



Towards a Cohesive Global Fire Management Strategy

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1. Introduction

Globally, fire regimes are altering in parallel with and under the influence of socio-economic developments, land-use change and climate change. Increasing vulnerability of society to the direct and secondary effects of wildland fires, as well as their transboundary nature and consequences, are prompting countries and international organizations to define their common interests in enhancing sustainable and integrated fire management capacities. The requirement for systematic and efficient sharing of scientific and technical expertise, solutions and resources, including transboundary cooperation, means that the transition from informal information exchange and networking to a more systematic and formalized cooperation is more necessary than ever.¹

Several international (global) conventions, such as the three “Rio Conventions” (CBD, CCD and FCCC) and the Ramsar Convention on Wetlands are examples of international legal agreements that provide rationale and a catalogue of environmental protection obligations for signatory countries. However, none of these or any other legally binding convention, informal or voluntary international instruments, such as the *Sendai Framework for Disaster Risk Reduction 2015-2030*², explicitly address wildland fires as a driver of environmental degradation. Nor do they address the need for integrating natural and prescribed management fires in those ecosystems and land-use systems that require fire for maintaining their function, sustainability and productivity. There are also no protocols in place that provide internationally accepted standard methods and procedures for countries that provide and receive assistance in wildland fire emergencies that would ensure inter-operability, efficiency and safety of cooperating parties.

In preparation for, and following the International Wildland Fire Summit of 2003³, the international wildland fire community has taken steps to develop preliminary concepts, templates and guidelines with widely agreed-upon principles and best practices in fire management and incident command structures. Detailed operational standards are now needed to facilitate the exchange of fire fighting resources, including aviation, management personnel, and equipment.

At the level of multilateral bodies, such as the Association of South East Asian Nations (ASEAN), the UN Economic Commission for Europe (UNECE), the Asia-Pacific Economic Cooperation (APEC), the Council of Europe (European Open Partial Agreement on the Prevention, Protection Against and Organization of Relief in Major Natural and Technological Disasters – EUR-OPA), the Organization for Security and Cooperation in Europe (OSCE), the European Union (EU), or the Southern African Development Community (SADC), recent developments have revealed the interest of countries to enhance the capabilities of regional, transboundary cooperation in fire management. Experience gained in bilateral (reciprocal) agreements include common usage of the Incident Command System (ICS) – as practiced under agreements between North American countries (U.S.A., Canada and Mexico) and between the U.S.A. and Canada on the one side, and Australia and New Zealand on the other side. These experiences may serve as examples for developing other regional agreements or protocols.⁴

¹ The keynote address refers largely to the White Paper „Vegetation Fires and Global Change“ directed to the United Nations (Goldammer, 2013a, b) and the outcomes of the UNECE/FAO Regional Forum on Cross-boundary Fire Management (see section 2.6)

² http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf

³ https://gfmc.online/iwfc/summit_2003-introduction.html

⁴ See special issue of UNECE/FAO International Forest Fire News (IFFN) No. 29, with examples of agreements and Annual Operating Plans: http://gfmc.online/iffn/iffn_29/content29.html

The Global Wildland Fire Network (GWFN)⁵ is a voluntary network which evolved in the late 1990s as an initiative of the Global Fire Monitoring Center (GFMC)⁶ and the UNECE/FAO Team of Specialists on Forest Fire⁷. The GWFN operates through the GFMC as a “Thematic Platform” under the United Nations International Strategy for Disaster Reduction (UNISDR), and promotes international cooperation in wildland fire management – notably through capacity building in wildfire prevention, preparedness and suppression, and the development of standardized procedures for use in international wildfire incident response. Lead institutions serve as coordinators of Regional Wildland Fire Networks and work with representatives of international organizations mandated or otherwise active in the wildland fire arena. These lead institutions are represented by the UNISDR Wildland Fire Advisory Group (WFAG), which provides advisory services to the UN system.

The application of fire management guidelines developed under the auspices of international organizations such as the International Tropical Timber Organization (ITTO) and the Food and Agriculture Organization (FAO) of the United Nations, coupled with major inputs of the regional network members, provide a voluntary basis of common understanding for best practices and solutions in fire management.

In the long-term, the GWFN is also aiming at developing an International Wildland Fire Accord (voluntary or binding under international law), which would be based on the rationale that there is a common international interest in protection of global vegetation cover against degradation or destruction and that common endeavors in fire management will contribute to disaster risk reduction. For example, reduction of the risks associated with direct fire damages to human assets and ecosystems, fire-generated smoke pollution affecting human health and security, release of greenhouse gases, secondary disasters such as landslides, erosion, floods and threats to biodiversity.

The following examples highlight achievements and ongoing activities, which reflect progress in the endeavor to enhance international cooperation in wildland fire management.⁸

2. Progress in regional cooperation in fire management

2.1 Association of South East Asian Nations (ASEAN)

As a consequence of extended fire and smoke episodes since the early 1980s and especially in the 1990s, ten member states of the Association of Southeast Asian Nations (ASEAN) commenced negotiations for an ASEAN agreement addressing regional air pollution resulting from land-use fires and wildfires. In June 2002 the Agreement on Transboundary Haze Pollution was adopted and came into force on 25 November 2003. With the ratification of the agreement by Indonesia in September 2014, all ASEAN member states are participating (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam).

This Agreement is historic, as it is the world’s first regional arrangement binding a group of contiguous states aimed at tackling transboundary haze pollution resulting from land and forest fires (see also Khee-Jin Tan, 2005; Nguitraoool, 2011).⁹ The Agreement requires the parties to:

- Cooperate in the development and implementation of measures to prevent, monitor, and mitigate transboundary haze pollution by controlling sources of land and/or forest fires;
- Develop monitoring, assessment and early warning systems, exchange information and technology, and allow the provision of mutual assistance;
- Respond promptly to requests for relevant information sought by a State or States that are or may be affected by such transboundary haze pollution, with a view to minimizing the consequence of the transboundary haze pollution; and

⁵ <http://gfmcc.online/GlobalNetworks/globalNet.html>

⁶ <http://gfmcc.online/>

⁷ <http://gfmcc.online/intro/team.html>, see section 2.6 of this chapter

⁸ **Note:** Materials of this paper have been presented at the 5th International Wildland Fire Conference, South Africa, 9-13 May 2011 (<https://gfmcc.online/iwfc/southafrica-2011.html>)

⁹ See ASEAN website „Haze Online“: <http://haze.asean.org/>, and the full text of the agreement at: http://haze.asean.org/wp-content/uploads/2019/11/ASEAN-Agreement-on-Transboundary-Haze-Pollution-AATHP-Reprint-2019_web.pdf

- Take legal, administrative and/or other measures to implement their obligations under the Agreement.

In 2015, the establishment of the ASEAN Haze Monitoring System (AHMS) and the ASEAN Coordinating Centre (ACC) for Transboundary Haze Pollution is currently being discussed.¹⁰ Pending the establishment of the AHMS and the ACC, the ASEAN Specialized Meteorological Centre (ASMC) in Singapore and ASEAN Secretariat, are co-performing the interim functions.

2.2 European Union (EU)

In the 1980s and 1990s, there was some exchange of firefighting expertise within the EU but little formal cooperation. The European Union Civil Protection Mechanism was established in 2001 and further strengthened in 2007. It provided a new capacity for coordination for Europe and now plays a central role in EU level forest fire risk prevention and forest firefighting coordination. There are currently 32 countries participating in the Mechanism („Participating States”): The 27 Member States of the European Union (EU) together with Iceland, Liechtenstein, Norway, Croatia and the Former Yugoslav Republic of Macedonia. The Mechanism, which is managed by the European Commission, has tools to cope with wildfires in three phases of the disaster management cycle.

The Emergency Response Coordination Centre (ERCC), launched in 2013, operating within the European Commission's Humanitarian Aid and Civil Protection department (ECHO), was set up to support a coordinated and quicker response to disasters both inside and outside Europe using resources from the countries participating in the Union Civil Protection Mechanism. The ERCC replaces and upgrades the functions of the previous Monitoring and Information Centre (MIC). With a capacity to deal with several simultaneous emergencies in different time zones, around-the-clock, the ERCC is a coordination hub facilitating a coherent European response during emergencies – including coordinated response to wildfires – helping to cut unnecessary and expensive duplication of efforts. It collects and analyses real-time information on disasters, monitors hazards, prepares plans for the deployment of experts, teams and equipment, and works with Member States to map available assets and coordinate the EU's disaster response efforts by matching offers of assistance to the needs of the disaster-stricken country. The ERCC also supports a wide range of prevention and preparedness activities, from awareness-raising to field exercises simulating emergency response.¹¹

2.3 Asia-Pacific Economic Cooperation (APEC)

In October 2010, the first *International Conference on Forest Fires: Management and International Cooperation in Preventing Forest Fires in APEC Region* was convened at the initiative of the Russian Federation. The aim of this conference was to strengthen cooperation between emergency services of the APEC member economies in order to emphasize the readiness of the region and to reduce the risks of disasters.¹² Following a comprehensive analysis of the problem of forest fires in the APEC region and other regions, the conference identified the urgent necessity for joint efforts, mutual help and cross-border cooperation in forest fire risk reduction. The conference released the “Khabarovsk Recommendations on Management and International Cooperation in Preventing Forest Fires in the APEC Region”. The following priority directions of international cooperation under APEC were among those proposed:

- Development of an international mechanism to monitor and enhance responsibility of APEC member economies to ensure forest fire protection on their territories and coordinate action under APEC using existing institutions of international cooperation, such as UNISDR Global Wildland Fire Network, ASEAN, UNECE and others.
- Promotion of economic cooperation in projects that aim to reduce the degree of fire risk and restoration of forests on lands degraded by fire and non-sustainable forest management;
- Development of bilateral agreements on cooperation in fire management, particularly between APEC economies sharing common borders, and a voluntary regional agreement on cooperation in fire management, aiming at harmonizing cooperation with neighboring regional

¹⁰ <http://www.channelnewsasia.com/news/asiapacific/five-asean-members-to/2011170.html>

¹¹ http://ec.europa.eu/echo/what/civil-protection/emergency-response-coordination-centre-ercc_en

¹² <https://gfmcc.org/wp-content/uploads/APEC-Fire-Conference-2010-Recommendations-ENG.pdf>

entities such as the UNECE and ASEAN, particularly in light of the overlapping membership of some economies.

- Development of long-term fire management strategies in each economy that allow for mitigation of the consequences of climate change.
- Improvement of strategic and operational early warning mechanisms in the APEC region as a regional activity to be coordinated with the Global Wildland Fire Early Warning system.¹³
- Conduct regular consultations to exchange knowledge and best practice.
- Reconvene and contribute to the 5th International Wildland Fire Conference scheduled for 2011 (South Africa), and the following conference scheduled for 2015 (South Korea).

A priority follow-up activity has already included a joint fire management study course offered to APEC countries in 2011, hosted by the Russian Federation.¹⁴

2.4 Southern African Development Community (SADC)

In the last two decades, vegetation fires have become a major concern in the region of the Southern African Development Community (SADC) with regard to the negative impacts they have on the welfare of the environment and humans.¹⁵ Uncontrolled wildfires cause forest and vegetation degradation as well as biodiversity loss. This can result in immediate and long-term impacts on the livelihoods of local communities and upstream impacts on national and regional economies. However, it is clearly recognized that fires are also needed to maintain healthy ecosystems and biodiversity of natural savannah and grassland vegetation types – many being adapted to regular fire occurrence. Prescribed burning is used to meet objectives often essential to sustaining livelihoods. Fire is used for conservation reasons, like removal of old growth, bush encroachment abatement, and to stimulate the growth of grazing grass. Additionally, fire is a tool for reducing fuel loadings to mitigate dangerous wildfires during the peak of fire seasons.

The SADC region of 14 Member States is home to 238 million people, of which approximately 75% are rurally based. The perceived rise in the number of wildfires negatively affects these rural communities, which are often situated near the forests that provide them with their basic needs. The on-going process of climate change has the potential to exacerbate this situation by altering the frequency, intensity, severity and seasonality of fires in the SADC region.

A SADC regional fire management programme was proposed in 2010. It provides a framework for cooperation on fire management issues across national boundaries. Fire management is a technical, socio-cultural and political challenge that requires an effective network of willing partners that include governments, the private sector, local communities and international partners to find the appropriate balance between developing and conserving natural resources and managing unwanted fires while at the same time promoting the safe and beneficial use of fire. The programme intends to foster cooperation and collaboration in fire management on a regional basis to move towards integrated environmental policies and fire management practices. It pursues a multiple stakeholder approach working closely with regional and international organizations to support five areas of fire management. These are: legal and regulatory aspects of fires; community based fire management; institutional strengthening and establishment of a fire management coordination centre; generation and dissemination of relevant fire information for detection and early warning and; associated capacity building in the respective areas.

The envisaged programme is based on the SADC Protocol on Forestry of 2002, which forms the policy framework for sustainable forest management in the SADC member states. Its objectives include the goal to achieve effective protection of the environment and to safeguard the interests of both the present and future generations.

The SADC Forestry Strategy of 2010 is based on the vision to develop and maintain a forest sector that contributes to rural development, poverty reduction and industrial progress, while continuing to retain vital ecosystem services such as water supply, climate change mitigation and biodiversity

¹³ Website of the Global Early Warning System for Wildland Fires: <https://gfmcc.org/gwfews/index-12.html>

¹⁴ <http://gfmcc.org/intro/APEC-EMERCOM-Wildfire-Management-Study-Course-2011-Agenda.pdf>

¹⁵ The information provided in the chapter is taken from the SADC Regional Fire Management Programme Document, draft proposal (June 2010). Web source: <https://gfmcc.org/wp-content/uploads/SADC-Regional-Fire-Management-Programme-Draft-Final-6.pdf>

protection. The strategy thereby provides motivation for countries to cooperate for the protection, management, and sustainable use of their forests. The primary purpose of the strategy is to provide a framework for both regional cooperation and international engagement on forest issues by paying special attention to those issues that transcend national boundaries. The strategy's mission is to facilitate cooperation among member states to 'promote the active protection, management and sustainable use of forest resources through sound policy guidance and the application of requisite skills and the best available technology, in order to enjoy the multiple benefits of forests in perpetuity'.

There is increasing willingness by SADC member states to cooperate on fire management on a regional and international basis. There is also recognition that a regional framework based on cross-border cooperation is required to address issues of national, regional and transboundary fire management. Member states have expressed the need for a regional agency or centre to foster and coordinate such cooperation and information exchange in fire management. Establishing an agency responsible for collecting and analyzing fire related data and formulating standardized rules, guidelines and procedures will ensure coordinated dissemination of relevant information and guide policy development. Furthermore, it would promote the integration of Community-Based Fire Management (CBFiM) to be included into national policies and fire management strategies.

The expected activities and outcomes of the SADC Regional Fire Management Programme include the establishment of a Regional Fire Management Coordination Center. This center will also facilitate and coordinate international and regional cooperation in fire management by providing a mechanism through which one country may request and receive wildfire suppression resources from another country. This mechanism should also encourage cooperation and exchange on other fire management activities such as training and lessons learnt. A SADC fire management programme will allow the development of a SADC Memorandum of Understanding (MoU) which will prescribe the conditions of cross-border cooperation to combat transboundary fires and include operational guidelines for the regional coordination centre.

The programme intends to foster regional-level interaction by developing guiding policy frameworks and procedures for several aspects of fire management. During the Consultative Workshop on the Development of a SADC Regional Fire Management Programme (January 2010, Maputo), participants from all SADC member states compiled capacity development measures that should be carried out by all SADC member states to ensure success of a regional fire management program.

Between 2010 and 2013 the Trilateral Cooperation Fund (TRI-CO Fund) project between South Africa, Tanzania and Germany (Trilateral Cooperation Fund – TRI-CO Fund) *Tanzania – South Africa Fire Management Coordination Project* was implemented to demonstrate the utility of coordination and exchange of techniques, resources, science and capacity building in fire management amongst contributing parties and SADC member states. The GIZ project *Transfrontier Conservation and Use of Natural Resources in the SADC Region* (2013-2015) is also addressing the cooperation of border-crossing processes in conservation, including transboundary fire management.

2.5 Latin America

Mesoamerica

Several developments during the last decade indicate the political willingness of nations in Mesoamerica to share information and resources in fire management. An important regional initiative has been launched by the First Central Mesoamerican Meeting on Forest Fire Protection (*Primera Reunión Mesoamericana de Cooperación en Materia de Protección contra Incendios Forestales*) held in Guatemala City in 2002. This regional meeting was organized within the framework of the project *Prevención y Combate de Incendios Forestales en Mesoamerica* of the *Programa Mesoamericano de Cooperación 2001-2002*, launched at the 4th Tuxtla regional dialogue. Delegates of Belize, Costa Rica, El Salvador, Guatemala, Honduras, México, Nicaragua and Panamá formally agreed to launch a programme of cooperation which includes the sharing of information and resources in fire management as well as in capacity building.¹⁶

¹⁶ In June 2003, consultations were held with the Government of Guatemala concerning cooperation between the *Mesoamerican Cooperation Regarding Protection against Forest Fires* and the GFMC. A Memorandum of Understanding was signed by the Mesoamerican Permanent Technical Group on Forest Fires (*Grupo Técnico Mesoamericano Permanente sobre Incendios Forestales*), represented by the President of the Coordinating

A number of follow-up conferences and workshops have consolidated these dialogues and strategic visions for cooperation in fire management. The Mesoamerica Meeting was followed by a meeting in Honduras (*Taller para el Desarrollo de un Plan Estratégico Regional para el Manejo del Gorgojo del Pino y los Incendios Forestales en Centroamérica*, 26-30 August 2002) in which the representatives from Central America developed a strategic plan for fire and bark beetle management in Central America. The momentum created by the Mesoamerican Meeting and the Honduras Strategy is currently maintained and coordinated by the *Comisión Centroamericana de Ambiente y Desarrollo* (CCAD). A Technical Commission on Forest Fires and Pests has been established under the CCAB/AP. In 2004 the Technical Commission requested the *Consejo Centroamericano de Bosques y Áreas Protegidas* (CCAB/AP) to officially create the Regional Central America and Mexico Forest Fire and Pest Network (*Red Regional de Centro América y México de Incendios y Plagas Forestales*) operating under the CCAD. The recommendations of the network were presented at the Pan-American Wildland Fire Conference on 23 October 2004, San José, Costa Rica.¹⁷ The Central American Strategy on Fire Management 2005-2015 (*Estrategia Centroamericana para el Manejo del Fuego*) was published in 2005¹⁸ and implemented in a number of regional activities in the following years.¹⁹

South America

In 2004, the Regional South America Wildland Fire Network was founded in Curitiba, Brazil.²⁰ In 2005 the South America Subregional Technical Workshop, sponsored by the FAO Latin American and Caribbean Forestry Commission (COFLAC) and facilitated by the Global Fire Monitoring Center (GFMC) developed the first draft of the South American Strategy on Fire Management 2006-2010 (*Estrategia de Cooperación de América del Sur para el Manejo del Fuego*).²¹ In the scope of this Strategy, it was decided to establish the *Regional South America Fire Management Network*. The network is co-chaired by the Brazilian Institute of Environment and Renewable Natural Resources (*Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA*) and its Centro Nacional de Prevenção e Combate aos Incêndios Florestais (PrevFogo), the Federal University of Paraná (Curitiba, Brazil) and the National Forestry Corporation (CONAF) of Chile.

Together with the representatives from Central America and the Caribbean, the *Regional Strategy on Cooperation in Wildland Fire Management in Latin America and the Caribbean* was finalized in a regional meeting in Santiago de Chile in 2005 and presented and at the 24th COFLAC Session in 2006. In 2007, IBAMA and COFLAC signed an MoU on technical cooperation and development of the South American Strategy on Fire Management (*Memorando de Entendimiento Para la Cooperación Técnica y el Desarrollo de la Estrategia de Cooperación de América del Sur Para el Manejo del Fuego*) and agreed on an operational bi-annual plan for the Secretariat of the network (*Plan Operativo Bianual de la Secretaría Ejecutiva del Grupo de Trabajo de América del Sur de Manejo del Fuego*). In 2012, Prevfogo/Ibama carried out the 2nd Meeting of Regional Networks (South America, Caribbean and Central America). Hosted by Brazil, this meeting aimed to review the Cooperation Strategy for the Caribbean, Mesoamerica and South America in fire management, information exchange, and to strengthen cooperative actions among these countries. Effective inter-governmental cooperation in fire management has been proven during mutual assistance in wildfire emergencies in 2012 by the cooperation between the authorities of Argentina, Brazil, Uruguay and Chile, and in 2015 by the cooperation between Argentina, Uruguay and Chile. Progress can also be noted in development and use of common regional assets in wildland fire early warning and satellite monitoring, led by Brazil and *Red Latinoamericana de Teledetección e Incendios Forestales* (RedLaTIF).²² Since 1999, the Program for Reduction of Wildfires and Promotion of Alternatives to Fire-Use in the Amazon (*Amazon without Fire*) is underway. This project started as a bilateral

Council of the *Sistema Nacional de Prevención y Control de Incendios Forestales* (SIPECIF), Guatemala, and Executive Coordinator of the Presidency of Guatemala, and the Global Fire Monitoring Center (GFMC), operating under the auspices of the UN International Strategy for Disaster Reduction (ISDR), concerning Cooperation in the Global Wildland Fire Network through active participation of the Regional Mesoamerica Wildland Fire Network.

¹⁷ <http://gfmcc.online/GlobalNetworks/Panamerica/Panamerican-Conference.html>

¹⁸ <https://gfmcc.online/wp-content/uploads/CCAD-FINAL-Estrategia-Manejo-Fuego-con-logos-2.pdf>

¹⁹ https://gfmcc.online/globalnetworks/mesoamerica/MesoAmerica_6.html

²⁰ <https://gfmcc.online/globalnetworks/southamerica/SouthAmerica.html>

²¹ <http://gfmcc.online/globalnetworks/southamerica/Estrategia-Cooperacion-America-Sur-TCP-RLA-3010.pdf>

²² <http://www.redlatif.org/>

agreement between Italy and Brazil (1999 to 2008). In 2010, it became a trilateral agreement among Italy, Brazil and Bolivia. Since 2015, the program has expanded to include Ecuador.

South America is also exchanging experiences and knowledge with other regions. As part of a Technical Training Program – Agriculture, Food Security and Social Policies – offered by the Brazilian Government, a Course on Climate Change and Forest Fires was conducted by Prevfogo/Ibama for representatives of 23 countries from the Pacific Islands, Caribbean and Sub-Saharan Africa. In 2012, Brazil hosted the International Workshop *Prescribed Burning as a Tool for Wildfire Prevention* in an effort to provide a forum for international discussions addressing a controversial topic in Brazil – the use of prescribed fire. The workshop allowed exchanging expertise with African countries with similar geography and challenges in fire management: Mozambique, Democratic Republic of Congo, Zambia, Malawi, Kenya, Tanzania, and Ghana.

Since Brazil has been improving its strategies and is now developing an approach for integrated fire management (IFM) that considers community/indigenous people involvement, prescribed burning of low intensity for conservation of protected areas, and addressing prevention of wildfires and decreasing of GHG emissions. A National Integrated Fire Management Policy is being developed as a Federal Decree. The achievements of Brazil are shared with other countries and it is expected that they will influence all regional cooperation efforts.

Under the auspices of the *Organización del Tratado de Cooperación Amazónica (OTCA)*, a framework agreement among the eight countries of the Amazon Basin was developed in 2013 and 2014. It includes operational regulations and a glossary. In 2015, a Memorandum of Understanding was drafted; the MoU remains to be signed at ministerial level. In 2015, a project entitled *Support of National and Regional Competency in Integrated Fire Management to Secure Sustainable Forest Management in Uruguay and through Cross-border Cooperation with Brazil, Chile and Other Neighbouring Countries of South America* was launched. The project is an initiative of GFMC, sponsored by the Federal Republic of Germany, in partnership with Uruguay, Brazil and Chile and in synergy with projects of the German Agency for International Cooperation (GIZ).²³

2.6 United Nations Economic Commission for Europe (UNECE)

In following up the recommendations of the 4th and the 5th International Wildland Fire Conferences (IWFC), the GFMC between 2010 and 2012, initiated the preparation of a project entitled *Safeguarding Sustainable Forest Management in the UNECE Region through International Cooperation in Fire Management*. An administrative arrangement was signed in March 2013 between the UNECE and the financial sponsor; the Federal Republic of Germany, entrusted the GFMC with the implementation of the project. The project was an unprecedented effort at the regional level of the UNECE, with participation of other regional organizations or representation outside the UNECE, including several UN agencies and secretariats, to highlight the current and future problems of wildfires affecting forests and other vegetation types or ecosystems, and to elaborate proposals for addressing the increasing threats of wildfires as a consequence of global change through international collaboration. Its core activity was the organization of the *UNECE/FAO Regional Forum on Cross-boundary Fire Management*.²⁴ The preparation of the Forum included:

- Study of the Contemporary and Expected Future Wildland Fire Problems in the UNECE Region²⁵
- Proposal: Building Resilience of Nations and Communities within the UNECE Region to Wildfire Emergencies and Disasters²⁶
- Adoption of Voluntary Guidelines for Fire Aviation²⁷
- Circulation and Evaluation of a preparatory enquiry / questionnaire on the status of fire management in UNECE Member States²⁸
- A White Paper on *Fire Management Policies and International Cooperation in Fire Management in the UNECE Region*²⁹

²³ <http://www.giz.de/en/worldwide/12505.html>

²⁴ Draft Forum Outline and Agenda: <http://gfmcc.org/intro/UNECE-Fire-Forum-2013-Draft-Outline.pdf>

²⁵ <http://gfmcc.org/iwpm/UNECE-FAO-Crossboundary-Fire-Forum-Report-1.pdf>

²⁶ <http://gfmcc.org/iwpm/UNECE-FAO-Crossboundary-Fire-Forum-Report-2.pdf>

²⁷ <https://gfmcc.org/iwpm/ifawg.html>

²⁸ <http://gfmcc.org/iwpm/UNECE-FAO-Crossboundary-Fire-Forum-Report-5.pdf>

- A White Paper *Vegetation Fires and Global Change. Challenges for Concerted International Action. A White Paper directed to the United Nations and International Organizations*³⁰

In preparation for the Forum, a precursor event was organized – the international congress *Forest Fire and Climate Change: Challenges for Fire Management in Natural and Cultural Landscapes of Eurasia*. Among other, the congress resolution included recommendations which were relevant for the rationale and outcomes of the Regional Forum.³¹

The *Regional Forum on Cross-boundary Fire Management* was held on 28-29 November 2013 at the United Nations in Geneva. The Forum was attended by 49 representatives from 22 UNECE Member States, from other regions, non-government organizations, regional and international organizations (ASEAN Secretariat, SADC Secretariat, Council of Europe, OSCE), and the following United Nations organizations and secretariats: UNECE / FAO Forestry and Timber Section; FAO; UN Office for Disaster Risk Reduction / UNISDR; OCHA Environmental Emergencies Section, Joint UNEP/OCHA Environment Unit, Emergency Services Branch; Secretariat of the UNECE Convention on Long-Range Transboundary Air Pollution. Recommendations of the Forum included but were not limited to addressing the:³²

- Need to promote the understanding of and the response to the transboundary effects of fire;
- Need to expand the scope of and strengthen international cooperation in fire management;
- Application of a holistic approach to wildland fire management at a landscape level;
- Adoption and continued development of the International Wildfire Support Mechanism (IWSM) and the voluntary International Fire Aviation Guidelines;
- Need to explore options for the transition from voluntary rules to a more formalized regulatory framework, including the “exploration of options for establishing a UN Secretariat mandated with the implementation of a global fire management programme that should have a key role in facilitating the free and open global transfer of knowledge”.
- Suggestion to seek the interest of UN Organizations to become involved.

Following the final meeting with members of the ToS on Forest Fire in June 2014 at the GFMC, in conjunction with the Joint Meetings of the Global Wildland Fire Network and the UNISDR Wildland Fire Advisory Group, the *International Fire Aviation Guidelines* and the proposed concept of the *International Wildfire Preparedness Mechanism* (IWPM) (replacing the earlier proposal of an *International Wildfire Support Mechanism – IWSM*) were finalized and published on the website of the IWPM (see also Section 7 of this paper).³³ Other documents that have been prepared during the Forum project (and quoted above) are available on the IWPM website.

2.7 Council of Europe (CoE)

The Council of Europe through its European and Mediterranean Major Hazards Agreement (European Open Partial Agreement – EUR-OPA) continued to support the Regional Network by sponsoring key facilities and outreach work.³⁴ After providing financial support for the establishment of the Regional South East Asia / Caucasus Fire Monitoring Center in 2010³⁵ and preceding activities to address the problem of fire management in territories contaminated by radioactivity, unexploded ordnance and land mines³⁶, the CoE financed the establishment of the Regional Eastern European Fire Monitoring Center in Kiev, Ukraine, in 2013.³⁷ Major investments in thematic outreach work included the development of the above-mentioned Guidelines *Defence of Villages, Farms and Other Rural Assets against Wildfires: Guidelines for Rural Populations, Local Communities and Municipality*

²⁹ <http://gfmc.online/iwpm/UNECE-FAO-Crossboundary-Fire-Forum-Report-6.pdf>

³⁰ <http://gfmc.online/latestnews/Vegetation-Fires-Global-Change-UN-White-Paper-GFMC-2013.pdf>

³¹ <http://gfmc.online/GlobalNetworks/BalticRegion/NovosibirskCongress.html>

³² <https://gfmc.online/iwpm/background.html>

³³ Additionally other documents that have been prepared during the Forum project (and quoted above) are available on the IWPM website: <https://gfmc.online/iwpm/index-7.html>

³⁴ <http://www.coe.int/en/web/europarisks/gfmc>

³⁵ <http://www.rfmc.mk/>

³⁶ <http://gfmc.online/globalnetworks/seeurope/Chernobyl-Resolution-Wildfires-Human-Security.pdf>

³⁷ <http://nubip.edu.ua/en/reefmc>

*Leaders in the Balkan Region*³⁸ and the analysis of the state of fire management and wildfire threats in protected / conservation areas registered under the UNESCO World Heritage Properties.³⁹

2.8 Organization for Security and Cooperation in Europe (OSCE)

In following up the Concluding Meeting of the 22nd OSCE Economic and Environmental Forum "*Responding to Environmental Challenges with a View to Promoting Cooperation and Security in the OSCE Area*", at which the GMFC presented the experiences and visions for enhancing fire management in the EECCA region and addressing the opportunities to follow-up the work of the UNECE/FAO Team of Specialists on Forest Fire⁴⁰, the 2014 OSCE Ministerial Council Decision 6/2014 *Enhancing Disaster Risk Reduction* tasked the OSCE executive structures and the OSCE Office of Economic and Environmental Activities (OCEEA) with DRR, with emphasis on exchange of knowledge and experience in fire management (Item 6 of the decision). This high-level decision of 57 OSCE Participating States reveals the commitment of the organization to continue focusing the outreach work in wildfire disaster risk reduction in the follow-up of the work of the former UNECE/FAO Team of Specialists on Forest Fire.⁴¹

2.9 Bilateral reciprocal agreements with multilateral character: The partnership between North America and Australasia

Looking back a decade, the United States wildland fire season of 2000 at that time was the worst fire season in more than 50 years. Almost 100,000 fires burned more than 2.8 million hectares of forest and range lands. This was approximately twice the U.S. ten-year average. The season was long and difficult and firefighters faced dangerous burning conditions throughout the western U.S.A.

Faced with this unprecedented situation, and with a forecast for continuing hot and dry weather patterns, fire managers realized they would need to reach beyond U.S. borders for assistance. During the remainder of the 2000 fire season, the U.S. received assistance from more than 1200 Canadian firefighters, 96 fire specialists from Australia and New Zealand and 20 Mexican firefighters. These additional resources performed important roles in the U.S. firefighting efforts. Some international fire fighters provided much needed support to fire crews on the fireline while others performed as middle managers on incident management teams. International agreements with Canada and Mexico were in place prior to the 2000 fire season but none existed with Australia and New Zealand.

Throughout 2001 and up to August of 2002 fire managers, risk managers and solicitors from the U.S., Australia and New Zealand proposed and reviewed options to solve the liability concerns raised after the 2000 fire season. One alternative explored, was the purchase of sufficient liability insurance to meet the risk managers requirements. However, the cost was prohibitive and the policies would have become unwieldy and complex. The best possible solution was to change U.S. law that would give any international firefighter brought to the U.S. under the "Wildfire Suppression Assistance Act," tort liability coverage equivalent to that provided to U.S. Government firefighters. In August 2002, the bill was passed and signed by the President of the United States of America. The language in the bill provided the assurance required by Australia and New Zealand with the result that U.S. fire managers were once again allowed to request assistance from these countries. Signatures of the Secretaries of Agriculture and the Interior were quickly inked on the official Arrangement papers and posted overnight to Australia and New Zealand. The Australian States of Victoria, New South Wales, Tasmania, Western Australia, and South Australia and New Zealand signed these documents and within a week of the passage of legislation, 50 Australian and New Zealand fire specialists were again on U.S. fire lines filling critical mid-level management fire positions in operations and aviation.

³⁸ http://gfmcc.org/Manag/CBFiM_11.html

³⁹ Pre-publication information: http://gfmcc.org/Manag/CBFiM_12.html, see also UNESCO presentation at IWFC-6

⁴⁰ The cooperative work between the UNECE/FAO Team of Specialists on Forest Fire and the GMFC respectively with the OSCE dates back to 2006 and is documented on a dedicated website of the GMFC: http://gfmcc.org/GlobalNetworks/SEEurope/SEEurope_8.html

⁴¹ Publication of the Ministerial Council decision at: <https://www.osce.org/files/f/documents/8/6/130406.pdf>, <https://www.osce.org/oceea/disaster-risk-reduction> and mirrored at GMFC: <http://gfmcc.org/intro/OSCE-Ministerial-Council-2014-Decision-6-Enhancing-DRR.pdf>

Through mobilizations of firefighters and numerous exchange activities, these arrangements have repeatedly proven the value of having effective, flexible, cooperative and formal relationships, which are continuing until today.

3. Progress in developing guidelines, protocols and standards for increasing efficiency and effectiveness of transnational cooperation

In addition to bi- and multilateral agreements, the international community has, in recent years, developed a number of proposals, templates and models for improving governance, efficiency and effectiveness of international cooperation in wildfire disaster risk reduction, management and response. The “tools” include common international wildland fire terminology, methods for wildland fire risk identification at national, regional, and global levels and non-binding guidelines for fire management and smoke management – including dedicated eco-zonal fire management guidelines. The use of a standardized, commonly accepted wildland fire incident management system for international cooperation in a disaster situation has been proposed. The Global Wildland Fire Network has also developed a template for international cooperative agreements for countries interested in entering formal relationships on reciprocal assistance with others facing similar issues. Training in fire disaster management through the development of internationally compatible standards and competency, as well as certification of international fire responders, are important elements of improving international cooperation in wildland fire management. The following highlights some key activities in this arena.

3.1 International wildland fire terminology

The fundamental prerequisite for international cooperation in fire management is a commonly agreed upon terminology – a language that is understood by all partners intending to develop cooperation in fire management. In a number of countries very useful terminologies have been developed. This includes English-speaking countries in which fire terminologies are becoming increasingly compatible at an international level. However, terminologies show some differences in the use and meaning of terms. In some countries specific terms have been developed that are unknown elsewhere. As the English language is becoming the major language used for international cooperation in fire management it has proven useful to develop a basic English glossary with explanations of the terms, which would then be translated directly. The “Global Wildland Fire Management Terminology”, first published by FAO (1986) was updated by the Global Fire Monitoring Center (GFMC) on behalf of FAO in 1999. The glossary has not been printed as it is considered a dynamic document, open for ongoing changes considered necessary. The glossary is available as an interactive search engine on the web.⁴² In the 1999 version, the only non-English language updated was German. The FAO also added French and Spanish in the FAO web-based terminology.⁴³ In 2010 the GFMC published the Russian and Mongolian version (together with English and German), which was updated in 2014 as a special volume in Mongolian and Russian to serve the cross-border cooperation in fire management.⁴⁴

3.2 International statistical wildland fire data collection

Internationally agreed upon methodologies and procedures for establishing fire databases and formatting national fire reports are not in place. However, such databases and national fire reports (assessments) are important decision support tools required at national, regional and international levels and for targeted cooperation in fire management.

The FAO “Global Forest Fire Assessment 1990-2000” (a special report of the Global Forest Resources Assessment 2000 [FRA-2000])⁴⁵ and reports from 12 Regional Wildland Fire Networks were summarized and evaluated in the “Fire Management Global Assessment 2006”⁴⁶. This exercise revealed the lack of compatible and up-to-date statistical data sets at the global scale. The concept

⁴² <https://gfmcoonline/literature/glossary.html>

⁴³ <http://www.fao.org/forestry/firemanagement/13530/en/>

⁴⁴ <https://gfmcoonline/literature/RUS-MON-GER-ENG-Glossary-Web.pdf>

⁴⁵ Global Forest Fire Assessment 1990-2000: <http://www.fao.org/docrep/006/ad653e/ad653e00.htm>

⁴⁶ Fire Management Global Assessment 2006: <http://www.fao.org/docrep/009/a0969e/a0969e00.htm>

proposed in the “Global Wildland Fire Assessment 2004” – an initiative of the GFMC – was used for a number of national reports submitted to the Regional Wildland Fire Networks.⁴⁷ However, the assessment covered only a small number of countries.

The effective flow of information from national and regional levels to a central repository for receiving, processing and disseminating fire data must be ensured. This central organization should also feed fire information back to countries and other users that are connected through a network of national fire management agencies. An earlier recommendation by the UNECE/FAO/ILO in 1996, in which it was proposed to establish a Task Force to produce a proposal for harmonized and coordinated data collection and reporting systems that will meet the demands of various user communities, remains valid and is considered a priority.⁴⁸

The next step in overcoming uncertainties and inconsistencies of fire inventories, is the development of a global satellite-based vegetation fire inventory. The Global Observations of Forest and Land Cover Dynamics (GOFD/GOLD) project, an element of the Global Terrestrial Observing System (GTOS), sponsored by the Integrated Global Observing Strategy (IGOS), provides a forum for international information exchange, observation and data coordination (including calibration and validation of sensors and algorithms) and a framework for establishing the necessary long-term monitoring systems. The GOFD/GOLD Fire Mapping and Monitoring Theme aims to refine and articulate common observation requirements and make the best possible use of fire products from the available satellite observation systems – for fire management, policy decision-making and global change research.⁴⁹

3.3 Template for international wildland fire management cooperation

The International Wildland Fire Summit of 8 October 2003⁵⁰ provided an important forum for discussions of how to manage the future of international wildland fire management and share solutions to global problems. One of the outcomes of the Summit was a paper that offered a template and other information on cooperation in wildland fire management to countries interested in entering formal relationships and agreements with others facing similar issues.⁵¹ The paper is intended to enhance current international coordination and cooperation by providing information on the following:

- A template outlining areas to consider when developing international cooperative agreements;
- Listing of the types of cooperation and assistance that may occur between countries;
- The responsibilities of countries sending assistance and of those receiving assistance;
- Websites containing information and examples of existing cooperative agreements and arrangements.

3.4 The role of the International Wildland Fire Conferences

With the first International Wildland Fire Conference, hosted by the North American Fire Management Working Group (FMWG) in the United States (Boston, Massachusetts) in 1989, a forum was initiated which aimed to share knowledge and expertise in wildland fire management, research and operational techniques in North America. The second conference was held in Canada (Vancouver) in 1996 and saw already increased international interest and participation. The third conference, held in Australia (Sydney) in 2003, became the first truly global conference of its type, as it included the inaugural “International Wildland Fire Summit”. Since the planning of the Sydney conference and summit, the “International Liaison Committee” (ILC) of the conference series, has consciously involved international experts and leading organizations. This is largely due to the support offered by the U.S. Forest Service and the fact that they operate under the FMWG. The outcomes of the 2003 International Wildland Fire Summit and the following conferences in Spain (Sevilla) in 2007 and South

⁴⁷ Global Wildland Fire Assessment 2004: <http://gfmcc.org/assessment/assessment.html>

⁴⁸ Initial proposal for a global fire dataset by the ECE/FAO International Conference “Forest, Fire, and Global Change”: https://gfmcc.org/iffn/org/ecefao/ece_3.html#Annex%20II

⁴⁹ GOFD/GOLD Fire Implementation Team: See section 6 of this paper.

⁵⁰ See section 3.4 of this chapter

⁵¹ Published in International Forest Fire News (IFFN) No. 29, p. 10-14:
http://gfmcc.org/iffn/iffn_29/content29.html

Africa (Sun City / Pilanesberg National Park) in 2011, reveal that the IWFC have become the premier international forum on wildland fire policy, management, and transfer of science and technology applications.

The outcomes of the International Wildland Fire Summit included a Summit Communiqué and five strategic papers released by the Summit participants:⁵²

- Guiding Principles for Wildland Fire Management: Guiding principles are suggested for consideration by international collaboration on fire management projects.
- International Wildland Fire Management Agreements Template: This paper identified issues and provided a template to encourage countries to cooperate in dealing with wildland fire.
- Incident Command System (ICS): A globally implemented ICS will improve firefighter safety, efficiency and effectiveness in management response.
- A Strategy for Future Development of International Cooperation in Wildland Fire Management: The Summit participants recommended a series of strategies that will build on the work of many groups, conferences and regional summits and produce a series of actions building towards enhanced international cooperation in wildland fire management.
- Community-Based Fire Management: The paper addressed the role of local communities to become involved in fire management, and examples of and suggestions for implementation.

The conclusions of the 4th and the 5th International Wildland Fire Conferences identified priority issues concerning wildland fires globally and recommended to systematically strengthen fire management at national, regional (multinational) and global levels. The calls for enhancing international cooperation in fire management are reflected by the outcomes of the regional sessions and the conference statements.⁵³ The 6th International Wildland Fire Conference in the Republic of Korea in 2015 will evaluate the achievements of the previous conferences.⁵⁴

4. Internationally compatible training standards and competency, and certification of international fire responders

Capacity building of human resources is a key prerequisite for efficient planning and implementation of sustainable fire management. Many countries that are in need of developing or reviewing fire policies or upgrading existing fire management methods and / or technologies, do not have the necessary resources or expertise in capacity building in fire management. International cooperation in fire management is critical to achieve this. Priority for international cooperation should focus on capacity building targeted at those groups responsible for developing fire policies, fire management planning and the subsequent implementation. Multi-stakeholder, inter-sectoral and inter-agency approaches will be a key consideration. It is also important to look beyond the responsible government agency to non-government organizations and the private sector to develop these capacities. Capacity building of instructors (training for trainers) is also a key prerequisite for the success of building capacities at local to national levels. Several fire management handbooks are available, and are tailored for use in countries that need to build fire management capacity. They strive to guide the application of advanced knowledge in fire ecology and fire management, including participatory approaches to fire management (Community-Based Fire Management).⁵⁵

Advanced international training courses for fire management specialists working in high-level positions in their country's public or private sector will support the development of a culture of transnational cooperation. Experience has been gained by several UN interagency training courses conducted by the United Nation University (UNU) and GFMC in Africa and in the South Caucasus countries. For instance, two *Regional Fire Management Training Courses for the South Caucasus, Western Balkans and Adjoining Countries* have been conducted by the GFMC on behalf of the OSCE and the Environment and Security (ENVSEC) Initiative at the Regional Fire Management Training

⁵² The outcomes of the International Wildland Fire Summit are published in the special issue of UNECE/FAO International Forest Fire News No. 29 (2003): http://gfmcc.org/iffn/iffn_29/content29.html. The Summit website at https://gfmcc.org/iwfc/summit_2003-introduction.html provides a full set of documentation of the Summit, its precursor events and the follow up.

⁵³ See documentations of the conferences on <https://gfmcc.org/iwfc/sevilla-2007.html> and <https://gfmcc.org/iwfc/southafrica-2011.html>

⁵⁴ <https://gfmcc.org/iwfc/korea-2015.html>

⁵⁵ <https://gfmcc.org/manag/cbifm.html> and FAO (2011)

Center in Antalya, Turkey, in 2010 and 2014.⁵⁶ Progress has also been made in developing unified approaches for capacity building in fire management in Latin America through the joint efforts of the U.S. Forest Service, U.S. AID and its Office of U.S. Foreign Disaster Assistance (OFDA). An example is the joint firefighter mobilization exercise in 2010 in Ecuador, which for the first time has been held at pan-Latin American level (*Quarto Ejercicio Nacional y Primer Latinoamericano de Movilización para Brigadas de Control de Incendios Forestales*).⁵⁷

All of this progress has been made while keeping the vision in mind to establish a decentralized worldwide network of training institutions in which donor organizations can collaborate. The development of training materials for international use is desirable.

First steps have been taken to develop internationally acceptable and applicable competency standards that will ensure the smooth cooperation between firefighting units of different nations, i.e. their inter-operability in international missions. The EuroFire project was an initial project financed by the EU Leonardo da Vinci programme and implemented jointly by the Global Fire Monitoring Center (GFMC) and partners between 2006 and 2008.⁵⁸ The EuroFire project team reviewed competency-based wildfire training systems globally to identify best practice examples from Europe and around the world. This research was the basis for the production of competency-based basic training materials specifically for use in European countries. The key target end-user groups for the EuroFire project included: firefighters; the rural and land-based sector; sectoral organizations and; education and training institutions. Meanwhile, EuroFire competency standards and training materials have been translated from the English base version to Armenian, Azerbaijani, French, Georgian, Greek, German, Macedonian, Mongolian, Russian and Ukrainian, and tested in Europe and neighboring countries in East Europe / Caucasus in the frame of the Environment and Security (ENVSEC) Initiative. The translation to Portuguese (Brazilian), Spanish and Turkish will be finalized in late 2015.⁵⁹

In future, competency-based standards could serve for certification of firefighters to be deployed on international fire response missions. In 2011 The "International Fire Aviation Working Group" (IFAWG) started to draft a set of voluntary guidelines for improving the safety, efficiency and effectiveness of international aerial firefighting missions (cf. sections 2.6 and 7 of this paper).

5. Fire management guidelines

Fire Management Guidelines are needed for the various user levels – ranging from practical guidelines for local fire managers to guidelines for land-use planning and policy development. Guidelines must consider the specific natural (ecological) conditions of vegetation fire, as well as the social, cultural, economic and political environment. Valuable examples of such guidelines already exist for local to global use. However, in many countries these guidelines are unknown, not applied, or are in need of adaptation for the specific conditions or simply need to be translated. Fire management guidelines for international use have been developed by international organizations since the 1990s, and are available on the Internet. These include:⁶⁰

- International Tropical Timber Organization (ITTO) Guidelines on Fire Management in Tropical Forests (1997)
- The WHO/UNEP/WMO Health Guidelines for Vegetation Fire Events (1999)
- The FAO Guidelines on Fire Management in Temperate and Boreal Forests (2002)
- The UN Fire Management Voluntary Guidelines (2006)⁶¹
- GFMC Guidelines "Defence of Villages, Farms and Other Rural Assets against Wildfires. Guidelines for Rural Populations, Local Communities and Municipality Leaders in the Balkan Region" (2013)⁶²

⁵⁶ http://gfmc.online/GlobalNetworks/SEEurope/SEEurope_1.html and <http://gfmc.online/GlobalNetworks/SEEurope/Antalya-2014.html>

⁵⁷ http://gfmc.online/GlobalNetworks/MesoAmerica/MesoAmerica_6.html

⁵⁸ EuroFire partners included the International Association of Fire and Rescue Services (CTIF) and Rural Development Initiatives Ltd.

⁵⁹ EuroFire project website with competency standards and training materials for download:

<https://gfmc.online/eurofire/index-11.html>

⁶⁰ Overview / portal: <http://gfmc.online/literature/Fire-Management.html>

⁶¹ <http://www.fao.org/docrep/009/j9255e/j9255e00.htm>

⁶² http://gfmc.online/Manaq/CBFiM_11.html

While guidelines have been developed primarily to assist countries in developing sound, sustainable fire management capacities – including fire management policies and implementation strategies – they also provide guidance on standard approaches or standards in fire management that have been proven effective internationally and which will facilitate international cooperation in fire management.

6. International systems to be shared: Global wildland fire monitoring and early warning

There are a number of fire management support tools that are based on international Earth Observation Systems (EOS). These systems include spaceborne sensors for fire detection and monitoring, and terrestrial networks of Hydrometeorological services for recording and forecasting of fire weather (cf. Ahern et al., 2001).

The Fire Mapping and Monitoring Theme of the Global Observations of Forest and Land Cover Dynamics (GOFCC/GOLD) project (cf. section 3.2.) and GFMC are closely interacting with the United Nations Office for Outer Space Affairs (UNOOSA), UNOSAT (Operational Satellite Applications Programme of the United Nations Institute for Training and Research – UNITAR), the International Charter “Space and Major Disasters”, and the Group on Earth Observations (GEO) with its Global Earth Observing System of Systems (GEOSS).

A number of public providers of near-real time satellite-based observations of active fires and burned area allow free access to public domain data and free open source software (Alexandris, 2011), such as the Rapid Response system - part of NASA's Land Atmosphere Near Real-time Capability for EOS (LANCE). Rapid Response provides daily MODIS imagery in near real time.⁶³ Monthly MODIS Burned Area images have been available in the *Web Fire Mapper* since 2010. The Fire Information for Resource Management System (FIRMS) – a part of LANCE since 2011 – integrates remote sensing and GIS technologies to deliver global MODIS fire locations and burned area information to natural resource managers and other stakeholders around the World. The operational transition of the FIRMS system to FAO in 2011 is now complete. Operational users are advised to use the services of the Global Fire Information Management System (GFIMS) hosted by the FAO.⁶⁴

Monitoring and modeling global emissions from vegetation fires is a component of Monitoring Atmospheric Composition and Climate (MACC), which is the current pre-operational atmospheric service of the European Global Monitoring for Environment and Security (GMES) programme. Its D-FIRE sub-project provides estimations of global emissions from biomass burning to the other MACC services and to the general public. The emissions are calculated in real-time and retrospectively from satellite-based observations of open fires (Kaiser et al., 2011).⁶⁵

In 2005, a global multi-hazard early warning system was proposed in the Hyogo Framework for Action. Subsequently, a concept for the development for a Global Early Warning System for Wildland Fires was endorsed by the United Nations and presented at the Third International Conference on Early Warning (EWC-III) in March 2006.⁶⁶ The Global Early Warning System for Wildland Fires is an activity of GOFCC-GOLD implemented by the Canadian Forest Service (CFS) and the Global Fire Monitoring Center (GFMC)⁶⁷ Its central aims are to develop:

- Early warning of fire danger on a global basis that will provide international agencies, governments and local communities with an opportunity to mitigate fire damage by assessing threat, likelihood and possibility of extreme fire behavior. This should enable implementation of appropriate fire prevention, detection, preparedness, and response plans before wildfires arise.
- A robust global operational early warning framework with an applied system that will provide the foundation upon which to build resource-sharing agreements between nations during times of extreme fire danger.

⁶³ <http://lance.nasa.gov/imagery/rapid-response/>

⁶⁴ expired

⁶⁵ expired

⁶⁶ Webpage of the website of the Global Early Warning System for Wildland Fires:

<http://gfmcc.online/fwf/EWS.html>

⁶⁷ See chapter 21 of „Vegetation Fires and Global Change. Challenges for Concerted International Action. A White Paper directed to the United Nations and International Organizations“: <https://gfmcc.online/wp-content/uploads/Vegetation-Fires-Global-Change-UN-White-Paper-GFMC-2013.pdf>

- Local expertise and capacity building in fire management for system sustainability through technology transfer and training.

7. Towards developing an International Wildfire Support Mechanism: A repeated proposal

As a result of severe fires over a number of years, national leaders have demanded a more coordinated approach to the management of wildfires, including receiving or sending firefighting assistance to other countries. However, the ability to effectively cooperate is still limited by organizational and communication barriers. In the USA, State and Federal legislators that are concerned at the lack of uniform emergency management protocols have directed federal, state, and local government to develop common incident management systems. The purpose is to provide a framework that enables wildland fire protection agencies to effectively facilitate clear response authority, acquire and mobilize resources, coordinate interagency actions and provide effective management during incident response. A fundamental element of incident management was the creation of the "Incident Command System" (ICS), which provides consistent terminology and established organizational structures to enable effective, efficient incident management. Australia and New Zealand, faced with similar emergency response issues, have evaluated incident management systems around the world and elected to adopt the ICS while modifying it to meet their specific needs.

The complexity of incident management, coupled with the growing need for multi-agency and multi-functional involvement during incidents, has increased the need for standard inter-agency incident management systems within countries and states as well as internationally. Many countries have chosen to adopt similar or common systems for addressing emergencies. Additionally, some countries have developed firefighting agreements based on a common system designed to enable interoperability when lending support across borders. In the past, this has usually occurred in the context of supporting adjoining States or Countries within the same geographical region. However, since 2000, we have seen examples of this being broadened by the provision of support occurring from different hemispheres. In 2000 and 2002, Australia and New Zealand sent critically needed incident managers to the USA. Similarly, early in 2003 the USA reciprocated by sending fire specialists to Australia. Canada and the USA frequently exchange firefighting forces, especially along their borders and New Zealand sent firefighting forces to Australia in 2002 and 2003.⁶⁸ ICS was also used commonly by all firefighting forces during the wildland fire emergency in Ethiopia in 2000.⁶⁹

If the purpose of adopting the ICS is to enhance cooperation between countries, through the sharing of resources such as fire management teams, it is highly recommended that the sending country and the receiving country both use the same emergency management system.

It is hereby proposed that there be broad-scale introduction of a single International Wildfire Support Mechanism (IWSM) based on the incident management components discussed previously, including the principles of the ICS. This system would not necessarily require that specific components, such as ICS, be used as the incident management system of the country receiving or providing firefighting assistance. However, IWSM components would need to be previously agreed upon, ideally in a formal arrangement, and utilized by all countries at the time of cooperation in wildfire emergencies.

An IWSM should also be considered as a candidate to be introduced in the UN-driven process to strengthen the international potential to respond to environmental emergencies. The UNEP and OCHA have established the Advisory Group on Environmental Emergencies (AGEE) as their most important cooperation and support mechanism for the response to environmental disasters. The AGEE is an international forum that brings together environmental experts from around the world to share information, expertise and lessons learned in order to improve response to environmental emergencies worldwide – particularly in developing countries. In 2007, AGEE founded the "Roserberg Initiative", which aims at strengthening the global regime that governs environmental emergency response and preparedness as well as initiated the establishment of the online Environmental Emergencies Center (EEC) in 2012.⁷⁰

⁶⁸ See: International Arrangements on the Sharing of Wildland Fire Suppression Resources between the United States of America and Australia and New Zealand: http://gfmc.online/iffn/iffn_29/USA-Australia-NZ-Int-Arrangements.pdf

⁶⁹ See: The Ethiopia Fire Emergency between February and April 2000: https://gfmc.online/iffn/country/et/et_1.html

⁷⁰ <http://www.eecentre.org/>

In this context, the application of the principles of developing High Reliability Organizations (HRO) may be of interest (Weick et al., 1999). A cooperation project between the U.S.A. and France reveals the utility of mutual exchanges of expertise and “lessons learned” by HRO may contribute improving incident management (Vidal et al., 2011).

The international firefighting assistance exchanged during the wildfire emergencies in Greece (2007), the Russian Federation (2010) and Israel (2010) reveal the need for introducing a unified incident command structure similar to the ICS that is used for exchanging fire management personnel between the USA, Canada, Australasia and South Africa.

The development of internationally accepted rules or SOPs for the safe and efficient deployment of aerial firefighting assets is already underway. Following the International Wildland Fire Summit (2003), an interest group was formed at the 4th International Wildland Fire Conference and returned recommendations for concerted international action.⁷¹ In a series of International Aerial Firefighting Conferences (2008-2015) this idea became further consolidated.⁷² In 2010 the *International Fire Aviation Working Group* (IFAWG) was founded and officially launched at the meeting of the UNISDR Global Wildland Fire Network / Wildland Fire Advisory Group at GFMC.^{73 74} The terms of reference have been laid down in the IFAWG Charter:

The IFAWG is working under the framework of the UNISDR Wildland Fire Advisory Group (WFAG) / UNISDR Global Wildland Fire Network (GWFN) as an advisory committee with the following principal objectives:

- Sharing of relevant information, especially information that will support the promotion and improvement of safety in the sector;
- Providing a conduit or facilitation mechanism for the sharing of resources between jurisdictions;
- Identification of opportunities for international harmonization of operating practices and establishment of consistent standards; and recommend or initiate suitable harmonization action, including the development of voluntary guidelines;
- Providing advice and guidance to individual states and the United Nations regarding fire aviation through the UNISDR Wildland Fire Advisory Group / Global Wildland Fire Network.

After presenting the draft voluntary International Fire Aviation Guidelines (incorporating the International Manual of Common Rules for Fire Aviation) at the Geneva Forum in November 2013 (see also Section 2.7 of this paper), the progress of finalizing the guidelines, including receiving comments and suggestions, can be monitored on a dedicated website.⁷⁵ At the occasion of the International Aerial Firefighting Conference in Zadar, Croatia, April 2015, the European Commission, EU Member State authorities and fire aviation operators indicated a high interest in endorsing the concept and objectives of the guidelines. The progress of developing the International Fire Aviation Guidelines thus far shows consent towards developing an international voluntary regime for fire aviation.

However, at the time of the 6th International Wildland Fire Conference in 2015, the international community is not yet entirely ready to agree on broader global / international voluntary or binding *International Wildland Fire Accord*. Such an accord may include an International Wildfire Support Mechanism (IWSM) and would express the common interests of the global community and secure interoperability in cases of cross-boundary cooperation in wildfire emergency response for those countries or organizations which do not have signed legal bilateral or regional cooperation agreements. This was the main reason why the UNECE/FAO Regional Forum on Cross-boundary Fire Management could not yet elaborate further on the originally proposed IWSM.

⁷¹ <http://gfmcc.org/online/sevilla-2007/groups/Session-Aviation-Communique.pdf>

⁷² See website of the last AFF Conference in Croatia in 2015, which includes the reports of all AFF conferences between 2008 and 2015: http://gfmcc.org/online/course/meeting/2015/meet2015_03.html

⁷³ <http://gfmcc.org/online/globalnetworks/Joint-WFAG-FAWG-ILC-FMAA-Meeting-June-2010-Agenda-final.pdf>

⁷⁴ IFAWG website: <http://www.ifawg.org/>

⁷⁵ <http://gfmcc.org/online/iwpm/ifawg.html>

Instead, an international task force, which followed up the Forum, suggested prioritizing first the establishment of the “International Wildfire Preparedness Mechanism” (IWPM). The IWPM, currently hosted by the Global Fire Monitoring Center (GFMC), is a non-financial instrument serving as a broker / facilitator between national and international agencies, programmes and projects to exchange expertise and build capacities in wildland fire management and particularly in enhancing preparedness to large wildfire emergency situations. The IWPM has been developed in tandem with the International Fire Aviation Guidelines and the International Manual of Common Rules for Fire Aviation.⁷⁶

8. Conclusions

The United Nations International Strategy for Disaster Reduction (UNISDR) and its Wildland Fire Advisory Group are working to strengthen the efforts of United Nations agencies, other international organizations, non-governmental organizations, and a large number of national agencies responsible for fire managements with the aim to reduce the negative impacts of wildland fires and to promote safe and ecologically benign models of fire use in ecosystem management. Similarly, the Global Wildland Fire Network (GWFN), facilitated by its secretariat, the Global Fire Monitoring Center (GFMC), is working systematically to enhance governance for intra- and inter-regional cooperation in wildland fire management throughout the world. The outcomes of the International Wildland Fire Summit of 2003 and the 4th and 5th International Wildland Fire Conferences in 2007 and 2011, reveal that many countries are ready to establish and strengthen regional and international dialogues on cooperation and exchange of information, research and wildland fire management, including through formalized agreements.

The way ahead between the 6th International Wildland Fire Conference of 2015 and the 7th International Wildland Fire Conference in 2019 in Brazil will be a challenge to the member states of the United Nations to respond to the consequences of accelerating climate change. Extreme wildfires, which have affected many countries in 2015, reveal that fire regimes are changing rapidly and dramatically at global level and require swift, targeted responses through international cross-boundary cooperation in fire management. The precursor work of the past two decades towards developing efficient voluntary or legal agreements – a voluntary *proto-regime* of the international fire management community – will provide rationale and a sound basis for the success of future efforts.

References

Note: Numerous references have been provided as footnotes or embedded in the text of this paper in order to facilitate online reading. Further search for documents on international cooperation in wildland fire management is facilitated by the search engine on the GFMC homepage (<http://gfmc.online/>). Other key references, including those cited in the text, are provided below:

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⁷⁶ National agencies responsible for the management of vegetation fires as well as projects seeking or offering to exchange expertise in fire management are encouraged to contact the GFMC: <https://gfmc.online/iwpm/index-7.html>

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White Paper on Vegetation Fires and Global Change

Vegetation fires and global change: challenges for concerted international action, produced by the Global Fire Monitoring Center, is a white paper directed at the United Nations and international organizations. It is a global state-of-the-art analysis of the role of vegetation fires in the Earth system and is published as a collective achievement of the world's most renowned scientists and research groups working in fire science, ecology, atmospheric chemistry, remote sensing and climate-change modeling. The aim of the white paper is to support the endeavor of the United Nations and international organizations and their affiliated processes and networks, to address global vegetation fires. The paper provides the rationale for coordinated international action in crossboundary fire management at a global scale. Margareta Wahlström, Undersecretary-General and Special Representative of the United Nations Secretary-General for Disaster Risk Reduction and Head of the UNISDR Office for Disaster Risk Reduction, who will deliver the opening speech at the 6th International Wildland Fire Conference, wrote the foreword.



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