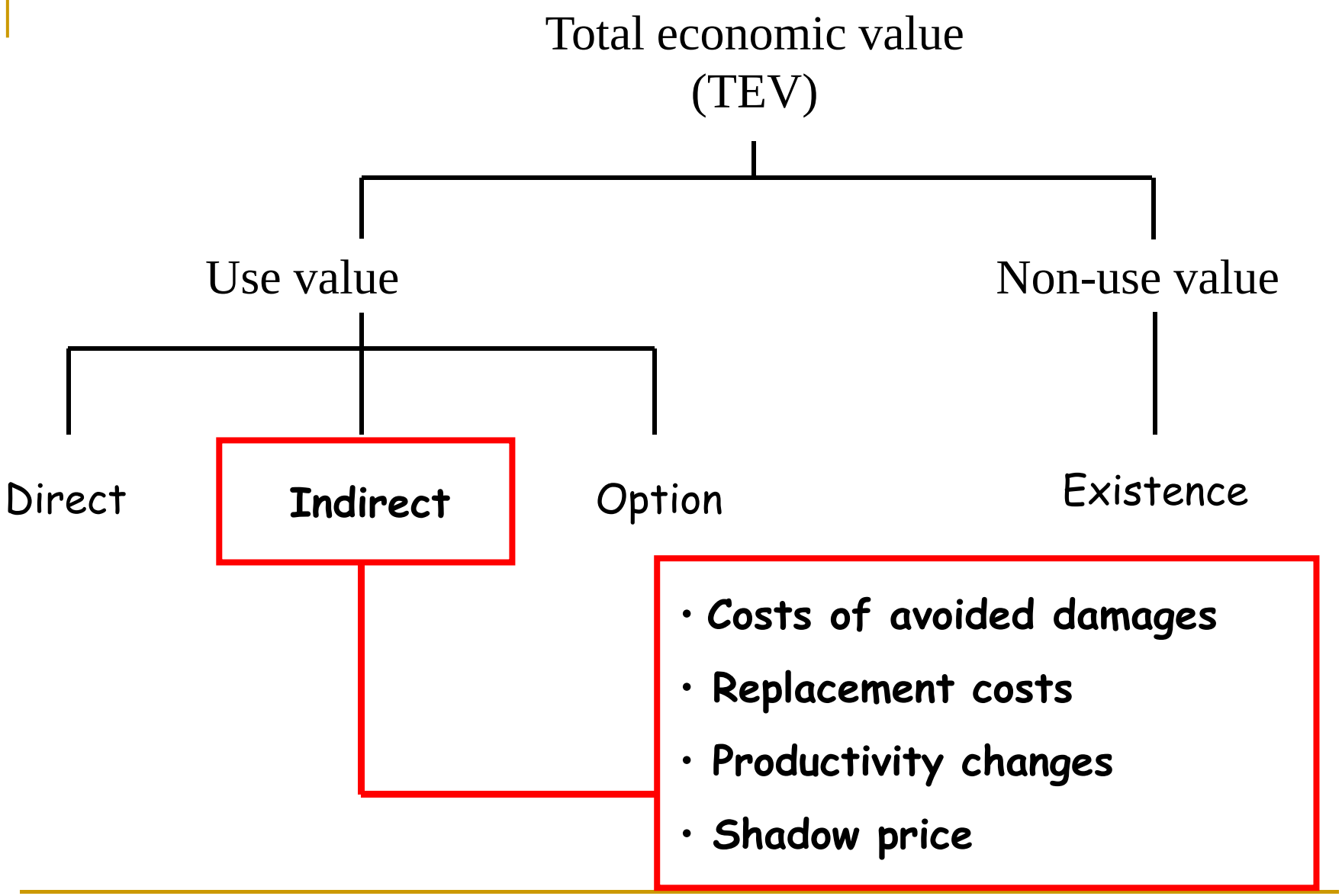



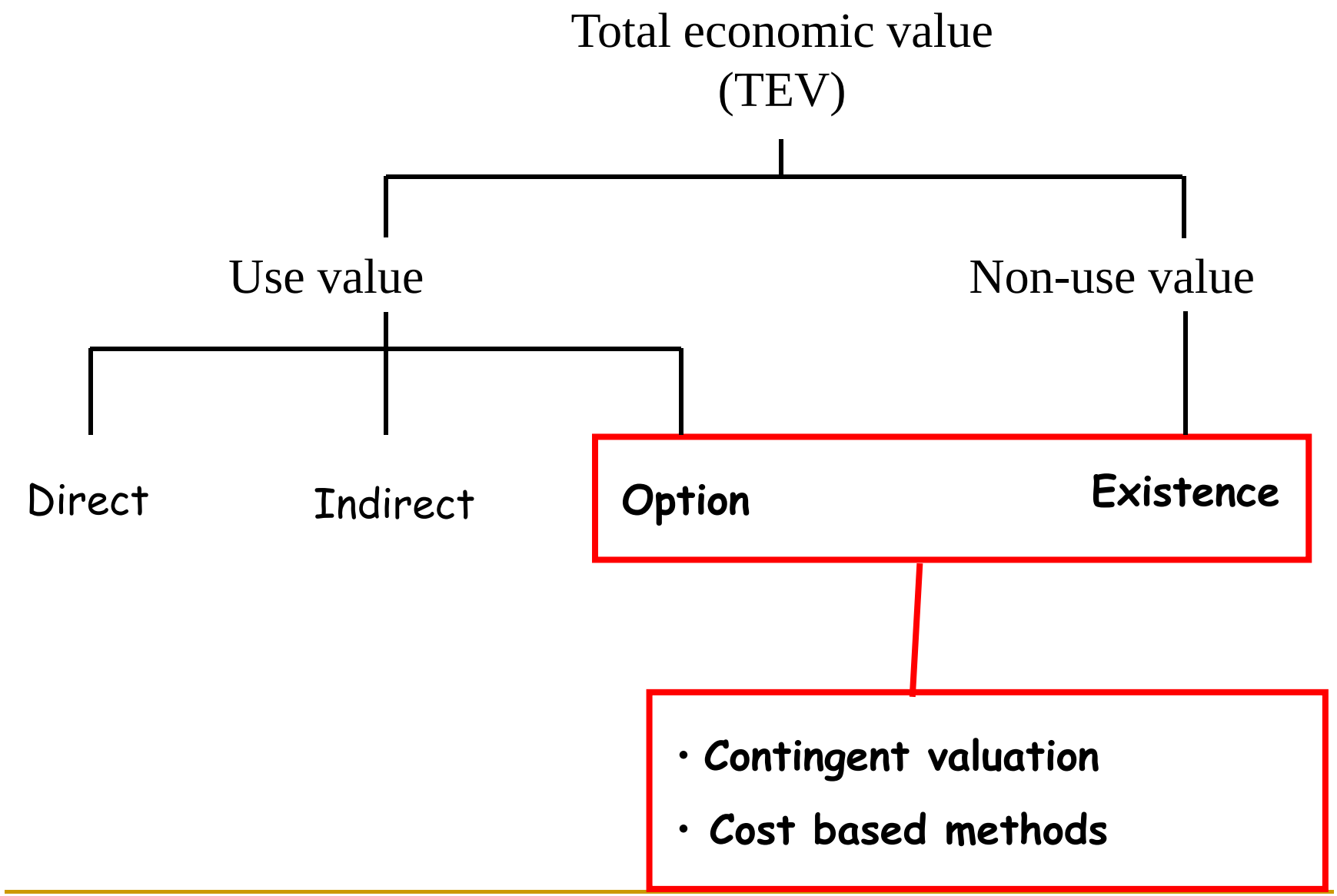

Most values correspond to non market benefits
Most values transferred towards other activities
Forest excessive use (overuse)
Soil erosion, productivity loss, etc…

# 5. Conclusions

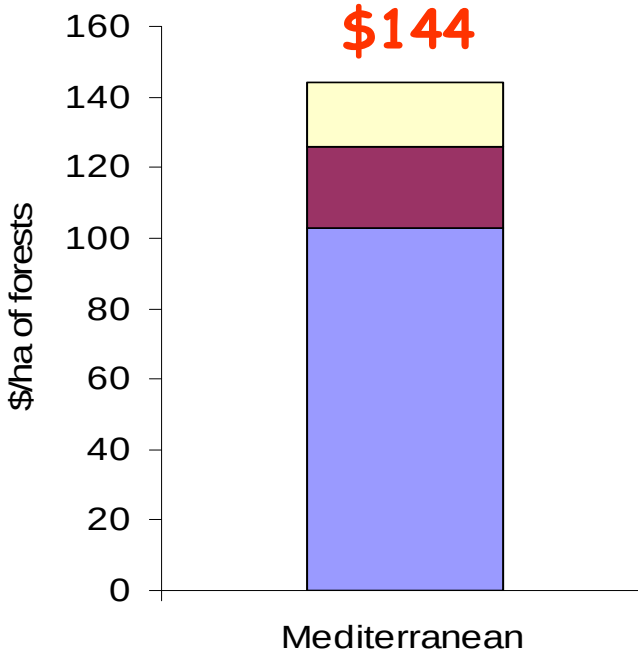
- Methodology :

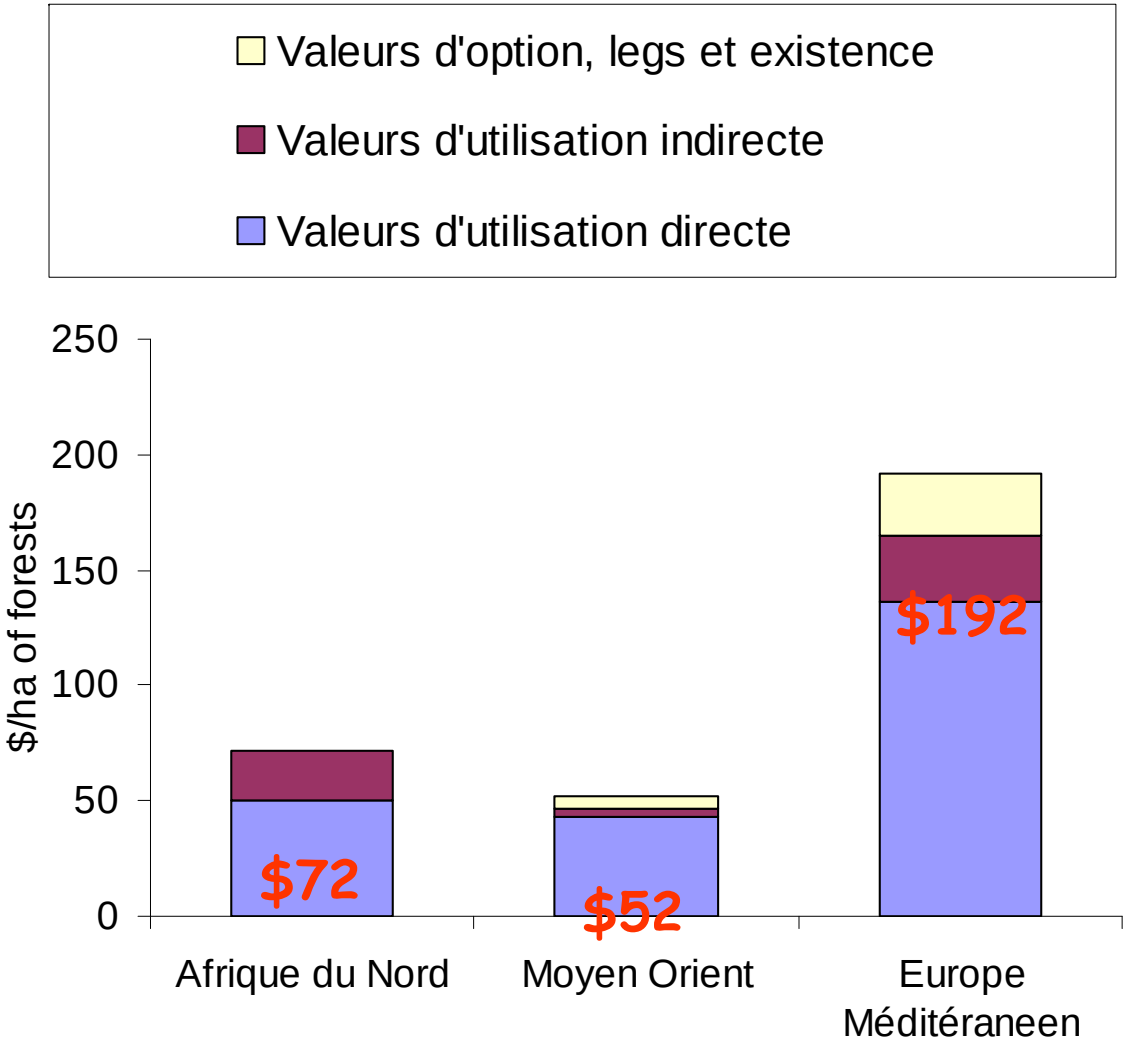



Total economic value
(TEV)
Use value
Non-use value
Direct
Indirect
Option
Existence
• Costs of avoided damages
• Replacement costs
• Productivity changes
• Shadow price


Total economic value
(TEV)
Use value
Non-use value
Direct
Indirect
Option
Existence
• Contingent valuation
• Cost based methods

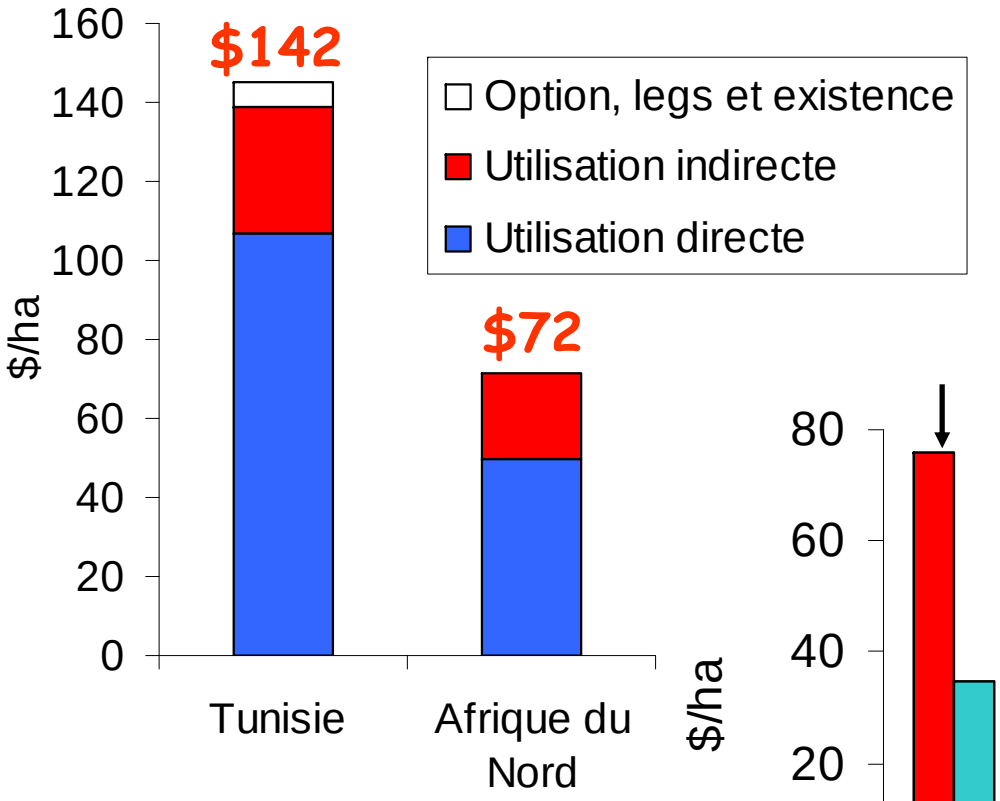
## ➢Results :



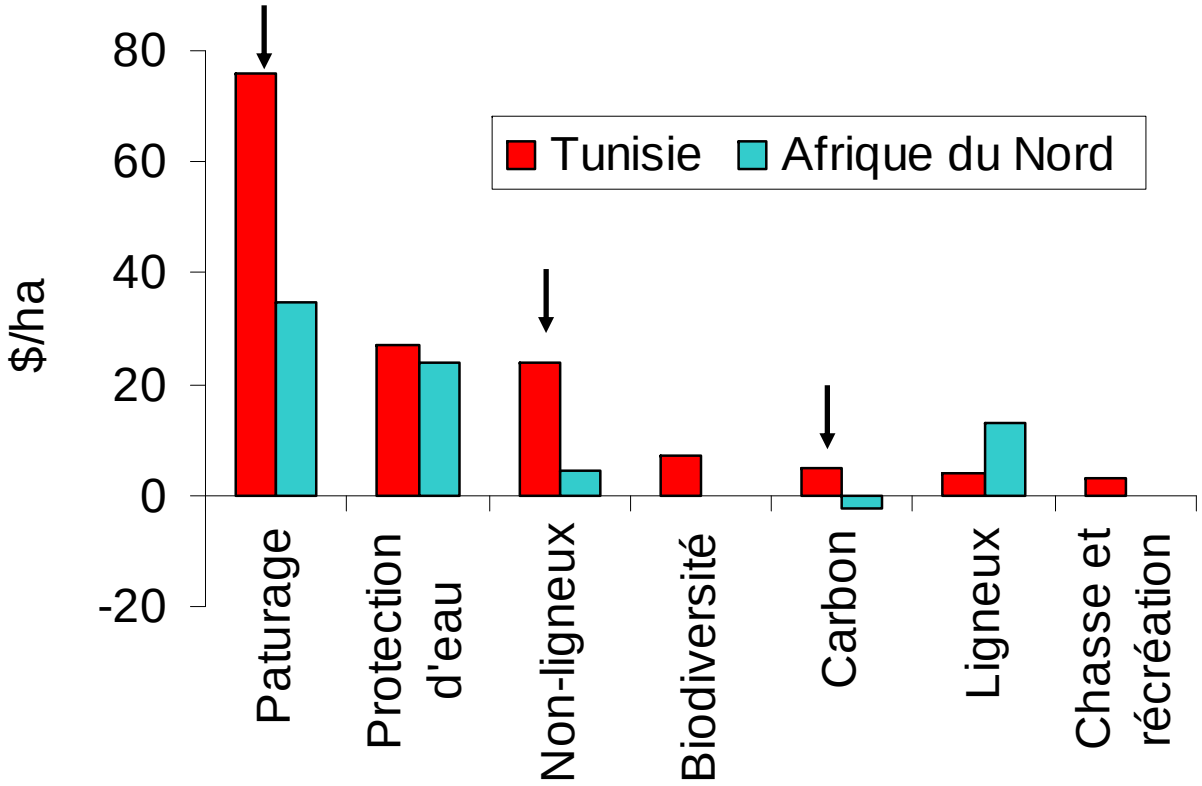




- Conservative valuation
- Greater underestimation in southern and eastern Med. countries than in Northern Med. countries

Based on Croitoru and Merlo, 2005




- Data availability
- The TEV in Tunisia is twice greater than the average for N. African countries, but similar to the average TEV for all Med. countries



# Criticism

- The traditional accounting system is not adapted to forest ecosystem valuation.
- Todate, there is an obvious lack of valuation studies of non market benefits using CVM.
- Many valuation methods used currently provide just rough estimates of values.
- Necessity for cumulative experience & research work in order to improve the reliability of forest economic estimates.