

THE DEVELOPMENT OF AN EARLY WARNING SYSTEM FOR FOREST FIRE MANAGEMENT IN EAST KALIMANTAN, INDONESIA

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During the 80's and 90's of the last century forest and land fires destroyed large parts of Indonesia's forest resources. Especially on the island of Sumatra and Borneo forest and land fires have become a regular event during the yearly drought seasons. In 1997/98 during a drought season prolonged by the El Nino phenomena the worst fires in Indonesia's history affected 5.2 million hectare of forests, agricultural and grassland in East Kalimantan. The economic losses were estimated to be between three and six billion US Dollars. The haze from these fires affected national and international air traffic and forced the airports in Singapore and Kuala Lumpur to temporarily close down. The German supported *Integrated Forest Fire Management Project* (IFFM) developed and Early Warning / Predictive System for the Province of East Kalimantan in order to assess and reduce the risks of disastrous forest and land fires. Based on the fire risk assessment of the newly established Provincial and District fire Centers early warning information is sent out to all stakeholders through already existing communication structure. The newly developed prevention concept guides the action of governmental institutions, communities and concessionaires in order to prevent fires and consequently the destruction of forest resources, which play an important role in the country's social and economic development (**Theme II of the Conference**)

Reliable and accurate data sources have been identified for this early warning system and a simple-to-use data processing system has been developed. To adequately respond to the early warning information, a prevention concept with short term and long-term fire prevention measures has been developed for the Province of East Kalimantan. To ensure that both, the early warning and the prevention system are functional, effective and efficient the improvement of the policy framework conditions for the management have been supported and decentralized institutional and communication structures have been built up. Education, training and extension concepts have been developed to increase awareness of the public about fire issues and to train government institutions and communities to correctly interpret the early warning information received and to make sure that they react accordingly.

The early warning system developed for East Kalimantan uses two tools:

- a) the **Fire Danger Rating Index** (FDR) based on the Keetch-Byram Drought Code. The routine calculation of the Fire Danger Rating Index (FDR) needs only the following weather data: daily maximum temperature, daily minimum temperature and daily rainfall. The few input data necessary and a simple calculation method for the FDR makes it a very useful tool to have rapid information about the changing fire danger conditions on a daily basis. The FDR index used in East Kalimantan has proven to be a suitable tool to predict/reflect correctly the fire danger conditions for East Kalimantan. During all catastrophic fire events in "El-Niño years" since 1978 the FDR showed also the highest fire danger index values.

- b) the **Preparedness Level** which is defined by the actual FDR, the actual fire occurrences, the actual weather forecast, haze conditions and hot temperature events (hot spots) detected by using NOAA-AVHRR data. This fire preparedness level is determined with a scoring method, each factors having a score according to its actual conditions. The Standard Operating Procedures (SOP) for each preparedness level (normal, level III, level II, and level I as the highest alert level) have been developed according to the overall field conditions in East Kalimantan and have been legalized by a decree of the provincial government of East Kalimantan in the year 2003. Due to the different roles and responsibilities of government institutions and communities in fire management different SOP have to be developed. Government institutions have the responsibility to gather information, disseminate information, monitor and co-ordinate while communities have to carry out their activities - involving the use of fire - accordingly to the preparedness level issued by government institutions (restricted use of fire, no use of fire for the time of high fire risks).

Due to the absence of weather data for remote areas in East Kalimantan² dynamic fire risk mapping is done to assess more precisely the fire risks of remote areas. The fire risk mapping used in East Kalimantan includes – apart of the weather data – information on infrastructure (settlements, roads, and rivers), actual land-use data, vegetation type and actual conditions of the vegetation, actual fire damage classification, NOAA NDVI and NOAA hot temperature events detection (hot spots). In future NOAA-AVHRR thermal channels will also be used to include land surface temperature in dynamic fire risk mapping. This method currently being tested could be a cheap and extremely valuable alternative for many countries facing the same problem of lacking sufficient meteorological stations to adequately assess their fire risks.

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² FDR for the province is currently based on only six meteorological stations along the east coast of the province