Advanced Seminar

Wildfires and Human Security: Fire Management on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines

Kyiv / Chornobyl, Ukraine, 6-8 October 2009

Conducted by the Global Fire Monitoring Center (GFMC)
in the frame of the activities of the Council of Europe (CoE) and the joint project "Enhancing National Capacity on fire Management and Risk Reduction in the South Caucasus" (Environment and Security Initiative [ENVSEC]), the UNISDR Regional Southeast Europe / Caucasus and Central Asia Wildland Fire Networks and the UNECE / FAO Team of Specialists on Forest Fire

Seminar Report

Rationale and Background: Threats Arising from Wildfires burning on Contaminated Territories

In several countries of Eurasia forests and other lands are contaminated by various types of hazardous chemical and radioactive pollution or residuals of armed conflicts, e.g. unexploded ordnance and landmines. Wildfires occurring in such contaminated terrain are resulting in secondary damages, such as chemical and radioactive air pollution and explosion of unexploded ordnance (artillery grenades, bombs) and landmines on active or abandoned mined areas.

The territories most affected by radioactive pollution have been contaminated by the release of radionuclides during the failure of the Chernobyl Nuclear Power Plant in 1986. The territories most affected by radioactive pollution have been contaminated by the consequences of the disaster on the Chernobyl Nuclear Power Plant in 1986. Wildfires burning on contaminated terrain in the Chornobyl Exclusion zone in Ukraine, in Belarus or in Russia result in lifting of radionuclides deposited on vegetation and organic layers and their uncontrolled emission and fallout.

Unexploded Ordnance (UXO) is found on several hundred thousands hectares of forests and other lands throughout Western, Eastern and Southeastern Europe. Remnants of World War I battles along the frontlines of 1917 in Southern Macedonia have repeatedly created problems, e.g. during the fire season of 2007 when more than 70 incidents of explosions of ammunition triggered by forest fires were noted.

In Germany, the battlegrounds of the final phase of World War II in Brandenburg State around Berlin are still highly contaminated by hundreds of thousand of tons of unexploded artillery grenades and bombs. In addition, former military exercise areas and shooting ranges, with some of them dating back to the early 1900s, some established after the war, are posing high risk to civilian populations and especially firefighters.

In Southeast Europe, notably in former armed conflict grounds in former Yugoslavia, active land mines are limiting access, forest and fire management in large areas. In Bosnia and Herzegovina alone more than 200,000 ha of forests are contaminated by land mines. Land mines are also found in the disputed territories in the Southern Caucasus, The combat grounds in and around the Nagorno-Karabakh region represent one of the major UXO-polluted terrains worldwide. During the armed conflict in Georgia in August 2008 a number of forest fires occurred as a consequence of military activities in several sites of the country.

Besides radioactive pollution and explosives there are other threats related to environmental pollution and fires, e.g. the lifting of mercury deposited in organic layers by wildfires.

In addition, the air pollution generated by vegetation fire smoke is a phenomenon, which has influenced the global environment and society significantly since the Middle Ages. In the recent decades, increasing application of fire as a tool for land-use change has resulted in more frequent occurrence of extended fire and smoke episodes with consequences on human health and security. Some of these events have been associated with droughts that are attributed to inter-annual climate variability, or possible consequences of regional climate change. In metropolitan or industrial areas, the impacts of vegetation fire smoke may be coupled with the emission burden from fossil fuel burning and other technogenic sources, resulting in increasing vulnerability of humans. The transboundary effects of VFS pollution are a driving argument for developing international policies; to address the underlying causes for avoiding excessive fire application and to establish sound fire and smoke management practices and protocols of cooperation in wildland fire management at international level.

The Seminar

This seminar addressed specific cases in East, South East Europe and South Caucasus. Examples from Western Europe, the United States and global observations were presented. Participants were briefed and at the same time contributed to identify regional problems, expertise, and solutions of managing land and fires in forests and other lands contaminated by radioactivity, unexploded ordnance and land mines. Fire smoke pollution and precautionary/protective measures were also addressed. This first seminar of this kind worldwide gave emphasis on the East / SE Europe / Caucasus region where radioactive contamination, UXO and land mines are rather common.

The seminar had been prepared by a preparatory meeting, which was held at the Ministry of Agriculture, Forestry and Water Economy, Skopje, and was jointly organized by the Global Fire Monitoring Center (GFMC) and the UNISDR Regional Southeast Europe / Caucasus Wildland and Central Asia Wildland Fire Networks. It resulted in recommendations submitted to the Council of Europe, Secretariat of the Euro-Mediterranean Major Hazards Agreement, the Organization for Security and Co-operation in Europe (OSCE) and the Environment and Security Initiative (ENVSEC). These organizations provided some funds for preparing and logistically supporting the seminar, as well as travel costs for participation of delegates from the Caucasus region.

Goals of the Seminar

The overall goal of this Seminar was to:

- Inform national decision makers (through attending delegates) of member states of the Council of Europe (particularly member states of the Euro-Mediterranean Major Hazards Agreement), countries belonging to the Economic Commission for Europe (ECE) and / or one of the UNISDR Regional Wildland Fire Networks, as well as international organizations, on the threats of wildfires burning in contaminated terrain
- Exchange experiences on prevention and control of wildfires in contaminated terrain
- Demonstrate the risk of catastrophic consequences of wildfires burning in radioactively contaminated terrain in Ukraine, Belarus and Russia as a consequence of the failure of the Chernobyl nuclear power plant in 1986
- Inform participants on secondary risks of forest fires and other vegetation fires, notably the consequences of smoke pollution on human health and security
- Conclude on the need for action at national and international levels

Organizers, Hosts and Supporters

The seminar was an initiative of the Global Fire Monitoring Center (GFMC) and financially cosponsored by the Council of Europe, Secretariat of the Euro-Mediterranean Major Hazards Agreement, the Organization for Security and Co-operation in Europe (OSCE) and the Environment and Security Initiative (ENVSEC) and organized jointly by the

- Global Fire Monitoring Centre (GFMC) / United Nations University (UNU) in conjunction with the Nations Economic Commission for Europe (UNECE) / Food and Agriculture Organization (FAO) Team of Specialists on Forest Fire [1]
- UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network [2]
- OSCE / ENVSEC
- European Centre on Forest Fires (ECFF)

The Seminar was hosted by the

- National University of Life and Environmental Sciences of Ukraine (NUBiP of Ukraine)
- Ministry of Ukraine of Emergencies and Affairs of Population Protection from the Consequences of Chernobyl Catastrophe

and further supported by the

- Yale University, Global Institute for Sustainable Forestry, U.S.A.
- Chopivsky Family Foundation, U.S.A.

Venue and Agenda

The first and third day of the seminar took place at Scientific Council Auditorium of the National University of Life and Environmental Sciences of Ukraine. The second day included a field visit of the Chornobyl Exclusion Zone and presentations at the administration building of the Chernobyl Nuclear Power Plant.

1. Report of the Seminar Contributions

Opening Ceremony (Tuesday, 6 October 2009)

The seminar was opened with the following short addresses:

- **Academician Dmytro Melnychuk,** Rector, National University of Life and Environmental Sciences of Ukraine (NUBiP of Ukraine), welcomed the participants on the university campus and underscored the importance of the objectives of the seminar, particularly with regards to the unresolved problems in the Chornobyl Exclusion Zone (CEZ)
- **Mr. Andriy Selskiy**, Head, Administration of the CEZ, Ministry of Ukraine of Emergencies and Affairs of Population Protection from the Consequences of Chernobyl Catastrophe, named the problems of the situation in Chornobyl
- **Mr. Victor Chervonyi**, Deputy Head of State Forestry Committee of Ukraine, pointed out the significance of radioactive contamination for forestry operations in the CEZ and other contaminated regions of Ukraine
- **Prof. Dr. Dr.h.c. Johann G. Goldammer**, Head, Global Fire Monitoring Center (GFMC), on behalf of the UNISDR Wildland Fire Advisory Group / Global Wildland Fire Network, and United Nations University (UNU), explained the reason for organizing this first seminar of its kind worldwide, with special reference to human security.
- **Prof. Chadwick Oliver**, Director, Global Institute of Sustainable Forestry, Yale University, School of Forestry and Environmental Studies, referred to the successful cooperation between scientists from Ukraine, USA and Germany in addressing the issue of radioactive contamination and fires.
- **Prof. Dr. Victor Poyarkov**, European Center of Technological Safety, Ukraine, explained the role of the EUR-OPA Major Hazards Agreement, Council of Europe, in fostering cooperation of countries in reducing risks of major disasters in the region.
- **Mr. David Swalley**, Representative of the Organization for Security and Cooperation in Europe (OSCE) and the Environment and Security Initiative (ENVSEC), explained the interests and role of the OSCE and the ENVSEC to support the seminar
- **Prof. Dr. Nikola Nikolov**, Coordinator, UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network, Faculty of Forestry, Skopje, Macedonia, welcomed the participants on behalf of the regional network.
- **Dr. Leonid Kondrashov**, Coordinator, UNISDR Regional Central Asia Wildland Fire Network, Pacific Forest Forum (PFF), Khabarovsk, Russia, said that this seminar will address a topic that is of key importance for Eastern Europe and Central Asia.

[1] http://www.fire.uni-freiburg.de/ and http://www.fire.uni-freiburg.de/intro/team.html
[2] http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/SEEurope.html

Presentation and discussion I: Forest Fires in Radioactively Contaminated Terrain

- **Forest fires in radioactively contaminated terrain in the Ukraine**, a keynote paper presented by Prof. Dr. Valeriy Kashparov, Ukrainian Research Institute of Agriculture Radiology, NUBiP of Ukraine, Ukraine
- **International cooperative efforts to address the problem of fires burning in the radioactively contaminated forests in the Chornobyl Exclusion Zone**, a keynote paper presented by Prof. Dr. Chad Oliver, Yale University, U.S.A.
- **Organization, facilities, tactic and new technologies which are utilized on the south of France for a fight against natural fires and management of personnel safety**, paper presented by Mr. Jean-Michel Dumaz, Centre de Secours Principal d'Aix en Provence SDIS13, France.
- **Problems of forest fire management on terrains with radioactive contamination out of the Chornobyl Exclusion Zone** paper presented by Mr. Victor Parfeniuk, Head, Revision and Control department, State Forestry Committee of Ukraine).

Presentations and discussion II: UXO and land mines

- **Wildfire Management and UXO in the Region of Southeast Europe / Caucasus,** paper presented by Prof. Dr. Nikola Nikolov, Faculty of Forestry, Skopje, Republic of Macedonia.
- **Organization of mine action in Croatia**, paper presented by Mr. Oto Jungwirth, Croatian Mine Action Centre, Croatia.
- **Demining technologies and fire-fighting interventions in forests, paper presented by** Mr. Vjekoslav Majetic, Croatia
- **Fire management in areas contaminated by land mines in Turkey**, paper presented by Prof. Dr. Ertugrul Bilgili, Faculty of Forestry, Karadeniz Teknik Üniversitesi, Trabzon, Turkey
- **Organization of destruction of explosively dangerous items on the territory of Ukraine. Structure of pyrotechnical units of Ministry of Emergency of Ukraine**, paper presented by Mr. Dmytro Chukavin, Department of rescue operation management, Ministry of Emergency of Ukraine
- **The use of prescribed fire on nature conservation areas in Germany contaminated by UXO**, paper presented by Prof. Dr. Johann G. Goldammer, GFMC, Germany

Presentations and discussion III: Recent armed conflicts and fire

- **Demining and forests fire protection in the mountain districts of Georgia**, paper presented by Mr. Giorgi Bagaturia, Ministry of Environment Protection and Natural Resources of Georgia, Forestry Department
- **Forest fire problems in Georgia**, paper presented by Mr. Ilia Edilashvili, Emergency Management Department, Ministry of Internal Affairs of Georgia
- **UXO and land mines on the territory of Armenia**, paper presented by Mr. Nver Gevorgyan, Ministry of Defense of Armenia
- **Overview on fire management in Armenia**, paper presented by Mr. Arthur Voskanyan, Ministry of Emergency Situations of Armenia

Presentations at Chornobyl Nuclear Power Station conference room and Field visit of Chornobyl Exclusion Zone (Wednesday, 7 October 2009)

Presentations and discussion IV: Radioactive Contamination and Forest Fires

- **Welcome remarks and introduction** by Mr. Mykola Proskura, Deputy Head, Administration Department of the Chornobyl Exclusion Zone
- **Wildfires and the global-scale Cesium-137 background activity**, paper presented by Dr. Gerhard Wotawa, Central Institute for Meteorology and Geodynamics, Austrian National Data Centre for CTBT Verification, Austria
- **Wildfire in the Chornobyl Exclusion Zone: A worst case scenario**, paper presented by Dr. Aaron Hohl, Humboldt University; Dr. Andrew Niccolai, Yale University, U.S.A)
- **Radioecological follow-on of the fire consequences in the radionuclide-contaminated forest sites**, paper presented by Dr. Andrey Razdayvodin, Dr. Eugeniy Zhukov, Dr. Alexander Radin, All-Russian Research Institute of Silviculture and Mechanization of Forestry (VNIILM), Ministry of Agriculture, Russian Federation

Presentations and discussion V: Fire Management in Contaminated Terrain

- **Aerial fire management on terrain contaminated by radioactivity**, paper presented by Mr. Andrey Eritsov, Aerial Forest Fire Center of Russia "Avialesookhrana", Russian Federation, and Prof. Dr. Johann G. Goldammer, GFMC
- **Fire hazard of the forests in the Chornobyl Exclusion Zone**, paper presented by Prof. Dr. Sergiy Zibtsev, NUBiP of Ukraine, and Mr. Anton Kruchok, Ministry of Emergency of Ukraine
- **Problems of forest and fire management in the Chornobyl Exclusion Zone**, paper presented by Anatoliy Prokopenko, Public Forest special enterprise "Chornobyl Puscha"
- **Problems of forest fire fighting in the Chornobyl Exclusion Zone**, paper presented by Mr. Vladimir Kukos, Chernobyl, Ukraine.

The presentations were followed by a visit of the sarcophagus of Chernobyl Reactor Number 4, the contaminated forests in the Exclusion Zone, and the Chornobyl Fire Station.

Presentations and discussion VI: Vegetation Fires, Human Health and Human Security (Thursday, 8 October 2009)

- **Asymmetric wildfire in the United States**, paper presented by Mr. Richard Lasko Richard, U.S. Forest Service, Washington U.S.A.
- **Wildland fire smoke pollution: Khabarovsk Case Study**, paper presented by Dr. Leonid Kondrashov, Pacific Forest Forum (PFF), Khabarovsk, Russian Federation.
- **Vegetation fire smoke and human health impacts**, paper presented by Prof. Dr. Milt Statheropoulos and Dr. Sofia Karma, National Technical University of Athens / European Center for Forest Fires, Greece, and Prof. Dr. Johann G. Goldammer, GFMC, Germany.

2. Minutes of the concluding discussion

The final discussion on 9 October 2009 was held to conclude the results of the seminar and to prepare the seminar statement. The main contributions are summarized as follows:

Remarks by Mr. Mykola Proskura, Administration of the Exclusion Zone and the Zone of Absolute Resettlement, Ministry of Ukraine of Emergencies and Affairs of Population Protection from the Consequences of the Chornobyl Catastrophe

He thanked all participants and expressed the hope that these meetings would become a tradition. He apologized that the Minister and the vice minister could not attend, due to a foreign mission and budget negotiations.

He underscored the need to screen the regulations that are stipulating the rating of contamination doses that influence the anticipated threat and determine the official measures taken by the administration. The proposals include:

- Besides the development of models it is important to use realistic data and scenarios to exactly calculating the dosage that people receive from emissions of fires burning in contaminated terrain. The following key scenarios were suggested:
  - Consequences of changing water regime of the cooling pond (lowering of the water table): Impacts of exposure of radionuclides embedded in sediments and organic layers.
  - Consequences of enhanced forest management activities on radionuclide deposits and wildfire hazard.
- Enhancing applied research for treating the management of contaminated vegetation (practical and methodological advice)
- The current draft fire management plan for the Chernobyl Exclusion Zone (CEZ) needs to be revised. The current draft provides space for improvement. The international community is asked to assist Ukraine to develop a comprehensive new fire management plan.
- Satellite remote sensing for monitoring the contaminated vegetation in Ukraine: There is no facility / center anymore to properly receive and process satellite data to allow near-real time monitoring of territories at risk, notably fires and fire effects, based on a GIS database. Such development could be done by the Ukraine Agricultural University.
- Information management concerning incidents in the CEZ: Clear protocols must be developed to inform the public properly in order to avoid unnecessary panic or insufficient information. Public

information of radiation doses should be handled ethically, based on best and reliable technologies and science.

Remarks by Prof. Dr. Victor Poyarkov, European Center of Technological Safety, Council of Europe, EUR-OPA Major Hazards Agreement

The proposals by the CEZ administration are supported, although realistically there is currently little financial support for implementation. So, we have to define priorities of proposed activities.

First of all we need to send a clear message to the population about risks related to wildfires in the CEZ. The model presented at the seminar reveals that there is an increased understanding of the fire-induced processes and demonstrated that there are no significant hazards to the population outside the CEZ. The problem of possible some food contamination by a major fire incident could be relatively easy be controlled.

This is correlated with the current understanding (based on models) of the consequences of a possible collapse of the sarcophagus of Reactor 4 (a worst-case scenario leading to the release of contaminated dust particles) is that populated areas would not significantly be affected.

However, inside the CEZ 4000 people are working, including firefighters. They need to be protected. Emergency planning is critical, local response protocols (following the USA experience) are needed. This refers also to other countries and different kind of contamination by toxic chemicals (e.g., mercury).

Remarks by Prof. Dr. Johann G. Goldammer, Global Fire Monitoring Center (GFMC)

Dedicated guidelines for fire management on contaminated terrain need to be developed, including the prevention of wildfires, the preparedness for coordinated and swift response, methods and equipment for fire suppression that are providing special protection to firefighters and the public against threats arising from the contaminated terrain, including smoke pollution. Standard Operating Procedures (SOP) and protocols need to be developed to address the problem from local, national, regional to international scales.

Characteristics and spatio-temporal range of threats to be addressed include:

- Land mine explosions triggered by firefighters: Immediate impacts. Spatio-temporal range. Localized to up to 100 m. Immediate threat – no early warning possible. Protective measures: Adequate personnel protective equipment for firefighters.
- UXO and land mine explosions triggered by wildfire: Immediate impacts. Spatio-temporal range. Localized to up to 1000 m. Immediate threat – no early warning possible. Protective measures: Adequate personnel protective equipment for firefighters.
- Radioactivity release by wildfire with high contamination doses on site and in the nearby surrounding territory: Threat to exposure of firefighters and local population. Spatio-temporal range. Localized to up to 10-20 km. Early warning possible. Protective measures: Adequate personnel protective equipment for firefighters. Issue of warnings and evacuation of population.
- Radioactivity release by wildfire with below-threshold contamination doses in remote fallout regions: Threat to contamination of foodstuff and water resources. Spatio-temporal range. Up to several hundred kilometers, several days. Early warning possible. Protective measures: Adequate information measures and regulatory orders (e.g., control of foodstuff and exposed water resources and other contaminated surfaces, restriction of crop harvest, processing and dissemination of foodstuff.
- Vegetation fire smoke (including emissions from burning of technogenic and chemical substances) containing substances / particles endangering public health and safety: Threat to exposure of firefighters and population. Spatio-temporal range. Up to several hundred kilometers, days to weeks. Early warning possible. Protective measures: Adequate personnel protective equipment for firefighters. Issue of warnings of population (advice for general public or highly vulnerable people, e.g. stay indoors / in shelters, wearing of respirators, preparedness of hospitals, in extreme cases evacuation), traffic safety advice / measures (due to reduced visibility)
- Fire release and long-range transport of anthropogenic radioactivity and other pollutants (e.g., mercury) from terrestrial deposits: Uncontrolled redistribution of pollutants from primary deposits to secondary deposits. Spatio-temporal range: Continental, inter-continental to global, several days to months. Tracking of pollutants possible. Protective measures: none.

Remarks by Mr. Richard Lasko, USDA Forest Service, Fire and Aviation Management

Based on the impressions of "asymmetric" fires, i.e. fires burning in "atypical" environments Mr. Lasko underscored the need for the development of international standards, notably safety standards, for fire management in contaminated terrains.

Remarks by Prof. Dr. Johann G. Goldammer, Global Fire Monitoring Center (GFMC)

He reflected briefly on the discussion on the necessity to reduce the threats of ground personnel operating on contaminated terrains. The use of automated fire detection systems based on advanced sensors installed on the ground, and the recent trend in the development and use of Unmanned Aerial Vehicles (UAV) (drones) and Unmanned Aerial Systems (UAS) for monitoring ongoing fires for operational decision support will contribute to a decrease of exposure / risk of firefighters.

Remarks by Prof. Dr. Nikola Nikolov, UNISDR Regional Southeast Europe / Caucasus Wildland Fire Network

He proposed the development of regional projects to enhance capabilities in fire management on contaminated terrain. He stressed the situation in the Balkan region, where besides land mines the remnants of ammunition consisting of depleted uranium pose an additional threat to firefighters and population. He pointed out the necessity of UXO and land mine clearing in the conflict zones on the territories of the Southern Caucasus countries.

Remarks by Mr. David Swalley, Organization for Security and Co-operation in Europe (OSCE)

He underscored that the interests of the OSCE and particularly of the Environment and Security Initiative (ENVSEC), in line with the concerns and proposals presented in the presentations and the discussion. Governments of countries confronted with problems arising from fires burning on contaminated terrain and requiring scientific and technical advice should officially approach the OSCE for consultation.

Remarks by Dr. Andrey Razdayvodin, All-Russian Research Institute of Silviculture and Mechanization of Forestry (VNIILM), Ministry of Agriculture of Russia

He described the current situation in Russia where the forestry and fire management responsibilities were decentralized. The federal responsibilities were reduced, and this is affecting, among other, the situation in Bryansk Oblast. This region suffered most from the Chernobyl event. VNIILM identified contamination by 137-Cs in the magnitude of up to 150-200 Cu km^2. The capabilities of local and provincial authorities to tackle the problems of fires burning in the highly contaminated terrain are limited. It is therefore proposed that a zone along the borders are established in which federal authorities are responsible.

Remarks by the representative of the Emergency Ministry of Azerbaijan

He reported that Azerbaijan is available for international cooperation in response to emergency situations. Azerbaijan has cooperated not only in response to earthquakes (e.g., in Iran) but also assisted Turkey in putting out fires. Azerbaijan is operating two BE-200 water bombers (Russian-made water scooping airplanes).

Concerning the UXO / land mine problem he stressed that modern mine / UXO clearing equipment, as presented by the representatives of Croatia, would be needed.

Remarks by Dr. Leonid Kondrashov, Pacific Forest Forum (PFF) / UNISDR Regional Central Asia Wildland Fire Network, Russia / UNISDR

He stressed that it will be most important that government be informed about the results of the deliberations of the seminar. It should also be considered to establish a Working Group that will follow up the seminar, by developing a plan of action and implementation of priority measures.

Remarks by Prof. Dr. Ertugrul Bilgili, Faculty of Forestry, Karadeniz Teknik Üniversitesi, Trabzon, Turkey

He urged the countries of the region to develop sound national fire management plans (integrated plans which would involve early warning and detection, preparedness, public awareness, training of efficient rapid response teams; and integrated management plan for contaminated terrains). Schemes should be developed to assess the effects of fires on human health and security.

Remarks by the State Forest Committee, Ukraine

The State Forest Committee stressed three important points:

- It must be taken into consideration that wildfires occur also outside of the exclusion zone where there are large areas contaminated by radioactivity as well. Attention must be given to these territories.
- It is mandatory to initiate the development of common standard procedures for fire extinguishing in contaminated terrains between Russia, Ukraine und Belarus.
- Common joint research efforts should be carried out to prevent the occurrence, severity and impacts of wildfires burning on radioactively polluted territories. Such efforts should be conducted under the auspices of the GFMC.

Remarks by Prof. Dr. Chad Oliver, Global Institute for Sustainable Forestry, Yale University, U.S.A.

He underscored the importance of specific national to international proactive measures and targeted response measures to be taken to prevent and manage fires burning on contaminated terrain. He suggested:

- An international "hotline" should be established to be alerted in cases of significant fire events that are threatening human health and security at larger scale. An international clearing house should be established to facilitate rapid assessment of critical situation and coordinated response.
- Strategies and internationally agreed protocols for firefighting on contaminated terrains should be developed.
- The analysis "Wildfire in the Chernobyl Exclusion Zone: A worst case scenario", conducted as a joint effort of Ukrainian, US and international institutions, will be finalized within a few weeks to months and will be sent out for peer review. Although preliminary results indicate secondary pollution of fire-generated radioactivity release will not exceed national Ukrainian thresholds to prompt immediate evacuation of populations living downwind, the fires burning on contaminated terrain are a reason of concern for additional dispersal of radioactivity. Thus all efforts should be made to reduce the risk of uncontrolled fires burning in the Exclusion Zone and elsewhere in Ukraine, Belarus and Russia.

Concluding Remarks by Prof. Dr. Johann G. Goldammer, Global Fire Monitoring Center (GFMC)

In conclusion and with special reference to the last contributions to the discussion he stressed that the call for a dedicated center at international level to serve as a clearing house and central alert contact for large environmental and humanitarian emergencies caused by extreme fires are in line with the intent of the UN Advisory Group on Environmental Emergencies (AGEE), which is operating under the auspices of the UN Office for the Coordination of Humanitarian Affairs, to establish an international "Environmental Emergencies Centre" that would possibly be working in a decentralized mode through dedicated existing centers such as the Global Fire Monitoring Center (GFMC).

The discussions during the seminar also revealed the needs for enhancing trans-border cooperation in fire management throughout Eastern Europe / Central Asia, particularly along those borders of countries that are sharing common problems such as radioactive pollution, e.g., in the border region between Belarus, Ukraine and Russia, and the borders that are contaminated by UXO and land mines dating back from historic armed conflicts. The declaration of the seminar should reflect on this and call for action.

3. Resolution of the Seminar

(see following separate pages)

Chernobyl Resolution on Wildfires and Human Security
Challenges and Priorities for Action to address Problems of Wildfires burning on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines

Rationale and Background: Threats Arising from Wildfires burning on Contaminated Territories

In several countries of Eurasia forests and other lands are contaminated by various types of hazardous chemical and radioactive pollution or residuals of armed conflicts, e.g. unexploded ordnance and landmines. Wildfires occurring in such contaminated terrain are resulting in secondary damages, such as chemical and radioactive air pollution and explosion of unexploded ordnance (artillery grenades, bombs) and landmines on active or abandoned mined areas.

The territories most affected by radioactive pollution have been contaminated by the release of radionuclides during the failure of the Chernobyl Nuclear Power Plant in 1986. Wildfires burning on contaminated terrain in the Chornobyl Exclusion zone in Ukraine, in Belarus or in Russia result in lifting of radionuclides deposited on vegetation and organic layers and their uncontrolled emission and fallout.

Unexploded Ordnance (UXO) is found on several hundred thousand hectares of forests and other lands throughout Western, Eastern and Southeastern Europe. Remnants of World War I battles along the frontlines of 1917 in Southern Macedonia have repeatedly created problems, e.g. during the fire season of 2007 when more than 70 incidents of explosions of ammunition triggered by forest fires were noted. In Germany, the battlegrounds of the final phase of World War II in Brandenburg State around Berlin are still highly contaminated by hundred thousand tons of unexploded artillery grenades and bombs. In addition, former military exercise areas and shooting ranges, with some of them dating back to the early 1900s, some established after World War II, are posing high risk to civilian populations and especially firefighters. In Southeast Europe, notably in former armed conflict grounds in former Yugoslavia, active land mines are limiting access, forest and fire management in large areas. In Bosnia and Herzegovina alone more than 200,000 ha of forests are contaminated by land mines. Land mines are also found in the disputed territories in the Southern Caucasus, The combat grounds in and around the Nagorno-Karabakh region represent one of the major UXO-polluted terrains worldwide. During the armed conflict in Georgia in August 2008 a number of forest fires occurred as a consequence of military activities in several sites of the country.

Besides radioactive pollution and explosives there are other threats related to environmental pollution and fires, e.g. the lifting of mercury deposited in organic layers by wildfires. In addition, the air pollution generated by vegetation fire smoke is a phenomenon, which has influenced the global environment and society significantly since the Middle Ages. In the recent decades, increasing application of fire as a tool for land-use change has resulted in more frequent occurrence of extended fire and smoke episodes with consequences on human health and security. Some of these events have been associated with droughts that are attributed to inter-annual climate variability and regional climate change. In metropolitan or industrial areas, the impacts of vegetation fire smoke may be coupled with the emission burden from fossil fuel burning and other technogenic sources, resulting in increasing vulnerability of humans. The transboundary effects of vegetation fire smoke pollution are a driving argument for developing international policies; to address the underlying causes for avoiding excessive fire application and to establish sound fire and smoke management practices and protocols of cooperation in wildland fire management at international level.

On 6-8 October 2009 an Advanced Seminar “Wildfires and Human Security: Fire Management on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines” was held in Kyiv and Chornobyl, Ukraine. The seminar was conducted by the Global Fire Monitoring Center (GFMC) in the frame of the activities of the Council of Europe (CoE) and the joint project “Enhancing National Capacity on fire Management and Risk Reduction in the South Caucasus” (Environment and Security Initiative [ENVSEC]), the Organization for Security and Cooperation in Europe (OSCE), the UNISDR Regional

Southeast Europe / Caucasus and Central Asia Wildland Fire Networks and the UNECE / FAO Team of Specialists on Forest Fire.

The presentation of the seminar – the first of its kind worldwide – covered the phenomena and problems arising from fires burning in radioactively contaminated terrain in the Eurasia Biota. Most severe problems are in the territories of Ukraine, Russia, and Belarus, which were highly contaminated by the failure of Reactor 4 of the Chornobyl Nuclear Power Plant back in 1986. Traces of radioactivity are found in emissions from wildfires burning in Central Asia and are transported long-range and intercontinental. Wildfire incidents in the U.S.A. have threatened nuclear test facilities but so far have not resulted in severe contamination.

Reports from Germany, the Southern Caucasus countries Armenia and Azerbaijan, the Near East countries Lebanon and Israel, the Balkan countries Bosnia and Herzegovina, Croatia and FYROM Macedonia revealed the magnitude of unexploded ammunition and land mine contamination on forests and other lands, remnants from armed conflicts dating back as long as World War I. Reports on fires burning in on former military exercise and shooting ranges reveal that unexploded ordnance are activated and have repeatedly resulted in casualties of firefighters.

Problems and Challenges for Fire Management

The problems and challenges for managing fire on contaminated terrain within Europe and at global level are demanding and calling for action. Therefore the participants of the Advanced Seminar concluded the following resolution:

The participants of the consultation:

Recognizing the magnitude of terrain contaminated by hazardous chemical materials, radioactivity, land mines and unexploded ordnance in Europe, adjoining countries of Eurasia and worldwide;

Expressing concern about the asymmetric consequences of wildfires burning on contaminated terrains in human health and security;

Noting that there are insufficient public and political awareness, policies and programmes in place to identify, publicly discuss and address the prevention and management of secondary effects of wildfires burning on contaminated terrain;

Noting an increasing vulnerability of the environment and societies to the consequences of wildfires burning on contaminated terrain;

Noting that the already observed and furthermore expected future effects of human-caused climate change will result in increase frequency and severity of droughts wildfires in some ecosystems and regions which are aggravating the threats to human health and security arising from wildfires;

Noting that armed conflicts in various parts of the world have resulted in collateral damages by accidental or targeted burning of valuable natural ecosystems, agricultural and forest lands;

Concluding from the analyses and reports of the countries presented at the Advanced Seminar that there are gaps in targeted fundamental research, development of policies, sound management practices and relevant implementation strategies and programmes concerning the reduction of adverse effects of hazardous / asymmetric fires;

Expressing the intention to overcome **current gaps and shortages** in:

- Consistent information and statistics about fires burning on contaminated terrain, their causes and their effects
- Applied research in social sciences and humanities, including finances for research
- Integration of social, economic, environmental considerations and institutions in developing tangible policies and practices related to fire management on contaminated terrain
- Availability of adequate safe fire early warning, monitoring and suppression technologies
- Training in the safe and efficient use of resources for suppression of hazardous wildfires (for example, appropriate equipment for fire suppression, wildland fire safety on hazardous terrain)

- Training in the appropriate use of fire (for example, prescribed burning for fuel reduction and nature conservation on terrain contaminated with unexploded ordnance)
- Compatible approaches and exchange of expertise between countries affected

Recalling the recommendations of the International Wildland Fire Summit (Sydney, 2003), the UN-ISDR Wildland Fire Advisory Group / Global Wildland Fire Network (2004), and the FAO Ministerial Meeting on Forests (2005) with respect to the management of wildland fires and the strategy to strengthen international cooperation in wildland fire management;

Endorsing the efforts of the United Nations International Strategy for Disaster Reduction (UN-ISDR) and its Wildland Fire Advisory Group to assist and strengthen the efforts of United Nations bodies, other international organizations, and non-governmental organizations, to reduce the negative impacts of wildland fires;

Endorsing the United Nations guidelines and recommended practices for fire management, notably the WHO / WMO / UNEP Health Guidelines for Vegetation Fire Events and the UN Fire Management Voluntary Guidelines;

Supporting the objectives of the UNISDR Global Wildland Fire Network (GWFN) and the Global Fire Monitoring Center (GFMC) to systematically increase the intra- and inter-regional cooperation in wildland fire management globally;

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Recommend to governments, international organizations and non-government organizations the following action for cooperation on wildland fire research and management on terrain contaminated by radioactivity, hazardous chemicals, unexploded ordnance, land mines and fires occurring during armed conflicts:

- Develop consistent information and statistics about fires burning on contaminated terrain, their causes and their effects;
- Initiate and financially support applied research in social sciences and humanities on the consequences of fires burning on contaminated terrain;
- Develop policies and practices related to fire management on contaminated terrain that take into account social, economic, environmental considerations and institutional responsibilities;
- Give highest priority in setting up fire early warning and monitoring of fires burning on contaminated terrain and provide safe fire suppression technologies, both ground-based and aerial;
- Introduce training in the safe and efficient use of resources for suppression of hazardous wildfires;
- Introduce training in the appropriate use of fire (for example, prescribed burning for fuel reduction and nature conservation on terrain contaminated with unexploded ordnance);
- Develop compatible approaches and exchange of expertise between countries affected;
- Support the establishment of an international expert group under the auspices of the UNISDR Global Wildland Fire Network in cooperation with the UNEP / UNOCHA Joint Environment Unit to be available for assisting nations and international organizations in the prevention, preparedness, response and impact assessment of fires burning on contaminated terrain and during armed conflicts;
- Support the concept of the development of an Environmental Emergencies Center under the auspices of the United Nations, to support nations in the prevention, preparedness and management of fires burning on contaminated terrain and during armed conflicts.

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