

**PROJECT: “Strengthening of the regional cooperation/networking in the forestry and water management sector and sustainable development in the river basins of the South-Eastern Europe countries”**

## **Forestry and Water Management in the Republic of Macedonia**

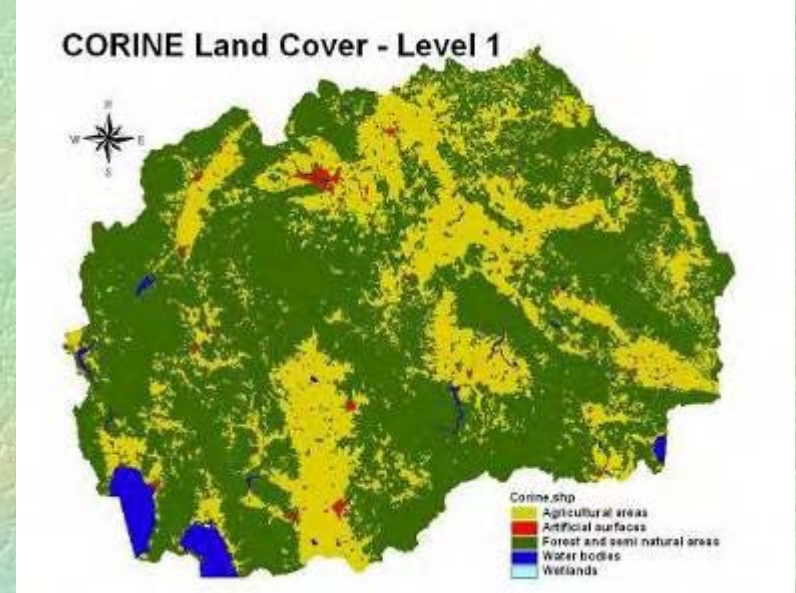
**Prof. d-r Ivan Blinkov, “Ss. Cyril and Methodius” University in Skopje, Faculty of Forestry, Dept. of Land and Water**

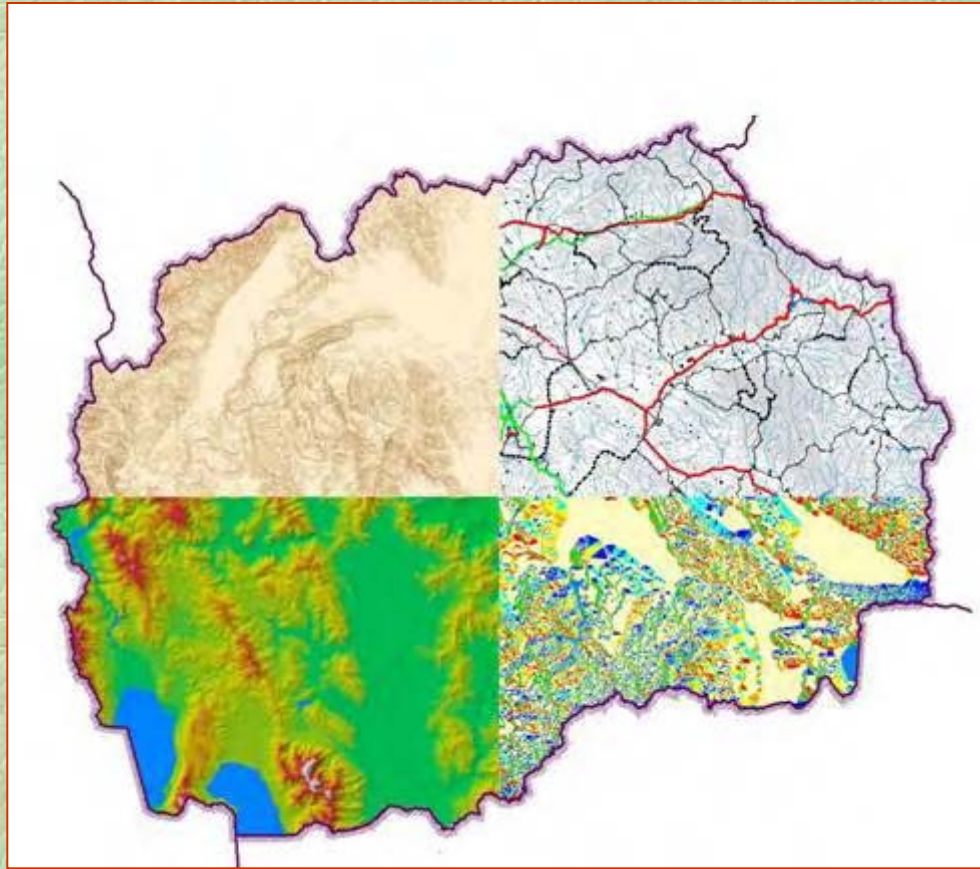


**Ohrid 18 June 2012**

# Content

- Governance - Competencies
- Forest and water resources in the RM
- National and regional policies including
- National priorities
- On going projects
- Forest – Water relation





## ■ Brief introduction to RM

# LOCATION

## and Basic Facts

**Area** – 25 713 km<sup>2</sup>

**Inhabitants:** 2,1 mil.

**Density:** 81 inh./  
km<sup>2</sup>

GDP – 9,157 USD  
(Human  
development  
index) HDI  
= 0.701,

**Participation of  
forestry in GDP –  
0.3-0,5%**



# Main Urban Centres



# Natural conditions - Relief

- Altitude :
- 40 – 2764 m asl
- Cca 80% of the territory – hilly-and hilly-mountain zone
- 14 peaks over 2000 masl

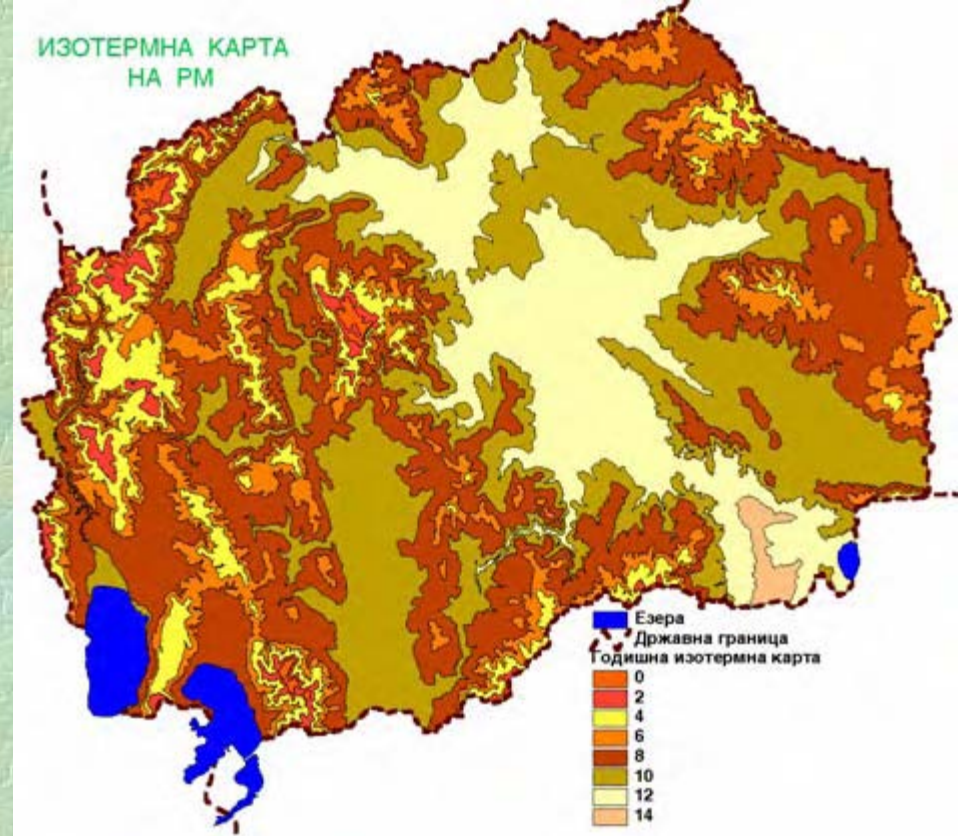
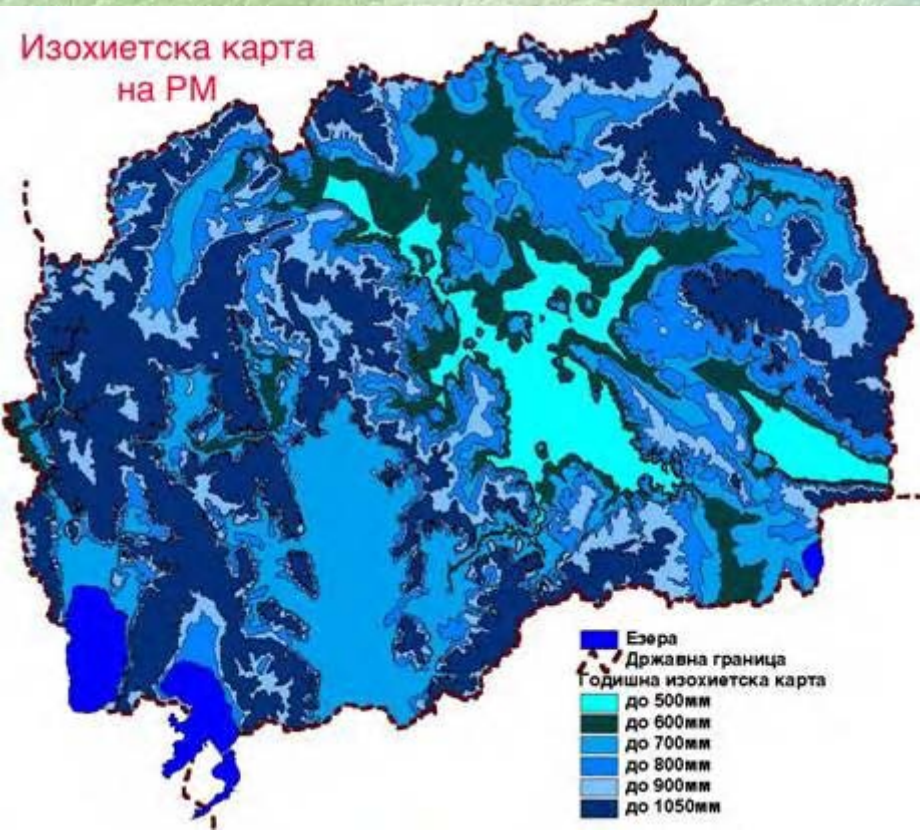


# CLIMATE

- 2 zonal climates:
  - mediterranean;
  - temperate-eastern continental
- 1 local climate : mountain

## - Precipitations:

годишна suma - annual - 661,36 mm  
vo leto- summer period – 127.84 mm



- – Temperature:
  - mean annual - 10,52 °C ;
  - abs.max: + 45,9 °C ;
  - abs.min.: -31,5 °C

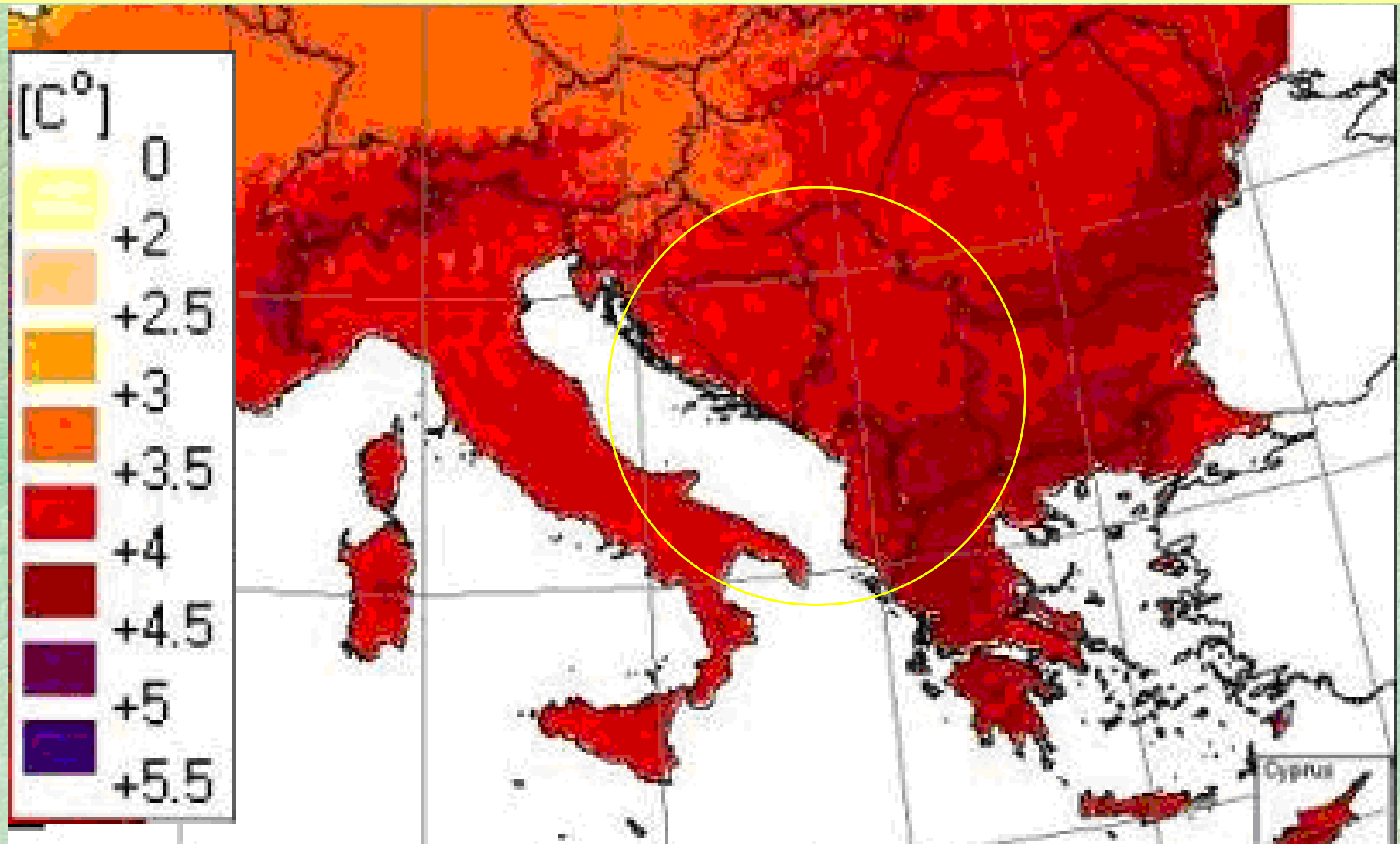
## Drought index

(by De Marton) : 34.45

# Map 1. Change in mean annual temperature by the end of this century (figure 1 in the Green Paper about Adaptation)

Absolute change in mean annual temperature between control period 1961-1990 and 2071-2100, under the IPCC SRES scenario A2.

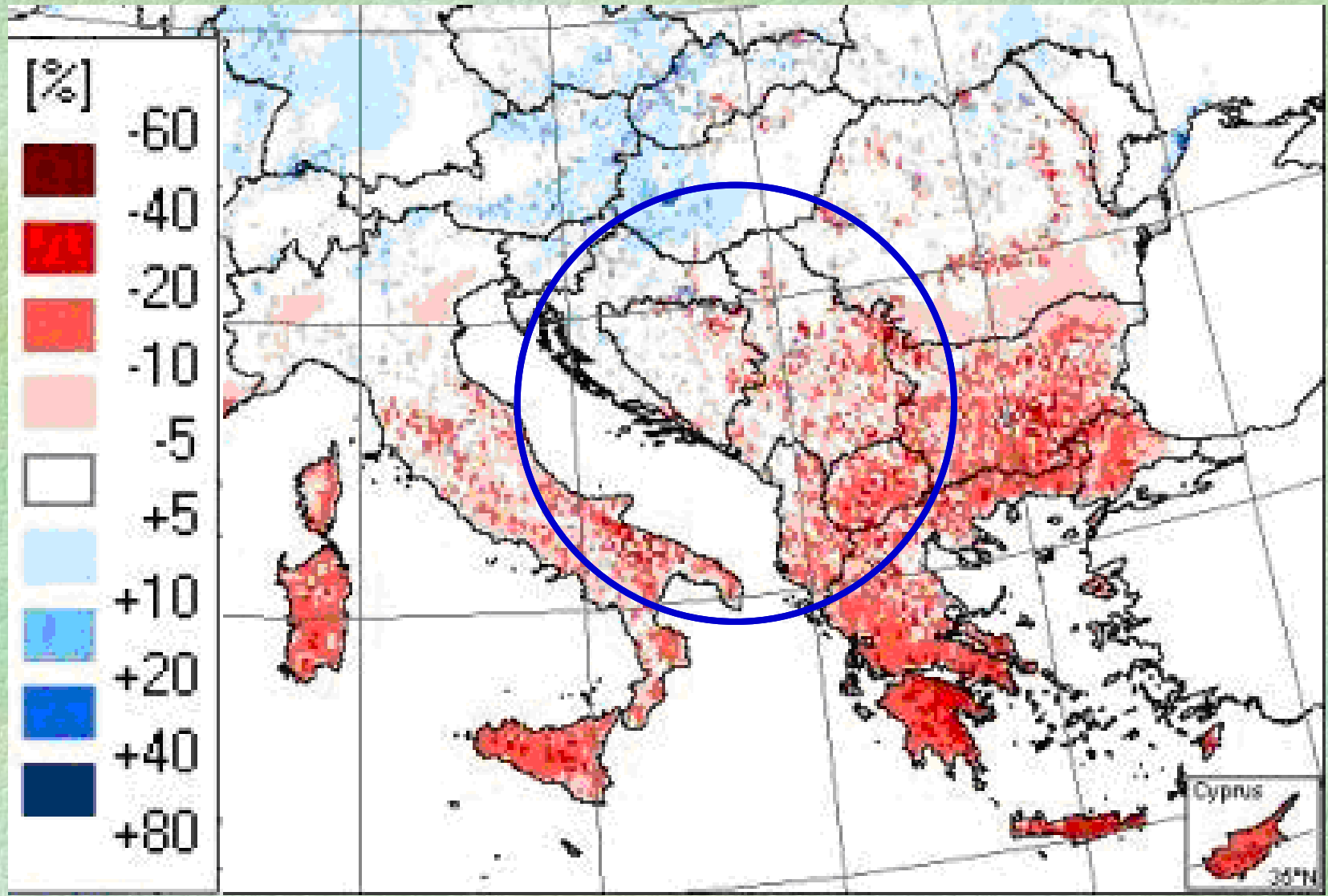
Data from EC-funded project Prudence



**Map 2. Change in mean annual precipitation by the end of this century  
(figure 2 in the Green Paper about Adaptation)**

*Relative change in mean annual precipitation between control period 1961-1990 and 2071-2100, under the IPCC SRES scenario A2.*

*Data from EC-funded project Prudence*

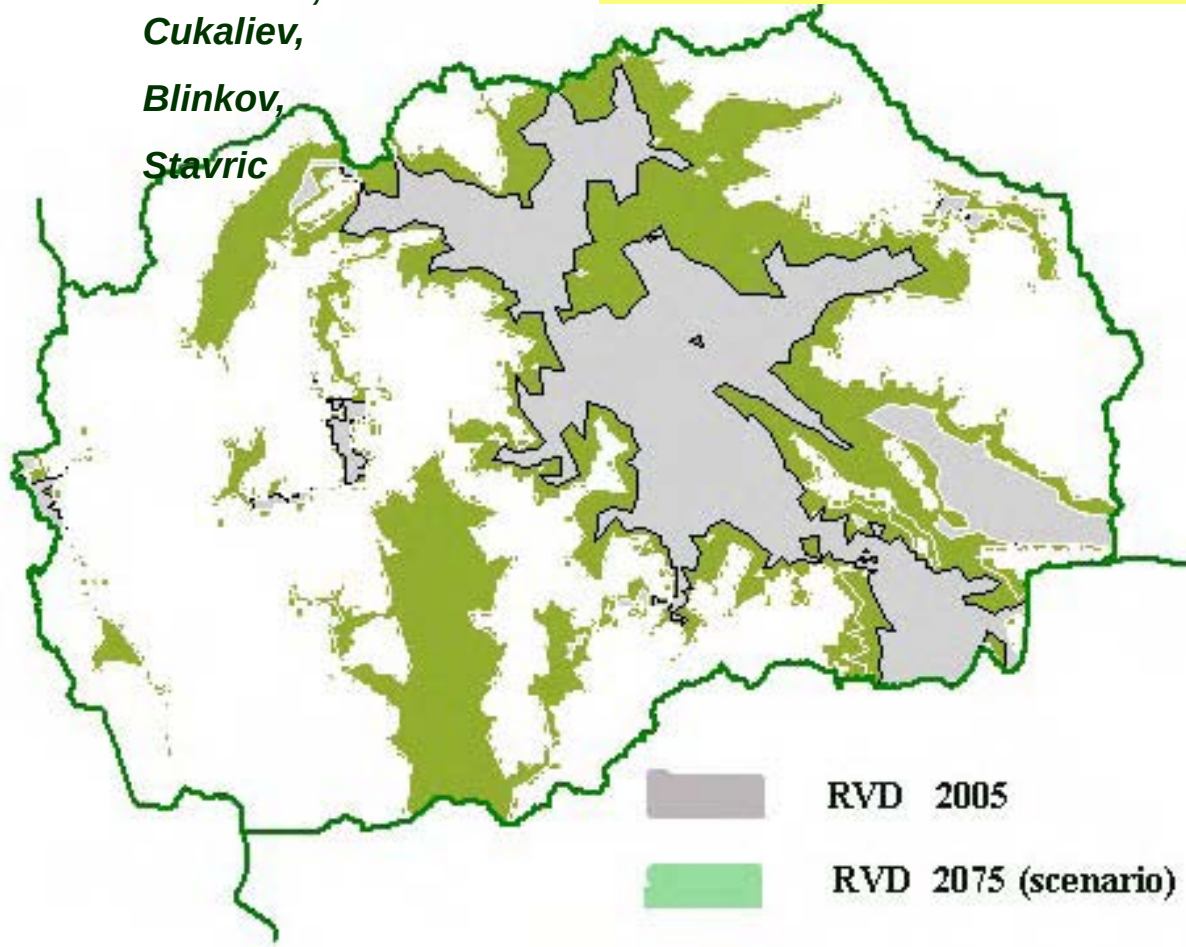


# Climate Changes - Scenario IS92 – year 2075

Precipitation: -25% ; Temperature: +2,5°C

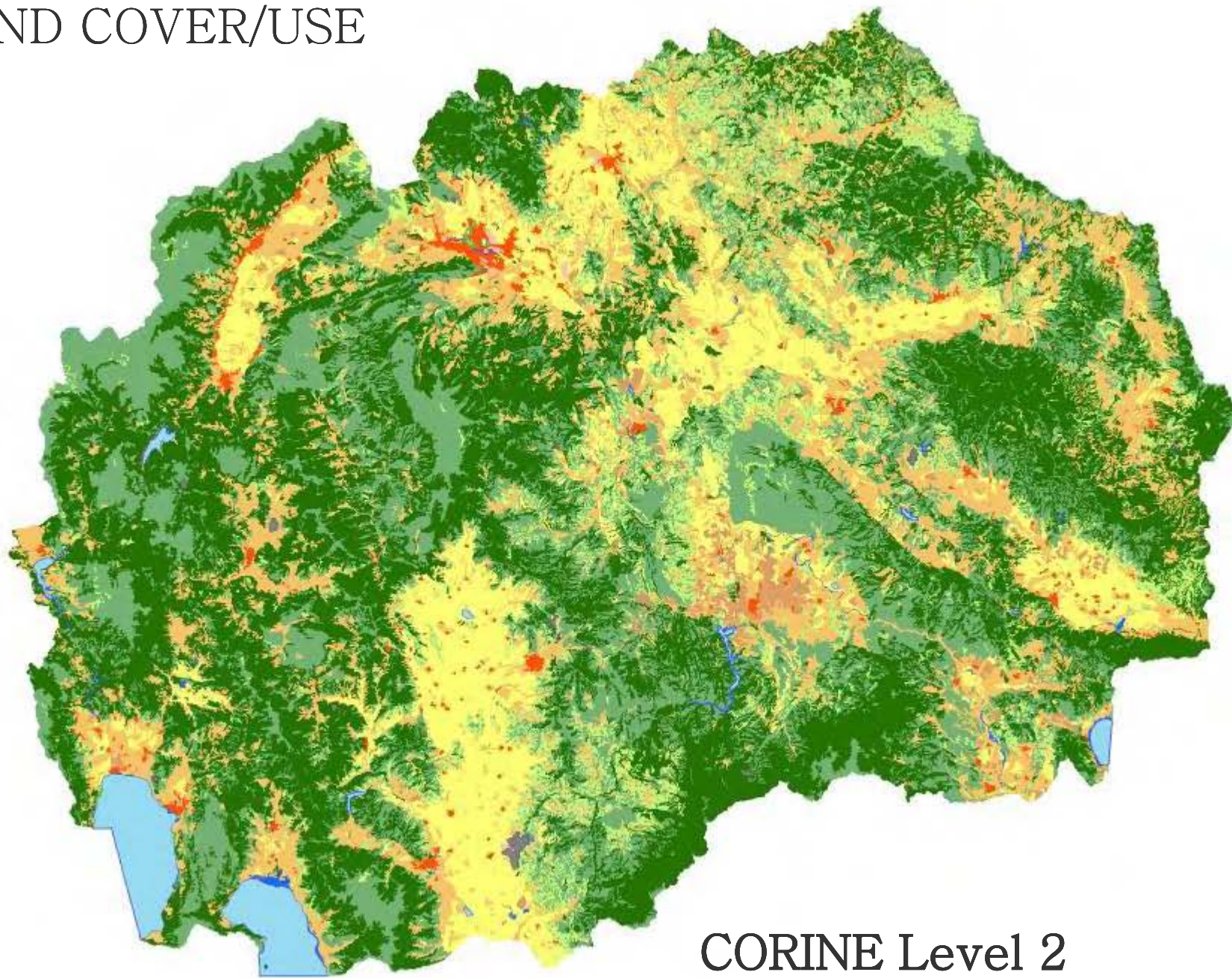
## Desertification Risk

*Mukaetov,  
Cukaliev,  
Blinkov,  
Stavric*



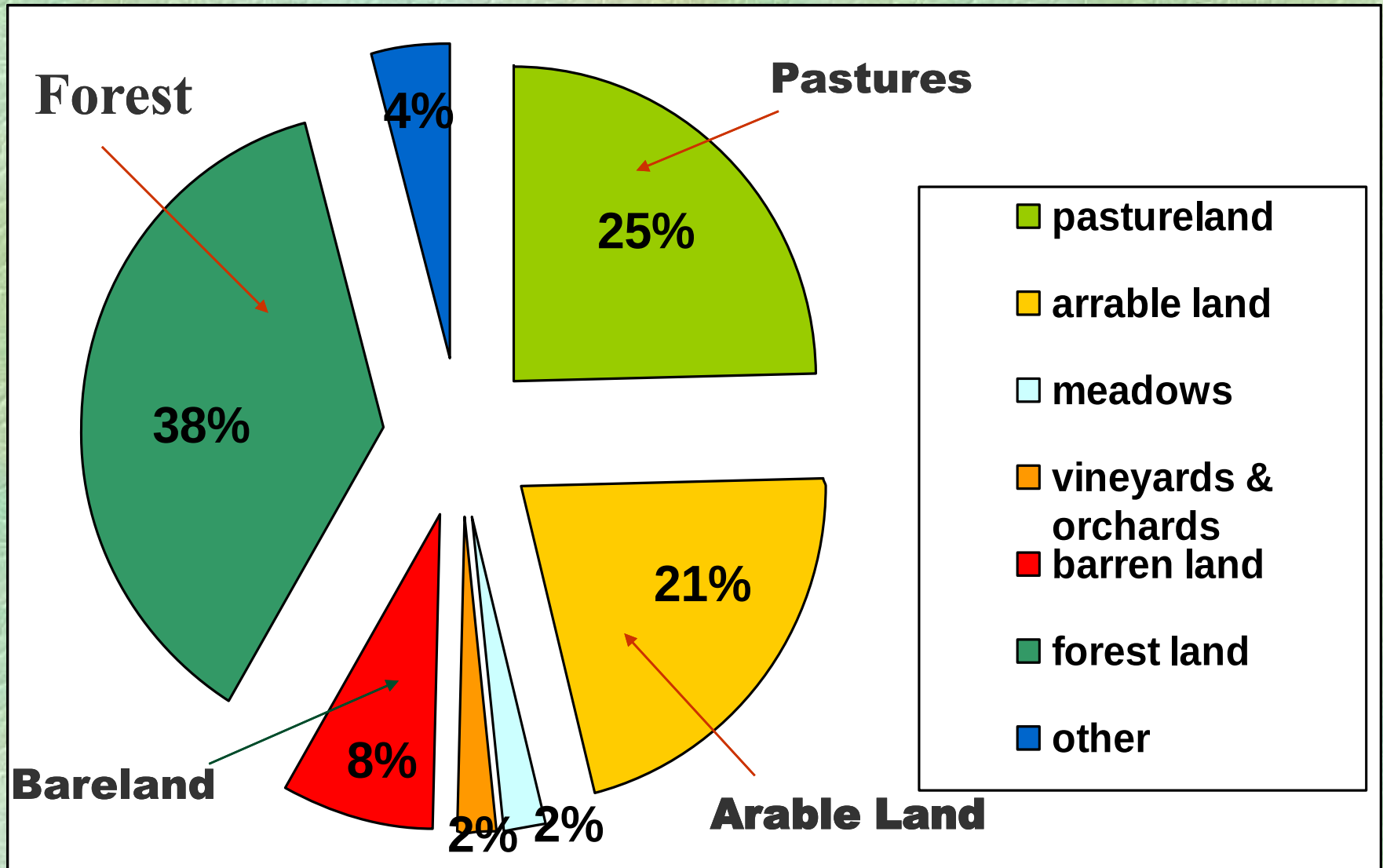
■ Sahara Jumps Mediterranean into Europe: Global warming threatens to create dust belt around the globe (P.Brown 2000)

LAND COVER/USE



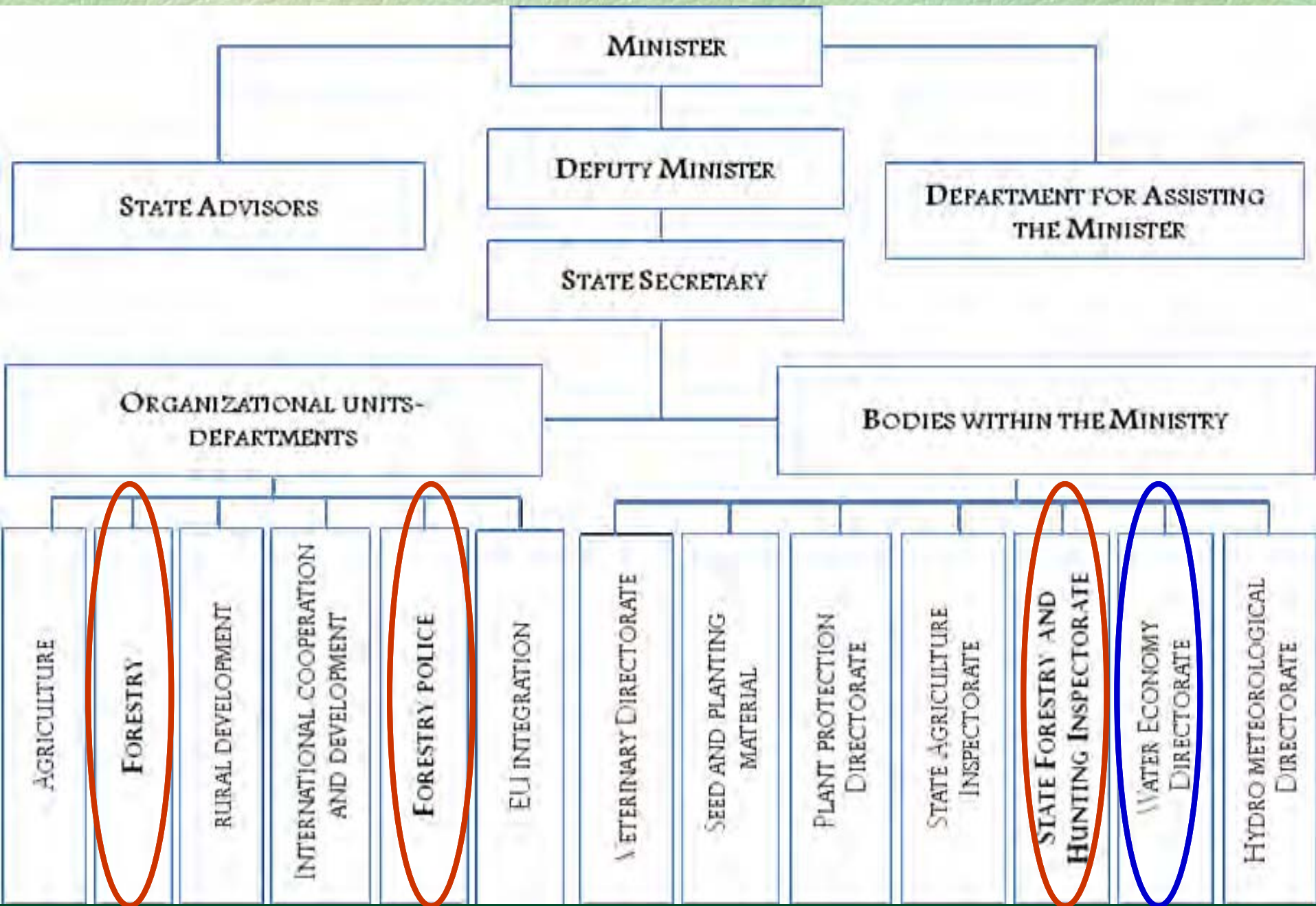
CORINE Level 2

# Land Use (Spatial Plan 2004)

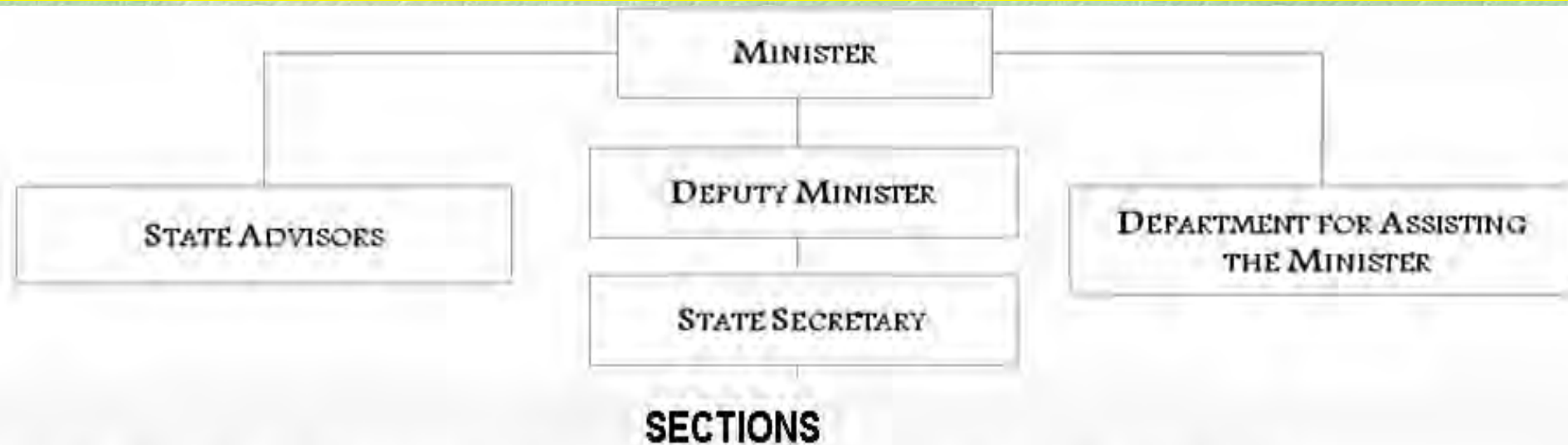


# **GOVERNANCE REOURCES MANAGEMENT**

# Ministry of Agriculture, Forestry and Water Economy



# Ministry of Environment and Physical Planning



- Department for Eurointegration
- Department for Sustainable Development
- Department for Physical Planning
- Department for Legislation and standardization
- Department for cooperation and project coordination
- Public Relation Office
- Office of Spatial Information System
- State Environment Inspectorate
- Informative center for environment
- Office (Directorate) for Environment
- Department for Waters
- Department on Nature protection
- Dept. for Environment
- Dept. for Waste Management
- Dept. for Industrial pollution and risk management

## **- Forest —**

- - Economic forests — MAFWE

(PE Macedonian Forests and private forest owners)

- Forests in protected areas —

MOEPP + MAFWE

(PI National Parks + other institutions)

## **- Water —**

MOEPP,

Ministry of health, Ministry of economy,

- Public water economies + water communities

## ■ RESOURCE MANAGEMENT SYSTEM – NO SPATIAL

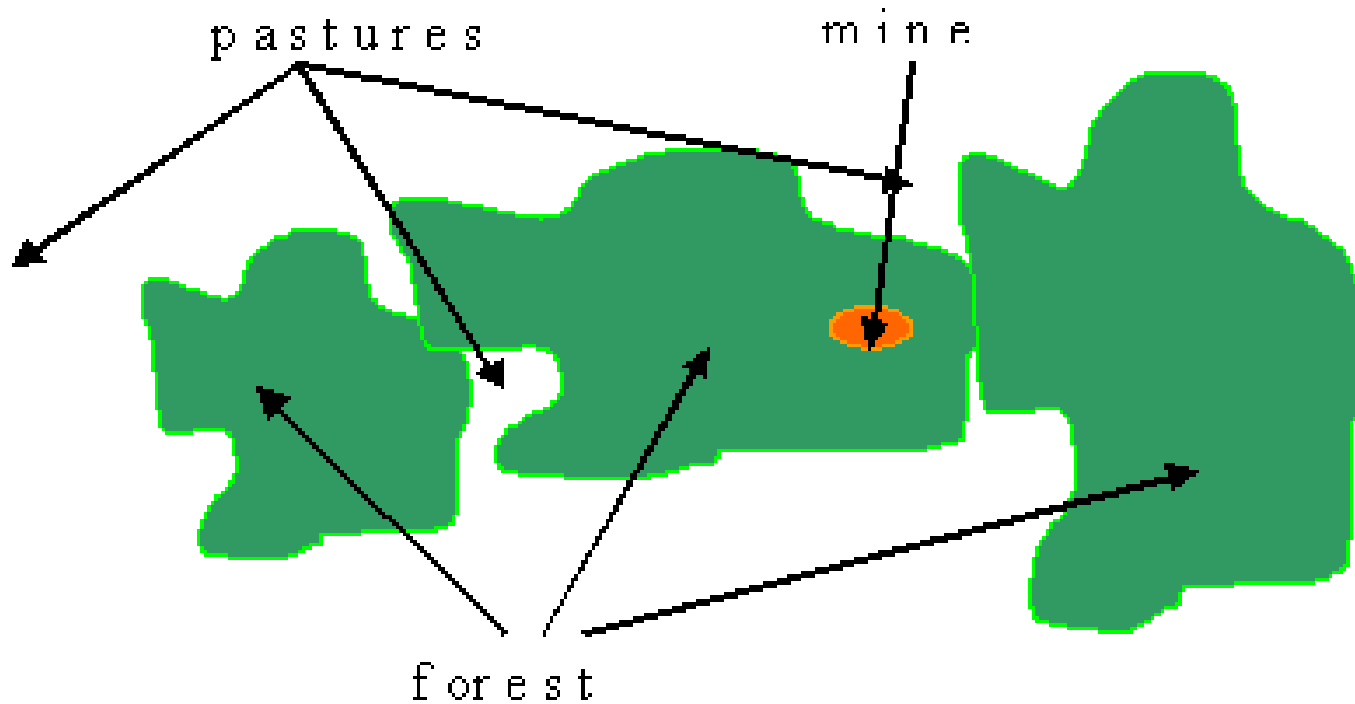
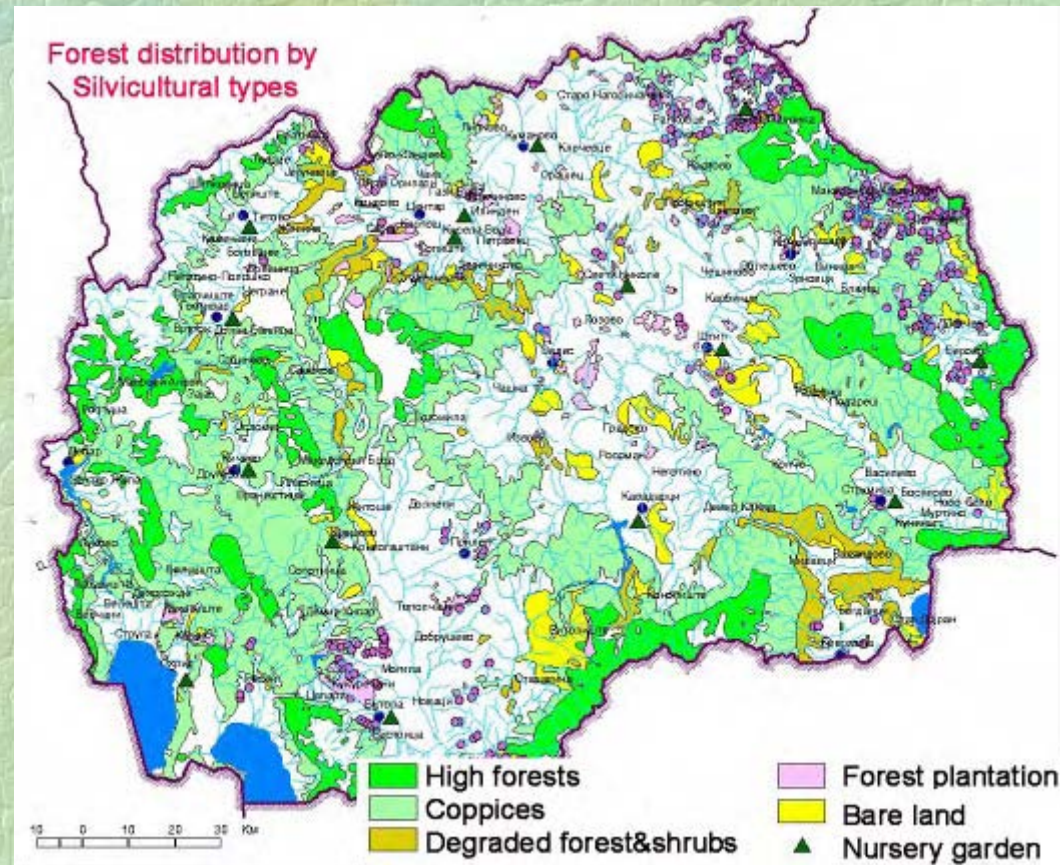


Fig.3 – Typical "land" management

- Forests (trees , shrubs..) – PE Macedonian forests, PI Nat. Parks, other
- Pastures – PE Macedonian pastures
- Water – Water economies + water communities ....
- Animals - PE MF, Hunting associations, concessioners

# FOREST RESERVES and FORESTRY



Forests and forest land: 1 159 600 ha (SSDF,2006) - 45,1% of RM

Forests: 947 653 ha - 36,85% of RM

- Wood mass: **74,343,000 m<sup>3</sup>**
- Total annual yield: **1,830,000 m<sup>3</sup>**
- Mean annual yield per ha: 2,02 m<sup>3</sup>/ ha

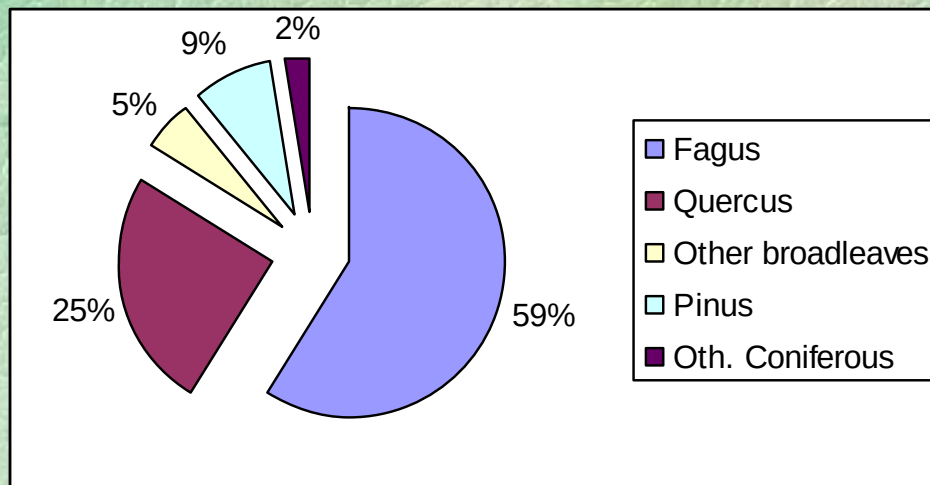
High forests 29% - annual yield: 3,45 m<sup>3</sup>/ ha

Coppices 71 % - yield: 1,44 m<sup>3</sup>/ ha

State owned : 90,4% (area), 92,2% (wood mass)

Private owned: 9,6% (area) 7,8% (wood mass)

- Economic forests : 92% ; Forests for special purpose : 8%



Allowed annual cut – 1300000 m<sup>3</sup>

| period  | Fuel wood | Techn. wood | Total   |
|---------|-----------|-------------|---------|
| 2005-09 | 458 832   | 134 780     | 593 612 |

# **WATER RESOURCES**

# Hydrography

## 3 BASINS :

- **Black Sea basin**  
(44 km<sup>2</sup> or 0.17 %) ;
- **Adriatic Sea basin**  
(3359 km<sup>2</sup> or 13.07 %
- **Aegean Sea basin**  
(22310 km<sup>2</sup> or 86.76%

**Rivers - 35**

**Natural lakes - 3**

**Reservoirs) - > 125**



- The total water resources of the Republic of Macedonia are estimated at
- 6,37 billion m<sup>3</sup> in a normal year and
- 4,80 billion m<sup>3</sup> in a dry year,
- out of which 80% are carried in the Vardar basin.
- The annual resources potential per capita is of about 3.000 m<sup>3</sup>, which is on the low side but more than the potential of e.g. Germany and a number of other European countries (European average approx. 1.900 m<sup>3</sup>/capita).
- **Water demand**

| <b>Sector</b>                   | <b>Millions of m<sup>3</sup></b> | <b>%</b>   |
|---------------------------------|----------------------------------|------------|
| water supply of municipalities: | 214                              | 11,6       |
| water supply of industry:       | 274                              | 14,8       |
| irrigation                      | 1.155                            | 62,6       |
| fish ponds                      | 202                              | 11,0       |
| <b>Total</b>                    | <b>1.846</b>                     | <b>100</b> |

- The main problem arising in the field of availability of water resources is:

- the uneven spatial and timely distribution over the country,
- long drought spells and
- high intensity rainfalls

which constitute at the same time a threat for crops and which prone *erosion* phenomena.

- About 85% of the surface water origins in the country, while only 15% of the water is inflowing to the country from the neighbouring countries.
- The uneven distribution of the surface water in space and time in the Republic of Macedonia, impedes to a great extent the utilization of water resources.
- Therefore, construction of dams and creation of reservoirs that would improve the water regime is an imperative

# Dams and Reservoirs

As to the catchment areas, 16 big dams were built in the Vardar catchment area, and 3 dams in each of the Strumica and Crn Drim catchment areas.

total volume of the water storage accounts to 2276 million m<sup>3</sup>.

In the Republic of Macedonia there are over 120 small dams. The level of the small dams is from a few meters to 28 meters, while the volume of stored water amounts from 10.000 m<sup>3</sup> to 1.000.000 m<sup>3</sup>.



# **National and regional policies including main objectives**

# Forests

The aim of the Government of the Republic of Macedonia is to increase the contribution of the forestry sector (now 0,3- 0,5) to the national economy and rural development through sustainable forest management, ensuring renewable resources and protection of local and global environment, and providing products and services for improving the quality of life of all citizens.

To maintain and enhance economic viability forest sector in favour of overall national development the Government will:

- Provide the regulatory, institutional and economic frameworks for the implementation of sustainable forest management;
- • Ensure the permanent financial mechanisms to improve the status of forests and the development of the forestry sector.
- *The main document related to forestry in the RM is the **Strategy for Sustainable development (SDSF) of Forestry in the Republic of Macedonia** (2007-2026) and Action Plan 2007-2009. Strategy was approved by the Government on 19 June 2006.*

*The Republic of Macedonia follow European forest policy.*

*In addition the RM on 11.02.2008, signed the MCPFE agreement.*

# Water

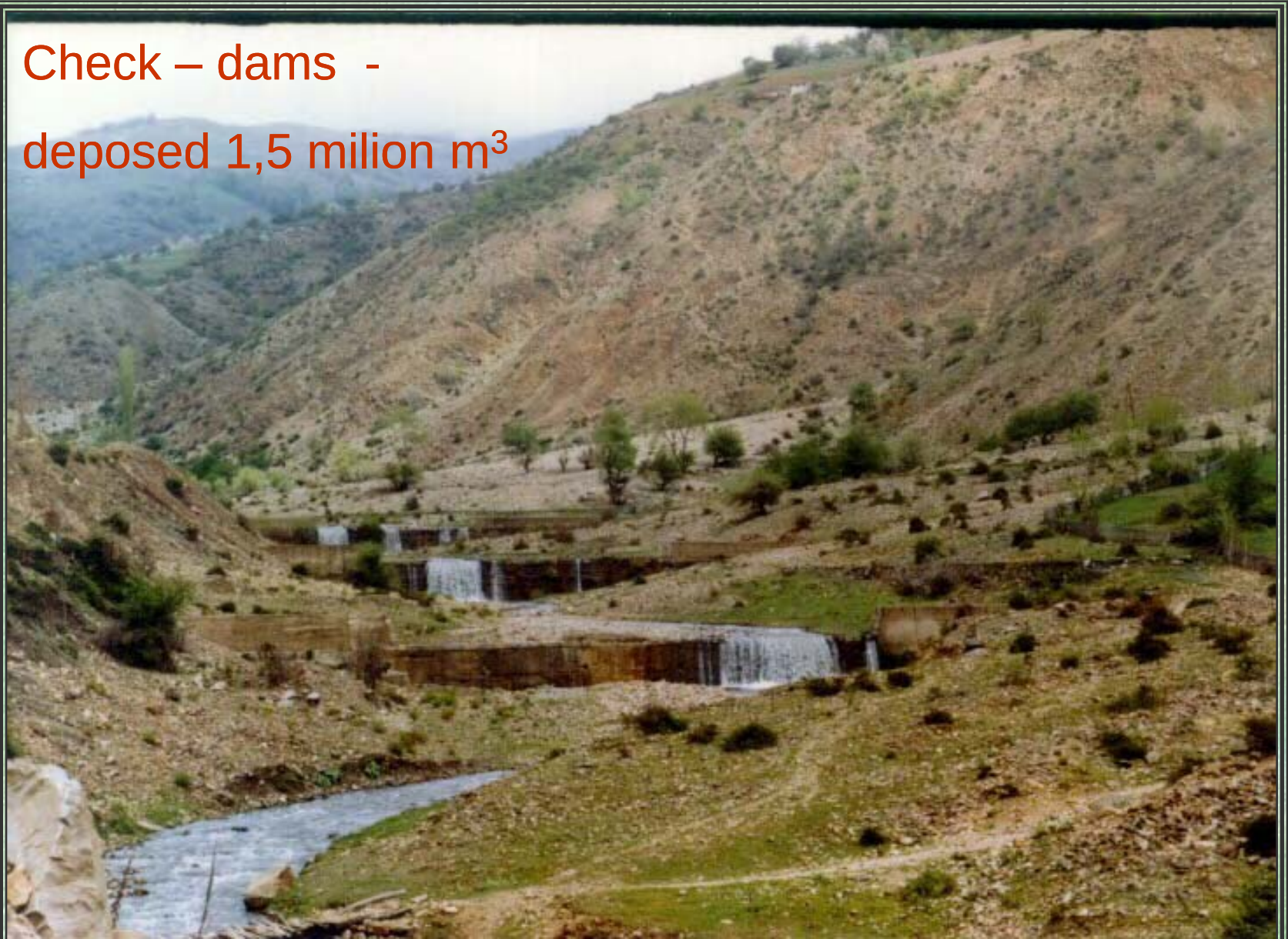
- The Ministry responsible for Waters in RM since 1. January 2011 is MOEPP. Previously waters were located at MAFWE. According Law on Waters (2008) waters are transferred to the MOEPP and MAFWE is responsible only for Irrigation and Drainage.

Due to lack of strategy (Strategy for Water is under procedure) and other strategically documents present policy and plans are not really defined and there is still huge gap in this issue.

- the major priority of the law on water is to Implement EU Water Framework Directive (WFD).
- Despite this among major priorities are following:
- To regulate conditions and principles of water use with emphasis on equal rights and special status of water as goods of general interest in state property
- Protection from harmful effects of waters
- Water protection from overexploitation and pollution
- Sources and methods of financing of water management activities
- Terms and conditions for conducting water management activities
- Issuing concessions for using of water and licensed use of waters
- Transboundary waters

# Heavily modified water bodies

Check – dams -  
deposed 1,5 milion m<sup>3</sup>



# **National PRIORITIES**

# FORESTS

- Traditionally, the understanding of forests<sup>1</sup> is considered to be their use as a resource that produces material goods, in first line timber and non-wood forest products, such as medicinal plants, plant parts, mushrooms, berries etc. Besides this, forests have many other benefits useful to society as relaxation and recreational use by people; multispectral protective function especially in the line of biodiversity conservation and erosion control; mitigation of climatic extremes and water protection; oxygen production and quality improvement of the environment.

- **National priorities in the forestry in the Republic of Macedonia are presented in SSDF and the AP.**

The following text is extracted from them:

- ***General Goal***
- **Increasing the areas of forests and improvement of their structure and quality based on sustainable forest management (SFM).**

## ■ **Measures:**

■ 1. Encouraging the activities and providing assistance for the increase of the reforestation and afforestation with adapted tree species in accordance with the global regionalization and local conditions, including regeneration of degraded forests, planting forests on uncultivated and poor-quality soils as well as other non-used land areas;

■ 2. Enforcing tending activities and thinning especially in young forests, as well as regeneration of degraded forests, speeding up of the conversion of coppice forest into high forests and reconstruction of degraded forests;

■ 3. Increasing the access of forests through **road construction** using environmental acceptable methods;

■ 4. Taking measures for protection and conservation of the natural **forest genetic resources** through:

■ • Identification and evaluation of the natural forest *gene-fund*;

■ • Selection of seed orchards and "plus trees" from economically valuable forest tree species.

- 5. Taking measures to enhance the **forest health condition** through removal or decrease of negative impact factors, and ensuring stable forest ecosystem:
  - • Strengthening the capacities of the State Forestry and Hunting Inspectorate and the Forestry Police in the Ministry of Agriculture, Forestry and Water Economy and the centre for Diagnostic- Prognostic-Reporting-Service of Republic of Macedonia (DPRS);
  - • Renewal and maintenance of the network for monitoring and control of the health condition of forests (IPC Forests);
  - • Support for the research in the area of forest protection, especially those with applied usage in forestry;
- 6. Introduction of guidelines to address operational, silvicultural, environmental and safety issues.
- 7. Promoting **sound use of wood and wood products** from sustainably managed forests, forest law enforcement to combat illegal activities in forests that have negative impact on the forest resources and the economy.
- 8. Increase the **use of modern scientific achievements in forest technologies**.

# National priorities for water management

- Establishing of Body for River Basin Management as a major change in water management ( **note: what about operative institution**)
- Water protection from pollution – issuing of permits for realising of waste waters, establishing of maximal emissions according the realised substances
- Establishing of water protection zones
- Protection from harmful effects of waters – erosion, torrents and floods, Operative plans

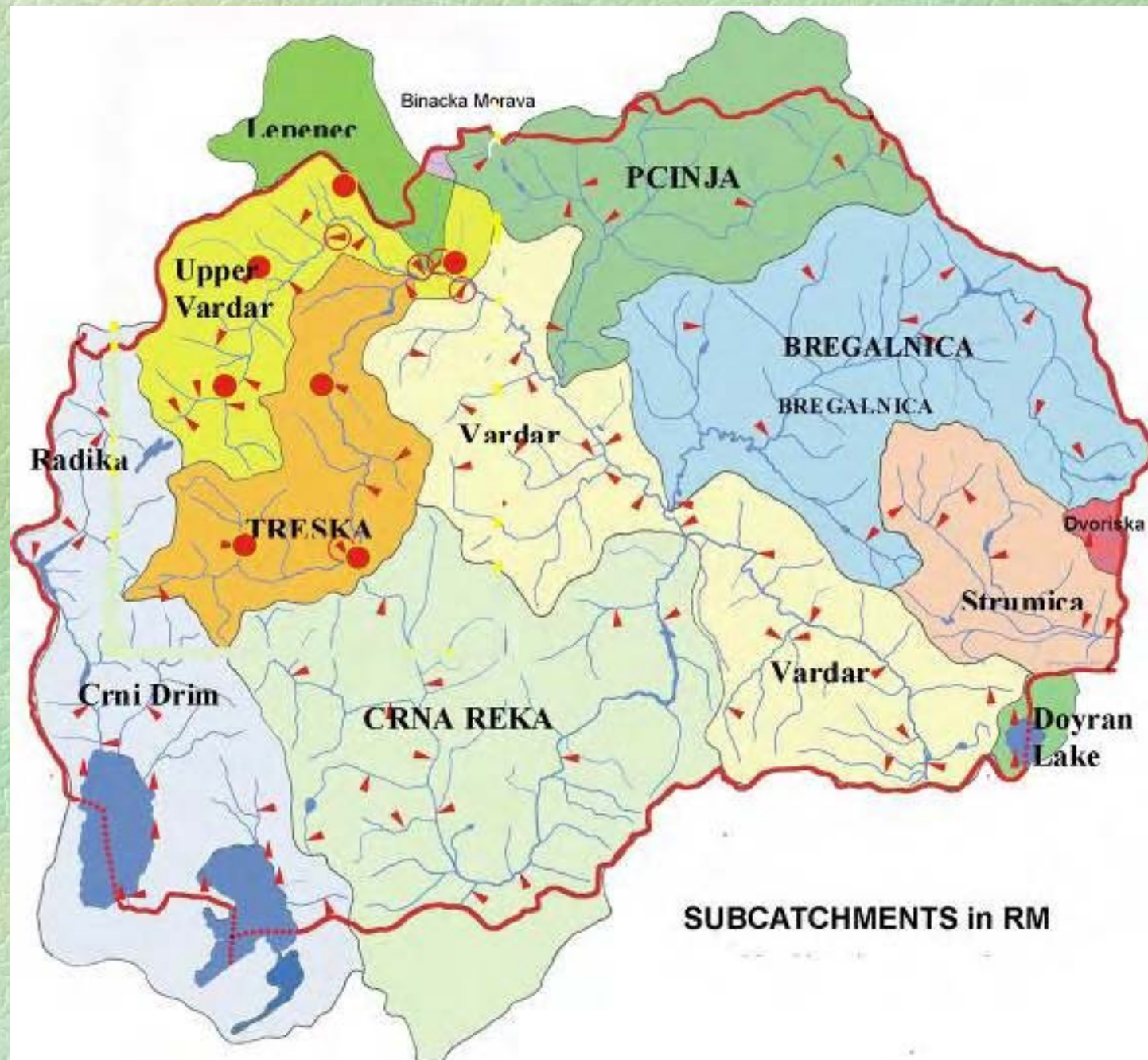
# On going projects in forest and water sectors

- *Regional Fire Monitoring Center (RFMC)*
- *FAO project - Forest fire preparedness*
- *FOPER 2 – Forest Policy and Economy Research 2*
- *National Parks - .....*
- GIZ (GTZ) project on Waters entitled as: Advice on the implementation of the Macedonian Water Law
- Zletovica project supported by JICA Water Utilization Improvement Project in Zletovica River Basin (ODA Loan)
- BREGLANICA RIVER BASIN – (SDC,)
- Implications of Climate Change in Macedonia (UNDP)
- Reducing Vulnerability to Climate Change in ECA Agricultural Systems (WB)
- Second Phase of Irrigation Southern Vardar Valley Project (KfW)
- Project related to urban waste water treatment plants

# Donors

- RM can use IPARD
- GEF programmes related to land degradation and desertification or climate changes.
- EU programmes.
- World Bank is represented by office in Skopje
- UNDP is represented with office in Skopje
- SIDA is represented by office in Skopje
- Swiss (SDC and SECO) Swiss Embassy
- Norwegian Embassy
- GIZ
- USAID
- JICA
- Due to Macedonian EU assession most of the donors are slightly prepared to move their funds from the country.

# SUB BASINS and Transboundary basins



# Vienna Declaration: European Forests-Common Benefits, Shared Responsibilities

## Ecological

## Economic

## Socio-cultural

V1: Cross-sectoral Co-operation and nfps

V4: Forest Biological  
Diversity

V2: Economic  
Viability of SFM

V3: Social and Cultural  
Dimensions of SFM

V5: Climate Change and SFM

L1: Socio-Economic Aspects of SFM

L2: Pan-European Criteria, Indicators and PEOLG for SFM

H1: Sustainable Management of Forests in Europe

H2: Conservation  
of the Biological  
Diversity

H3: Co-operation with Countries with Economies in Transition

H4: Adaptation of Forests  
to Climate Change

S1: Monitoring  
of Forest Ecosystems

S2: Genetic  
Resources

S3: Data Bank on Forest Fires

S4: Adapting the Management  
of Mountain Forests

S5: Research on  
Tree Physiology

S6: Research into  
Forest Ecosystems

## Forest Europe (MCPFE) resolutions

**Strasbourg 1990**

**Helsinki 1993**

**Lisbon 1998**

**Wien 2003**

**Warszawa 2007**

**Warszawa resolution – 1: Forests, Wood and Energy (2007)**

**Warszawa resolution – 2: Forest and Water (2007)**

## **WARSAW RESOLUTION 2**

### **Forests and Water**

- **1. Recognizing the close interrelation between forests and water.**
- **2. Concerned that there is a growing imbalance between freshwater supply and demand.**
- **3. Aware of the need to ensure adequate water quality and quantity.**
- **4. Stressing the need for adequate water conditions in order to sustain European society.**
- **5. Emphasizing the role of forests and forest management for biodiversity of water ecosystems.**
- **6. Concerned that climate change will have severe effects on the frequency, Scale and intensity of natural hazards such as floods, debris flow, avalanches, storms, and droughts and will have an impact on forest and water resources and their management.**

- 7. Stressing the role of forests and forest management in protecting water quality, managing water resources for the quantity of all waters, **flood alleviation, combating desertification and soil protection as well as the importance of mountain forests in the reduction of land slides, erosion and effects of avalanches.**
- 8. Concerned that the frequency and size of **forest fires** is increasing and that fires occur more frequently, even at higher latitudes and altitudes, resulting in severe impacts on watersheds, water quality, quantity and soil erosion
- 9. Emphasizing that the full **economic value of forests** has to be adequately recognized and in particular the value of providing ecosystem services.
- 10. Recognizing that **forest owners have rights** and responsibilities and noting the importance of prior consultations regarding the provision of water related services.
- 11. Stressing the need **to involve local communities** and other relevant stakeholders in planning and implementation of water related forest policies.
- 12. Building on previous MCPFE commitments and recognizing the ongoing work in the area of forests and water carried out by international conventions, organizations and processes.

- The Signatory States and the European Community, commit themselves to:
- I. Sustainable management of forests in relation to water
- 13. maintain and enhance the protective functions of forests for water and soil, as well as for mitigating local water-related natural disasters through sustainable forest management, including through public and private partnerships,
- 14. assess afforestation and reforestation programmes in terms of their effects on quality and quantity of water resources, flood alleviation and soil,
- 15. promote the restoration of degraded forests, particularly in floodplains and upper watershed areas for the benefit of the water environment, flood reduction, conservation of biodiversity and soil protection,

## **■ II. Coordinating policies on forests and water**

- 16. develop and improve policies for forest and water resources management that contribute to the maintenance of ecosystems and the sustainable provision of their services,**
- 17. coordinate forest and water resources management policies through national forest programmes or equivalents and integrated water resources management plans and strategies at the appropriate levels,**
- 18. develop adequate or improve the existing institutional arrangements to better cooperate in addressing the interrelation between forest and water issues,**
- 19. address the management of forests and water at the transboundary watershed level through enhanced international cooperation,**
- 20. enhance education, training, research and extension services to promote knowledge and understanding of forest and water interactions,**
- 21. increase awareness of the relationship between forests and water as well as the potential of forests and their sustainable management to improve the water environment,**

### ■ **III. Forests, water and climate change**

- 22. develop a deeper understanding of the potential consequences of climate change on forest and water interactions, including desertification and biodiversity loss as well as the frequency, scale and intensity of floods, storms, droughts, forest fires, pests and diseases,
- 23. develop appropriate policies and strategies for managing forests and water resources sustainably to adapt to climate change and contribute to its mitigation,

### ■ **IV. Economic valuation of water-related forest services**

- 24. assess the economic value of forest services related to quality and quantity of water resources and flood alleviation from which society benefits,
- 25. incorporate the economic valuation of water-related forest services into relevant policies and strategies on forests and water,
- 26. facilitate the development and implementation of measures, which may include economic tools such as payments for ecosystem services (PES) in order to broaden and diversify the financial basis for sustainable forest management and to maintain the protective functions of forests.

# Land Management and Hydrology

Land management is considered one of the essential keys to identify and implement adaptation strategies to natural hazards (including, but not limited to, flood prevention)

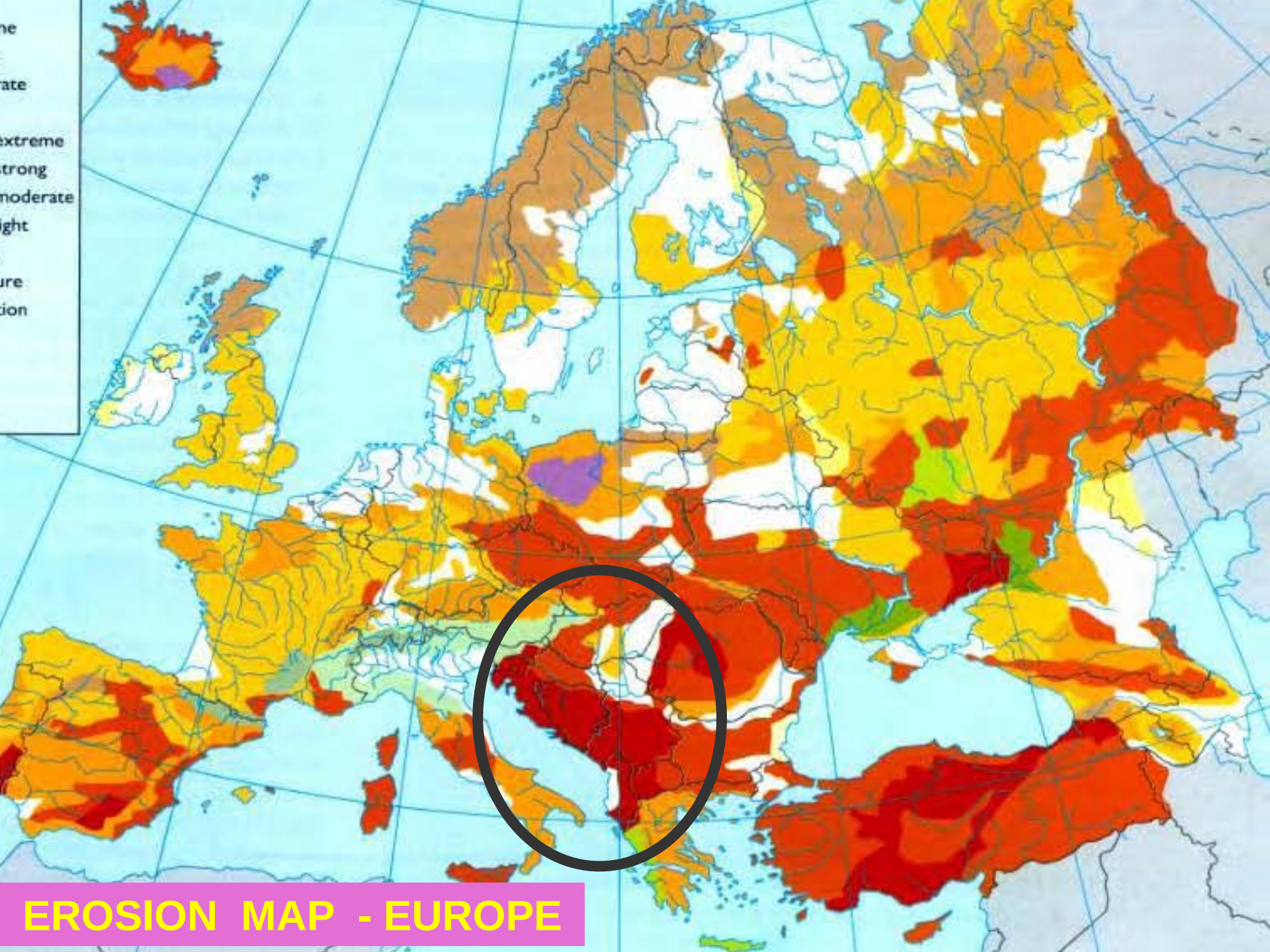
**Table 1. Spatial dimension of land use effects (FAO, 2002, cited in FAO 2007)**

| Impact               | Basin size [km <sup>2</sup> ] |   |    |     |       |        |         |
|----------------------|-------------------------------|---|----|-----|-------|--------|---------|
|                      | 0.1                           | 1 | 10 | 100 | 1 000 | 10 000 | 100 000 |
| Average flow         | x                             | x | x  | x   | -     | -      | -       |
| Peak flow            | x                             | x | x  | x   | -     | -      | -       |
| Base flow            | x                             | x | x  | x   | -     | -      | -       |
| Groundwater recharge | x                             | x | x  | x   | -     | -      | -       |
| Sediment load        | x                             | x | x  | x   | -     | -      | -       |
| Nutrients            | x                             | x | x  | x   | x     | -      | -       |
| Organic matter       | x                             | x | x  | x   | -     | -      | -       |
| Pathogens            | x                             | x | x  | -   | -     | -      | -       |
| Salinity             | x                             | x | x  | x   | x     | x      | x       |
| Pesticides           | x                             | x | x  | x   | x     | x      | x       |
| Heavy metals         | x                             | x | x  | x   | x     | x      | x       |
| Thermal regime       | x                             | x | -  | -   | -     | -      | -       |

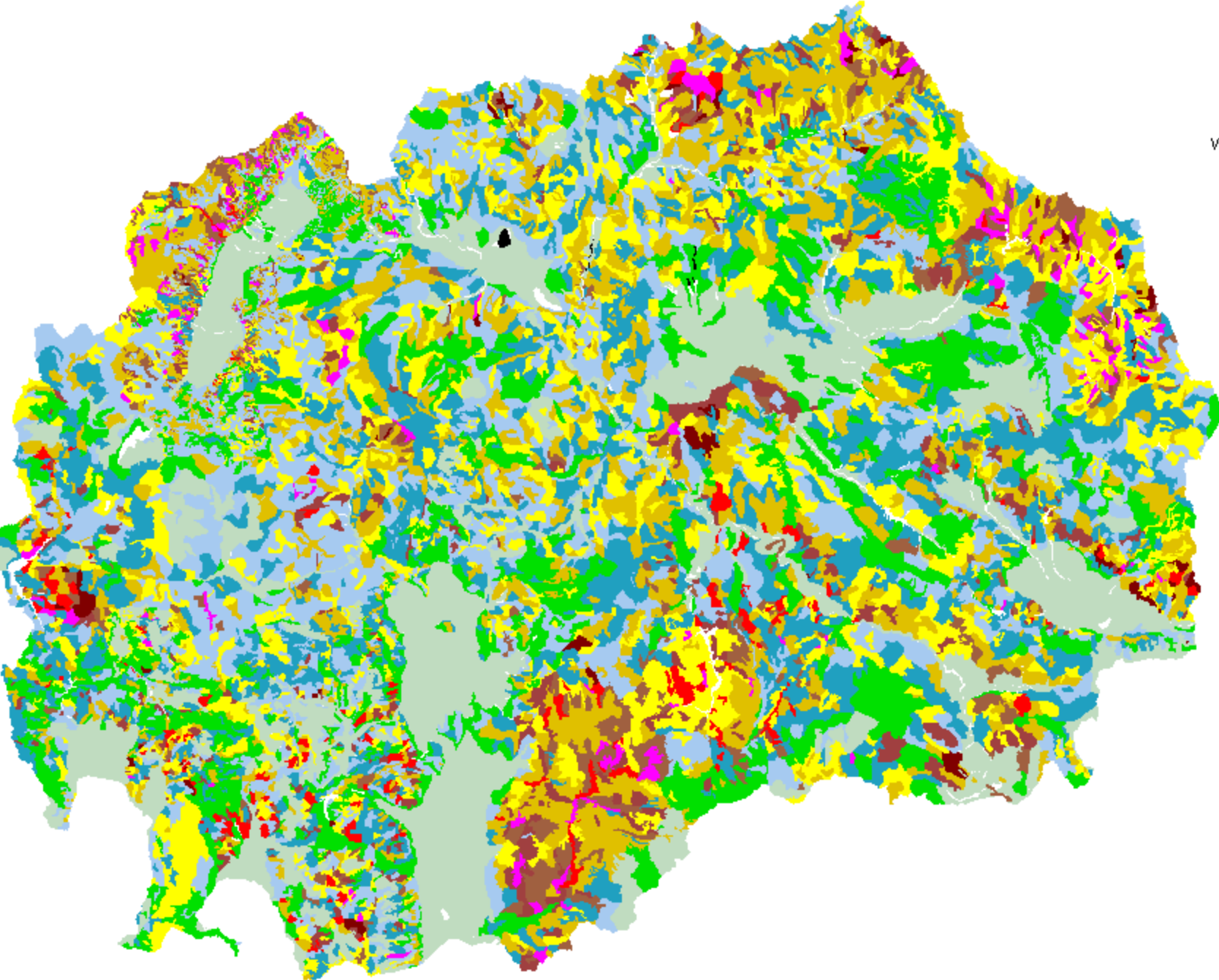
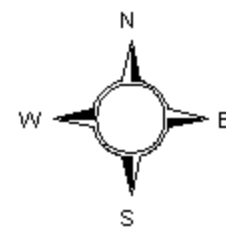
Legend: x = Observable impact; - = no observable impact

# ■ EROSION, RUNOFF, SEDIMENTATION

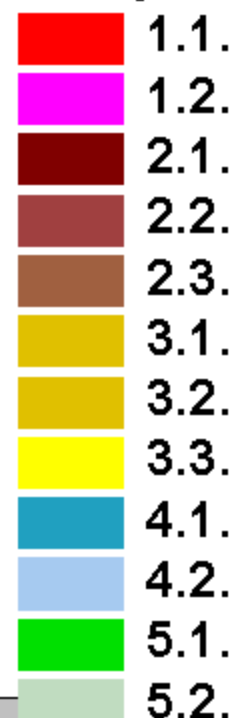
- Erosion and runoff have not only on-site effects, mainly soil degradation, but also off-site effects
- On-site erosion effects affecting farmers and create losses in eroded areas: (Losses of water, fertilizers and pesticides; Immediate production loss; Loss of arable land; Long-term productivity loss etc).
- Off-site - or downstream – erosion effects-damage usually affect towns people: (Deterioration in water quality - pollution of rivers, death of fish, silting up of reservoirs.; Increase in suspended load (SL) - higher costs for drinking water; • Rise in peak flows of rivers - **Flooding of inhabited areas - mud flows, debris flow, sanded up ditches; destruction of structural works, bridges, etc.**



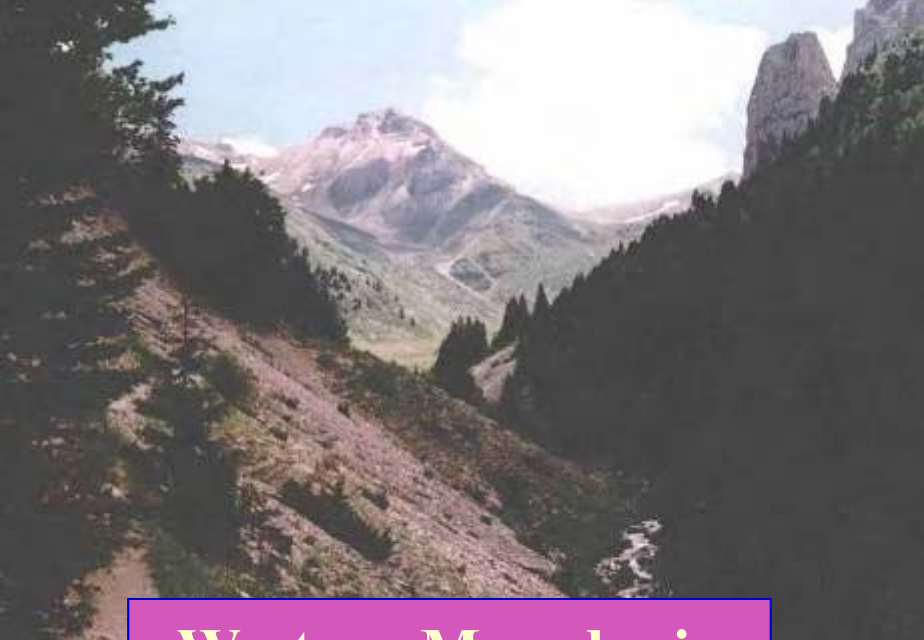
**EROSION MAP - EUROPE**



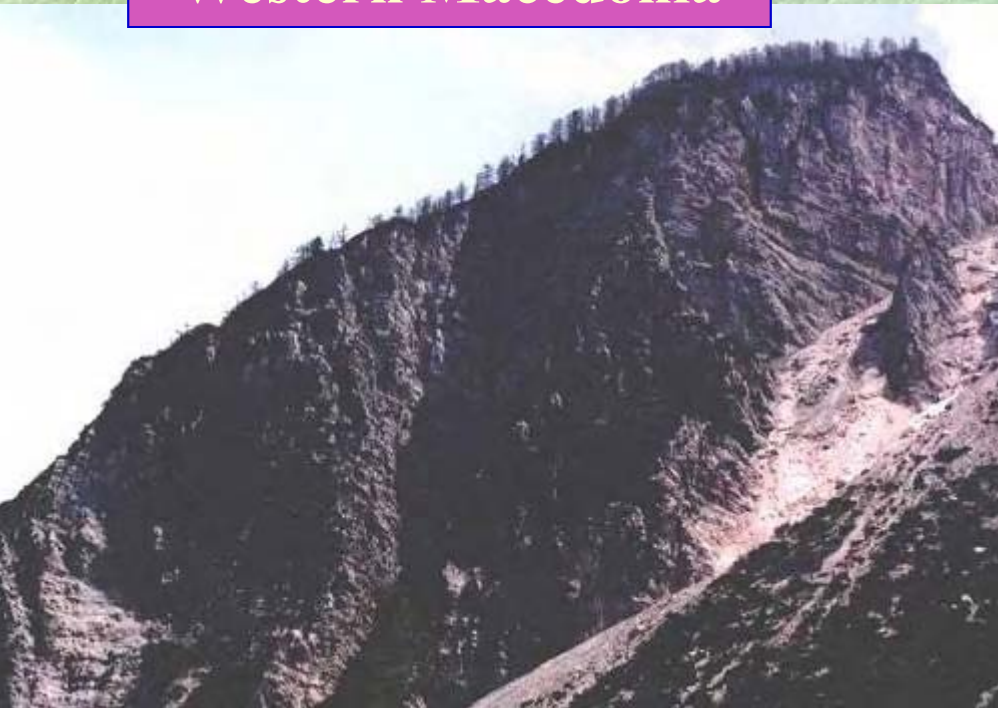
Erozija.sh



Unknown Units: View1



**Western Macedonia**



**Eastern Macedonia**





## Central Macedonia



# Landfall- Mokliste 1958



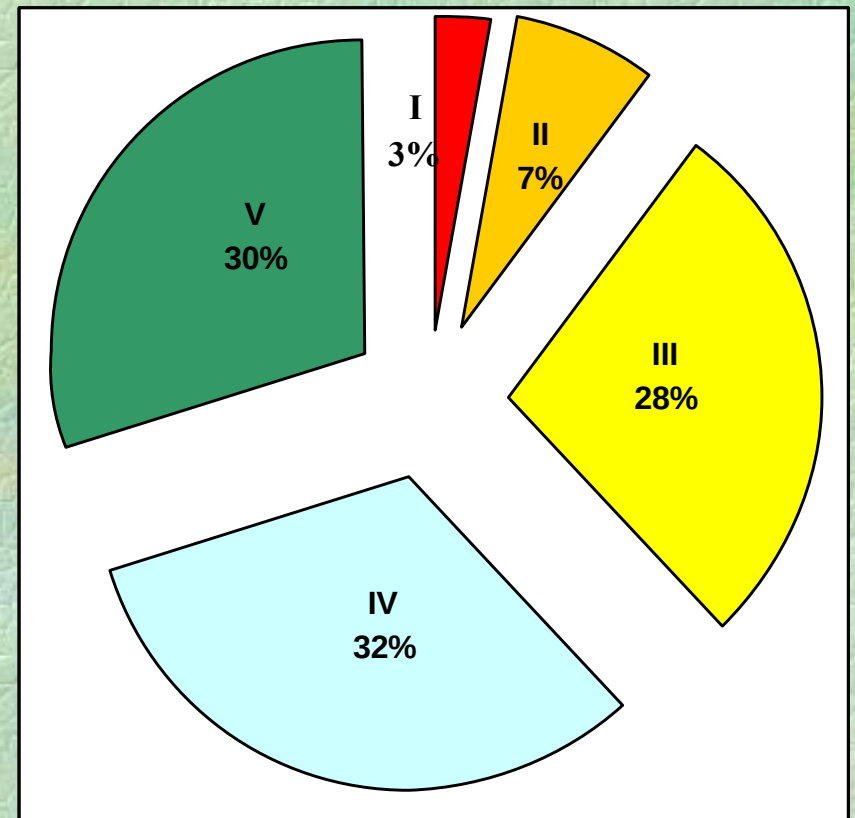
## Central Macedonia

# Landslide- Timjanik 1992



# Erosion Distribution by Intensity

| EROSION<br>category | categ. | ha      |
|---------------------|--------|---------|
| extreme erosion     | I      | 69 800  |
| high erosion        | II     | 183 200 |
| medium erosion      | III    | 689 300 |
| low erosion         | IV     | 793 600 |
| very low erosion    | V      | 746 300 |



**Total annual sediment  
production – 17 000 000 m<sup>3</sup> -  
661 m<sup>3</sup>/km<sup>2</sup>**

**Total annual sediment  
transport 7 531 000 m<sup>3</sup> -  
293 m<sup>3</sup>/km<sup>2</sup>**

**36,5% of RM territory,  
higher erosion processes**

# Sedimentation into the reservoirs -

**3 000 000 m<sup>3</sup> annually**

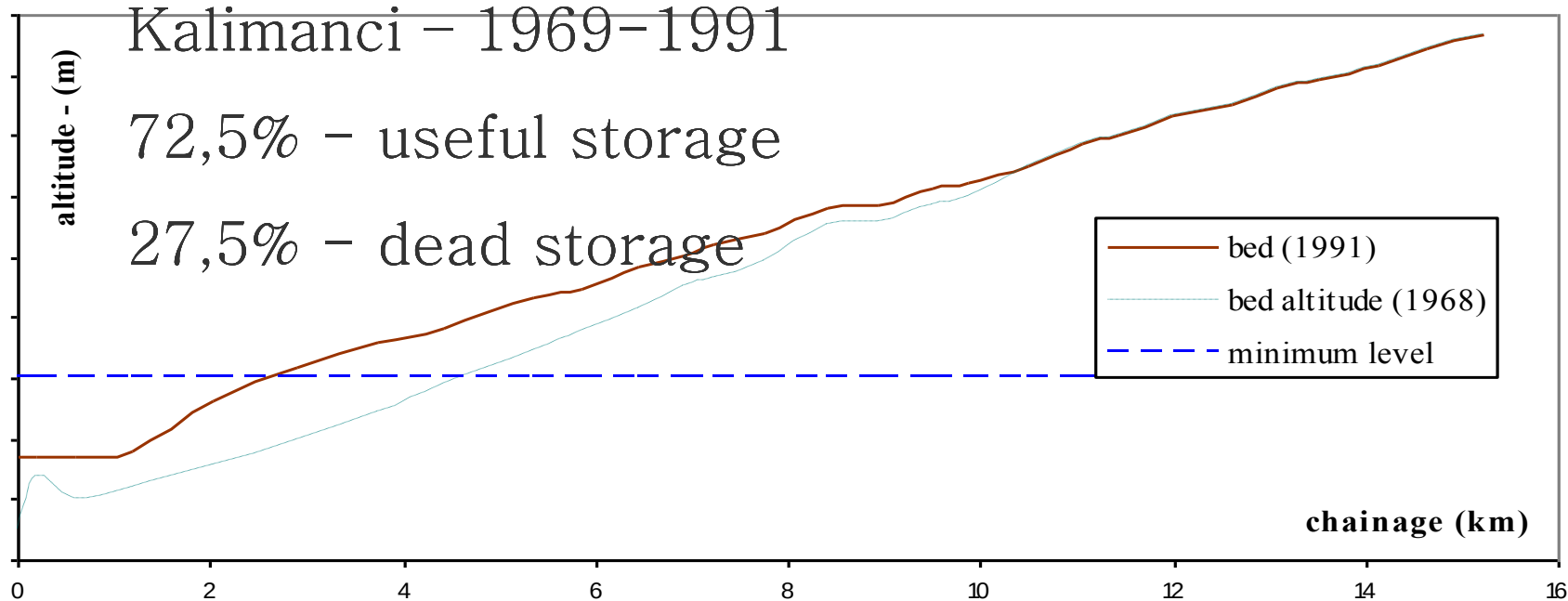
| <i>Nr</i> | <i>Reservoir</i> | <i>A</i>              | <i>Z</i> |  |  | <i>G</i>                  | <i>Gsp</i>                            |
|-----------|------------------|-----------------------|----------|--|--|---------------------------|---------------------------------------|
|           |                  | <i>km<sup>2</sup></i> |          |  |  | <i>m<sup>3</sup>/year</i> | <i>m<sup>3</sup>/km<sup>2</sup>.y</i> |
| <b>1</b>  | <i>Glaznja</i>   | 100                   | 0.71     |  |  | 36 141                    | 362                                   |
| <b>4</b>  | <i>Kalimanci</i> | 1135                  | 0.58     |  |  | 418 731                   | 368                                   |
| <b>11</b> | <i>Tikves</i>    | 5378                  | 0.34     |  |  | 1 274 783                 | 237                                   |
| <b>14</b> | <i>Turija</i>    | 213                   | 0.27     |  |  | 62 273                    | 292                                   |
| <b>15</b> | <i>Vodoca</i>    | 73                    | 0.34     |  |  | 16 797                    | 230                                   |
| <b>18</b> | <i>Spilje</i>    | 2889                  | 0.52     |  |  | 563 154                   | 195                                   |
|           |                  |                       |          |  |  |                           |                                       |

## Kalimanci - 1969-1991

72,5% - useful storage

27,5% - dead storage

altitude - (m)

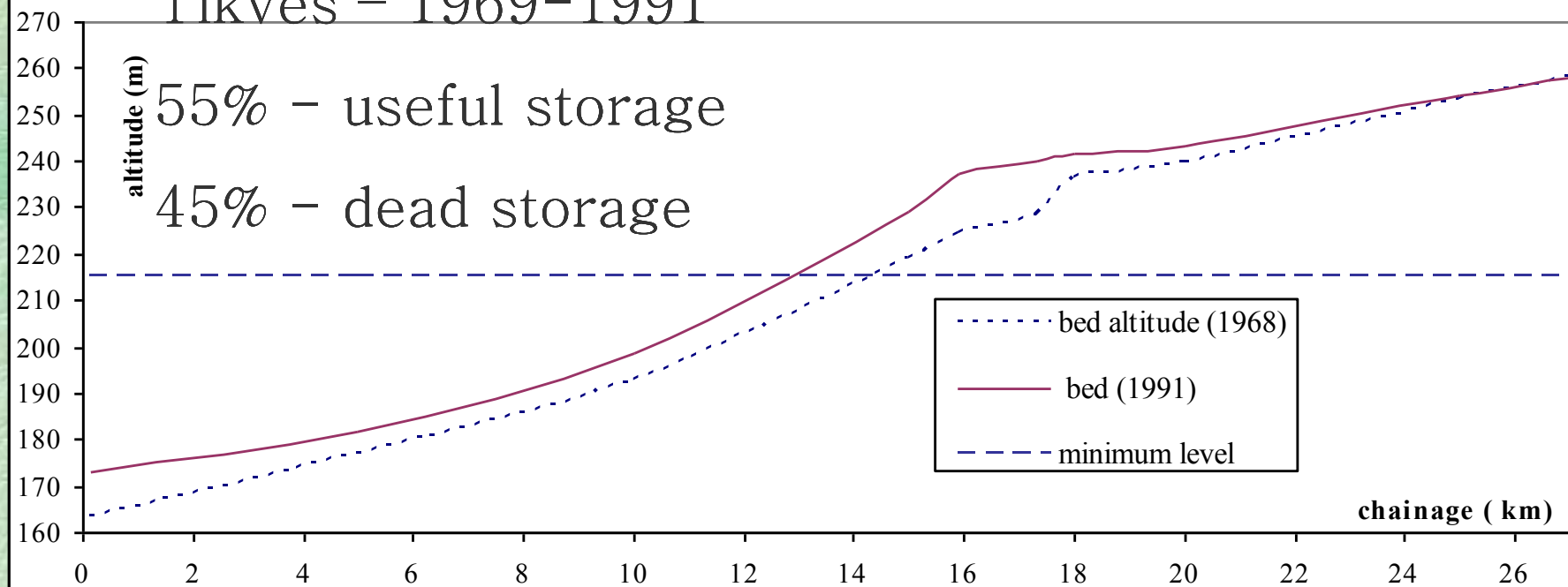


## Tikves - 1969-1991

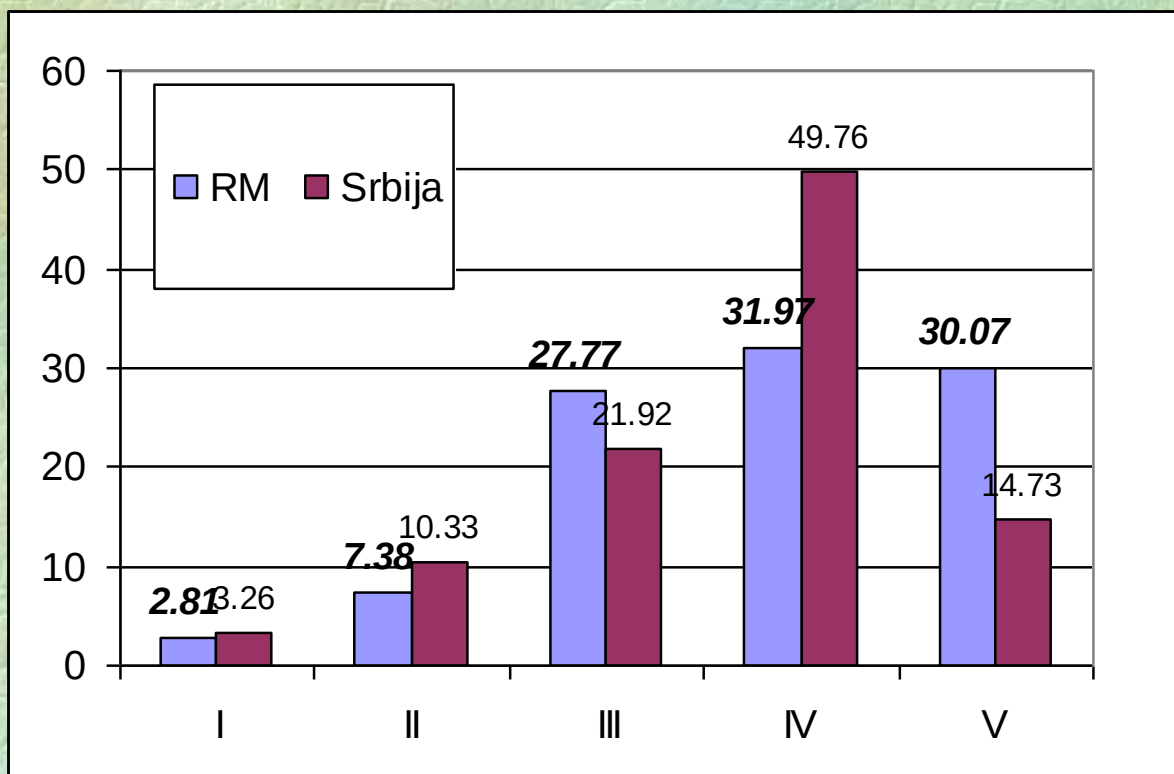
55% - useful storage

45% - dead storage

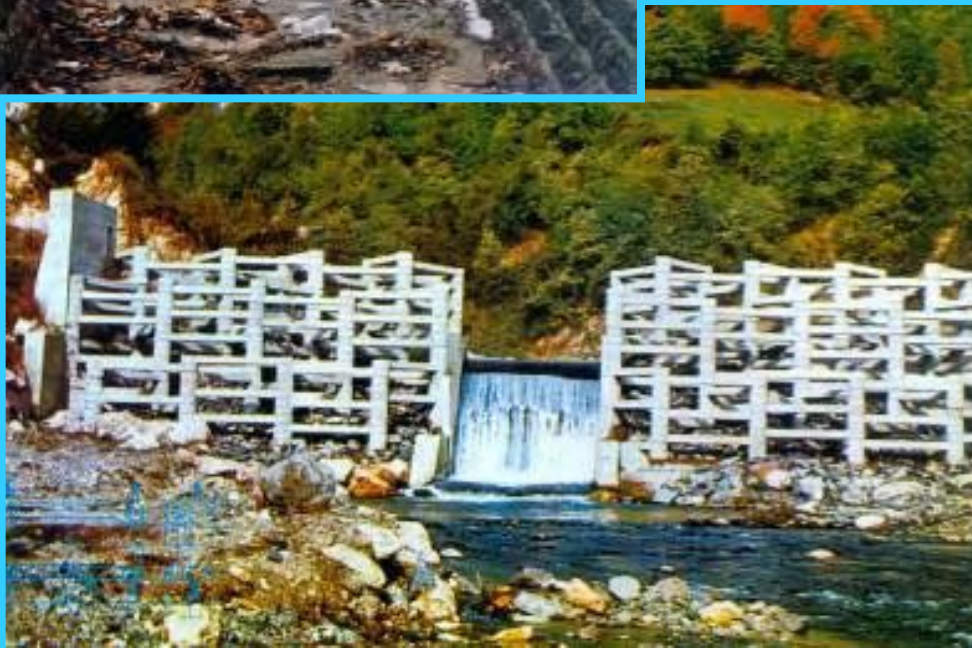
altitude (m)



| Erosion Intesity | Category | RM              |       | SRBIJA          |       |
|------------------|----------|-----------------|-------|-----------------|-------|
|                  |          | km <sup>2</sup> | %     | km <sup>2</sup> | %     |
| Excesive erosion | I        | 698             | 2.81  | 2888            | 3.26  |
| Strong erosion   | II       | 1832            | 7.38  | 9138            | 10.33 |
| Meium erosion    | III      | 6893            | 27.77 | 19386           | 21.92 |
| Low erosion      | IV       | 7936            | 31.97 | 43914           | 49.76 |
| Veru low erosion | V        | 7463            | 30.07 | 13035           | 14.73 |
| Symry            |          | 24 822          | 100   | 88 361          | 100   |

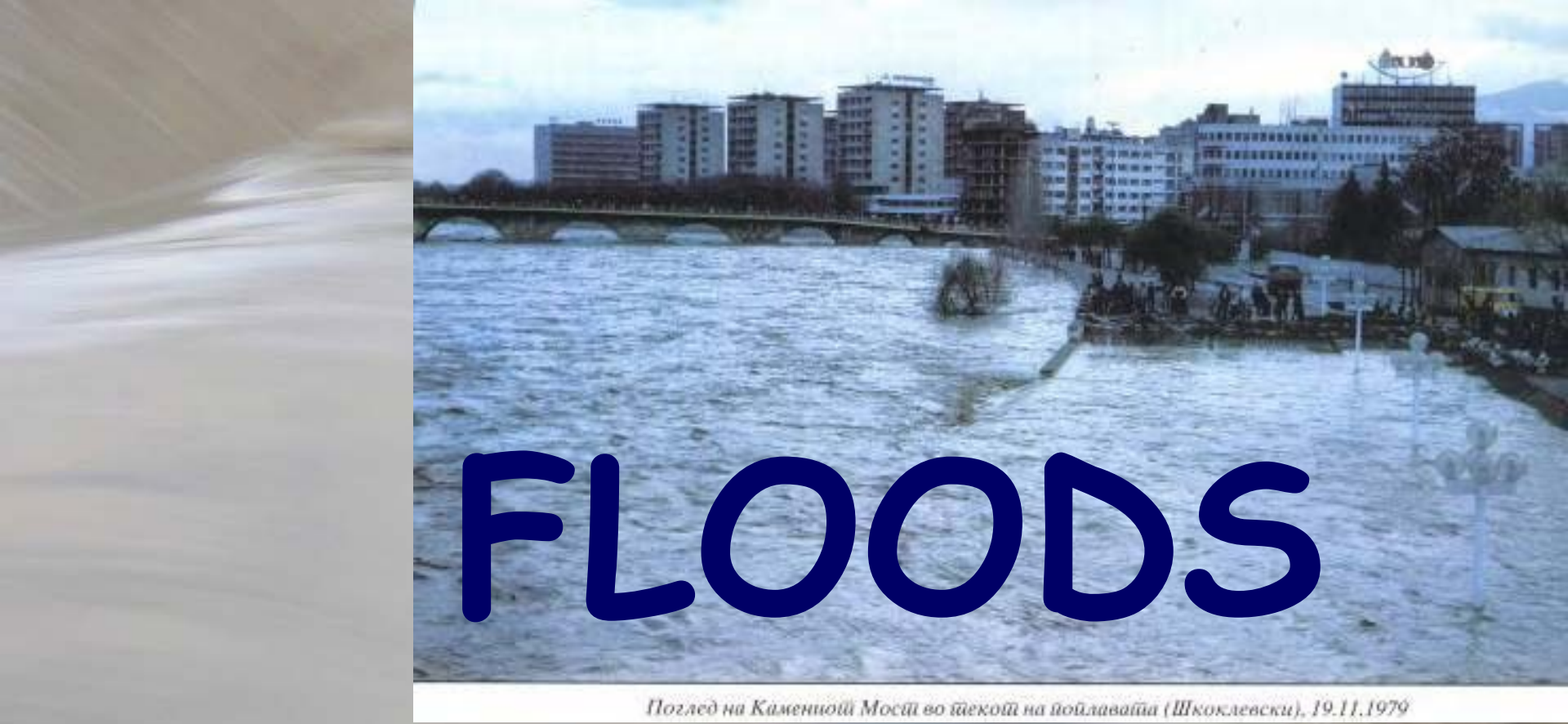


# Hydraulic Structures









# FLOODS

*Поглед на Каменниот Мост во текот на поплава (Шкоклевиќ), 19.11.1979*

**According European Union, Flood means the temporary covering by water of land not normally covered by water;**

**Some human activities and climate change contribute to an increase in the likelihood and negative impacts of flood events. (Flood Directive, 2007).**

# Flood types

Flood types according to their duration

1. Slow-Onset Floods (last long period)
2. Rapid-Onset Floods (last one or two days)
3. Flash Floods (last minutes or a few hours)

Flood types according to their location:

1. Coastal Floods
2. River Floods
3. Urban Floods

Flood types according to their social, economic and environmental impact:

1. Minor flooding causes inconvenience with low-lying areas located next to water courses, ...;
2. Moderate flooding may require evacuation of some homes, ...;
3. Major flooding causes inundation to extensive rural areas and considerable urban areas; numerous evacuations may be required,...

# Flash Floods

"Flash flood" is a term widely used by flood experts and the general population.

The National Weather Service defines a flash flood as "A rapid and extreme flow of high water into a normally dry area, or a rapid rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event."

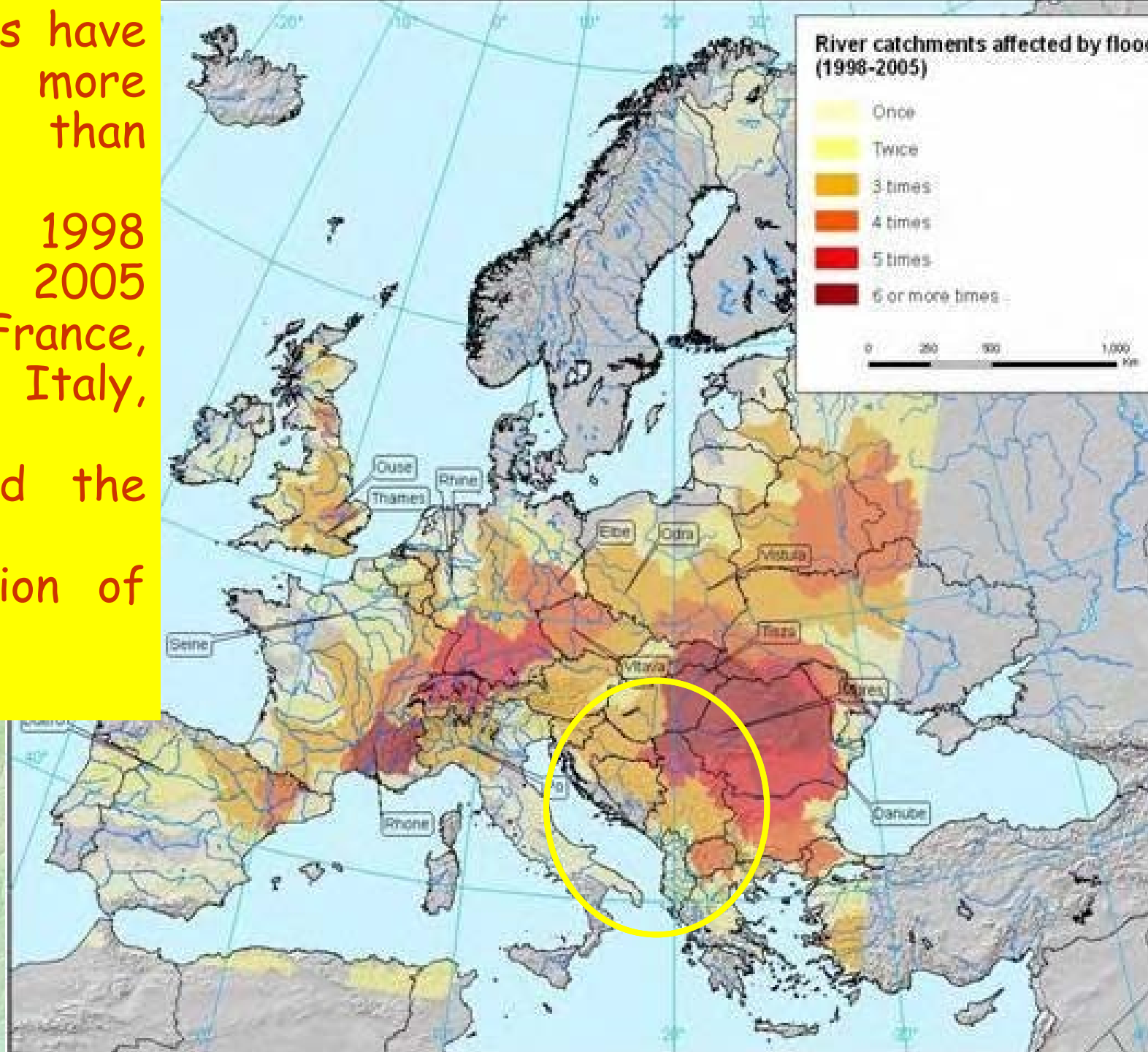
Flash floods are also characterized by a rapid rise in water, high velocities, and large amounts of debris.

Major factors in flash flooding are the intensity and duration of rainfall and the steepness of watershed and stream gradients.

# Mud flow - Mudslide- Debris flow

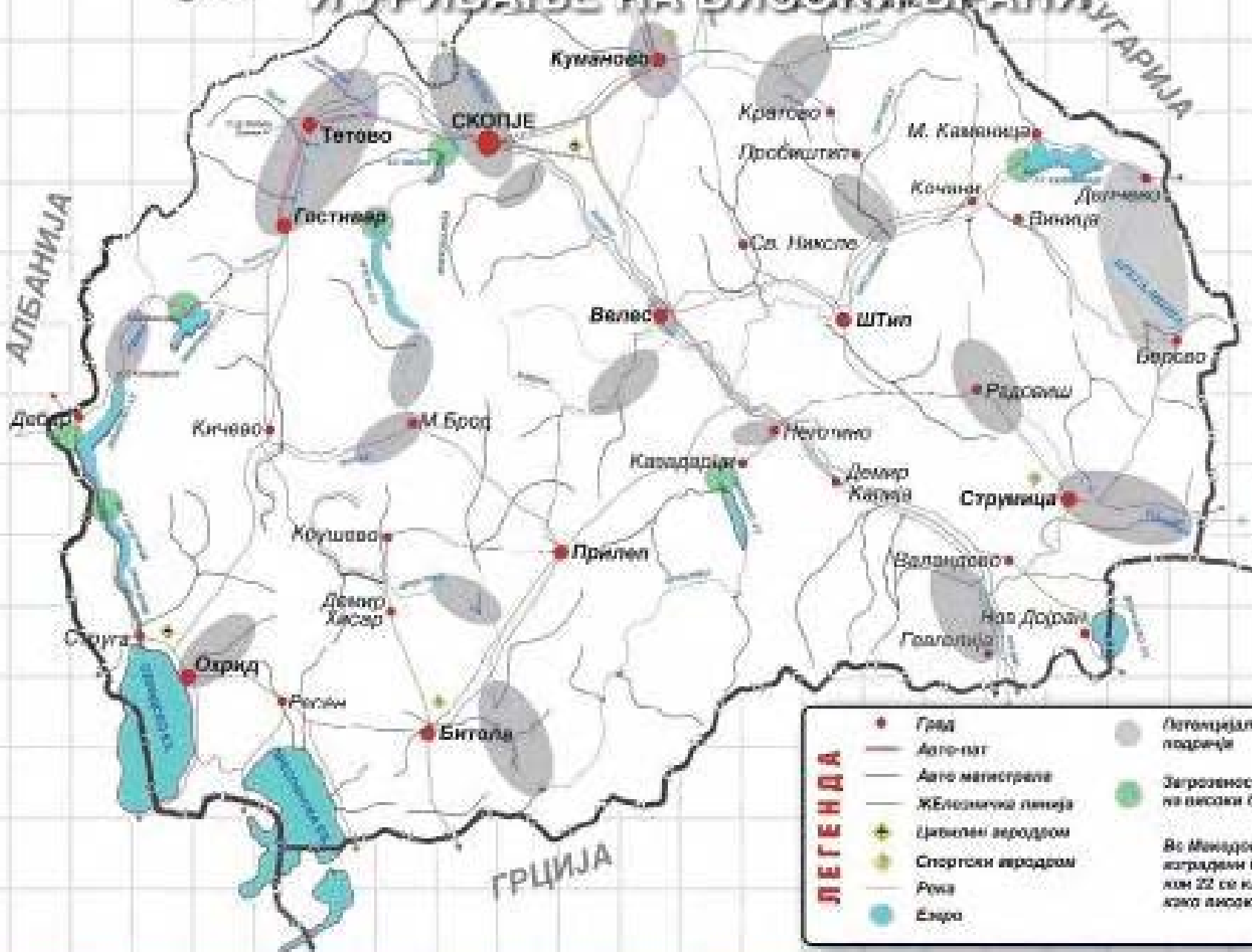
- **Mudflow** — flow of water that contains large amounts of suspended particles and silt. It has a higher density and viscosity than a streamflow;
- A mudslide (mudflow) — is a flow of dirt and debris that occurs after intense rainfall or snow melt, volcanic eruptions, earthquakes and severe wildfires;
- A **debris flow** is a fast moving, liquefied landslide of unconsolidated, saturated debris that looks like flowing concrete. Flows can carry material ranging in size from clay to boulders, and may contain a large amount of woody debris such as logs and tree stumps.

Some areas have been more affected than others. Between 1998 and 2005 Romania, France, Germany, Italy, England experienced the highest concentration of repeated flooding.



# ПОТЕНЦИЈАЛНИ ПОПЛАВНИ ПОДРАЧЈА И УРИВАЊЕ НА ВИСОКИ БРАНИ

АЛБАНИЈА



**ЛЕГЕНДА**

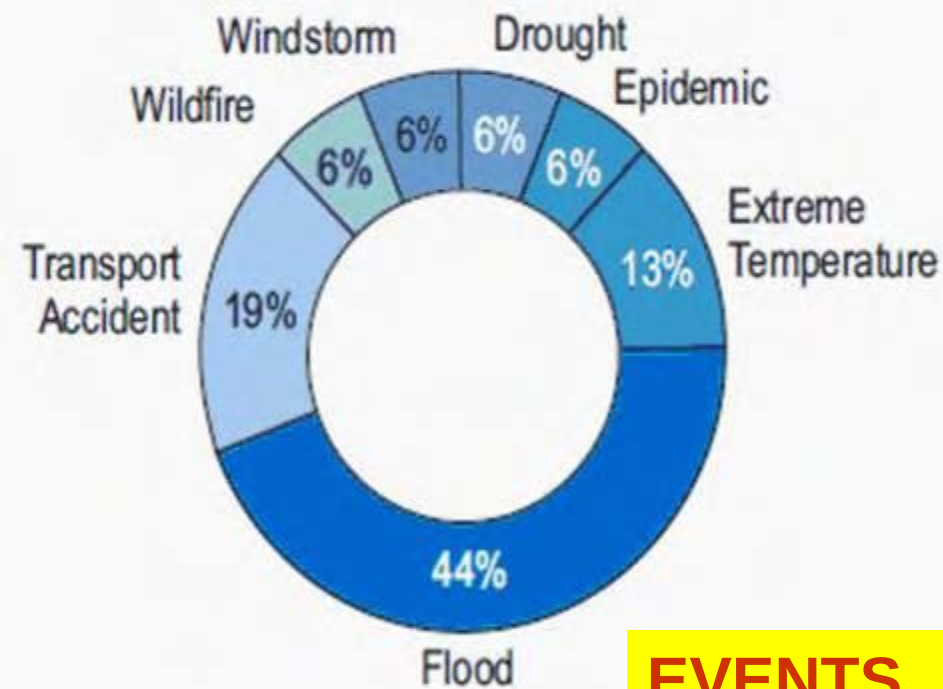
- Град
- Авто-пат
- Авто магистрала
- Железничка линија
- ✈ Градски аеродром
- ✈ Спортски аеродром
- Река
- Езеро

- Потенцијални поплазни подрачја
- Загрозеност од уривање на високи брани

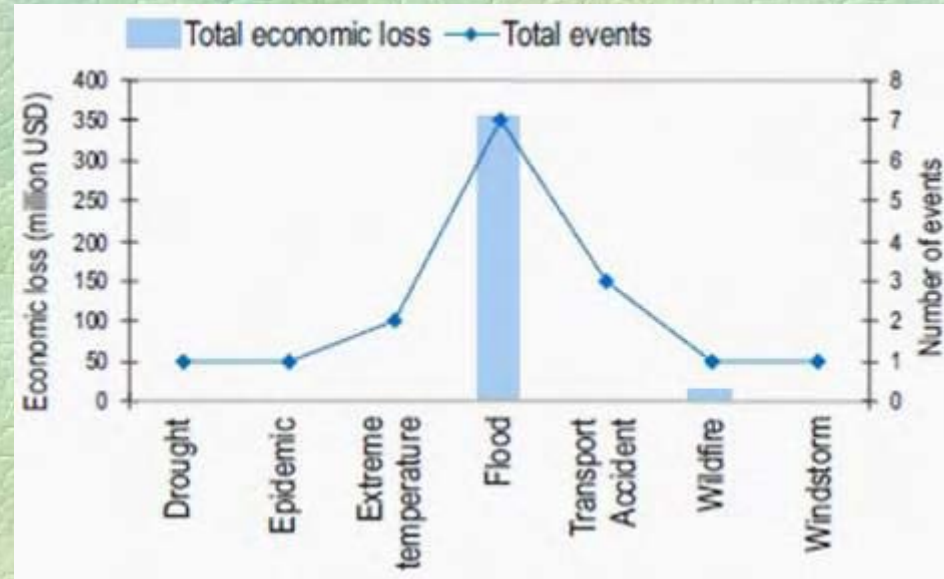
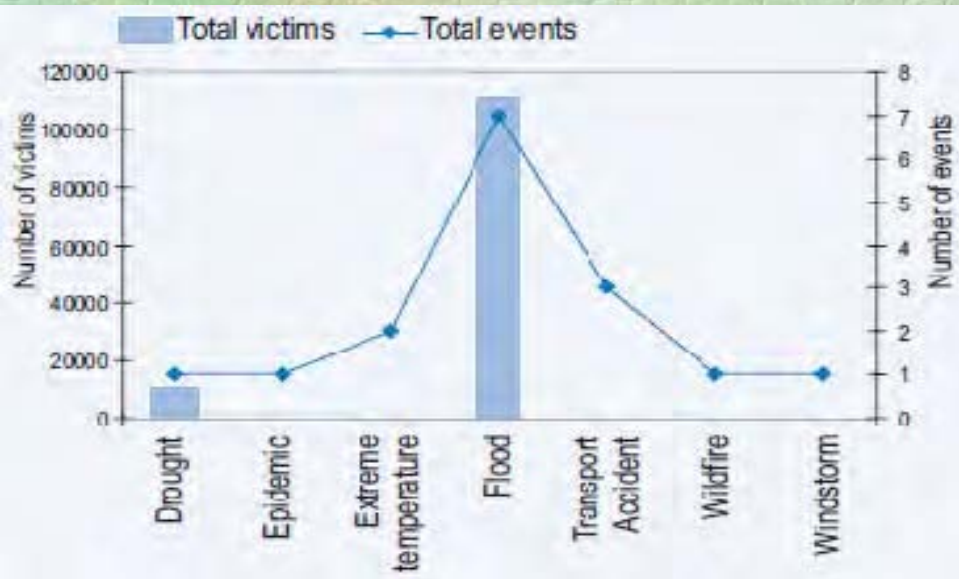
Во Македонија досега се изградени 63 брани од кои 22 се класифицирани како високи брани

# Republic of Macedonia

## Disastrous events 1989-2006



**EVENTS**



2010



(MIA)



# NEGOTINO 1995

$Q = 0,5 \text{ m}^3/\text{s}$



$Q = 200 \text{ m}^3/\text{s}$





## **The Destructive Power of Water – Sushica – RADOVIS 2008**





**Too much sediment - Cost of Damages 2,4 milion euros**



# Sushica scenario

- There are about 1500 ha bare land, eroded land II,III and IV category of erosion, suitable for afforestation. Total cost of afforestation, is calculated as over 2,4 million Euros.
- Total cost of all erosion control works. Is calculated as 1,7 million Euros.
- If we afforest this area, and built designed check dam, then land cover coefficient would be  $X_a = 0,16$  and erosion coefficient  $Z = 0,17$ . It means about 50% decrease of erosion risk.
- More significant is that if this measure is carried out, then significant part of erosive material production in this area would be minimized and risk of transport of sediment downstream and its aggradations in the streambed in the city would be minimized.
- Related to peak flow, if we afforest the bareland on the basin then peak flow would be about 24%.lower.

This new calculated peak flow with relative low quantity of sediment can pass under the bridges on Sushica without problem.

- **The following water risk/disaster mitigation measures in general can be taken to reduce the negative effects on humans:**
- **Shift from state scale and reactive approach (emergency/crises management) to a transboundary scale and pro-active approach (basin management, monitoring, forecasting, contingency plans).**
- **Raise the awareness of the need for water related risks mitigation, mobilize support through partnerships, expand disaster mitigation activities within societies, encourage and support efforts to incorporate disaster mitigation into community decision making.**
- **.**

# **PLANNING PROCESS in RM**

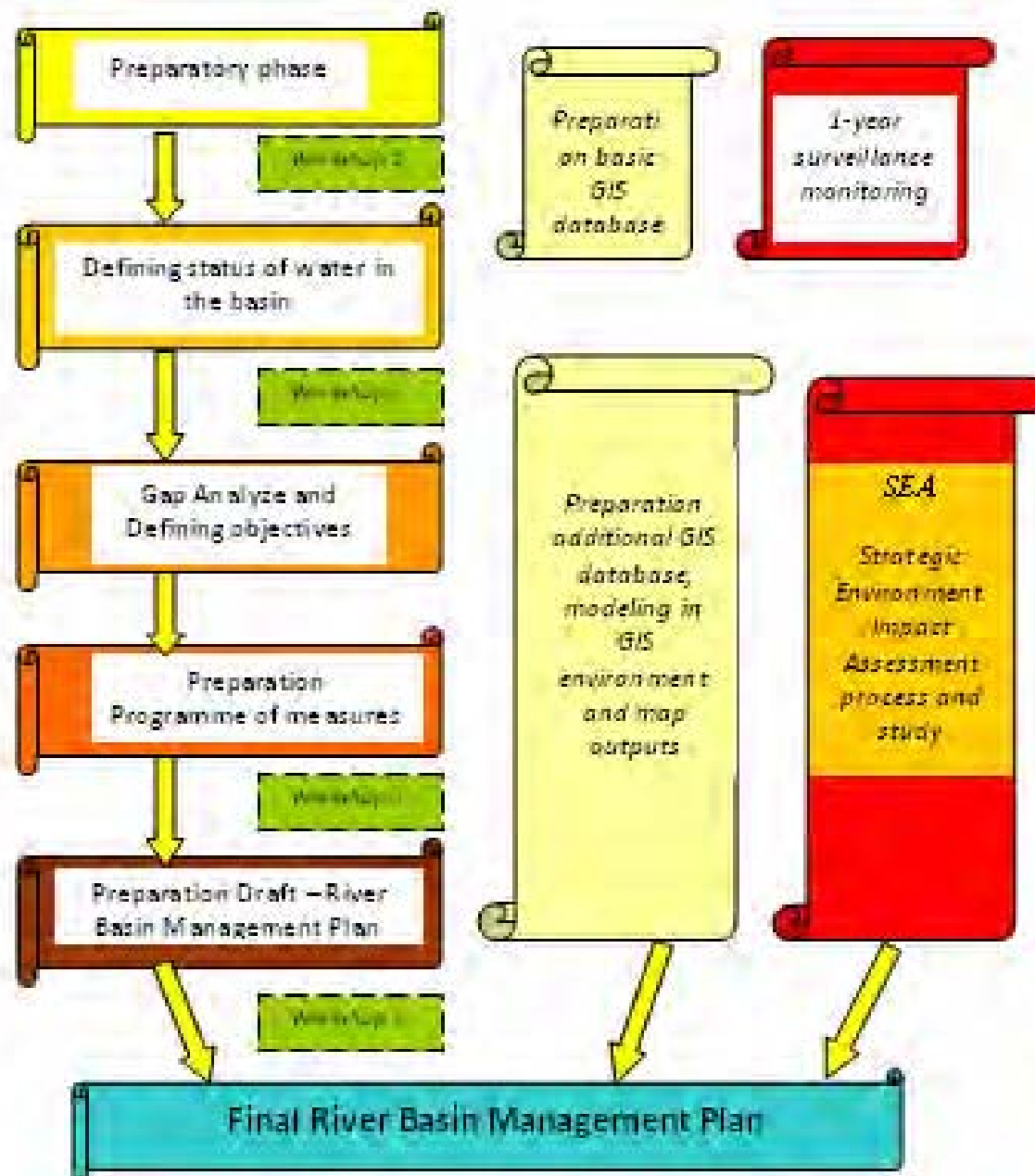
- **River Basin Management PLANING**
- **Forest Management PLANNING**

# RBMP - according to WFD

- Law on Water – transposed WFD and other directives (Nitrate, Flood, UWW ...)
- The first and the only RBMP according to the new Law on Water is
- Prespa Lake Watershed Management Plan ( UNDP – GEF) Reference No.: *RFQ 50/2009*

|                                                          |                                                              |
|----------------------------------------------------------|--------------------------------------------------------------|
| <b>Todor Conevski, grad.civ.eng.</b>                     | <b>Team leader</b>                                           |
| <b>Prof. d-r Svetislav Krstid, grad. biol.</b>           | <b>DTL, water quality</b>                                    |
| <b>Prof. d-r Ivan Blinkov, grad.for.eng</b>              | <b>DTL, Land use, GIS, harmful impact of water</b>           |
| <b>M-r.eng. Vladimir Stavric, grad. civ.eng</b>          | <b>WFD principles, WM Planning</b>                           |
| <b>Prof. d-r Ordan Cukaliev, grad. agr.eng</b>           | <b>Irrigation, agriculture</b>                               |
| <b>Jens Longholt, grad.env. eng.</b>                     | <b>WM Planning</b>                                           |
| <b>M-r Igor Ristovski, grad.env.eng.</b>                 | <b>SEA expert , environment issues</b>                       |
| <b>Zvonko Kočovski, grad. ecc.</b>                       | <b>Economist</b>                                             |
| <b>M-r Ivan Minčev, grad.for.eng</b>                     | <b>GIS / RS</b>                                              |
| <b>M-r Ćoko Dinev, grad. arch.</b>                       | <b>SEA expert</b>                                            |
| <b>Josif Mileski, grad.eng.</b>                          | <b>Hydrology</b>                                             |
| <b>Mitko Dimov, grad.eng. geol.</b>                      | <b>Hydrogeology</b>                                          |
| <b>Radmila Bojkovska Spirovska,</b>                      | <b>WQ monitoring</b>                                         |
| <b>D-r Trajče Talevski</b>                               | <b>Fishes</b>                                                |
| <b>D-r Marina Talevska</b>                               | <b>Macrophyts</b>                                            |
| <b>M-r Valentina Slavevska Stamenkovid</b>               | <b>Macrozoobenthos</b>                                       |
| <b>Prof. D-r Trajce Stafilov</b>                         | <b>Chemical analyses</b>                                     |
| <b>D-r Ivanco Kaevski,</b><br><b>M-r Sanja Spirovska</b> | <b>Hydrological modeling</b><br><b>Hydrological modeling</b> |
| <b>Irina Soreva, grad biol.ecol.</b>                     | <b>Field sampling and laboratory</b>                         |
| <b>Martina Blinkova, grad. biol.ecol.</b>                | <b>Field sampling and laboratory</b>                         |

# RIVER BASIN MANAGEMENT PLAN



# Achievements for 2 years duration of the project

- **Watershed Management Plan (bilingual)**
- *Plan is accompanied with 5 technical reports and 3 annexes,*
- TR - 1 - Data collection and analyses of existing conditions - 53 pgs.  
TR-1 - Annexes - 95 pgs
- TR- 2 - Identification of the major watershed management issues in Prespa Lake Watershed - 267 pgs  
TR-2 Annexes - ID of water bodies - 81 pgs
- TR - 3 - GAP Analyze and Programme of Measures - 75 pgs
- TR- 4 - Public Consultation Process - 45 pgs
- TR-5 Preliminary expert judgment related to protected zones -  
TR-5 – Annex - Maps in scale 1:25000
- r
- **SEA Report,**
- **Manuel for preparation RBMP (on Macedonian language)**
- **Complete GIS database.**

# THE FINAL STATUS OF DELINEATED WATER BODIES

| WATER BODY NAME                            | WB TYPE | STATUS |      |          |      |     | ACTION NEEDED UNDER |     |
|--------------------------------------------|---------|--------|------|----------|------|-----|---------------------|-----|
|                                            |         | High   | Good | Moderate | Poor | Bad | UWWTD or ND         | WFD |
| SURFACE Water Bodies - RIVERS              |         |        |      |          |      |     |                     |     |
| Istočka Reka 1                             | 1       |        | Good |          |      |     | no                  | no  |
| Istočka Reka 2                             | 1       |        |      |          |      | Bad | yes                 | yes |
| Istočka Reka 3                             | 1       |        |      |          | Poor |     | yes                 | yes |
| Golema Reka 1                              | 1       |        | Good |          |      |     | no                  | no  |
| Golema Reka 2                              | 1       |        |      | Moderate |      |     | yes                 | yes |
| Golema Reka 3                              | 1       |        |      | Moderate |      |     | yes                 | yes |
| Golema Reka 4                              | 1       |        |      | Moderate |      |     | yes                 | yes |
| Golema Reka 5                              | 1       |        |      | Moderate |      |     | yes                 | yes |
| Kurbinska Reka 1                           | 1       |        |      | Moderate |      |     | yes                 | yes |
| Kranska Reka 1                             | 1       | High   |      |          |      |     | no                  | no  |
| Kranska Reka 2                             | 1       |        |      | Moderate |      |     | yes                 | yes |
| Brajčinska Reka 1                          | 1       | High   |      |          |      |     | no                  | no  |
| Brajčinska Reka 2                          | 1       |        |      |          | Poor |     | yes                 | yes |
| SURFACE WATER BODIES – HEAVILY MODIFIED WB |         |        |      |          |      |     |                     |     |
| Golema Reka 6                              | 1h      |        |      |          |      | Bad | yes                 | yes |
| SURFACE WATER BODIES – ARTIFICIAL WB       |         |        |      |          |      |     |                     |     |
| Golema Reka 7                              | 1a      |        |      |          |      | Bad | yes                 | yes |
| Golema Reka 8                              | 1a      |        |      |          | Poor |     | yes                 | yes |
| SURFACE WATER BODIES – LAKE                |         |        |      |          |      |     |                     |     |
| PRESPA LAKE                                | 1L      |        |      | Moderate |      |     | yes                 | yes |

## ПРИРАЧНИК ЗА ПОДГОТОВКА НА ПЛАН ЗА УПРАВУВАЊЕ СО РЕЧЕН СЛИВ

Автор:

проф. д-р Ирена Белицка

Козатори:

д-р д-р. олод. Зоранко Кочовски, Потпирач 8. Економски  
анализи на користењето на вода и 11.1. Економски  
анализи на алтернативите  
проф. д-р Савиослав Крстич, Авиас 1 – Мониторинг  
програма

Внатрешна контрола:

проф. д-р Ордан Чукотков  
проф. д-р Савиослав Крстич  
м-р м-м. Владимир Савиоски

## 1. ВОВЕД

Планирање и управување со речен слив е процес што ги обединува:

- жителите во сливот
- претставниците на владата
- организациите на засегнати чинители

Овој процес треба да овозможи одржливо управување на водата и ресурсите поврзани со неа за сегашните и наредните генерации.

Интегриран план за управување со речен слив (ПУРС) е документ одобрен од страна на релевантните субјекти на сливот. Овој документ ги опишува потребните акции и ресурси како и временската рамка потребни за достигнување на одржлив и функционален слив. Интегрираниот ПУРС е всушност патоказ за управување со водните ресурси во иднина.

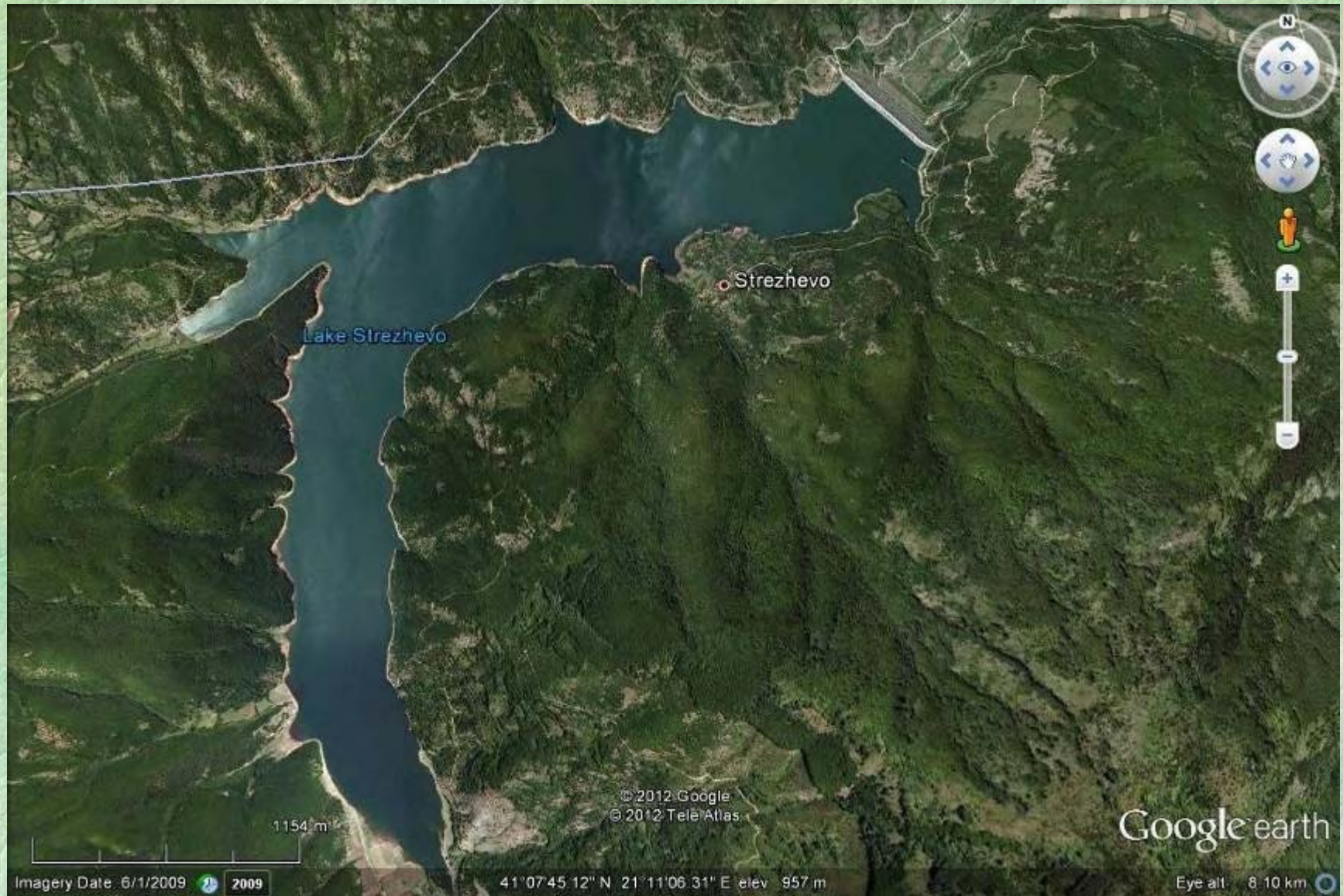
За подготовка на ПУРС покрај законските одредби во Законот за водите и подзаконските акти, постојат и бројни документи-упатства изработени од страна на секретаријатот на Рамковната директива за води при Европската комисија (ЕК).

Методологијата дадена со Документите-упатства треба да биде прилагодена кон регионалните и националните услови во рамките на Директивата. Упатствата предлагаат една генерална Методологија. Таму се дадени принципите и процесите на циклусот на управувањето. Поради разликоста на условите во Европската Унија, логичниот пристап и одговор на барањата ќе варира од еден слив до друг. Предложената методологија треба да биде прилагодена кон специфичните услови. (WFD „guidance document nr.11- Planning process“)

# LAW on WATER

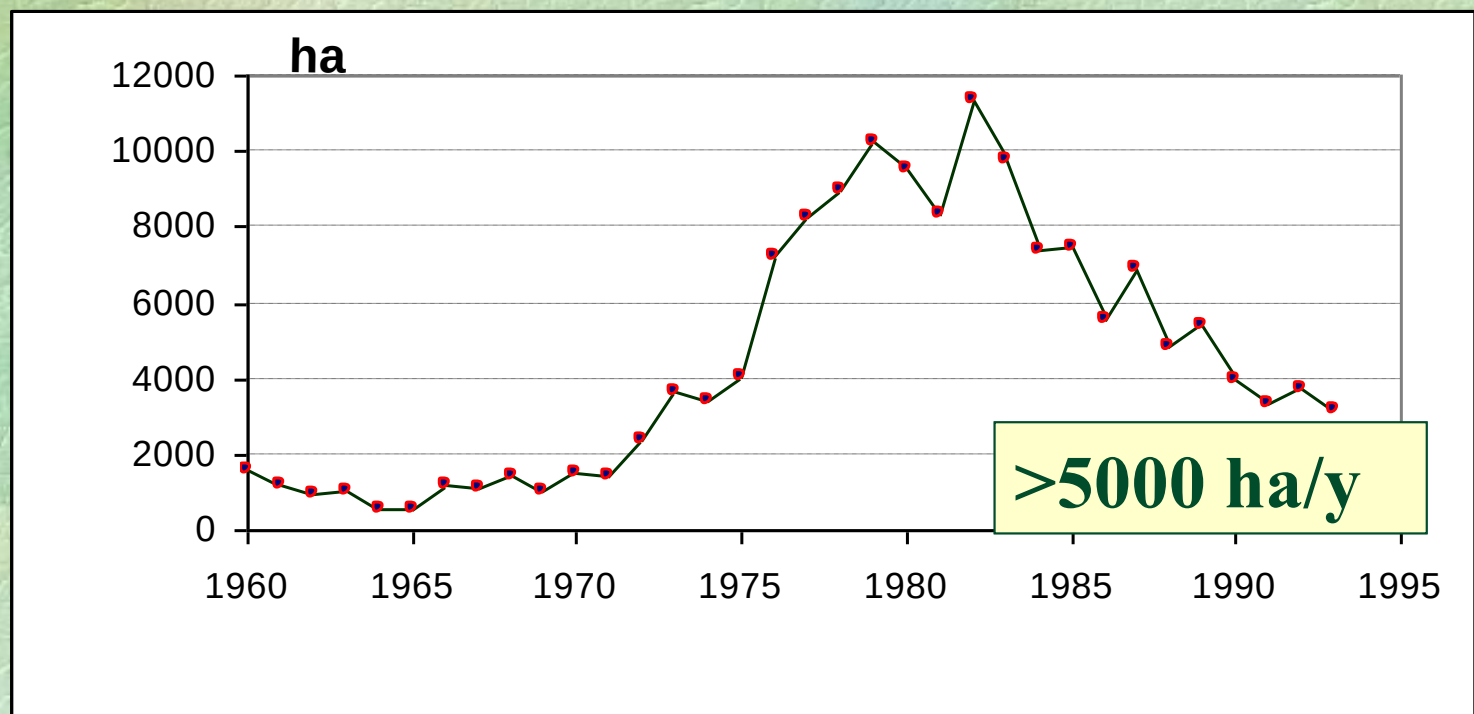
- - **Protective role of forest** (protection of soil and water, protection from erosion, and torrents. ита од ерозија, заштита од порои, урамнотежување на воден биланс...)
- Law on Water (2008),
- Articles 96-104, water protection zones (around springs for water supply, recreational water zones. Nitrate sensitive zones
- Articles 134-141, Procedures for proclaiming erosive zones
- Article 156 – riparian zones
- It means that forest within these protective zones automatically must got status protective forests and forest activities to be adopted to it.

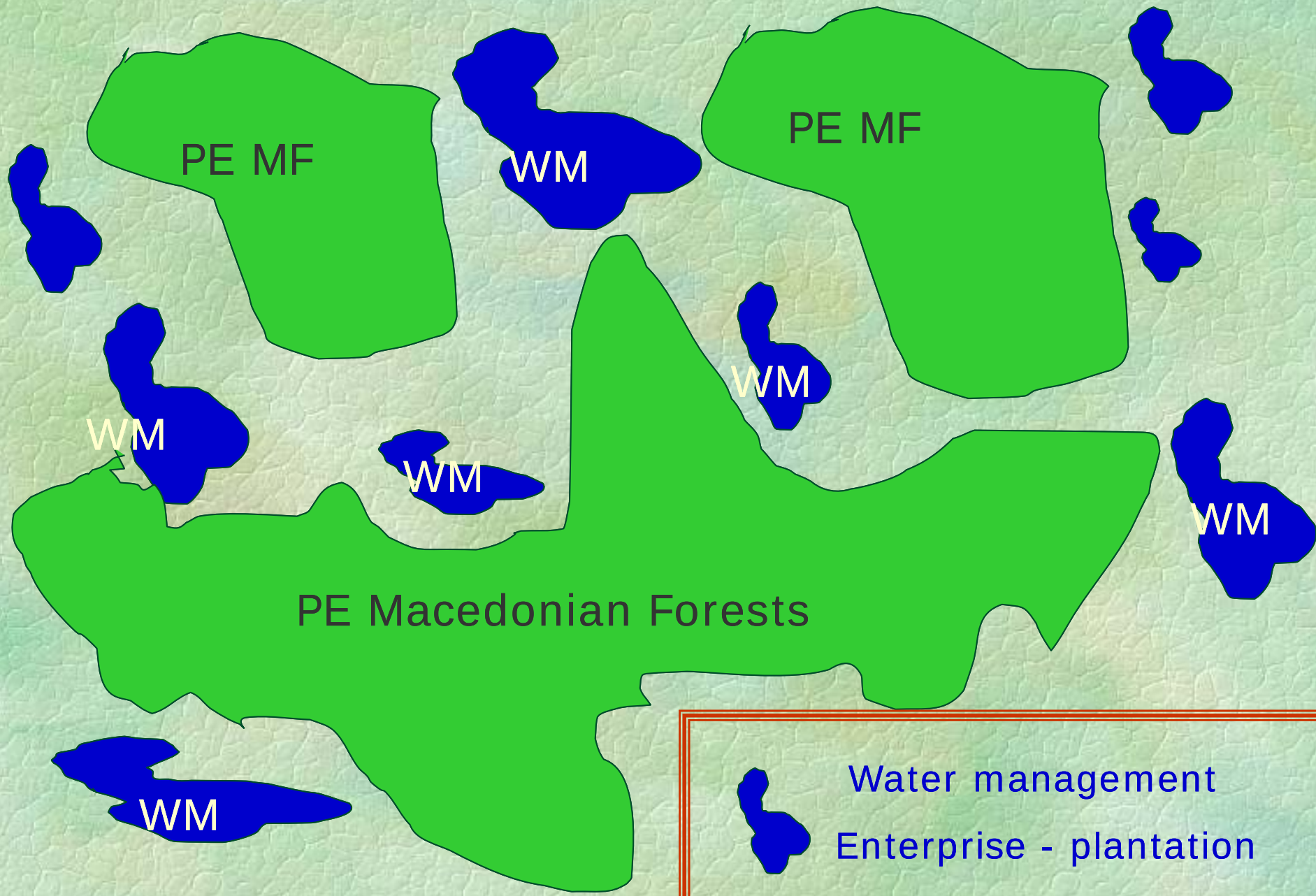
# Afforestation,



## Planned forestry started after the II WW

- **According to the legislation in the 50's** of the XX century (Law on afforestation of bar eland -1951,
- Law on hydro-ameliorative systems - 1958 idr)
- Started organized afforestation and amelioration of bare lands. Up to 2010 afforested 150 000 ha (% of success is 70%) .
- In the last 5 year were afforested cca 20 000 ha bare land ( actions organized by NGO "Treeday Macedonia" and PE "Macedonian forests")





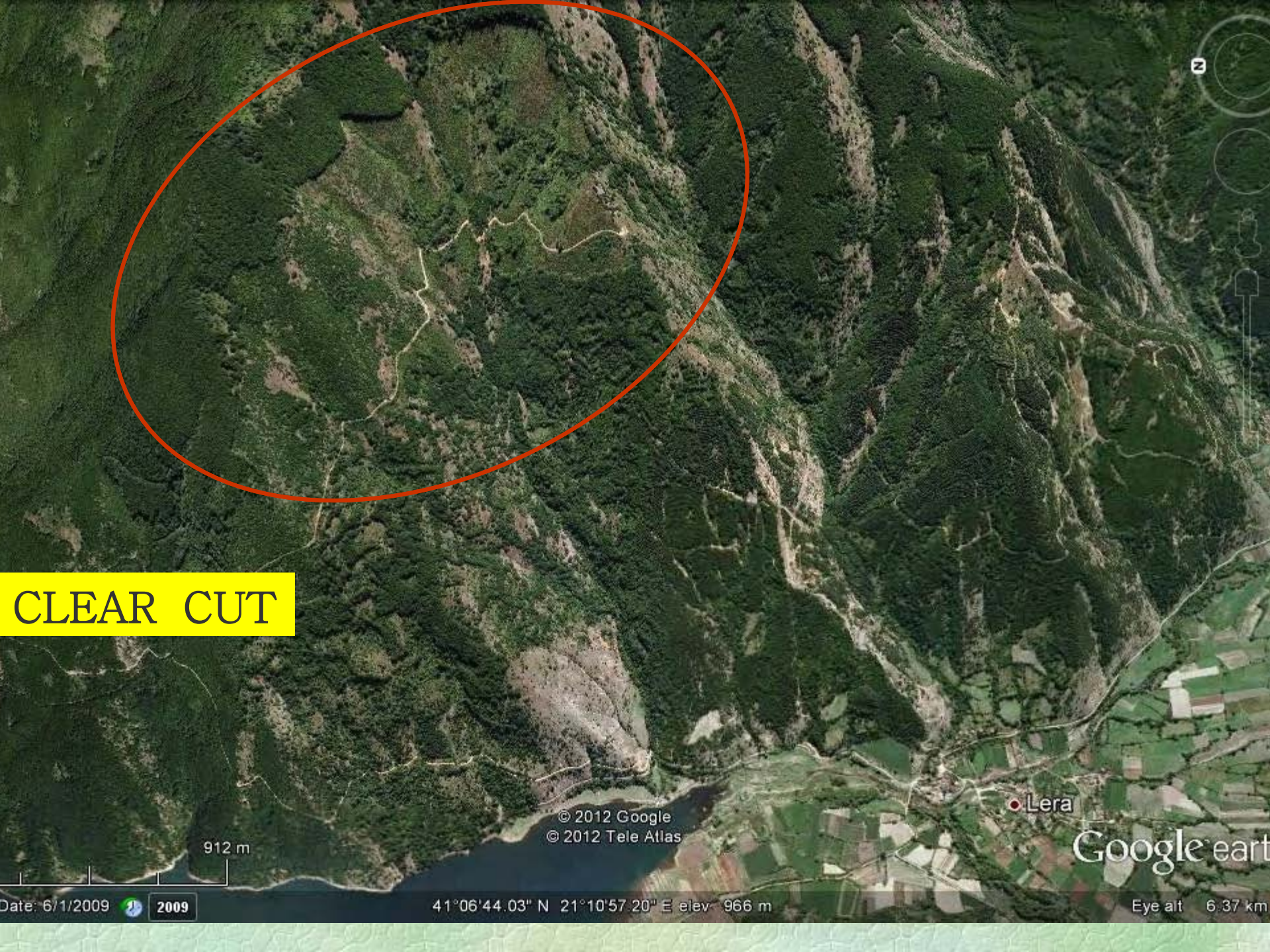
# **Forest management planning**

- **Long tradition – from 40's of the XX century**
- **About 190 forest management units**
- **Planning of area covered with trees and some barelands or grasslands close to the forests.**

- **Current rulebook for preparation forest management plans is absolutely obsolete and not suitable.**
- **Current practice in planning is also obsolete, conservative.**
- **A lot of deficiencies:**
  - technically very low quality (no GIS/RS database, although 10 years is in the faculty curricula) – *more of planers interest for this but it is not supported by the management team of company- PEMF*
  - not paying attention on biodiversity needs
  - not paying attention on other plans in the region where is preparing plan- (spatial plan and other plans)
  - not paying attention on other sectors needs (protective zones: around water bodies, roads, railway ...)
  - Other deficiencies
  - **NO PUBLIC PARTICIPATION PROCESS (According to the Law on environment for each FMP should be followed SEA procedure and report)**

- According to the official data from MAFWE, there are no recognized “PROTECTIVE FORESTS in RM
- *(note: in past there were about 20 000 ha protective forests)*
- According to the practice all forest management units are economic????

Depend on the personal knowledge and conscience of the planer some compartments could be noticed as forest for special purpose (usually for biodiversity or gen-fund, no for protection)



CLEAR CUT

CLEAR CUT

Strezhevo



© 2012 Google  
© 2012 Tele Atlas

Google earth

ry Date: 6/1/2009 2009

41°08'34.35" N 21°11'58.94" E elev 730 m

Eye alt 4 22 k

# Reality

- Part of FMU are located on a extreme steep slope (over 100%)

- Red squares - >45%

- Black squares >100%

- Some compartments are located in gorges, located near springs for human consumption etc.

## Forest management units and slope

### FMU and slope

□ sse-mk so 7 i 4

naklon - naklon

<VALUE>

0 - 15

15-30

30-45

45-60

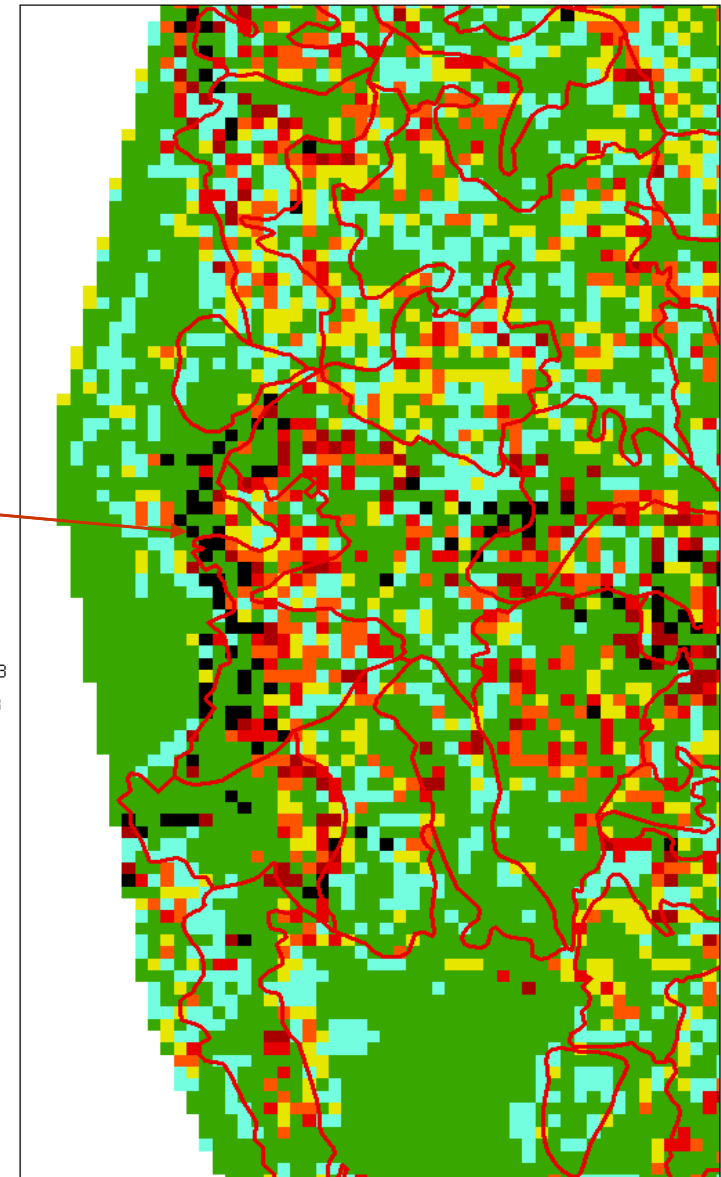
60-75

75-100

100-565,6333994

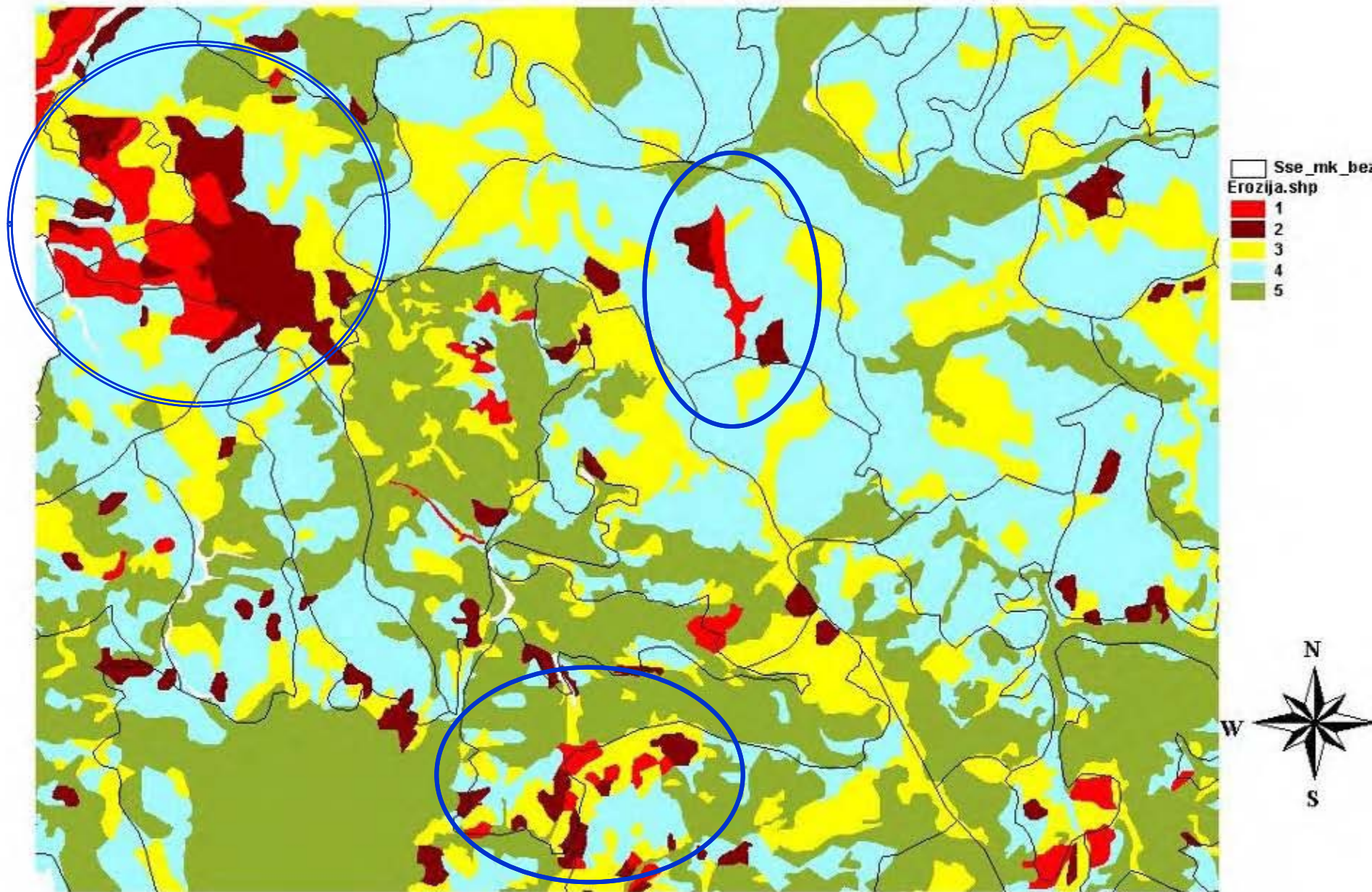
565,6333995 - 830,3979693

830,3979694 - 1.534,43103



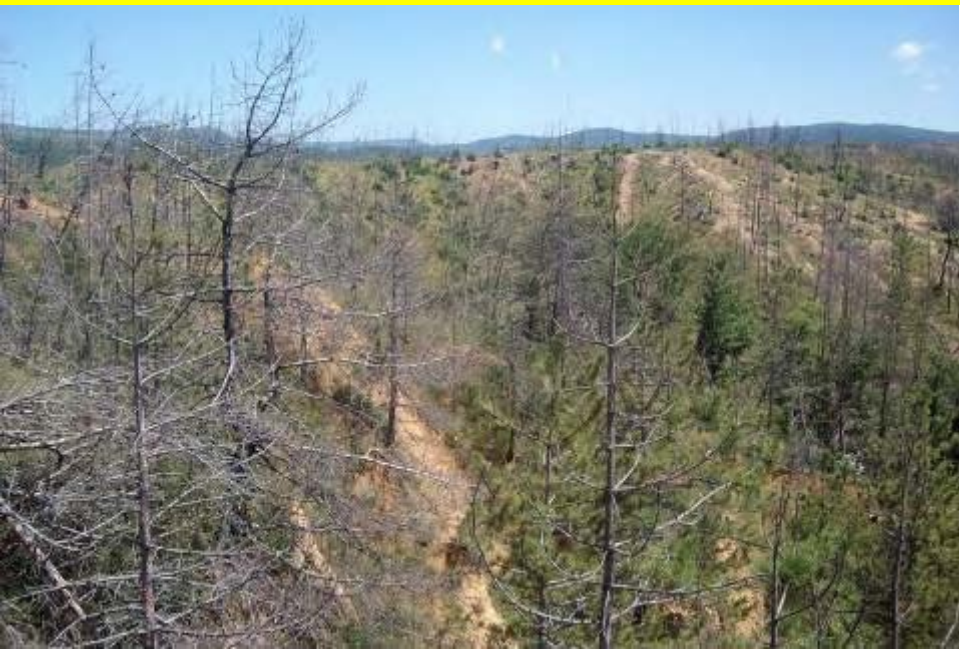
0 1.600 3.200 6.400 9.600 12.800  
Unknown Units

# FMU and EROSiON

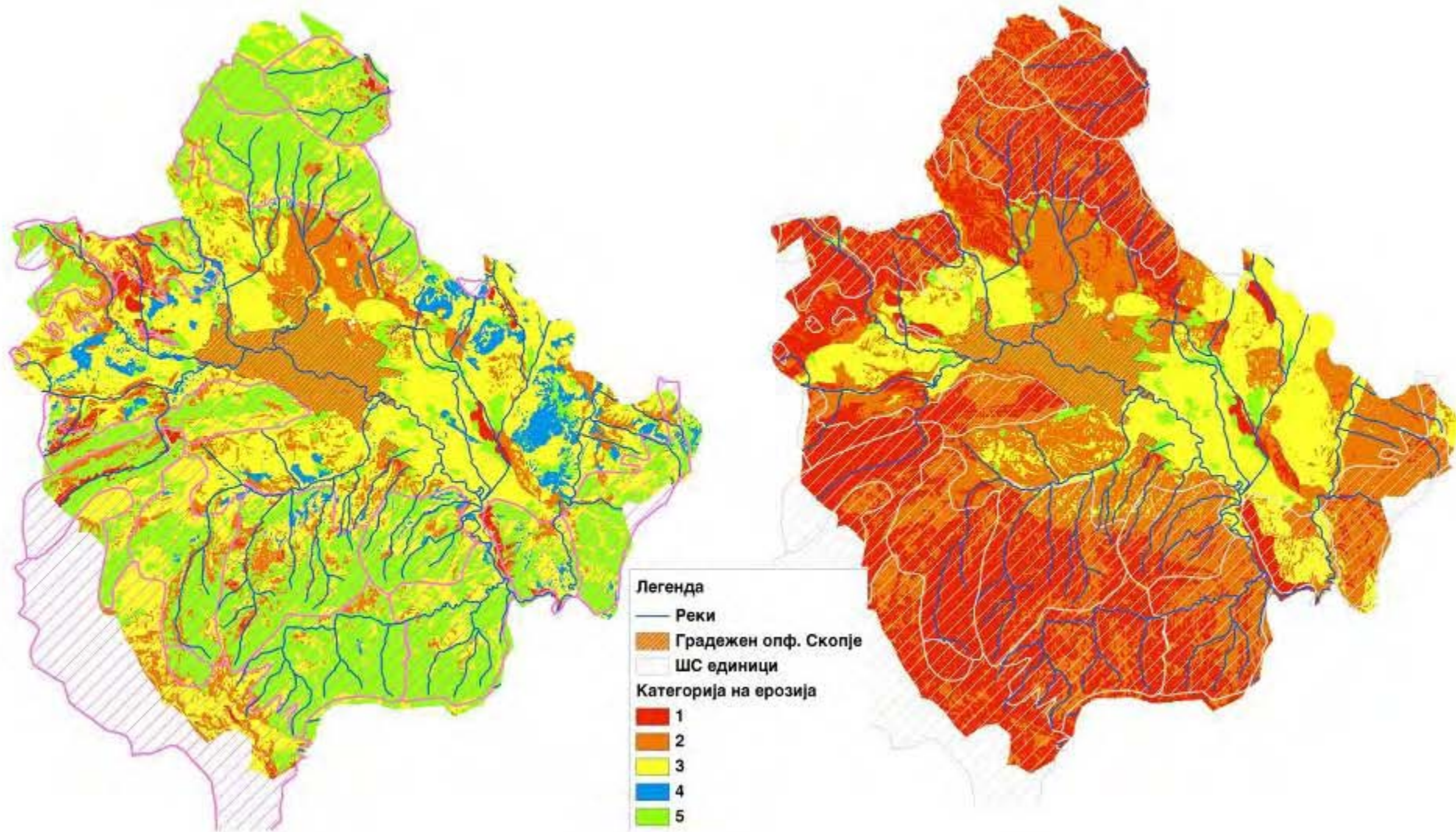




**Officially economic forests, but in fact protective forests**



# Theoretically all forests in RM have protective role



- Actual and Potential Erosion Risk ( scenario no forest))

# **PE MF is self – financing company**

**According to Law on Forest, there is no subsidies for protective forests, for ecological forests by the State budget**

- PE MF is obliged to maintain almost all state owned forests (excluding forests in national parks and some communal protective forests – Vodno)
- PE MF is obliged for fire control, pest control, diseases control.
- Great part of the forest governed by PE MF are not viable and create economically of the company.
- Each subject who use wood mass is obliged to pay 15% of the values of the wood mass to the State budget. Part of these finances back to the forestry sector.
- **There is no other sources for financing forest activities**

- **Percent from the State Budget like in other countries**

**Or**

**PES (Payment For Ecosystem Service ?????)**

# **Study and Analysis of Innovative Financing for Sustainable Forest Management in the Southwest Balkans**

## **Project 2012- 2013**





# WB – PROFOR

- Project financed by WB – PROFOR

## **PROFOR is:**

- Programme on Forests
- Multi-donor partnership
- Generating and sharing innovative knowledge
- To achieve “Sustaining Forests for All”
- Focused on:
  - enhancing forests’ contribution to poverty reduction,
  - sustainable development, and
  - protection of environmental services
- Supervised by the World Bank

## **Project Consortium**

### **Lead Partner**

- **SNV Netherlands Development Organisation**

### **Partners**

- **NRS, Natural Resource Solutions, Kosovo**
- **REGEA – NW Croatia Regional Energy Agency, Croatia**
- **Diava Consulting, Albania**
- **Sv. Cyril and Methodius University, Faculty of Forestry Skopje, Macedonia**
- **Wageningen University, The Netherlands**

# Project data

## Title

- Study and Analysis of Innovative Financing for Sustainable Forest Management in the Southwest Balkans
- Duration: 24 months
- Area: Southwest Balkans – Albania & Kosovo

## Focus

- Study and Analysis SFM for environmental services

## Two case studies:

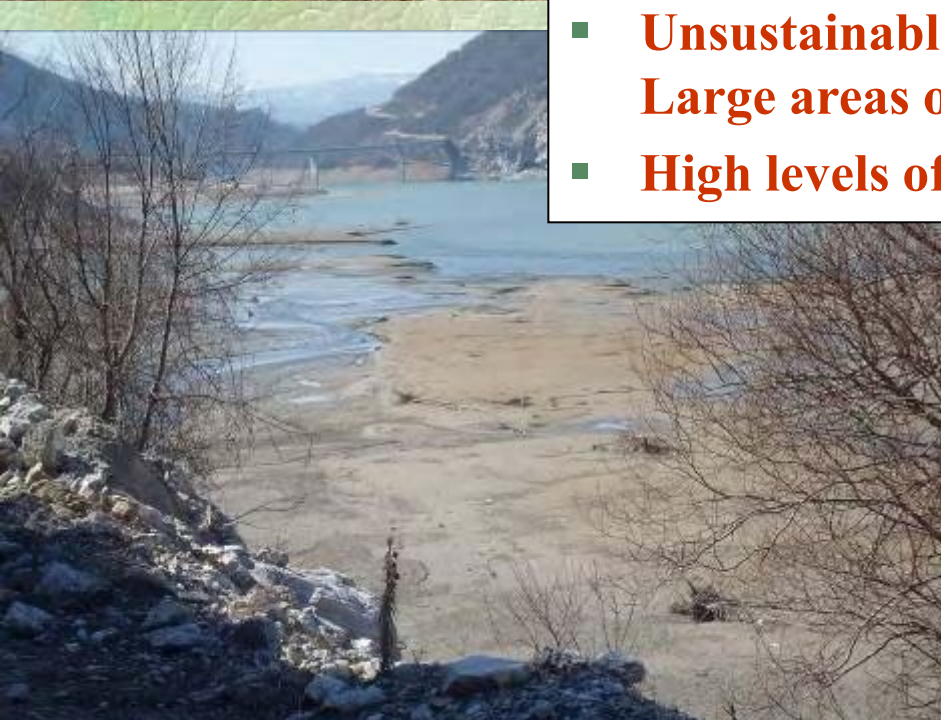
- Albania on SFM and watershed management
- Kosovo on SFM and wood biomass production and use

# Project Objectives

- Define scientifically sound methodologies based on two country studies;
- Establish key baseline date in the case studies;
- Provide quantitative estimates of the value of some specific targeted environmental services;
- To propose mechanisms to start/increase payment for these services in two case studies; and
- To fully disseminate the results and experience regionally and more broadly



- **Mountainous terrain**
- **Unsustainable forest and agricultural practice**  
**Large areas of abandoned agricultural land**
- **High levels of soil erosion, landslides etc**



# Erosion measurement and modeling



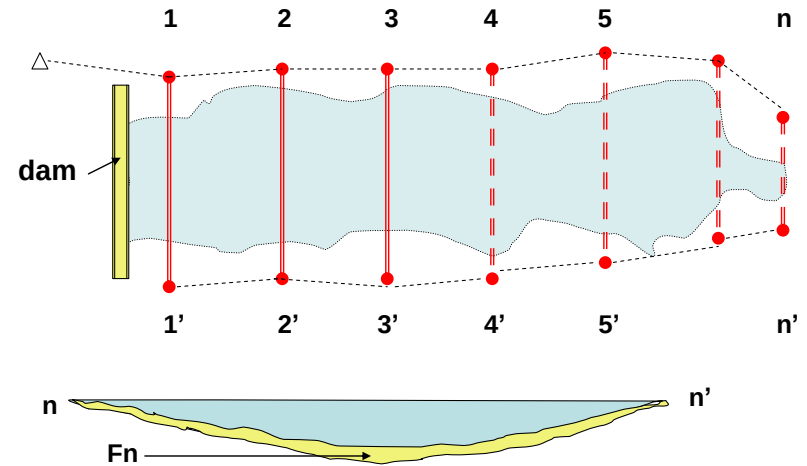
**Specific erosion measurement will be conducted to show the influence of different land use on erosion**

**A total of 45-50 plots will be established in three sites**

**One year round measurement will take place**

## Sediment measuring methodology

polygonal points (1,2,3...); cross profiles (1-1', 2-2'..)



# Albania case - Tasks

- **Measuring erosion (MKD)**
- **Measuring sedimentation in the reservoir (MKD)**
- **Modeling land cover/use impact on erosion and sedimentation (MKD)**
- **Calculating PES - Payment for Ecosystem Services)**

**(NL - Wageningen University)**

# RESUME

## Policy dialogue

- Improving and harmonizing national forest and water legislation with spatial planning and nature protection legislation to secure an integrated approach involving all relevant sectors and to secure harmonization with EU requirements.
  - Developing policies and strategies for forest and water management to mitigate and adapt to the impacts of climate change.
  - Develop policies and measures for forest and water management to counteract erosion, floods, droughts and sedimentation.
- 
- Develop policies and measures for Combating illegal logging to meet the EU Timber Regulation prohibiting placing illegal timber and timber products on the EU market by 2013.

# Working Group Activities

## Capacity Building programme

- EU WFD and IRBMP (e.g. cost benefit analyses and tools, preparing programme of measures, developing typology, reference conditions, assessing ecological status of water bodies etc)
- Sustainable Forest Management and Biodiversity Management
- The implications and application of the new EU common agricultural policy
- Tools for negotiating, building and sustaining collaborative relations
- GIS applications in rural development and water management planning
- The provision and financing of ecosystem services provided by forests
- Participatory management including stakeholder analysis and public involvement.

# Working Group Activities

## Platform for harmonising Methodologies and Monitoring programmes

- Establishing monitoring systems across the region, such as flooding control, flood protection, flood or drought prevention, water pollution or water exploitation, fire and pest control and erosion risk control and monitoring
- Establishing harmonised WFD typology for identifying a) surface WBs, b) artificial or heavily modified WBs, and c) groundwater bodies.
- Developing WFD methodologies for assessing a) ecological/ chemical status of surface WBs, b) ecological potential for heavily modified/artificial WBs, and c) chemical/quantitative status for groundwater bodies
- Establishing WFD intercalibration: To ensure that national assessment methods deliver comparable results, an intercalibration exercise is required between countries and the EU.

# Working Group Activities

## Exchanging information and knowhow

- Exchanging expertise, experiences, knowledge and/or best practices on topics of WFD methodologies, integration of water management and sustainable forest management, etc.
- Exchanging information, expertise, experiences and knowledge.
- Improving communication and exchanging knowledge and information, achievements and innovations through technical discussions
- Sharing knowledge, methodologies and techniques on technical aspect and implications of implementing EU directives such as the EU WFD and forest policies.
- Identifying and transferring European knowhow and best practices with EU Member States

# Working Group Activities

## Initiating, facilitating and implementing projects

- Developing IRBM Plans of shared rivers and river basins or sub-basins and integrating forest management measures into the plans
- Cooperation across borders to counteract important topics such as erosion, forest fires, flooding risks, surface and ground water pollution or overexploitation, for neighbouring countries where the problem will require mutual understanding and united actions.
- Harmonising forest management plans for cross-border forest areas and incorporating forest management measures into water management
- Protecting forests in border areas including controlling forest logging and preventing illegal forest logging in cross-border forest areas
- Management of cross border protected areas including important Natura 2000 forest and water habitat types and species
- Integrated (rural development) plans including tourism development, nature protection and forestry (in accordance with EU RDPs/CAP).

# Blagodaram na vnimanieto

*Thank you for your attention!*

