



Wildfire Threats to the Environment and Human Security: Views from Eurasia  
Johann G. Goldammer, Global Fire Monitoring Center (GFMC)


5º Simpósio Sul-Americano Sobre Controle de Incêndios Florestais  
9ª Reunião Técnica Conjunta FUPEF-SIF-IPEF Sobre Controle de Incêndios Florestais  
Sao Paulo, Brasil, 11 e 12 de abril de 2011



**As ameaças dos incêndios florestais ao ambiente e à  
segurança humana:  
Desafios do manejo do fogo para o século 21**

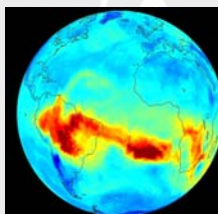
**Wildfire Threats to the Environment and Human  
Security: Views from Eurasia**

 **Johann Georg Goldammer**  
Global Fire Monitoring Center (GFMC)  
Freiburg, Germany



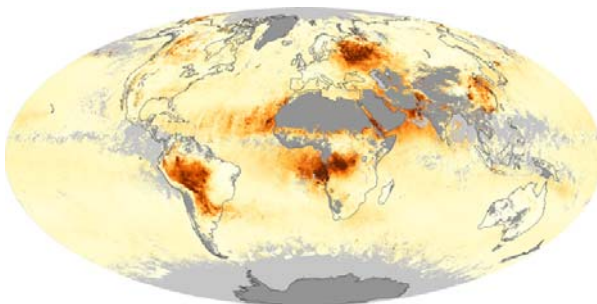
**Transboundary Impacts of Fires and Smoke:  
Issues to be addressed globally**

- **Environment**
  - Radiatively active trace gases and aerosol: Magnitude and impact on biogeochemical cycles and functioning of the atmosphere
- **Human health and Security**
  - Transnational smoke transport
  - Impact on human health
  - Radioactive contamination



**Fire (and dust) aerosols measured by the MOPITT  
instrument on satellite Terra between 1 and 31 August 2010**

Source: NASA



**Overview of this presentation (I)**

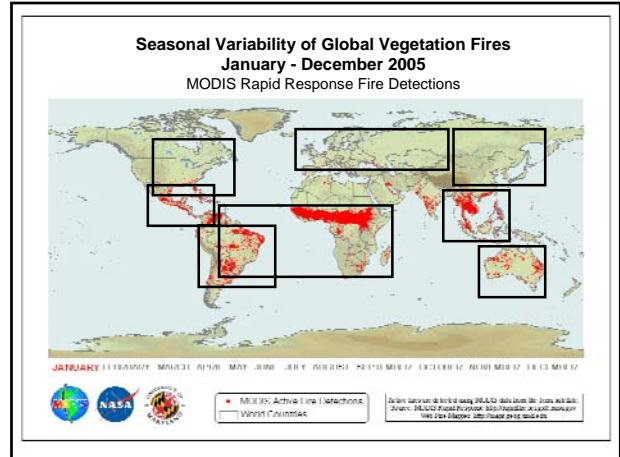
Transboundary impacts of fire smoke pollution on human health and security: Some impressions of 1990-2010

- Southern Atlantic: Smoke generated ozone plumes connecting Africa and South America (natural and land-use fires)
- South East Asia: Regional smoke-haze pollution since the 1980s (land-use fires)
- Central Siberia / Far Eastern Eurasia: Extended forest and grassland wildfires (natural, human made)

**Intent and Overview of this presentation (II)**

**Transboundary impacts of fire smoke pollution on human health and security: Some impressions of 1990-2010**

- **Western Eurasia: Agricultural burning emissions impacting the Arctic (black carbon emissions from excessive burning) and human populations**
- **Asymmetric threats: Fires burning on contaminated terrain**
  - Radioactivity
  - Chemical
  - Unexploded ordnance and land mines



**Unifying global issues (I):**

**Change of land-use, climate and fire regimes – Eurasia (e.g., West Europe and Russia) and in the tropics (e.g., Bolivia, Brazil)**

- **In the tropics / developing world: Continuing human pressure** on ecosystems involving fire use for land clearing, often associated with wildfires
- **In the temperate-boreal zone / industrialized world: Rural exodus (people urbanizing)** resulting in increasing wildfire hazard because of abandonment of land cultivation and weakened professional and local community work force to use fire properly or to suppress wildfires

**Western Russia 2010**



**Rural exodus with increasing occurrence of uncontrolled fires**

**In August 2010 Russia declared national emergency:**


- 25,000 wildfires burning
- Area affected: 6 M ha




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**Bolivia 2010**

**Almost unnoticed at international level**



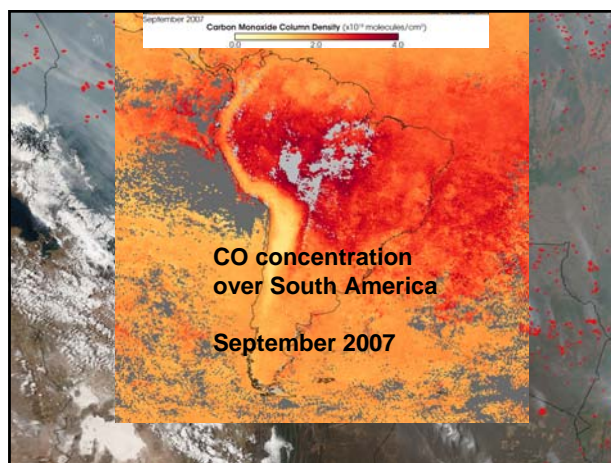
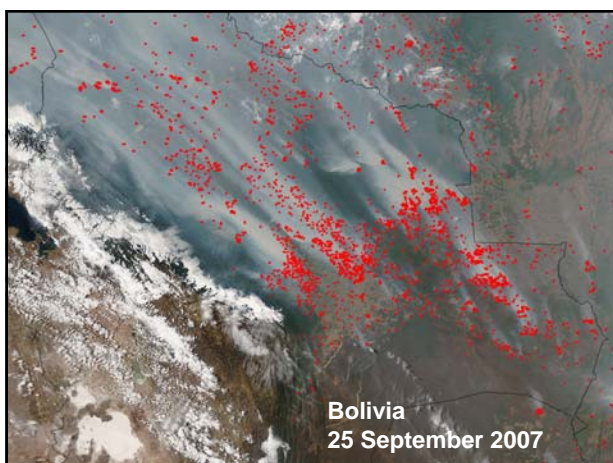
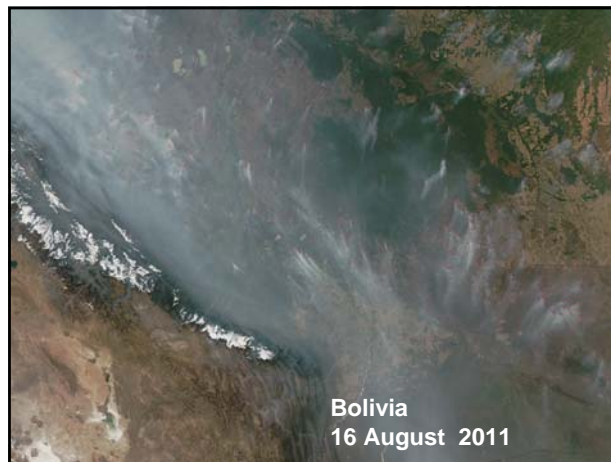
**Conversion and maintenance burning in native vegetation**



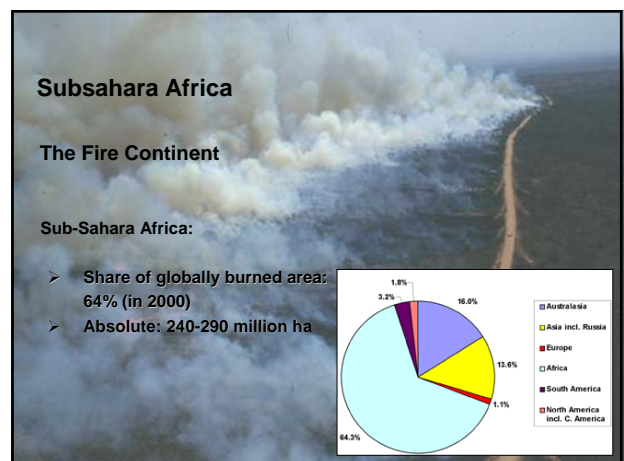
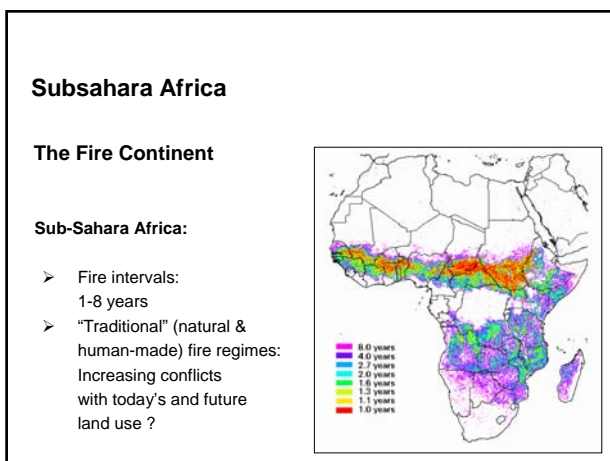
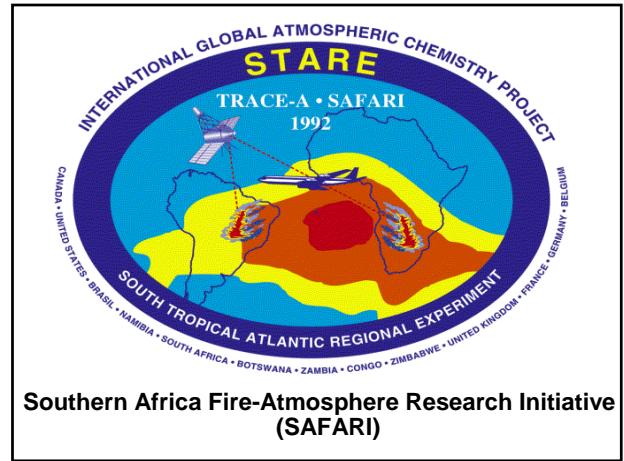
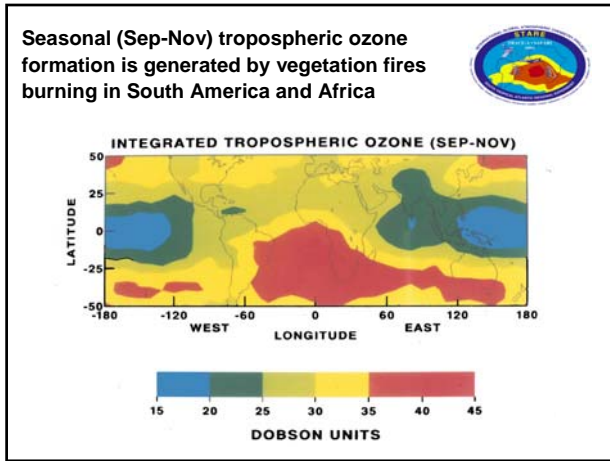
**In August 2010 Bolivia declared national emergency:**

- 25,000 wildfires burning
- Area affected: 1.5 M ha

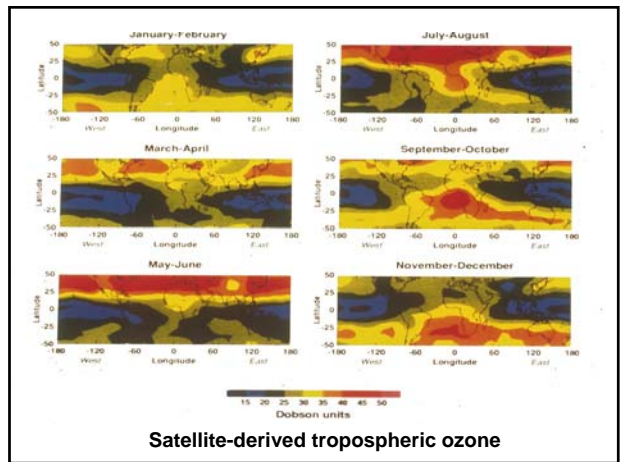
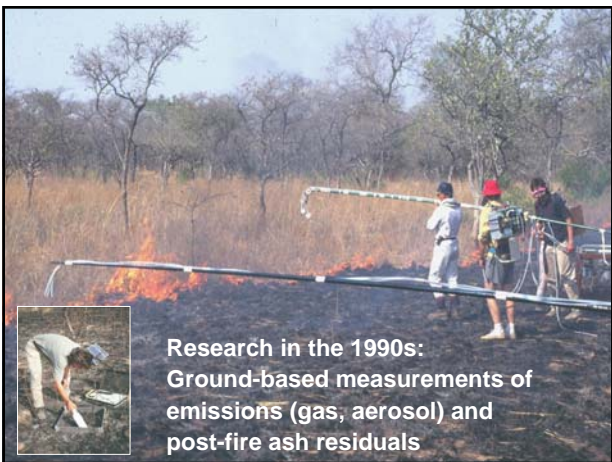
19 Aug 2010 - The Government of Bolivia declared an emergency and requested assistance to Brazil and Argentina following forest fires burning 1.5 million hectares. In Bolivia, drought and fires most often occur in August and September.



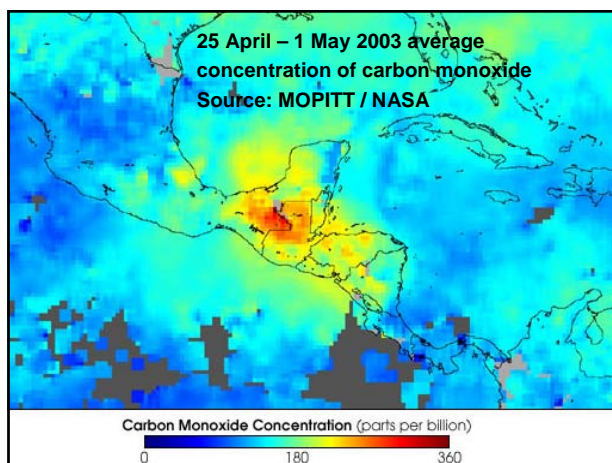
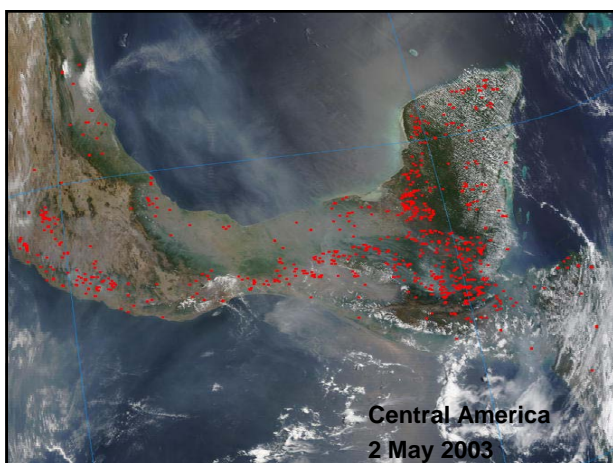
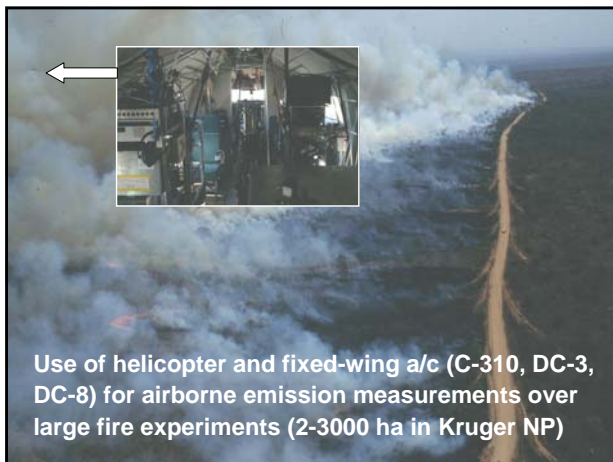
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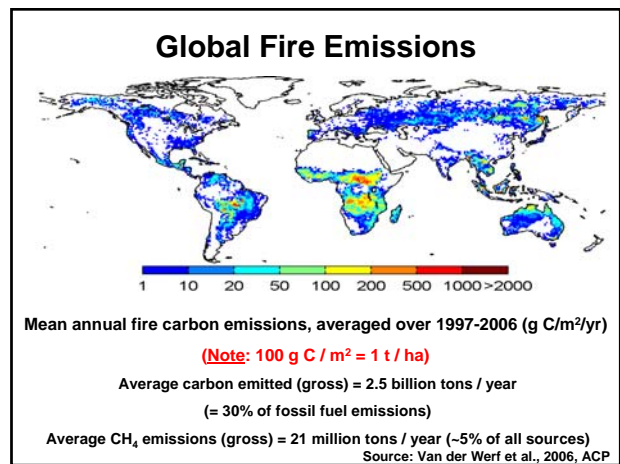
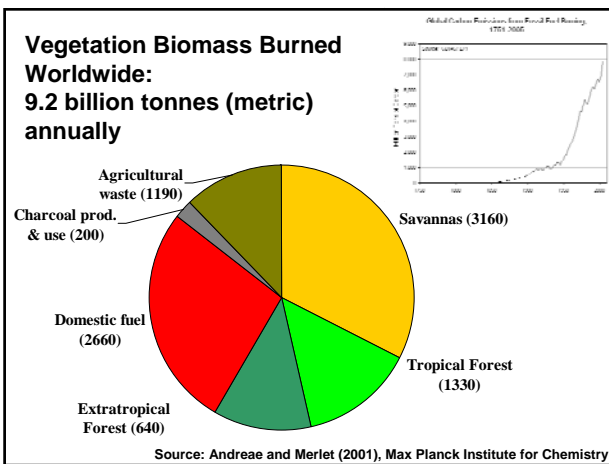
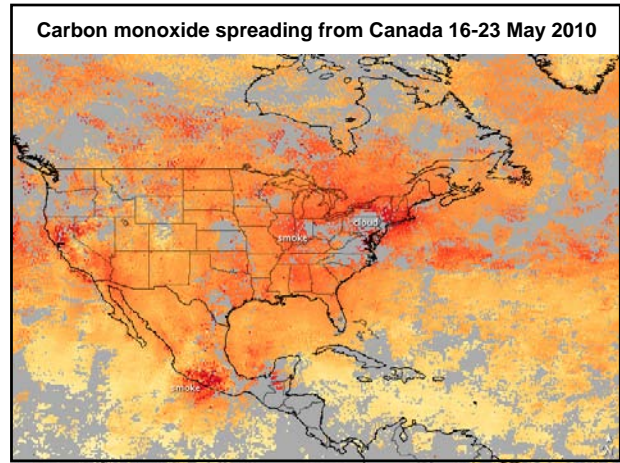
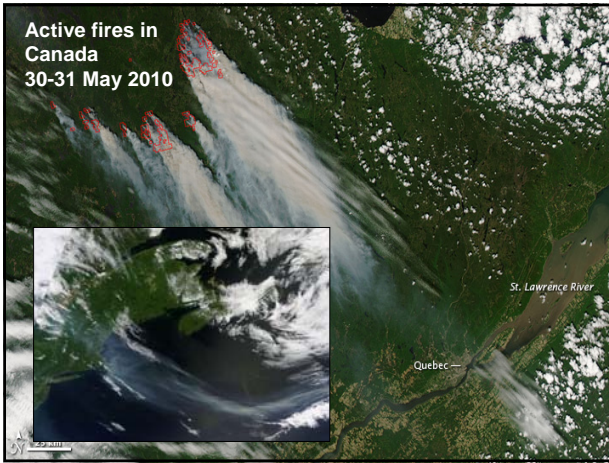
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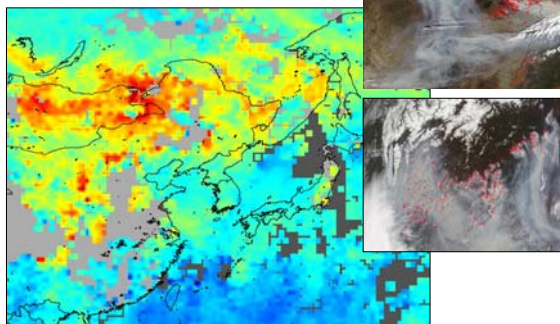
### Global Fire Emissions



Global total carbon (C) emissions from deforestation fires (1997-2006) =  
Net release of carbon to the atmosphere:  
On average 0.6 billion t C / year

Source: Van der Werf et al., 2006, ACP

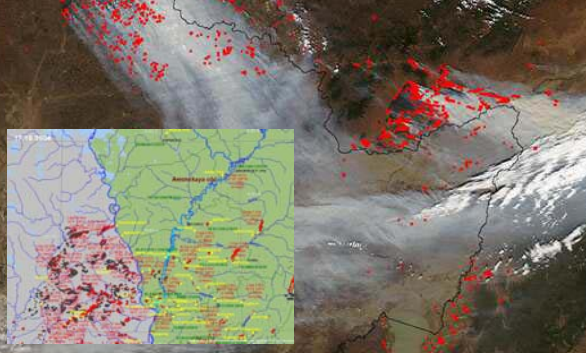
### Eurasia / Central Asia



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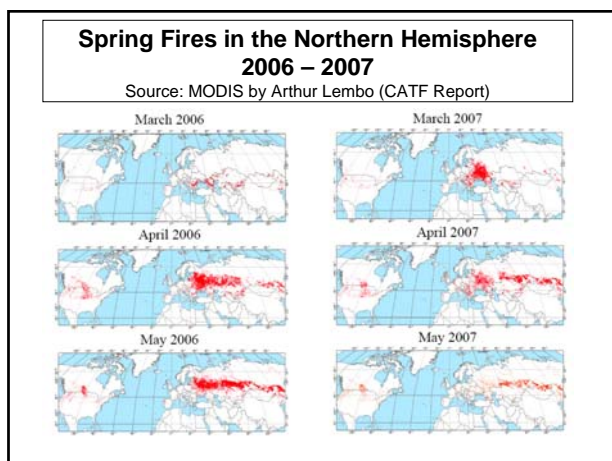
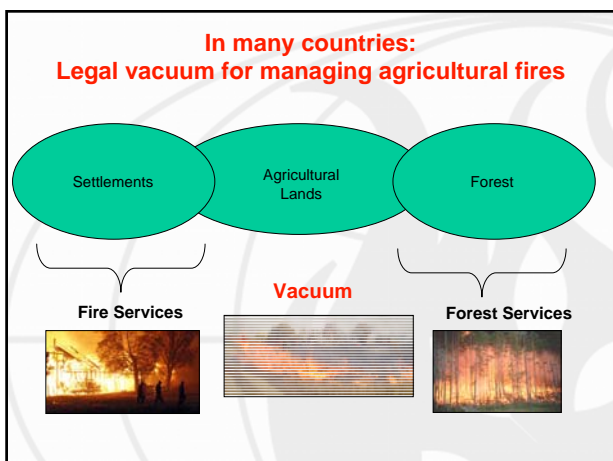


### Situation in Central-Eastern Asia in 2004: Wildfires in NE China / Far East of Russia 18 October 2004







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*Лед и снег отражают солнечные лучи.*



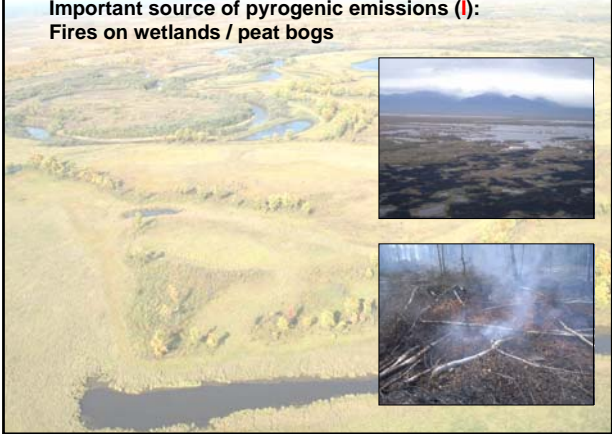


*Отложения черного углерода затемняют поверхности и сокращают их отражательную способность.*

**Impacts of “black carbon”:** The carbon deposits are darkening the snow / ice surface in the Arctic region and reduce reflectivity, thus accelerate melting of snow and ice cover.

**Source:** A. Pettus / CATF Agricultural Fires and Arctic Climate Change: A Special CATF Report

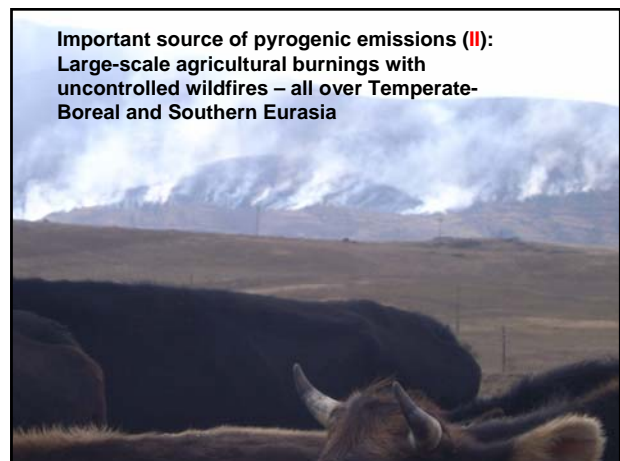
**Important source of pyrogenic emissions (I):**  
Fires on wetlands / peat bogs



**Important source of pyrogenic emissions (I):**  
Fires on wetlands / peat bogs



**Important source of pyrogenic emissions (II):**  
Large-scale agricultural burnings with uncontrolled wildfires – all over Temperate-Boreal and Southern Eurasia



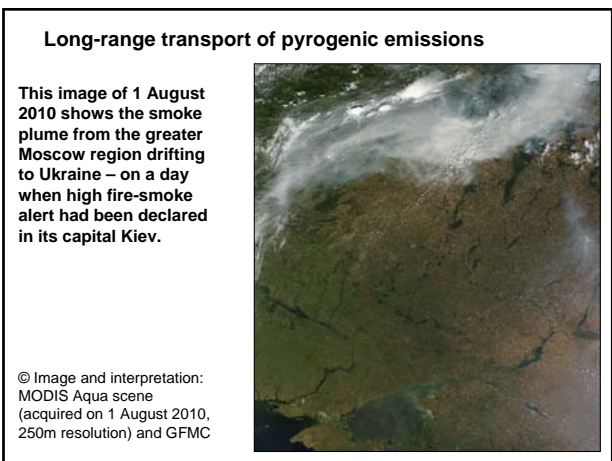
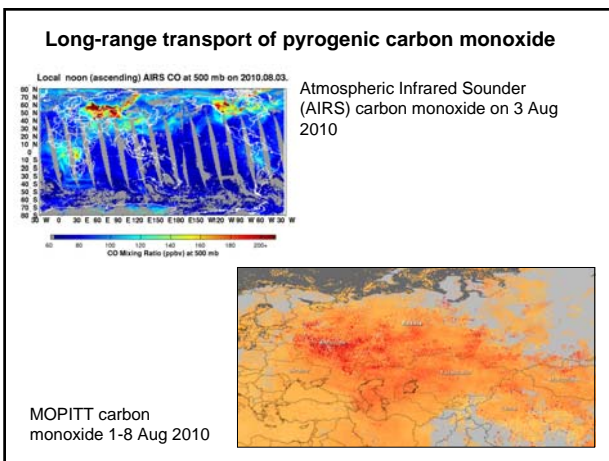
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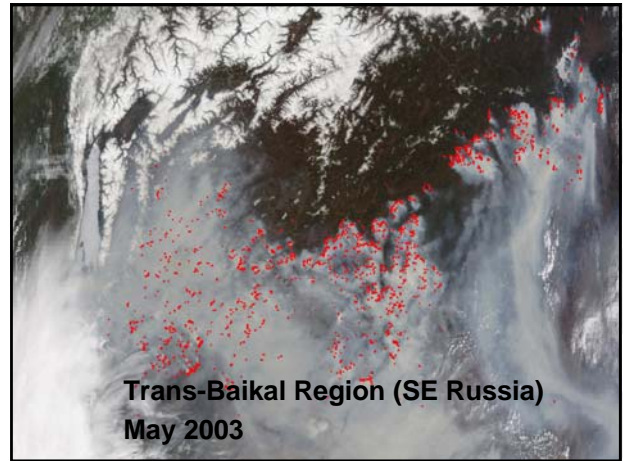
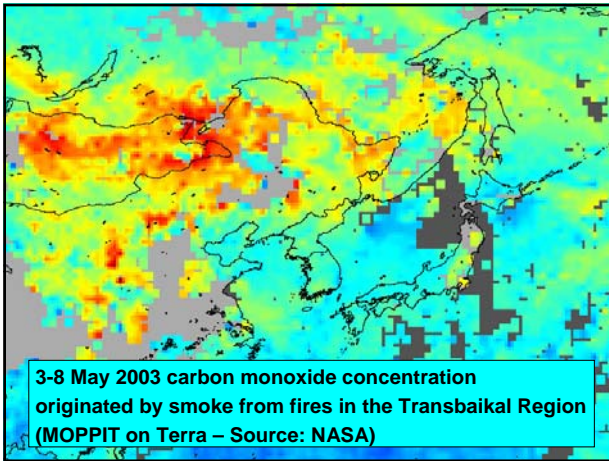
**Communities affected in Western Russia**

Besides more than 50 people killed directly by wildfires:

- 800,000 ha burned
- 2000 houses burned
- > 30 villages destroyed
- drought and fire destroying agricultural crops
- 60,000 flights delayed or cancelled



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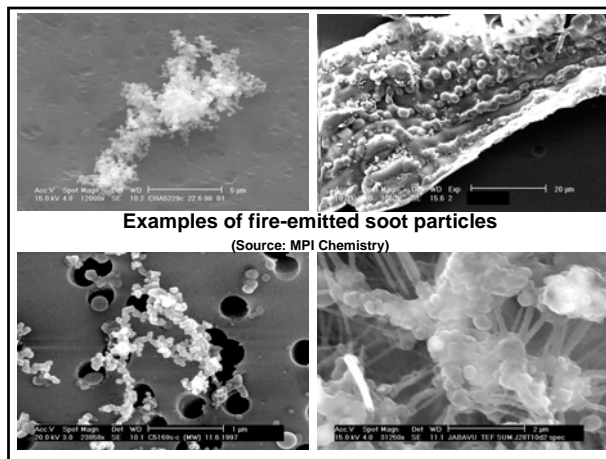


### Chemical synthesis of Vegetation Fire Smoke (VFS)

#### Complex mixture of gases, liquids and solids

Aerosol: solid and / or liquid particles dispersed in the gas phase

Over 100 -120 different chemical species have been identified in the smoke from vegetation fuel combustion



### Vegetation fires in the interface of an urban or industrial area

The flame-front pathway can pass over:



- Houses, infrastructures, plastic storehouses
- Agricultural areas with pesticides, fungicides, fertilizers
- Landfills (residual wastes)
- "Other" wastes (e.g. batteries, radioactive materials)

#### Examples:

- Co-burning of forest fuel and wastes → significant quantities of dioxins
- Co-burning of forest fuel and construction materials → pulverized glass, cement, dust, plaster, asbestos, can be contained in the smoke produced

### Smoke Impacts of peat and forest fires

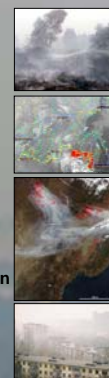
Composition of vegetation fire smoke

Acute toxicity:

- Particulates below 2.5µm
- Formaldehyde
- Acrolein
- Polycyclic Aromatic Hydrocarbons
- Free radical precursors
- Carbon monoxide

Particulate effects on the respiratory / cardiovascular systems

- Respiratory infections in adults and children
- Acute and chronic changes in pulmonary function
- Asthma attacks
- Cardiovascular diseases (CVD)
- Hospital admissions
- Increase of daily mortality



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**Vegetation Fire Exposure Characteristics and Health Effects (I)**

➤ **Acute effects (exposure 24<h)**

- Nose & eye irritation
- Cough
- Acute respiratory infection (ARI)

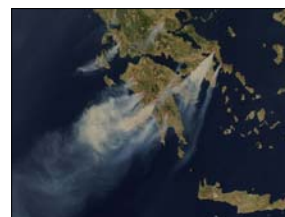
➤ **Short-term effects (exposure <7 days)**

- Lung function decrements
- Increases in airway responsiveness

**Vegetation Fire Exposure Characteristics and Health Effects (II)**

➤ **Long-term effects (sub-chronic or chronic exposure/months or years)**

- Lung & chest diseases (e.g. Chronic Obstructive Pulmonary Disease / *COPD*)
- Asthma
- Cancer



Greece 2007

**Western Russia 2010:  
The Moscow Times 27 October 2010**

**Deaths Up 18% in Heat Wave**

▪ Deaths soared nearly 18 percent nationwide last summer amid a heat wave that fanned wildfires and blanketed Moscow with acrid smoke, a new government report said.

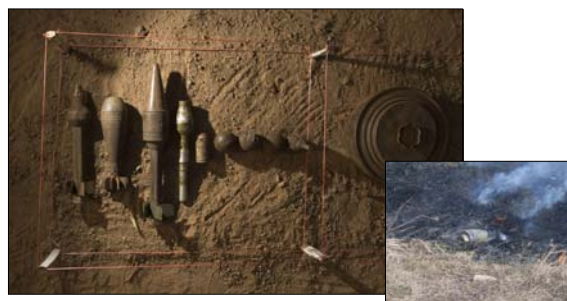
▪ Economic Development Ministry: "In connection with the unusual heat, forest fires and smoke, 14,500 more people died in July this year and 41,300 more people died in August than during the same period last year"

➤ **55,800 excessive (pre-mature) deaths due to heat and smoke in Russia 2010**



**Armed Conflicts and Wildfires**

**Unexploded Ordnance (UXO), Land Mines and Uranium-depleted Ammunition: Threats to Human Security**



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**Heritages of armed conflicts**

Germany has about 700,000 ha active or former military exercise and shooting ranges with high conservation value

About 250,000 ha are contaminated with Unexploded Ordnance (UXO)

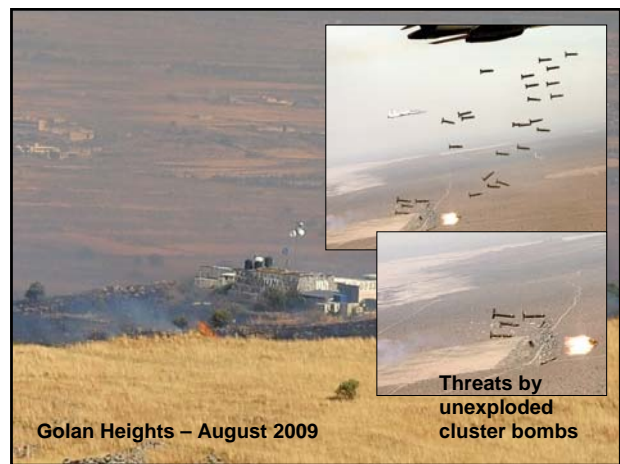
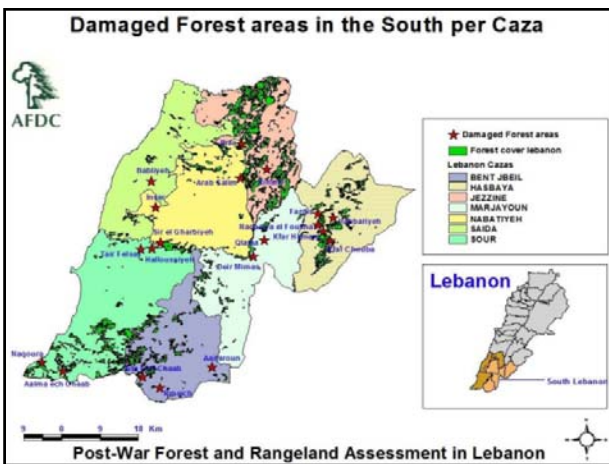
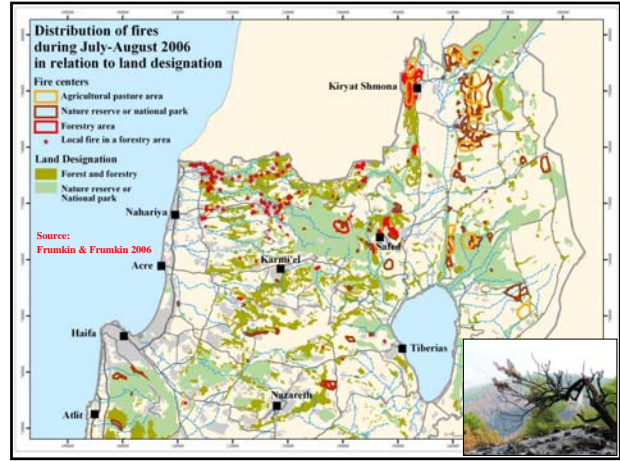


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**2006-2008 Hotspots:**

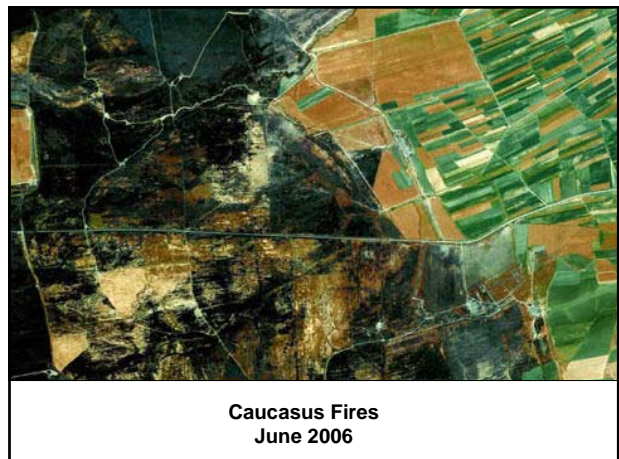
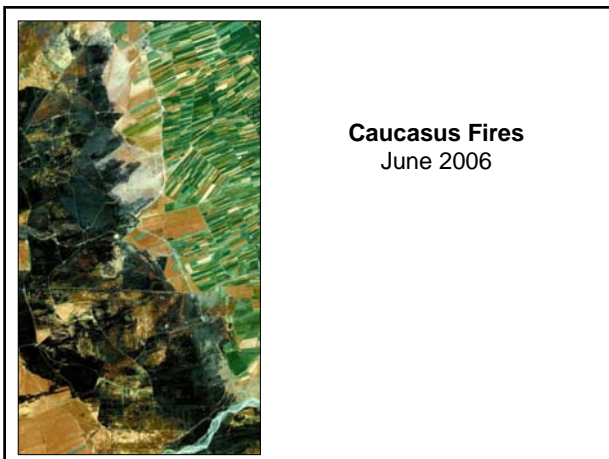
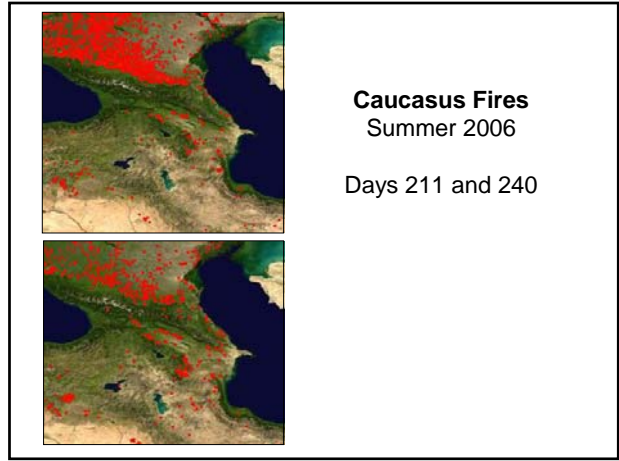
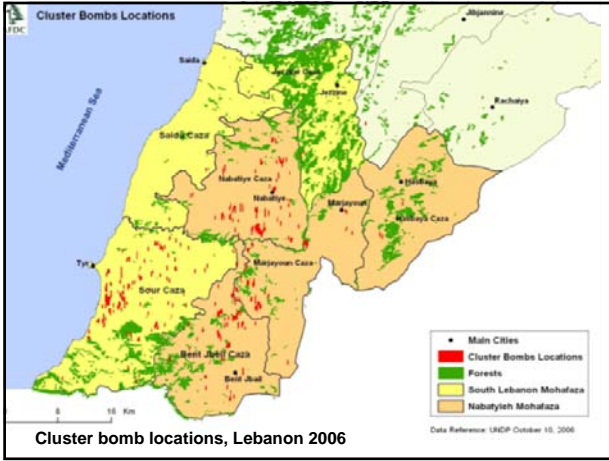
- Near East: Israel and Lebanon
- Caucasus:  
Nagorno Karabakh, Georgia
- Afghanistan
- Pakistan
- Macedonia
- Bosnia-Herzegovina



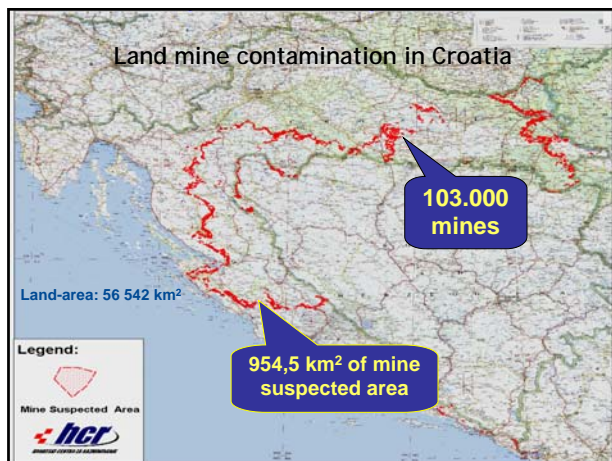
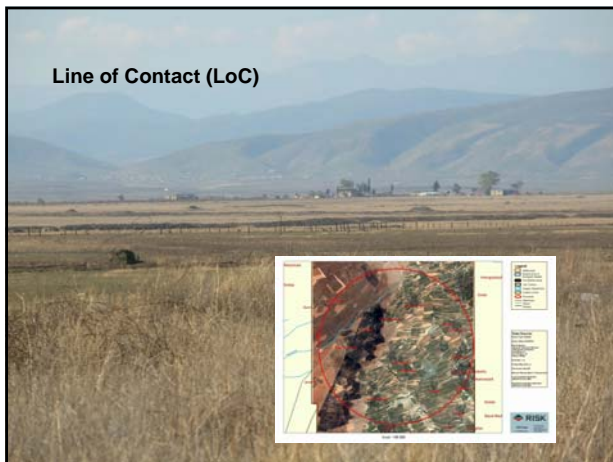




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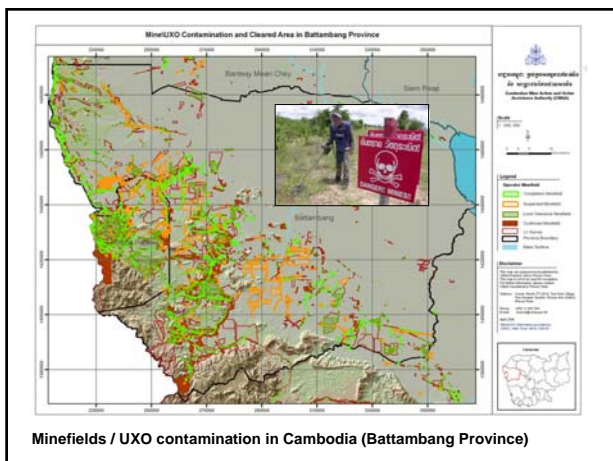
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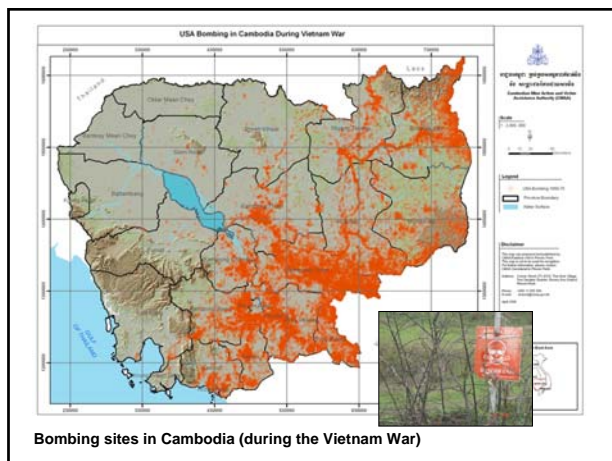
Land mine contamination in Croatia



Forest fire burning in the mine-contaminated region

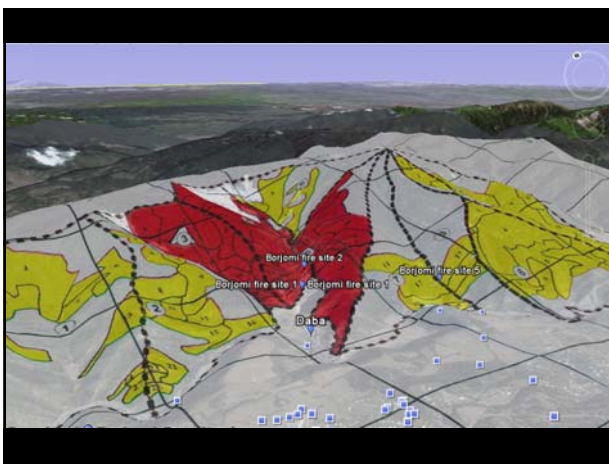


Minefields / UXO contamination in Cambodia (Battambang Province)

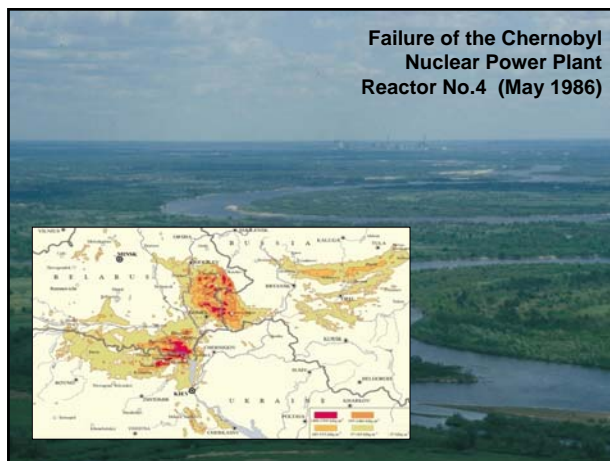


Bombing sites in Cambodia (during the Vietnam War)

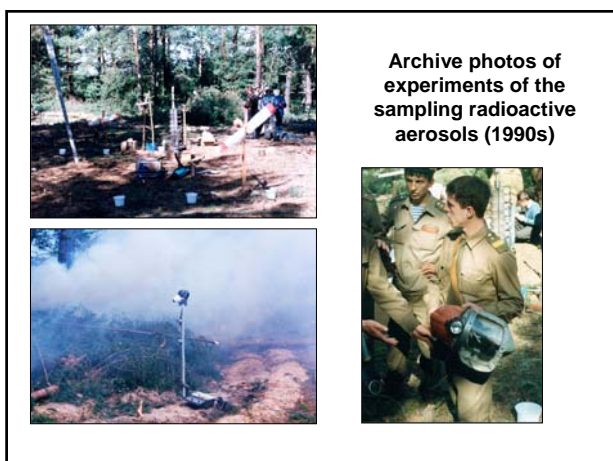
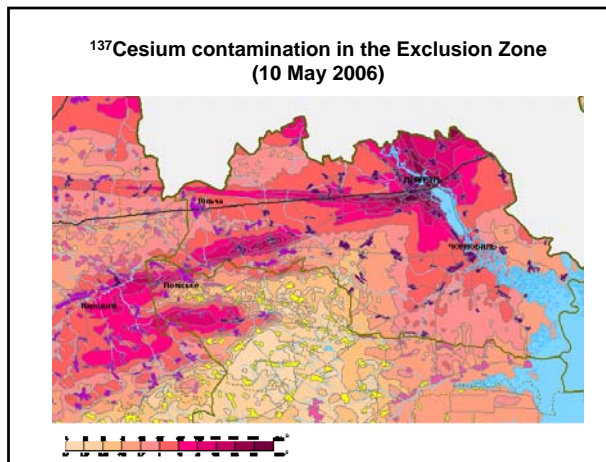
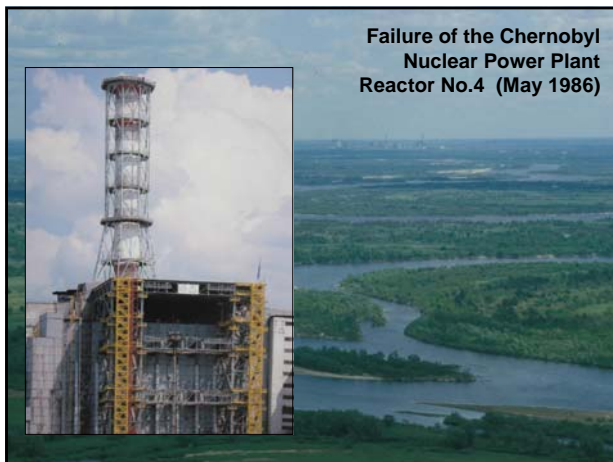
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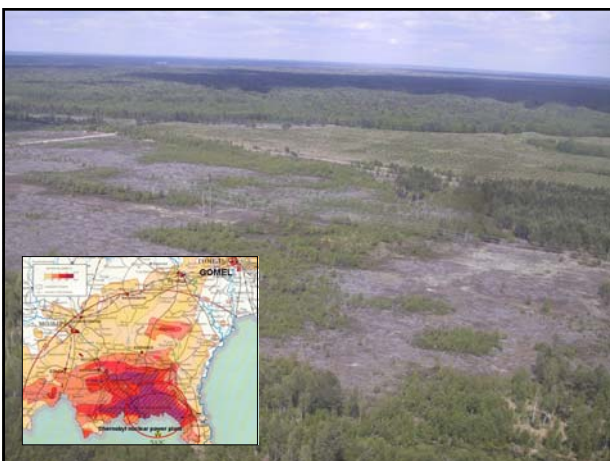


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**Consequences of the Chernobyl failure**

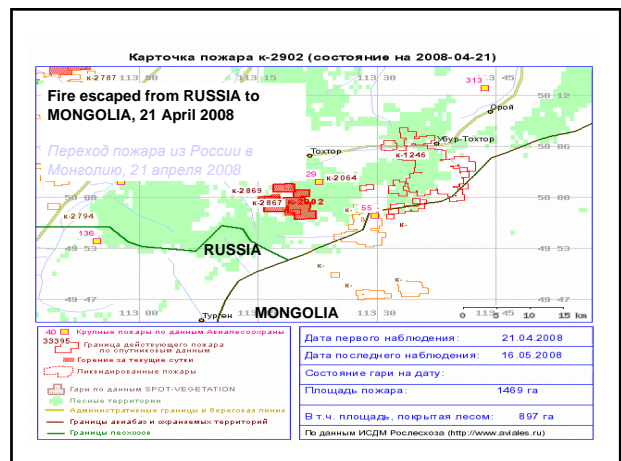
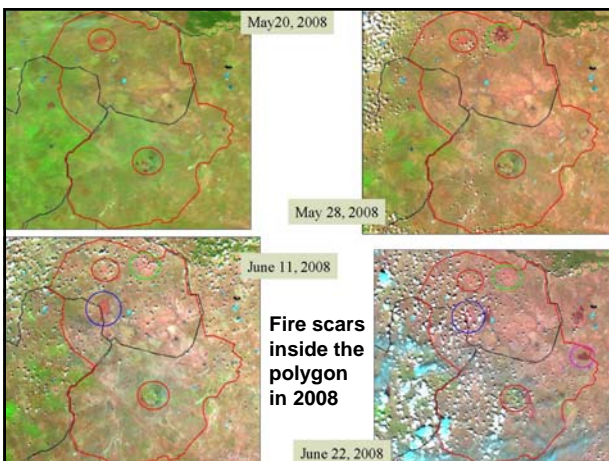
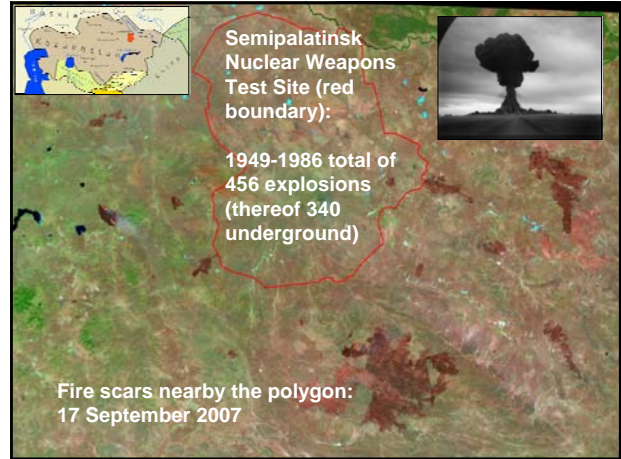
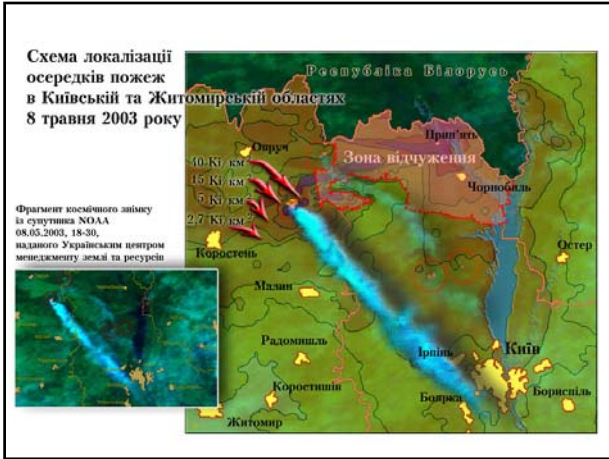
The Chernobyl firefighters scrap yard



**Situation in Ukraine – Consequences of the Chernobyl failure: Increasing wildfire hazard in non-managed and insect-damaged forests**

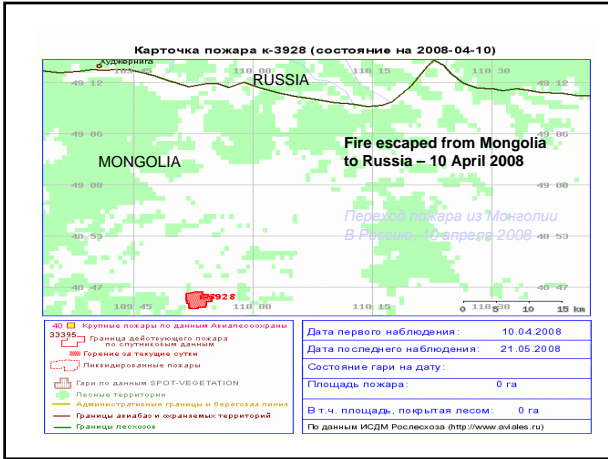


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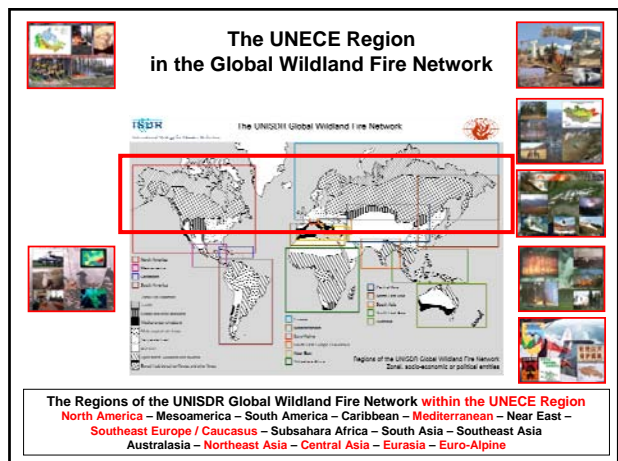
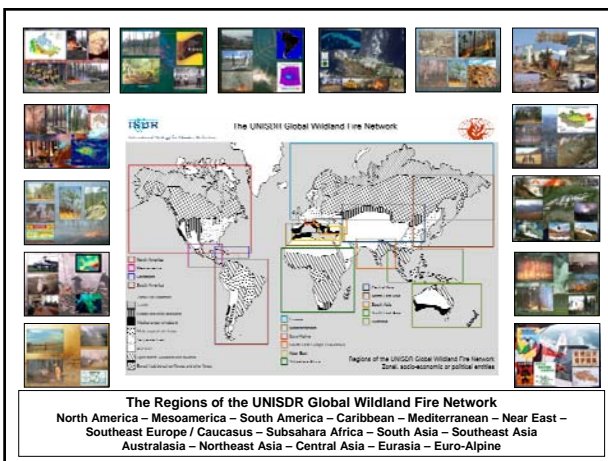
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**Intent and Overview of this presentation (III)**

In 2010 regional initiatives have made progress towards by initially discussing new and further developing existing regional mechanisms to address transboundary fire / smoke problems and cooperation in fire management

- UN Economic Commission for Europe (UNECE)
- Asia-Pacific Economic Cooperation (APEC)
- North America / Australasia Cooperation
- European Union (EU)
- Southern African Development Community (SADC)
- Association of South East Asian Nations (ASEAN)



**Government-mandated Team of Specialists on Forest Fire – Terms of Reference (extract)**

To provide, in close cooperation and coordination with the partners.....

- **guidance to ECE member states on forest fire management and forest fire policies, including bilateral / international cooperation of ECE member states.**

**Emphasis:**

- .....
- **Implementation of transboundary cooperation**

**UNECE Activity 2010-2011 (I)**

**International meeting on Cross-boundary Fire Management** (Irkutsk, Russia, 16-18 June 2010)

**Emphasis:**

- Enhancing efficiency and effectiveness of regional cooperation in fire management




**New edition of the International Multi-Lingual Fire Management Glossary**

**Russian and Mongolian added**

<http://www.fire.uni-freiburg.de/literature/glossary.htm>




**UNECE Activity 2010-2011 (II)**

**Organization of the “UNECE Regional Conference on Cross-boundary Fire Management” (to be hosted by the United Nations in 2011)**

**Goal:**

- Development of an UNECE Agreement on “Cross-boundary Fire Management”



**INTERNATIONAL YEAR OF FORESTS • 2011**



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### The Asia-Pacific Economic Cooperation (APEC) Region in the Global Wildland Fire Network

The UNISDR Global Wildland Fire Network

**The Regions of the UNISDR Global Wildland Fire Network within the APEC Region**  
 North America – Mesoamerica – South America – Caribbean – Mediterranean – Near East – Southeast Europe / Caucasus – Sub Sahara Africa – South Asia – Southeast Asia – Australasia – Northeast Asia – Central Asia – Eurasia – Euro-Alpine

### APEC Member Countries in the Global Wildland Fire Network

**APEC Member Countries in the Global Wildland Fire Network**

- Australia
- Brunei
- Canada
- Indonesia
- Japan
- Republic of Korea
- Malaysia
- New Zealand
- Philippines
- Singapore
- Thailand
- United States
- Chinese Taipei
- Hong Kong, China
- People's Republic of China
- Mexico
- Papua New Guinea
- Chile
- Peru
- Russia
- Vietnam

### Asia-Pacific Economic Cooperation (APEC) Activity 2010

**International APEC Conference on Forest Fire: Management and International Cooperation in Fire Emergencies of the Asia Pacific** (Khabarovsk, Russia, 3-7 October 2010)

**Emphasis:**

- Harmonization of design of bi- and multilateral agreements with the UNECE region

МЕЖДУНАРОДНАЯ КОНФЕРЕНЦИЯ  
 по управлению лесными пожарами и международной кооперации в чрезвычайных ситуациях в Азиатско-Тихоокеанском регионе  
 3-7 Октября 2010 г. Хабаровск, Россия

INTERNATIONAL CONFERENCE  
 ON FOREST FIRE MANAGEMENT AND INTERNATIONAL COOPERATION IN FIRE EMERGENCIES OF THE ASIA PACIFIC REGION  
 OCTOBER 3-7 2010  
 KHABAROVSK, RUSSIA

### The ASEAN Region in the Global Wildland Fire Network

The UNISDR Global Wildland Fire Network

**The Regions of the UNISDR Global Wildland Fire Network within the ASEAN Region**  
 North America – Mesoamerica – South America – Caribbean – Mediterranean – Near East – Southeast Europe / Caucasus – Sub Sahara Africa – South Asia – Southeast Asia – Australasia – Northeast Asia – Central Asia – Eurasia – Euro-Alpine

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**Association of South East Asian Nations (ASEAN)**

**ASEAN Agreement on Transboundary Haze Pollution:**



ASEAN  
 Signing ceremony  
 of Haze Agreement  
 Kuala Lumpur, 2002




**The North America – Australasia Alliance  
 in the Global Wildland Fire Network**



The Regions of the UNISDR Global Wildland Fire Network **within the set of Agreements**  
 North America – Mesoamerica – South America – Caribbean – Mediterranean – Near East –  
 Southeast Europe / Caucasus – Sub Sahara Africa – South Asia – Southeast Asia –  
**Australasia** – Northeast Asia – Central Asia – Eurasia – Euro-Alpine

**North American – Australasian Cooperation  
 Activities in 2010**

**Continuation of exchange of fire management personnel  
 during wildfire emergencies**

**Emphasis:**

- Reciprocal deployment of Australian / New Zealand / USA / Canada Incident Management personnel to assist in fire emergencies
- Compatible bilateral agreements
- Use compatible incident management systems = Incident Command System (ICS)




**The European Union (EU)  
 located in the landscape of the Global Wildland Fire Network**



The Regions of the UNISDR Global Wildland Fire Network **within the European Union**  
 North America – Mesoamerica – South America – Caribbean – **Mediterranean** – Near East –  
**Southeast Europe / Caucasus** – Sub Sahara Africa – South Asia – Southeast Asia –  
 Australasia – Northeast Asia – Central Asia – **Eurasia** – **Euro-Alpine**


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**European Union / European Commission Activities (I)** 

**Consolidation of the European Forest Fire Information System (EFFIS)**

**Emphasis:**

- Overview of pan-European fire weather
- Processing of satellite-derived information (burned area)
- Continuous dialogue of an Expert Team



**European Union / European Commission Activities (II)** 

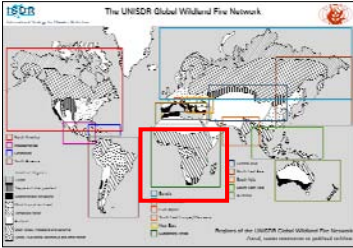
**Consolidation of the Civil Protection Mechanism**

**Emphasis:**

- Strengthening the role of the Monitoring and Information Center (MIC) in brokering requests and offers for assistance in (wildfire) emergencies
- EU Forest Fires Tactical Reserve – EUFFTR
- Coordination and sharing of (aerial) firefighting resources



**The SADC Region in the Global Wildland Fire Network**




**The Regions of the UNISDR Global Wildland Fire Network within the SADC Region**  
 North America – Mesoamerica – South America – Caribbean – Mediterranean – Near East – Southeast Europe / Caucasus – **Subsahara Africa** – South Asia – Southeast Asia  
 Australasia – Northeast Asia – Central Asia – Eurasia – Euro-Alpine

**SADC Activities 2010-2011**

**Regional consultative workshop “Development of a SADC Cross-Border Fire Management Programme”**  
 (Maputo, Mozambique, 25-27 January 2010)

**Emphasis:**

- Establishment of a regional fire management programme



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**A Coordinated approach for International Deployment and Cooperation of Aerial Firefighting Assets**

**The International Fire Aviation Working Group (IFAWG)**

- "Foundation Process" 2007-2010
- **Mission Statement:** Facilitate multilateral communication and cooperation to improve
  - safety
  - efficiency and effectiveness

of aerial fire management.



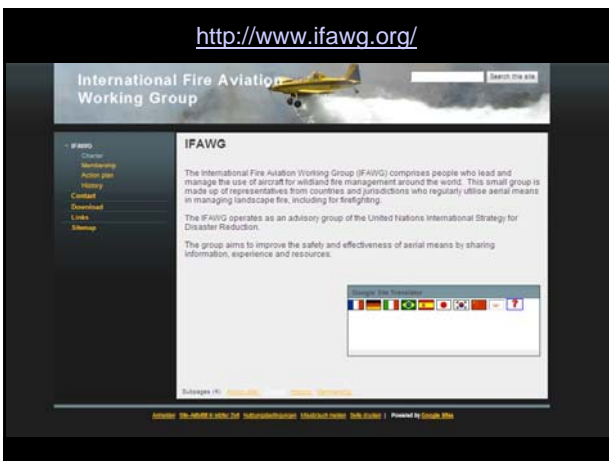
**The International Fire Aviation Working Group (IFAWG)**

**Initial membership**

- Core Group (2008-2010)
  - Australia
  - Canada
  - USA
  - Russia
- Enlarged IFAWG
  - Italy
  - South Korea
  - Spain



<http://www.ifawg.org/>



**Coordinated Outlook for 2011 and beyond**

**Support the preparation and outcomes of the 5th International Wildland Fire Conference (South Africa, May 2011)**

**Emphasis:**

- Inter-regional cooperation will be enhanced by harmonization of regional agreements (legal, voluntary)
- Reporting back to the 6th International Wildland Fire Conference (Korea, 2015): Globally most regions will be covered with intra- and inter-regional agreements on transboundary cooperation in fire management



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