

# Example of Early Warning System in South East Europe: Croatia



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1. Background - Assessment of natural hazards
2. Legal framework of EWS in Croatia
3. DUZS (Mission, Organizational Structure, Strategic Partners, International Collaboration, Goals)
4. DHMZ (Mission, Organizational Structure, Strategic Partners, International Collaboration, Goals)
5. DHMZ and DUZS - Common Achievements and Activities
6. Future Development

DUZS= National Protection and Rescue Directorate

DHMZ = Meteorological and Hydrological Service



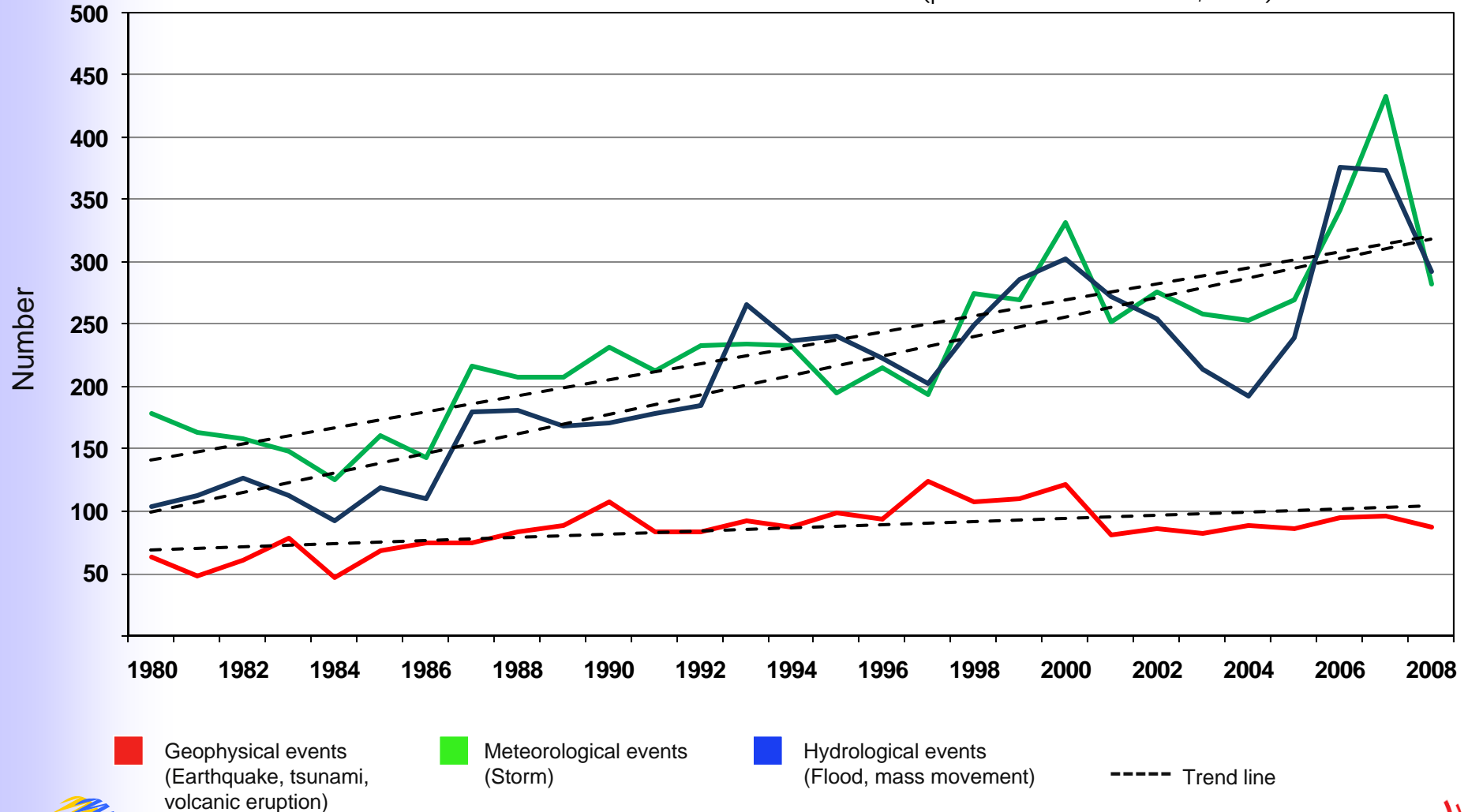
# WORLD



# Perspective from insurance companies: Natural disasters 1980 – 2008 (global)

## Geophysical, meteorological, hydrological events

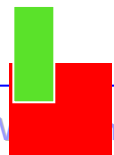
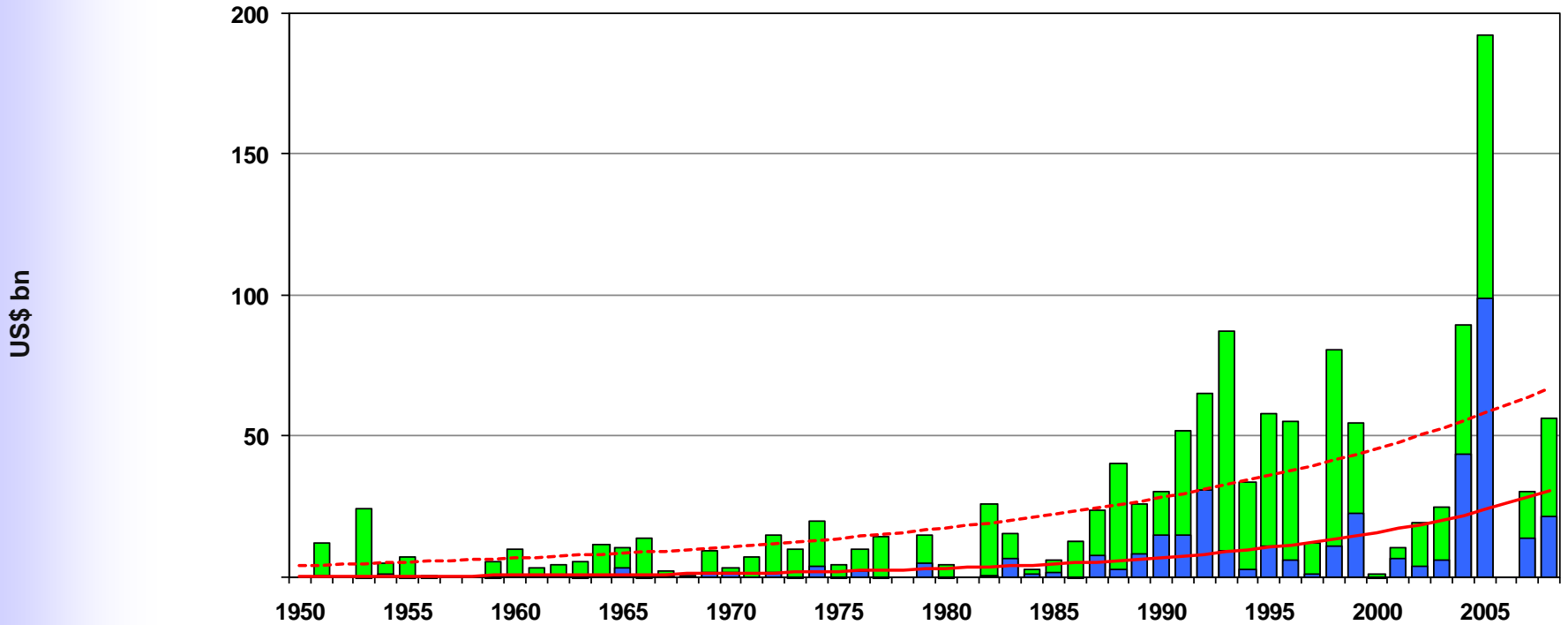
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(presented at WMO-RA VI, 2009)



# Perspective from insurance companies:

## World Great Weather Catastrophes 1950 – 2008 Overall and insured losses with trend

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(presented at WMO-RA VI, 2009)



Overall losses (in 2008 values)

Trend overall losses



Insured losses (in 2008 values)

Trend insured losses



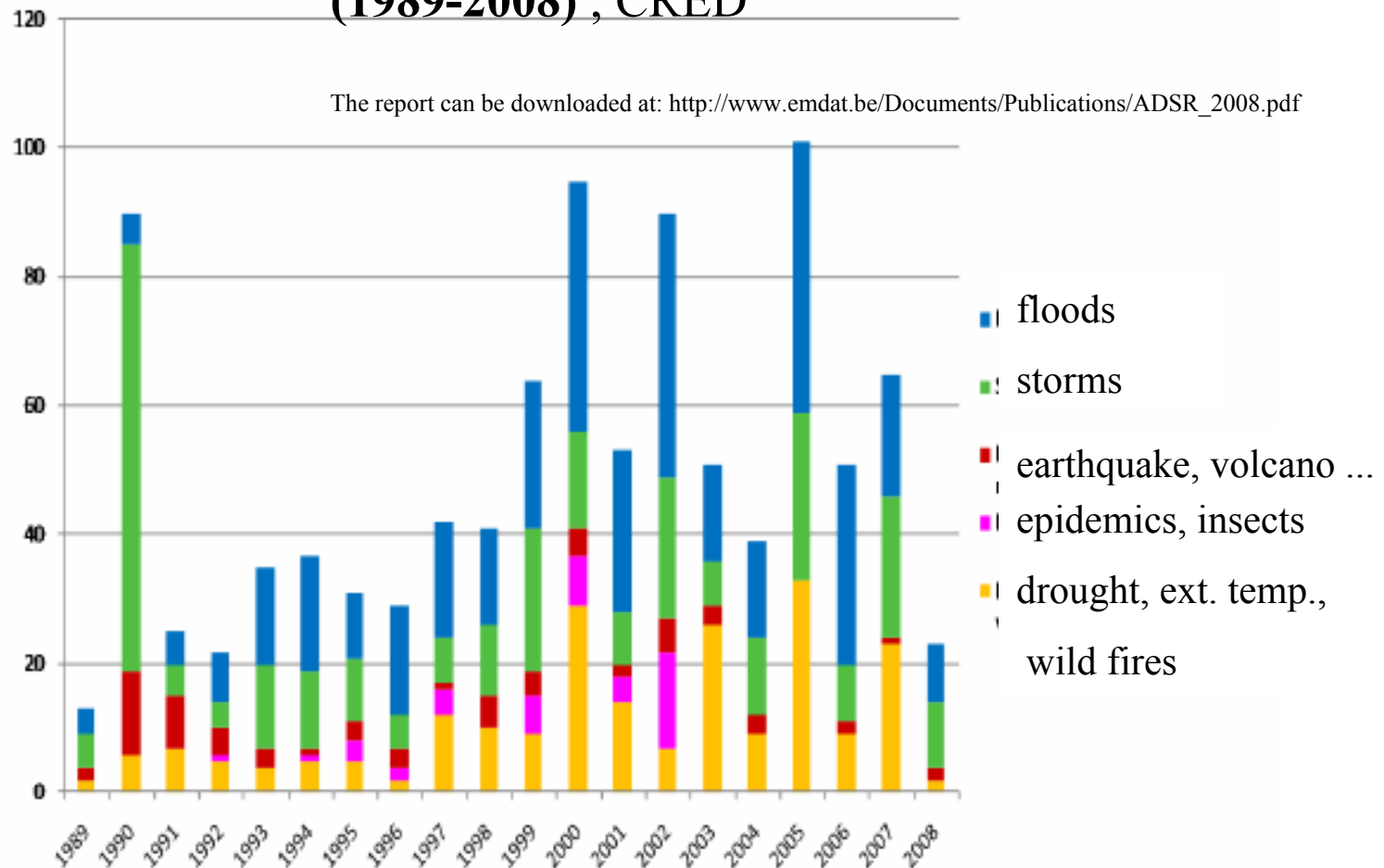
DHMZ

# EUROPE

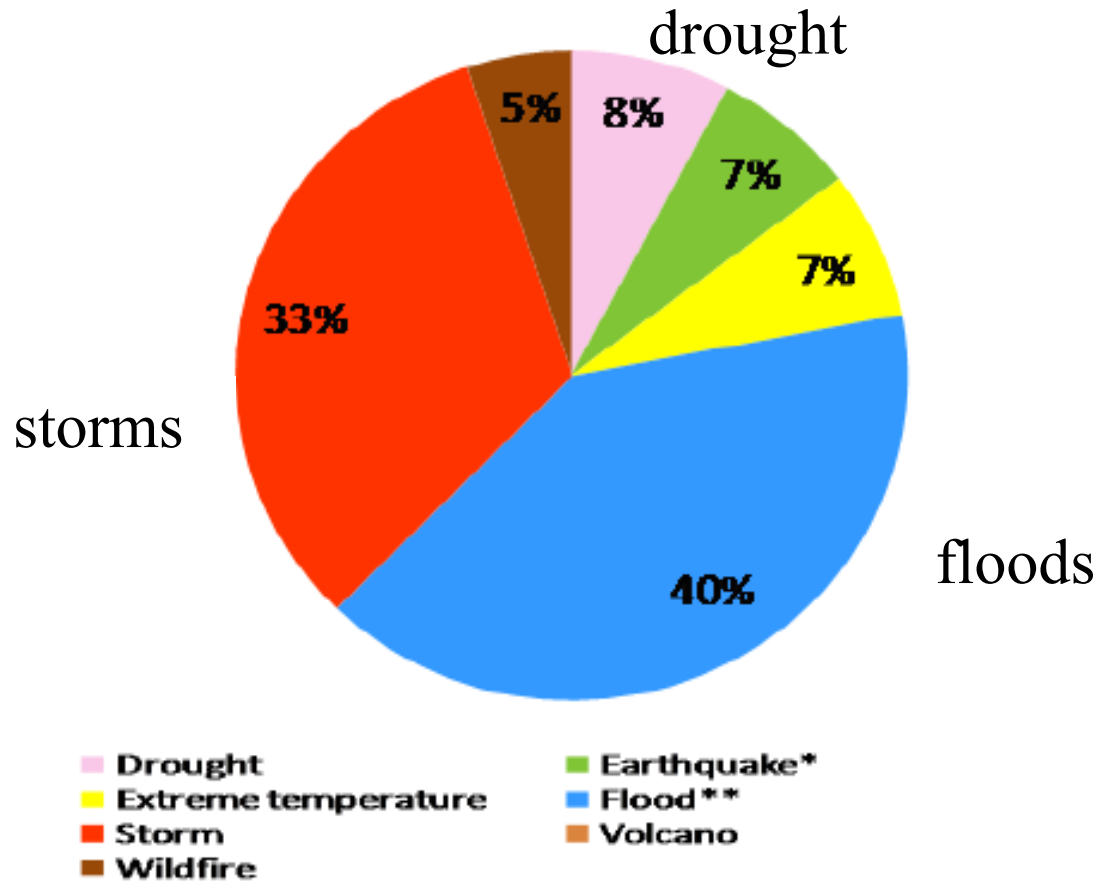


## Natural disasters occurrence in Europe

### *Debarati Guha-Sapir* : Overview of Natural Disasters in Europe over the last 20 years (1989-2008) ; CRED



## Economic Losses



\* Includes dry mass movements

\*\* Includes wet mass movements



# CROATIA



DHMZ

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Training Workshop on Multi-Hazard Early Warning Systems ; Pula, 01-03.10.2009.



# WEATHER AND CLIMA IN CROATIA

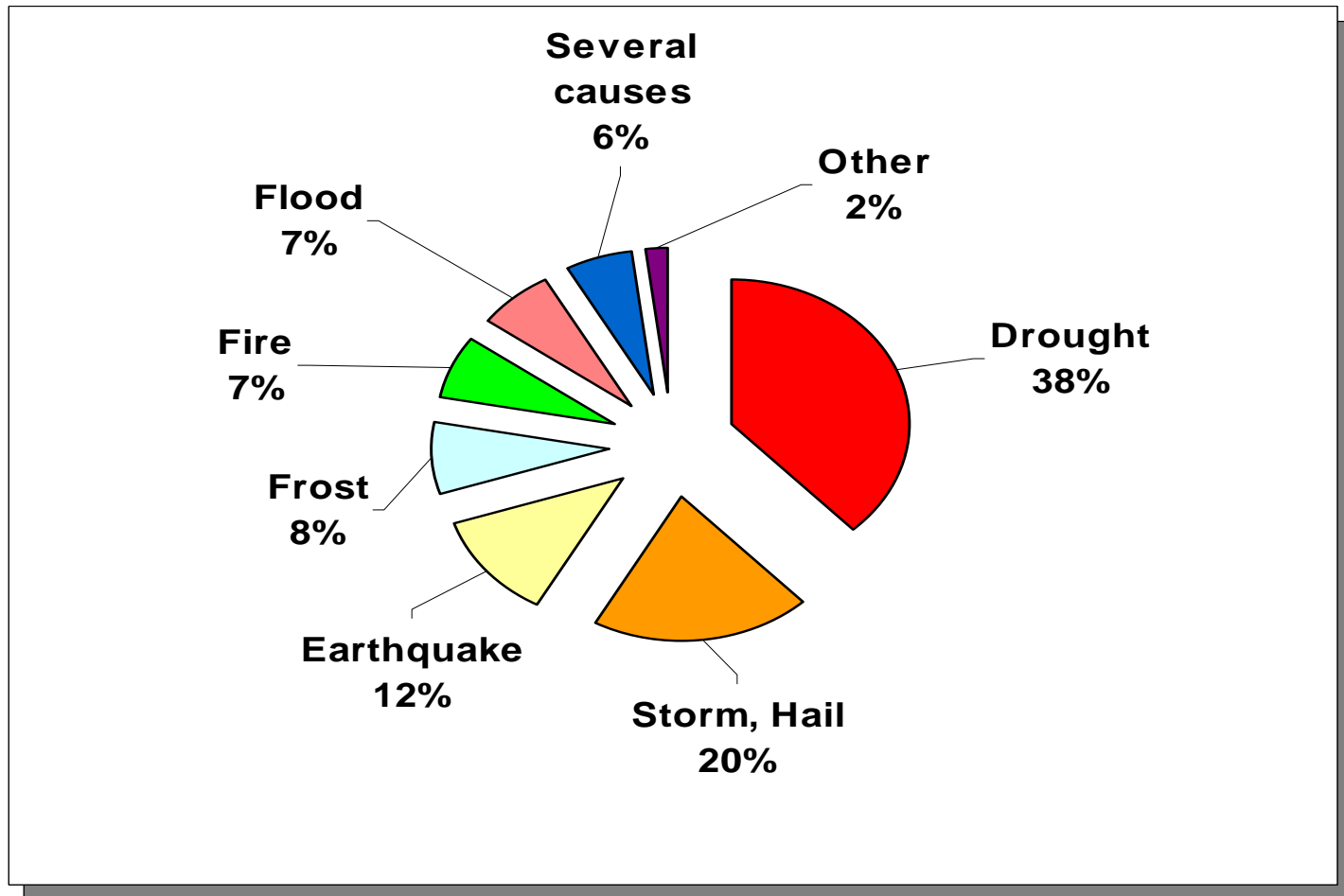


## Hazards list

- **Tornado (rotational high winds)**
- **Strong winds**
- **Storm surge**
- **River flooding**
- **Coastal flooding**
- **Flash flood**
- **Thunderstorm or lightning**
- **Heavy snow**
- **Hailstorm**
- **Freezing rain**
- **Dense fog**
- **Heat wave**
- **Cold wave**
- **Drought**
- **Marine hazards (storm, sea ice, icebergs, etc.)**
- **Landslide or mudslide**
- **Airborne hazardous substances (i.e., nuclear, biological, chemical, etc.)**
- **Waterborne hazards (i.e., nuclear, biological, chemical, oil spills, etc.)**
- **Hydrometeorological hazards to aviation (i.e., turbulence, icing)**
- **Forest or wild land fire**
- **Smoke, Dust or Haze**
- **Earthquakes**



## Economic losses (%) caused by different natural hazards in Croatia, 1980 - 2002



Floods are threat for ~15% of Croatian continental territory!



(DUZS, 2009: Assessment of Natural and Technological Hazards in Republic Croatia)

# Legal framework of EWS in Croatia

National Protection and Rescue Directorate



is an independent, professional and administrative organisation, tasked with preparing plans and managing operational forces as well as co-ordinating the activities of all participants in the protection and rescue system



the basic tasks are stipulated by the Law on protection and rescue came into force on December 18, 2004 (the most important tasks are risk and vulnerability assessment, drafting measures aimed at preventing crises and accidents, ensuring that these measures are implemented, and effective emergency management in case of major disasters)



# Legal framework of EWS in Croatia

## Meteorological and Hydrological Service



is a national centre of excellence based on high standards of scientific, professional and technical resources for the production, collection and dissemination of high-quality meteorological and hydrological information



the basic tasks are stipulated by the Law on meteorological and hydrological activities in Croatia (to provide support to economic development, environment protection, to act towards the preservation of life and material goods from natural hazards and disasters and to mitigate their consequences)



# National Protection and Rescue Directorate

- Mission
  - Organizational Structure
    - Strategic Partners
- International Collaboration
  - Goals





## Mission of National Protection and Rescue Directorate:



- risk and vulnerability assessment, drafting measures aimed at preventing crises and accidents, ensuring that these measures are implemented
- effective emergency management in case of major disasters.



## **Structure of National Protection and Rescue Directorate - National level**

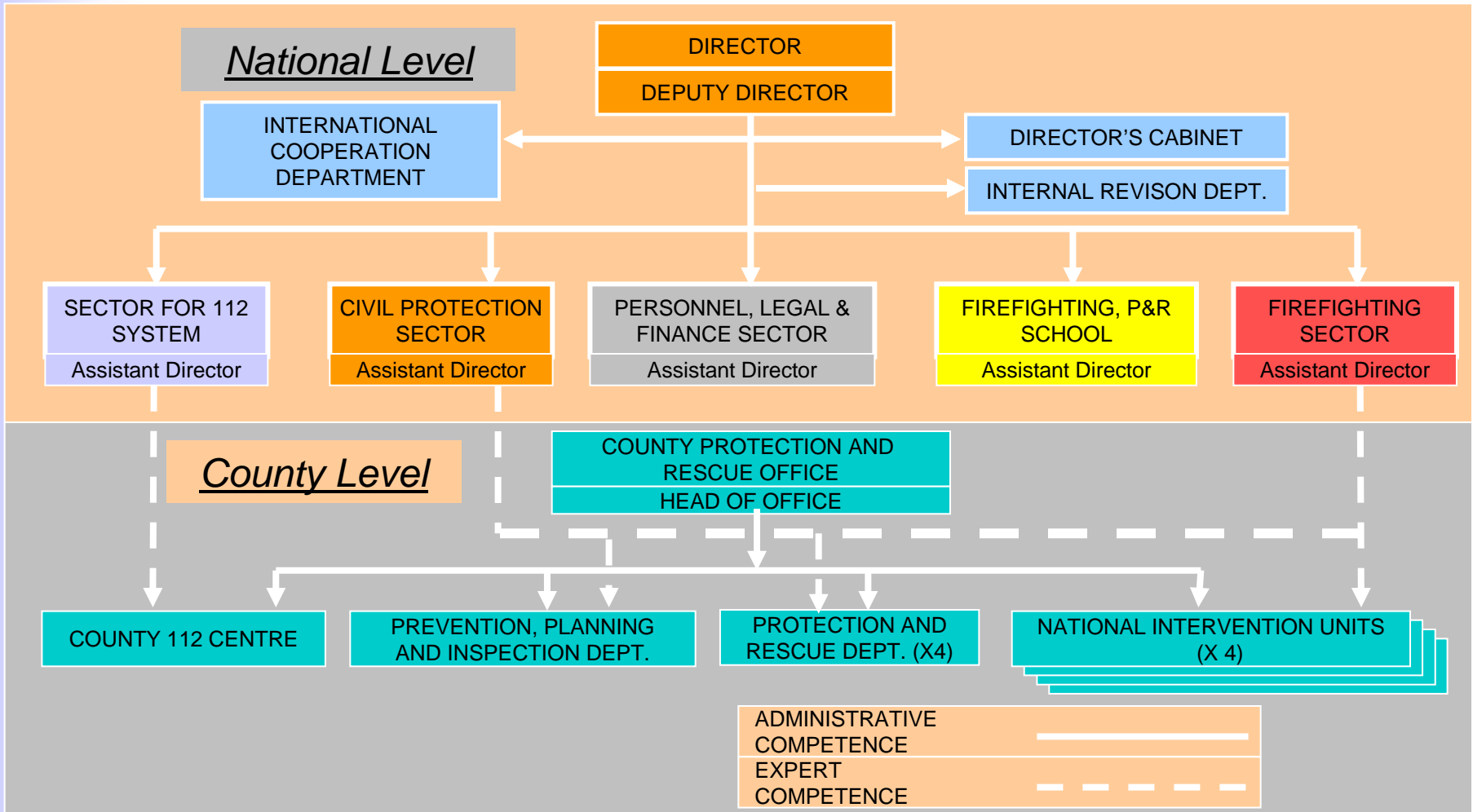
- **Sector for 112 System**
- **Civil Protection Sector**
- **Firefighting Sector**
- **Firefighting, Protection and Rescue School**
- **Personnel, Legal and Finance Sector**



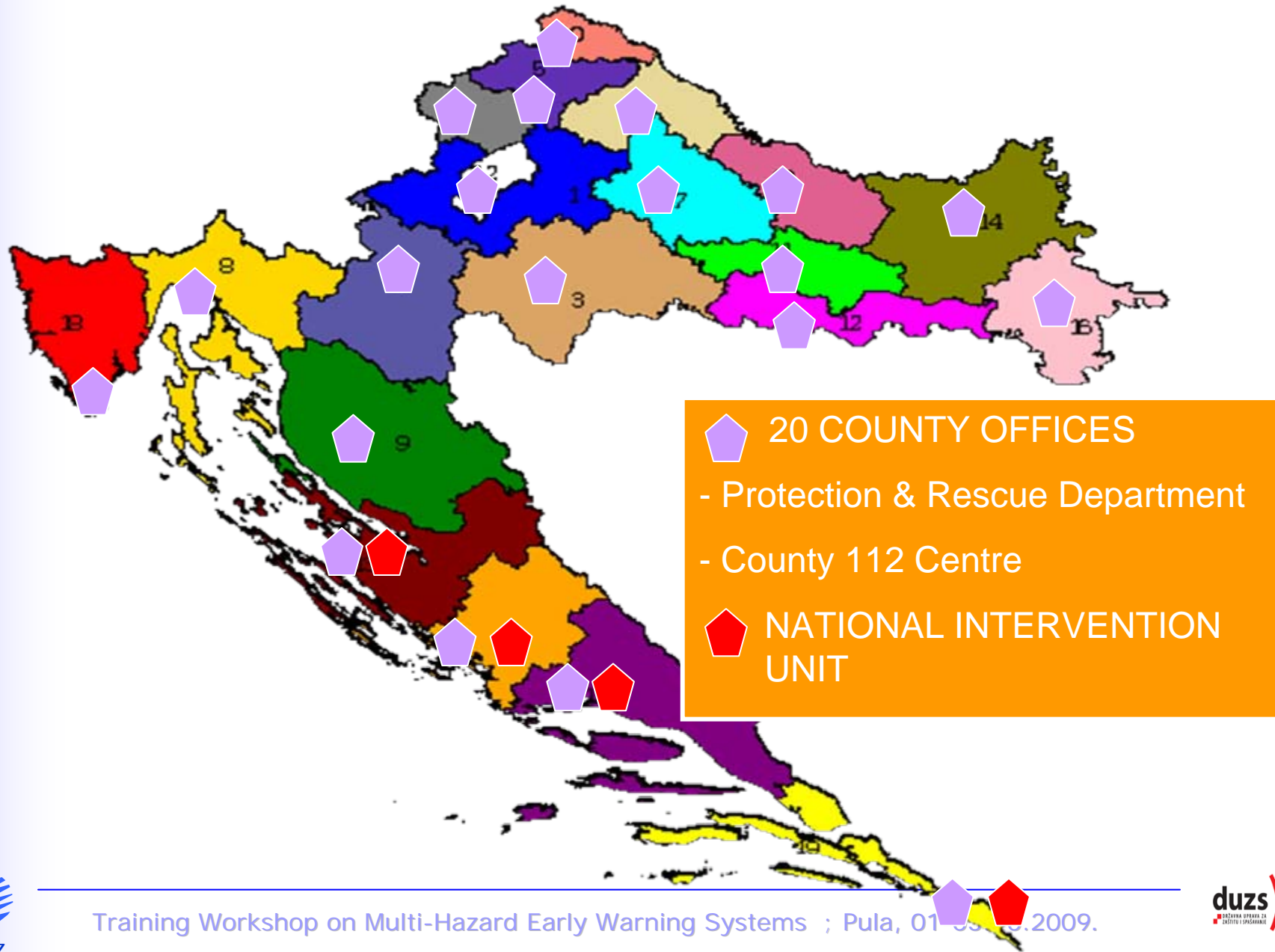
## Structure of National Protection and Rescue Directorate - County level

- **20 County Offices in the whole territory of the Republic of Croatia**
  
- **Established at County Offices:**
  - ◆ **Protection and Rescue Department**
  - ◆ **County 112 centre**
  - ◆ **At 4 County Offices, established national intervention units (Split, Zadar, Šibenik and Dubrovnik)**

# Administrative and Expert Competence Chart



# Structure of National Protection and Rescue Directorate:



# Strategic Partners:

## 1. State Administrative Organizations:

- **Meteorological and Hydrological Service**
- **State Office of Nuclear Safety**
- **State Institute of Radiation Protection**
- **Croatian Waters**
- **National Red Cross Society**
- **Mountain Rescue Service**

## 2. Ministries:

- **Ministry of Defense**
- **Ministry of Interior**
- **Ministry of the Sea, Transport and Infrastructure**
- **Ministry of Environmental Protection, Physical Planning and Construction**
- **Ministry of Forestry and Water Management**
- **Ministry of Health and Social Care**



## INTERNATIONAL COOPERATION

### BILATERAL

Hungary, Slovenia,  
B&H, Austria,  
Slovakia, Poland,  
France, Montenegro

**MoU** (Germany,  
Holland)

### REGIONAL

CMEP SEE Council

DPPI (DUZS as Chair-  
in-Office in 2008)

SEDM – SEESIM

Adriatic – Ionic Initiative

### INTERNATIONAL ORGANIZATIONS

NATO CEP

UN (ISDR, OCHA,  
CADRI)

EU

Council of Europe

### In progress:

FYR Macedonia,  
Russia, Serbia, Albania



## Goals of the National Protection and Rescue Directorate:



- **Establishment of coordinated system of participants in protection and rescue**
- **Introduction of 112 single emergency number system**
- **Establishment of single national disaster response system**
- **Cost-effective disaster response system**
- **Compatibility of equipment and procedures with those of EU and NATO**





## Meteorological and Hydrological Service

- Mission
  - Organizational Structure
    - Strategic Partners
- International Collaboration
  - Goals

# Mission of Meteorological and Hydrological Service



- to provide support to economic development, environment protection and quality of life
- to act towards the preservation of life and material goods from natural and social hazards and disasters and to mitigate their consequences
- to maintain and develop the national meteorological and hydrological observation system

## **Structure of Meteorological and Hydrological Service:**

- **Weather Analysis and Forecast Division**
- **Weather and Climate Monitoring Division**
- **Research and Development Division**
- **Air Quality Division**
- **Remote Sensing Division**
- **Hydrology Division**
- **IT Division**
- **International and Customers Relation Division**
- **Personnel, Legal and Finance Division**
- **Independent Department for Measurements Calibration**

# Strategic Partners:

## 1. State Administrative Organizations:

- **National Protection and Rescue Directorate**
- **Croatian Waters**
- **State Office of Nuclear Safety**
- **State Institute of Radiation Protection**

## 2. Universities and Scientific Institutes

## 3. Ministries:

- **Ministry of Science**
- **Ministry of Sea, Transport and Infrastructure**
- **Ministry of Environmental Protection...**
- **Ministry of Forestry and Water Management**
- **Ministry of Health and Social Welfare**



# International collaboration

## Meteorological and Hydrological Service



### Membership in International Organisations:

- WMO
- ECMWF
- EUMETNET
- EUMETSAT
- ALADIN/RC LACE
- GEO
- ECOMET

### International Projects:

- MAP – D PHASE
- EMEP
- EU FP 6/7, COST
- MEDEX
- EUMETSAT/CEI projects (SATREP, EUMeTrain, Nowcasting....)
- WB/ISDR/WMO Sava project

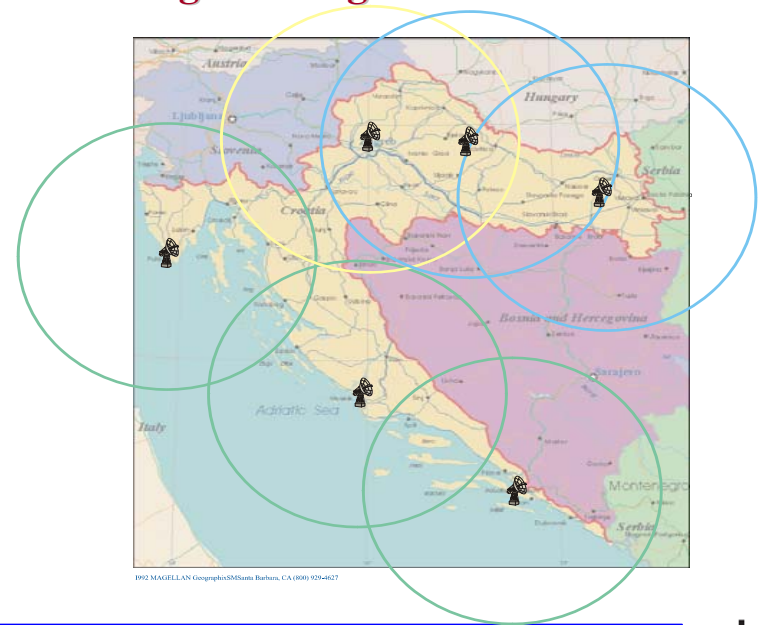
# Goals of Meteorological and Hydrological Service:

## Improvement of our infrastructure:

- **Radar network - 3 new radars at the Adriatic sea and modernization of the old radars – national radar composite as input for regional radar network (EUMETNET project OPERA)**
- **Lightning detection system integrated with neighbouring countries**
- **Air quality monitoring**
- **New premises in Zagreb**

## Capacity building

- **Strengthening the units responsible for warnings**
- **Numerical hydrological forecasting**



# DHMZ and DUZS

## Common Goals, Achievements and Activities



## National Protection and Rescue Directorate & Meteorological and Hydrological Service

### Common goals and mutual interest:

- **improving natural disaster prevention, prediction, early warning, response and recovery**
- **risk assessment, as outcome of the interaction between a hazard phenomena and vulnerability**

### Common achievements:

- **June 23th, 2006 come into force “Standard Operations Procedure on weather forecast information” - document deals with mutual rights and obligations in weather forecast information – dissemination for the purpose of prevention**
- **Local hosts of this joint workshops in Pula!**



# COMMON ACTIVITIES

*Early warning system*



## Role of DHMZ in the EWS

---

1. **Strengthening the capacity to deliver severe weather forecast (observational network, forecasting tools,....)**
2. **Delivery of timely and understandable warnings and specialized forecasts**
3. **Integration of DHMZ products and services in disaster risk reduction management**
4. **Analyzing and providing hazard information for risk assessment**
5. **Public outreach campaigns**
6. **Strengthening cooperation and partnerships at national to international level with disaster risk reduction organizations**



# Role of DUZS in the EWS

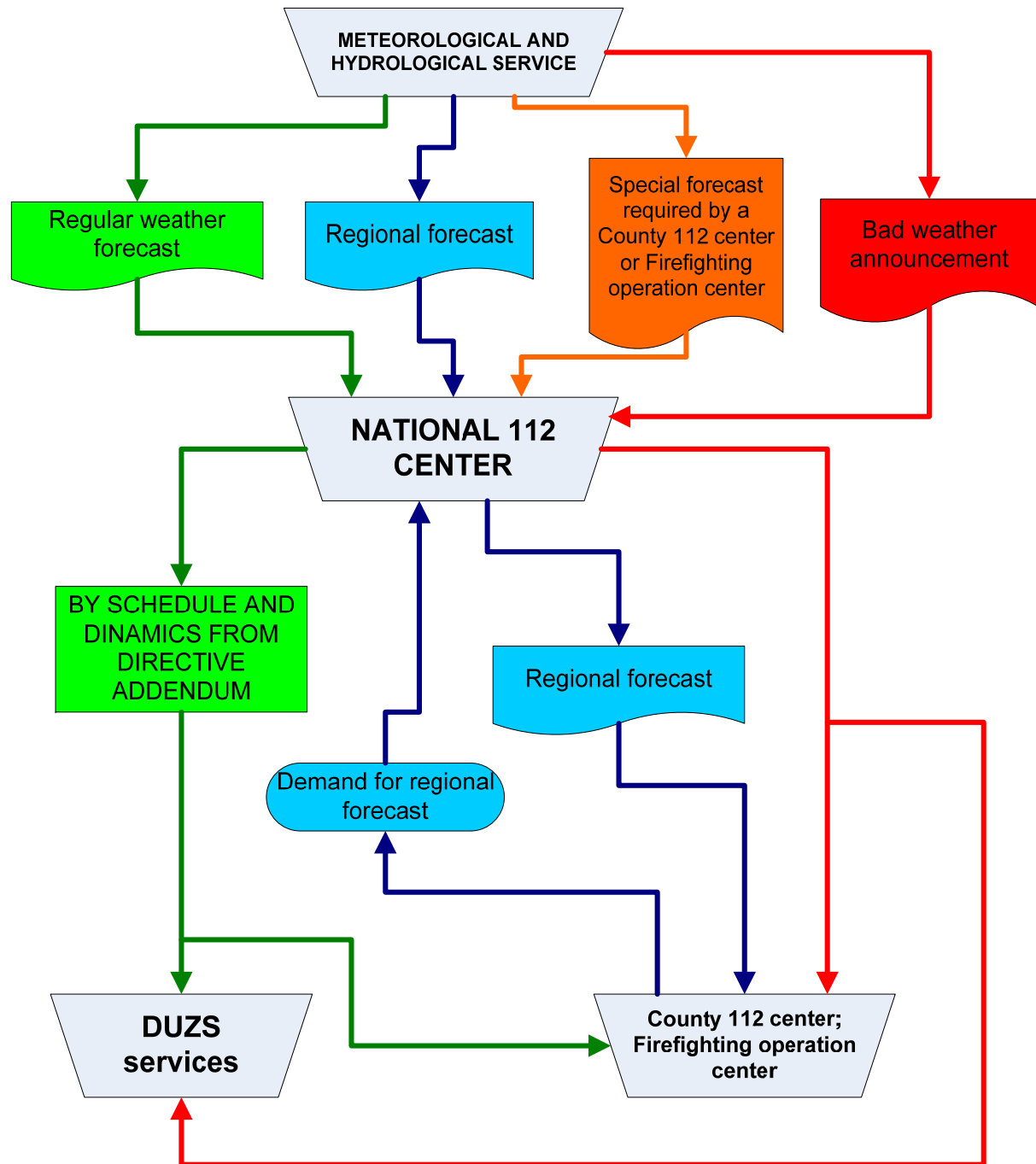
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- 1. Establishing legal framework (Regulation of the unique characters of alerting, Rules of Procedure of the population warning)**
- 2. Strengthening cooperation and partnerships at national to international level with disaster risk reduction organizations**
- 3. Organizing, building and maintenance of EWS infrastructure**
- 4. Collecting, analyzing and delivering of warnings on all levels**
- 5. Public information**



All operative activities are governed by SOP



And when there is expected exceptionally severe hazard weather or technological event with possible high impact, higher level personal contacts are recommended.

Phone links DHMZ – DUZS related to the severity of expected/possible events:



Chief of Weather forecast office – Shift leader of National 112 center



Head of Weather forecast analysis and forecast department – Head of National 112 center



Assistant Director of Weather forecast analysis and forecast division – Assistant Director of 112 Sector



# DUZS - Warning dissemination mechanisms

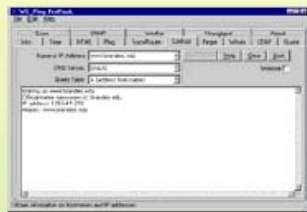
112 Centar



Advanced IT solution



Standard Operator's Procedure



Digital charts



Integrated Communication Network



PMR



Ambulance

Police

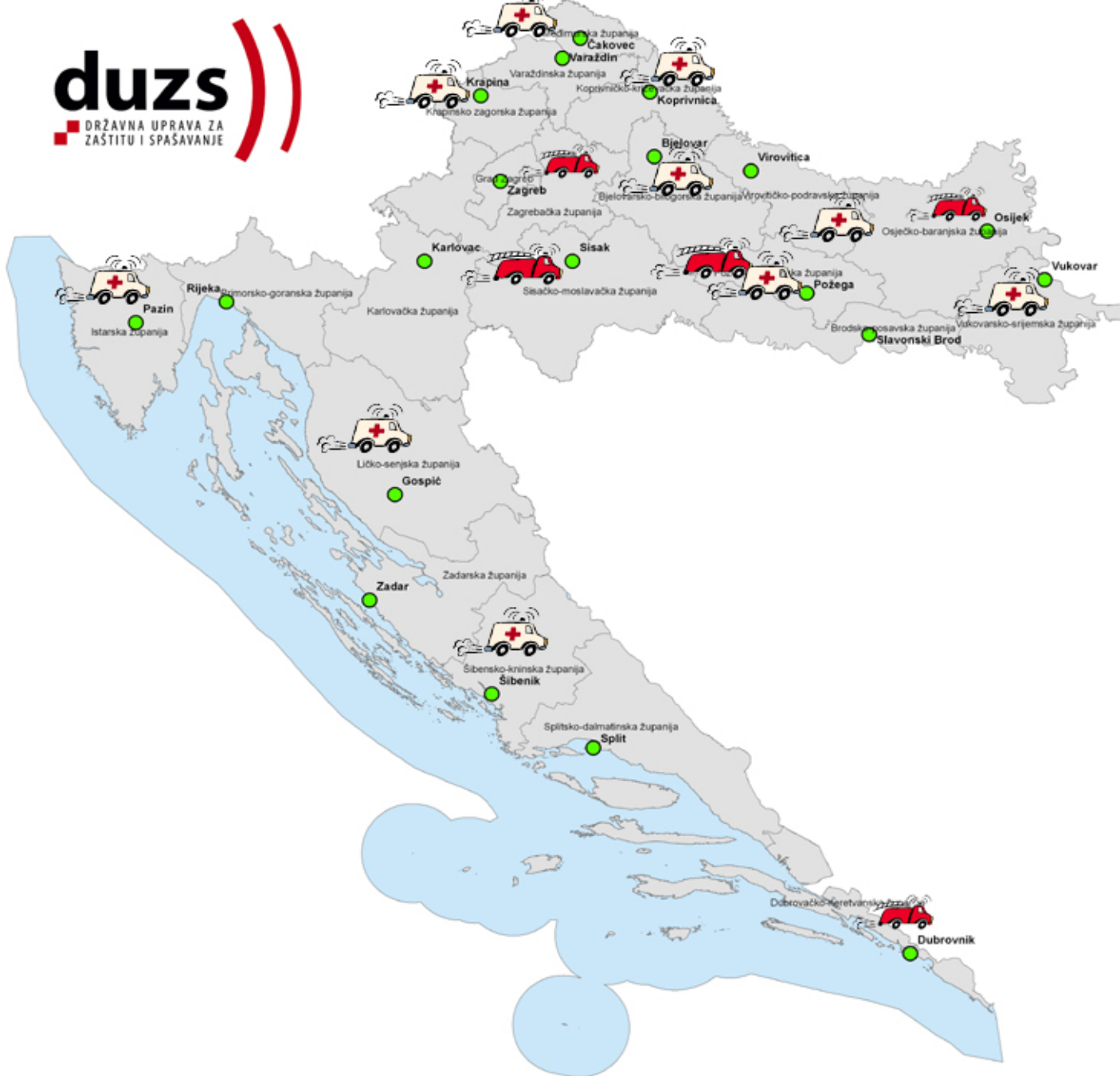
Fire Brigades

Port Authorities, CZ, HGSS, MORH, MRCC

DHMZ, DZNS, Ministries,



# Redirection of national emergency numbers to 112 system



**LEGEND**

COUNTY 112 CENTER

AMBULANCE - 10

FIREFIGHTERS- 5



## Example:

### Varaždin county

- Bad weather announcement
- Special forecast required
- Alarming
- Preparedness of emergency services
- Quick reaction







## WEATHER FORECAST

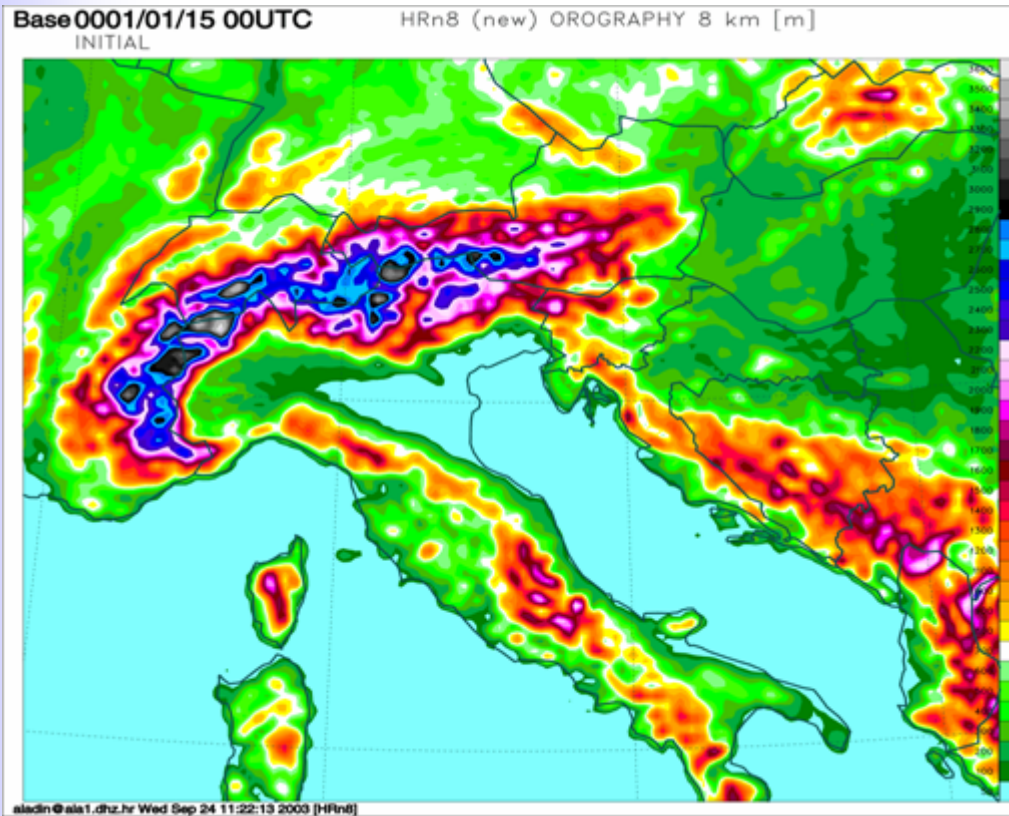
- Nowcasting - (0 – 3 hours)
- short range forecast –(up to 72 hours)
- Medium range forecasts – (up to 10 days)
- Long-range seasonal forecast– (up to 6 months)

## CLIMATE FORECAST

- Regional climate modeling – (up to 100 years)



# ALADIN/HR mesoscale numerical model



**Horizontal resolution: 8 km**

**Coupling model: ARPEGE**

**Coupling frequency: 3 hours**

**Forecast range: 72 hours**

**Output every: 1 hour**

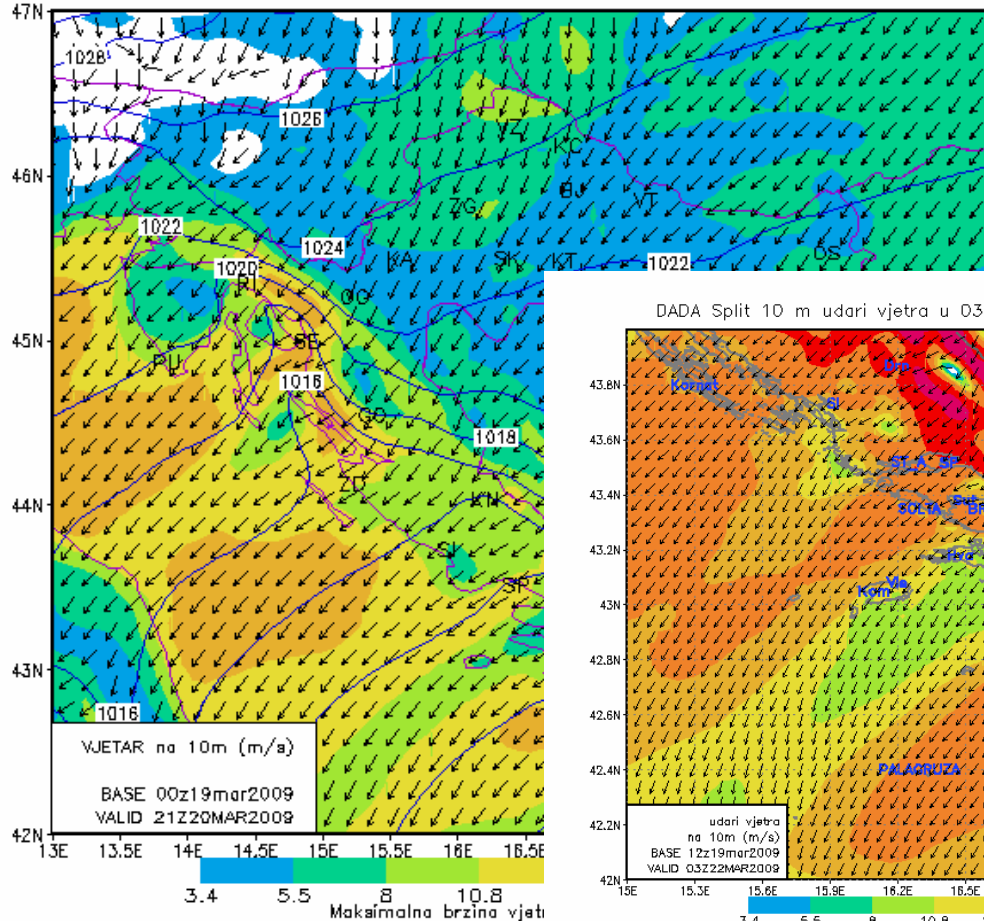
**Run: 00 and 12 UTC**



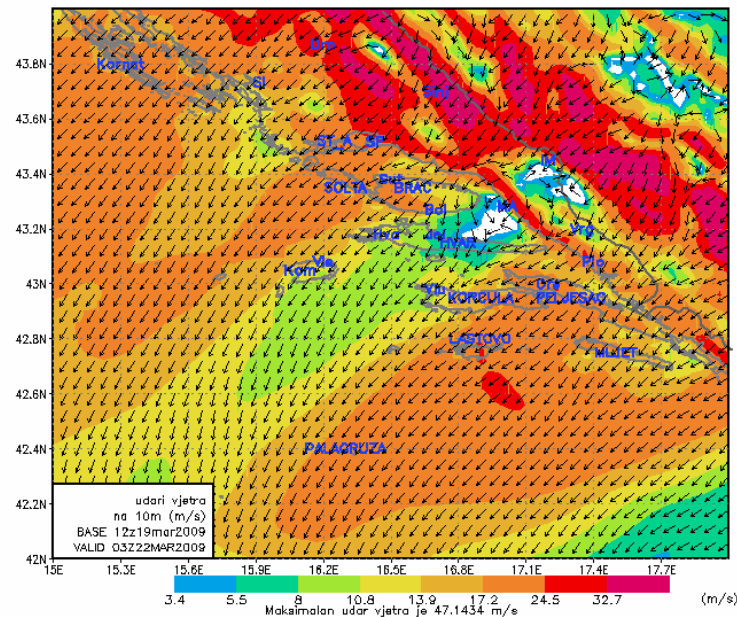
# ALADIN/HR

[www.meteo.hr](http://www.meteo.hr)

ALARO/HR VJETAR u 21Z20MAR2009 UTC 45h forecast



DADA Split 10 m udari vjetra u 03Z22MAR2009 UTC 63h forecast



**Dynamical  
adaptation**

**Resolution  
2 x 2 km**



DHMZ



# Weather forecast for Fire Fighting Sector



Zaštita od požara - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://cirus.gric.dhz.hr/~pozari/pozari.html

Sinoptika sučelje Zaštita od požara

Home Proгноza indeksa Ispravak indeksa Proгноza razreda Dopuna podataka Ispravak podataka Analize

**ZAŠTITA OD POŽARA**



Izveštaja Podaci Pogreške SINOP jučer SINOP danas  
Upute Dokumentacija

Done

Start 2 Windows Expl... Windows Media Pl... Eudora Zaštita od požara DHMZ - DUZS Cro

Zaštita od požara - Mozilla Firefox


File Edit View History Bookmarks Tools Help

http://cirus.gric.dhz.hr/~pozari/pozari.html

Sinoptika sučelje Zaštita od požara

Home Proгноza indeksa Ispravak indeksa Proгноza razreda Dopuna podataka Ispravak podataka Analize

PROGNOZA RAZREDA OPASNOSTI OD ŠUMSKIH POŽARA PO PODRUČJIMA



21.09.2009 (DANAS) (SUTRA) 22.09.2009

Prilo mala	Mala	Umjereni	Velika	Prilo velika		Prilo mala	Mala	Umjereni	Velika	Prilo velika
•	•	•	•	•	ISTRA	•	•	•	•	•
•	•	•	•	•	HRVATSKO PRIMORJE	•	•	•	•	•
•	•	•	•	•	SJEVERNA DALMACIJA	•	•	•	•	•
•	•	•	•	•	UNUTARINJA DALMACIJA	•	•	•	•	•
•	•	•	•	•	SREDNJA DALMACIJA	•	•	•	•	•
•	•	•	•	•	JUZNA DALMACIJA	•	•	•	•	•

Pošlji Ponovo

Done

Start 2 Windows Expl... Windows Media Pl... Eudora Zaštita od požara DHMZ - DUZS Cro 14:58

# Meteorological stations for which actual and forecasted forest fire index is calculated



# Alert chart for forest fire danger

24.06.2009.

KARTA OPASNOSTI OD  
NASTANKA POŽARA NA  
OTVORENOM PROSTORU  
ZA 24.06.2009. KORIŠTENI  
PODACI IZ DHMZ-a

LEGENDA:

-  VRLO VELIKA OPASNOST
-  VELIKA OPASNOST
-  UMJERENA OPASNOST
-  MALA OPASNOST
-  VRLO MALA OPASNOST



IZRADIO VOS

# Alert chart for forest fire danger

25.07.2009.

KARTA OPASNOSTI OD  
NASTANKA POŽARA NA  
OTVORENOM PROSTORU  
ZA 25.07.2009. KORIŠTENI  
PODACI IZ DHMZ-a

LEGENDA:

-  VRLO VELIKA OPASNOST
-  VELIKA OPASNOST
-  UMJERENA OPASNOST
-  MALA OPASNOST
-  VRLO MALA OPASNOST



IZRADIO VOS



# PUBLIC WARNINGS

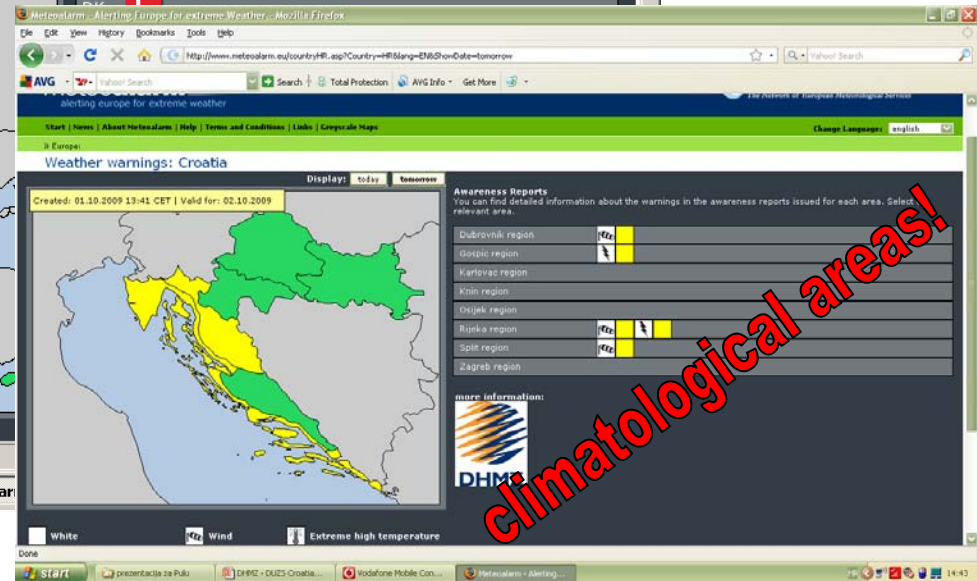
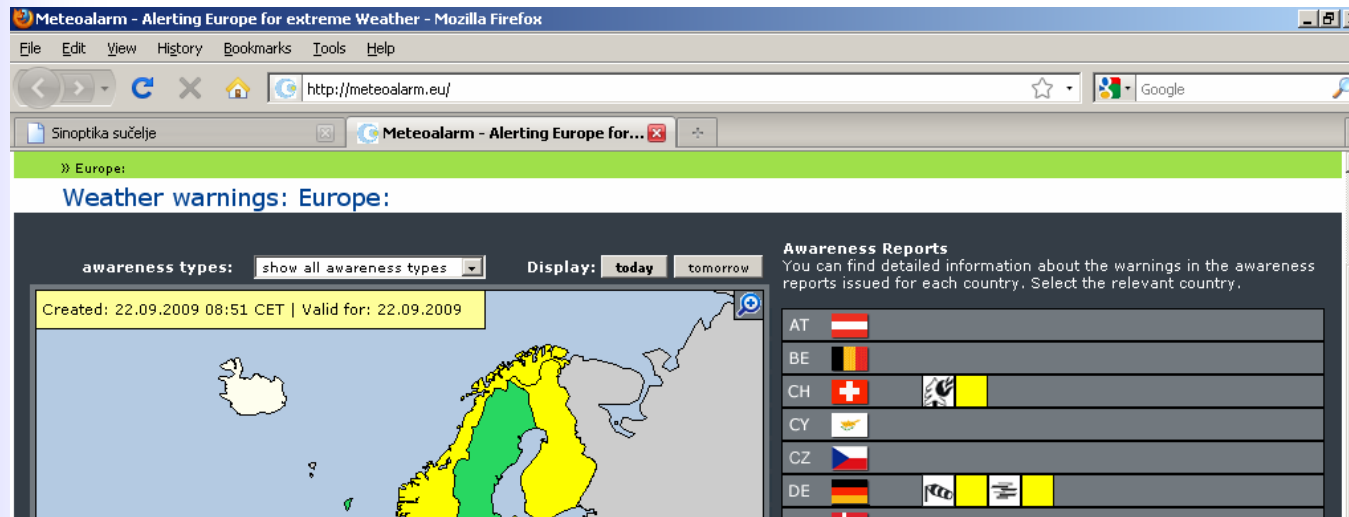
TV, radio, web,...





DHMZ = single official voice for weather warnings





### White:

Missing, insufficient, outdated or suspicious data.

### Green:

No particular awareness of the weather is required.

### Yellow:

The weather is potentially dangerous. The weather phenomena that have been forecast are not unusual, but be attentive if you intend to practice activities exposed to meteorological risks. Keep informed about the expected meteorological conditions and do not take any avoidable risk.

### Orange:

The weather is dangerous. Unusual meteorological phenomena have been forecast. Damage and casualties are likely to happen. Be very vigilant and keep regularly informed about the detailed expected meteorological conditions. Be aware of the risks that might be unavoidable. Follow any advice given by your authorities.

### Red:

The weather is very dangerous. Exceptionally intense meteorological phenomena have been forecast. Major damage and accidents are likely, in many cases with threat to life and limb, over a wide area. Keep frequently informed about detailed expected meteorological conditions and risks. Follow orders and any advice given by your authorities under all circumstances, be prepared for extraordinary measures.



# Expertise is mandatory!!

## EXAMPLES

	Colour	
<b>WIND</b>	Green	$v < 10 \text{ m/s}$
	Yellow	$v > 10 \text{ m/s}$ (gusts $v > 17 \text{ m/s}$ )
	Orange	$v > 17 \text{ m/s}$ (gusts $v > 33 \text{ m/s}$ )
	red	$v > 33 \text{ m/s}$

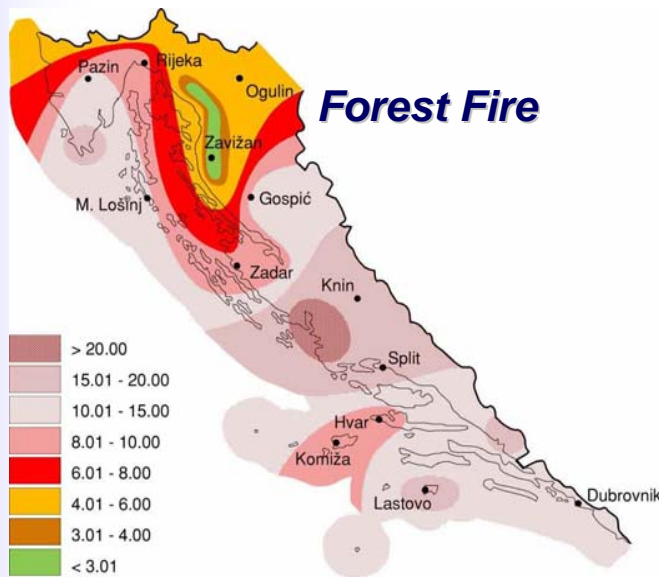
	Colour	
<b>FOG</b>	Green	Visibility $\geq 200 \text{ m}$
	Yellow	Visibility $\leq 200 \text{ m}$

# FUTURE DEVELOPMENT

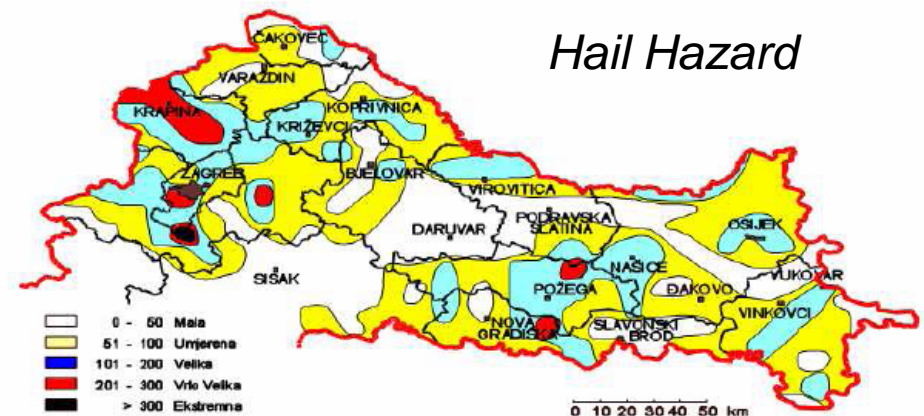


## Disaster Risk Reduction national Platform in Croatia – preparation phase

*- to improve the cooperation at the national level between DHMZ and DUZS and relevant institutions and end-users to further enhance national system for preventing and mitigating the impact of extreme weather and climate events*



*Prostorna raspodjela indeksa ugroženosti od pojave tuče sa štetom na branjenom području Hrvatske za vrijeme sezone obrane od tuče od 1. svibnja do 30. rujna u razdoblju 1981-2000:*



## Disaster Risk Mitigation and Adaptation Project (DRMAP) – World Bank

### Project Objective:

*enhance preparedness and response to disasters and emergencies, as well as to strengthen monitoring and forecasting of weather-related hazards in order to reduce disaster risk*

### Component A: Disaster Preparedness and Emergency Response

- A.1 Enhancement of 112 Emergency call system
- A.2 Enhancement of National and Regional Fire Fighting
- A.3 Enhancement of Public Awareness and Emergency

### Component B: Strengthening Severe Weather Forecasting

- B.1 Integrated Nowcasting System
- B.2 Designing DHMZ facility

# CONCLUSIONS

## **Benefits of DHMZ – DUZS collaboration and cooperation:**

- **Improved coordination during all phases of disaster management**
- **Greater sustainability**
- **Improved efficiency**
- **Sharing the best practice**
- **Capacity buliding**
- **To be an essential partner whenever needed**



**Enhanced collective capability  
of dealing with potential hazards  
and disaster management**



An aerial photograph of a coastline, showing a dark blue ocean on the left and a lighter blue, sandy beach area on the right. The sky is filled with soft, white clouds. The text 'THANK YOU!' is overlaid in the center in a large, blue, outlined font.

**THANK YOU!**