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WIND RISK



Task D – Action plan

Action D.3: Recommendations concerning the institutional preparedness and emergency plans for civil protection institutions in view of wind risk

For the Wind Risk prevention project

University of Ljubljana
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Municipality of Ajdovščina



Chapter D.3 – Recommendations concerning the institutional preparedness and emergency plans for civil protection institutions in view of wind risk

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1. Introduction

Strong winds present a real danger, especially when combined with hail and other extreme weather conditions. Strong winds cause damage to buildings, infrastructure, transit, forests and especially threaten the safety of people. This is why in areas where this events occur preparedness actions are of utter importance.

The Chapter D.3 focuses on preparing recommendations for Protection and Rescue Plans and Plans for Mobilization and Communication of Protection and Rescue Providers for the Wind Risk study cases: Ajdovščina and Ljubljana (Slovenia), Central Dalmatia (Croatia) and North Rhine Westphalia (Germany). The basis for Protection and Rescue Plans is Risk Assessments which was already described in Action C taking into account five parameters; population, infrastructure, transport, buildings and forests.

In Slovenia, institutional preparedness and emergency plans for local civil protection institutions in view of wind risk are made on national, regional and municipal level. They comprise of Natural and Other Risk Assessments, Protection and Rescue Plans, Plan for Mobilization and Communication of Protection and Rescue Providers and Other documents. These documents include recommendations for organizational measures, demonstrate systematic linkages with the emergency units responsible for civil protection and disaster relief and early warning systems and reveal the importance of technical, financial and logistical factors in protection mechanisms.

In Germany, civil protection takes place at three administrative and geographical levels; the national level (federal state), the regional level (Bundesländer) and the local level (counties and country free cities like the City of Essen).

In Croatia, vulnerability assessment, and protection and rescue plans are delivered on national, regional and local level. National vulnerability assessment and protection and rescue plans serve as a basis for regional documents, while regional assessments and plans are basis for local level vulnerability assessment and protection and rescue plans.

Protection and Rescue Plans in general cover topics: scope and levels of planning, protection, rescue and relief concept, available forces, assets and resources, observation, warning and alarm, activation of leadership, forces and resources, administration and management, protection, rescue and relief, personal and reciprocal protection, damage assessment and mitigation of consequences. All these topics are thoroughly examined in this report with recommendations for better institutional preparedness.

2. Civil Protection and Emergency Response Procedures in Slovenia and the Municipality of Ajdovščina

Protection and Rescue Plans are developed for the cases of natural and other risks that pose the greatest threat to the Municipality of Ajdovščina. These documents ensure an organized and coordinated action in order to prevent accidents or to mitigate their consequences. They also ensure the earliest possible provision of basic living conditions in the case of disaster. As soon as the Protection and Rescue Plan is launched, services and units with available resources can successfully intervene and take appropriate actions. The decision to activate the Plan measures is a matter of the CP Commander or the Mayor.

The Protection and Rescue Plan in the case of strong wind composes of the next concepts and sections:

1. Characteristics of the strong wind
2. Scope and levels of planning
3. Protection, rescue and relief concept
4. Available services, assets and resources
5. Observation, warning and alarming system
6. Activation of leadership, forces and resources
7. Administration and management
8. Protection, rescue and relief
9. Personal and reciprocal protection
10. Damage assessment and mitigation of consequences
11. Explanation of terms and abbreviations
12. Annexes

According to Wind Risk Project Action D.3. Municipality of Ajdovščina updated its Protection and Rescue Plan also for the case of wind risk which is made on the basis of the Law on Protection against natural and other disasters (Ur. L. RS, no. 97/2010), Regulation on the content and development of protection and rescue plans (Ur. L. RS, no. 24/2012), Risk assessment in the Municipality of Ajdovščina, general legislation and implementing regulations.

In the updated version of the document Risk assessment, strong winds are recognized as a threat to Municipality of Ajdovščina. Especially the typical wind Bora which can achieve the speed up to 180 km/h and more. This is why a Protection and Rescue Plan for the case of strong wind is necessary in the municipality.

From the below Figure 1 and Figure 2, drawn up by the Agency of the Republic of Slovenia for environment (ARSO), it is clear that the wind in the area of the Vipava Valley is very active. Thus, the average wind speed as well as the average annual wind power density are in this area very high.



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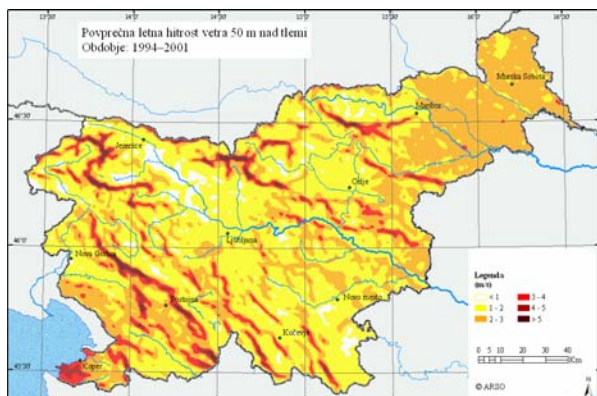


Figure 1: ARSO (average annual wind speed of 50 m above the ground (1994-2001))

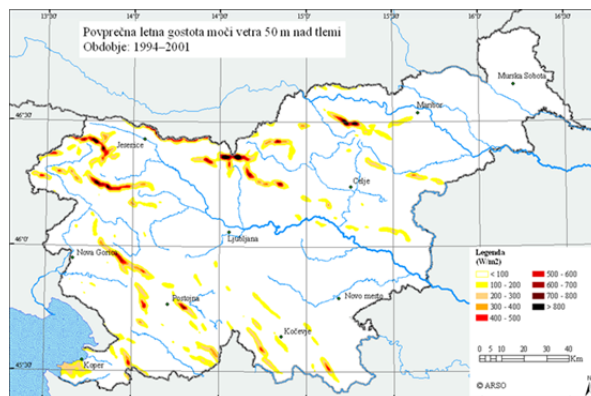


Figure 2: ARSO (annual average wind power density of 50 m above the ground (1994-2001))

Wind conditions are monitored at several levels. Above mentioned agency ARSO is responsible for measuring the current intensity of the wind. Its task is to monitor, analyse and predict natural phenomena and processes in the environment and reducing natural threats to people and property. ARSO therefore in the event of a major hazard triggers red alert (Table 1).

Table 1: Awareness levels provided by Meteoalarm and used by ARSO

COLOR MARK	HAZARD LEVEL	DESCRIPTION OF HAZARD LEVEL
WHITE	No data	Missing, insufficient, outdated or suspicious data.
GREEN	No danger	No particular awareness of the weather is required.
YELLOW	No greater danger	The weather is potentially dangerous. The weather phenomena that have been forecast are not unusual, but be attentive if you intend to practice activities exposed to meteorological risks. Keep informed about the expected meteorological conditions and do not take any avoidable risk.
ORANGE	High level of danger	The weather is dangerous. Unusual meteorological phenomena have been forecast. Damage and casualties are likely to happen. Be very vigilant and keep regularly informed about the detailed expected meteorological conditions. Be aware of the risks that might be unavoidable. Follow any advice given by your authorities.
RED	The highest level of danger	The weather is very dangerous. Exceptionally intense meteorological phenomena have been forecast. Major damage and accidents are likely, in many cases with threat to life and limb, over a wide area. Keep frequently informed about detailed expected meteorological conditions and risks. Follow orders and any advice given by your authorities under all circumstances, be prepared for extraordinary measures.

Source: Meteoalarm, 2016: http://www.meteoalarm.eu/index2.php?lang=sl_SI&country=SI

Within the Wind Risk prevention project another system to measure wind characteristics and get information about different types of wind was set up in Ajdovščina which is WindMaster Pro anemometer from GILL Instruments. It was set up on the roof of the stadium of the local football team next to the sport plane airport. The WindMaster Pro not only measures wind speed but also forces it generates alongside with air temperature. The readings of this anemometer are also used as an alarm system for local civil protection service and will alert them immediately after average wind speed or wind gusts exceed specific limits.



From the point of view of traffic restrictions and measures, Motorway Company of the Republic of Slovenia (DARS) and the Directorate of the Republic of Slovenia for Roads (DRSC) monitor wind conditions. DARS has all through the Vipava Valley, along the main highway H4 Razdrto - Vrtojba, positioned nine measuring devices, which measure the wind speed and according to their measures alert people of road conditions and restrictions.

Scope and levels of planning

The core emergency plan in case of strong wind is municipal. It has been prepared on the basis of national and regional emergency response plans.

The expected consequences in the case of strong wind are:

- Disrupted or blocked traffic due to traffic accidents or objects on roads and railways,
- Damage to infrastructure installations and therefore the possibility of interrupted supply of electricity, plumbing and interrupted telecommunication connections
- Damage to buildings (real estate), also of such a nature that the facility is not applicable for stay (removal of roof collapse of part of the building or the entire building in the event that this is not maintained or has worn out, etc.)
- Injury to people and animals, due to rollover and movement of large objects (falling of trees, billboards, traffic signs, etc.)
- Environmental pollution,
- Damage in agriculture (removal of earth, uprooting trees, wind gusts, etc.).

Protection, rescue and relief concept

The protection, rescue and relief concept in the Municipality of Ajdovščina in the case of strong wind is directed to:

1. Closing public buildings: depends on weather forecasting and red alarm triggered by ARSO,
2. The rescue and relief to those who are exposed to an imminent life or other hazard due to direct consequences of such disasters: to provide immediate assistance for the improvement of living conditions (damaged roofs and other events which threaten the safety of residential and commercial buildings),
3. Most urgent intervention to improve the situation, which is urgently needed to prevent and mitigate further consequences of the accident,
4. Chain accidents.

2.1. Responsible institutions in Civil Protection in Municipality of Ajdovščina

2.1.1. Available services, assets and resources

The Municipality of Ajdovščina

- **Mayor** delegates the protection, rescue and aid and eliminates the consequences. He decides on the use of budget funds, provides funding for the support of preparedness, proclaims the risk of natural and other disasters and performs other tasks within his jurisdiction.
- **Municipal forces for protection and rescue and civil protection authorities (CP):**
 - *CP Commander* delegates operative professional work of members of the Civil Protection and other forces for protection, rescue and relief from municipal jurisdiction. He informs the mayor about the consequences and the situation in the affected area and gives opinions and proposals relating to the protection, rescue, assistance and disaster relief. He prepares a final report of the accident and



proposes it to the municipal council, and performs other tasks within his jurisdiction,

- *Deputy CP Commander,*
- *CP headquarters.*

Public services and other associations

Public services and other associations carrying out tasks of protection, rescue and relief are mainly:

- **Public fire service:** Fire and rescue center; 4 volunteer fire brigades: Ajdovščina, Col, Selo and Šmarje. They carry out firefighting and rescue tasks in case of fire; other tasks of protection, rescue and assistance for which they are equipped and trained.
- **Public health Service:** Ajdovščina Health Center. It carries out emergency medical service, rescue service, health care, and other tasks within its competence.
- **Police:** Police station Ajdovščina. It ensures the public order, tranquility and security. It protects the disaster area, allowing intervention to units, detects and investigates crimes and offenses related to the accident, identify persons, search for missing persons and investigate the causes of the accident: Police station Ajdovščina.
- **Associations:** speleological Society Danilo Remškar Ajdovščina, scouts Rod Mladi Bori Ajdovščina, Scouts STEG Ajdovščina - Šturje 1, Radioklub Ajdovščina, Josip Križaj Flying Club, Mountain Rescue Association of Slovenia, Tolmin Station Group Ajdovščina, Postaja Tolmin, Skupina Ajdovščina, Mountaineering Club Ajdovščina and Križna Gora.

Financial, Material and technical resources

Operators use their own equipment and the equipment they have for this purpose. Equipment, resources and means of assistance from municipal CP warehouses (food, drinking water, medicines, etc.), which are intended for free distribution and are provided on the basis of companies, public institutions and other organizations lists, are also at the disposal.

Municipality of Ajdovščina funds operational costs, cost of training, education, examination and exercise, and the cost of purchasing and maintaining equipment. Additional funds in accordance with the regulatory procedure are provided from the budget reserve funds. Activities by state administration bodies and public service are covered by themselves.

2.2. Early Warning and Disaster Preparedness

In the events when the Bora wind is starting to cause damage, which poses a threat to the population (for example, open roofs, flying objects, trees blocking the traffic, etc.), the affected area is closed and the emergency services are organized to monitor the situation. This is decided by the CP Commander. The emergency service and a hotline is organized by the public fire service in agreement with the commander of the CP.

Informing the public on the implementation of the plan is done after ARSO triggers red alert (some public institutions need to be closed) and in the hazardous events, such as damage to infrastructure (electrical, water and telecommunications installations or damage to buildings), which threatened the safety and well-being of the lives of people and animals.

2.3. Emergency Intervention Procedures in case of wind-related disasters

2.3.1. Activation of leadership, forces and resources

Forces and resources are activated according to the size of the effects of the disaster and its duration.

The *CP Commander* or the *Head of Intervention* **assesses the situation** in the affected area. After the first report and other requirements of the Head of Intervention, the bodies responsible for the activation of the municipal protection, rescue and relief forces and means, **analyse the situation**, the potential development and outcome of the disaster as well as the need for the activation of municipal protection, rescue and relief forces.

The *CP Commander* decides **when to activate the bodies** for the operational and professional leadership of protection, rescue and relief which are CP Headquarter members, responsible municipal officials and technical municipal staff, CP Support Service members, commission for damage assessment and other responsible persons or bodies.

If the events exceed the capacities of the municipal CP, the CP Commander asks for help from the neighbouring municipalities, municipalities of neighbouring regions (state aid) and neighbouring countries (international aid).

The management bodies for protection against disasters within the Municipality of Ajdovščina are:

- **The Municipal Council** prepares and implements regulations related to the protection against natural and other disasters in the municipality territory.
- **The Mayor** is the head of the protection, rescue and relief and recovery operations. He appoints the CP Commander as the operational and professional head of these operations.
- For the purposes of the protection against disasters, the **municipal administration bodies** carry out tasks according to their field of work and their competences. During interventions, the municipal administration bodies provide support to the CP management bodies and protection, rescue and relief forces in implementation of protection, rescue and relief measures.

The operational protection, rescue and relief bodies are the following:

- **CP Commander** is the operational and technical head of the disaster protection, rescue and relief operations.
- If CP Commander is absent, **CP Deputy Commander** holds all his powers and is responsible directly to the Mayor.
- **Civil Protection Headquarters** provide expert assistance in managing and performs other operational and technical tasks related to disaster protection, rescue and relief.
- **Head of Intervention** is generally the commander of the firefighting unit in charge of the area where the disaster has occurred, unless otherwise specified in Protection and Rescue Plans or by the CP Commander. If different units (firefighters, paramedics, police etc.) are involved in the operation, each of them is coordinated by their own head and a separate Directing Team of Intervention is formed. The Head of Intervention or the Directing Team of Intervention act in accordance with the CP Commander instructions.

The most typical protective measures in the case of strong wind are:

- protection of location/area,



- protection of infrastructural facilities and installations (care for water supply, electricity, etc.),
- preventive constructional interventions,
- preventive technical measures,
- traffic management,
- retreat of the endangered inhabitants and evacuation,
- setting a temporary accommodation for evacuated citizens,
- providing medical aid and transport to hospital,
- etc.

Personal and reciprocal protection

Personal and reciprocal protection includes all measures for the prevention and mitigation of disasters consequences that affected residents in order to protect their health and safety of their property.

Municipality of Ajdovščina is responsible for organizing, encouraging and guiding personal and reciprocal protection in the municipality. They organize appropriate advisory service, composed by volunteers, especially psychologists, sociologists, social workers, health professionals, and others.

Citizens must carry out the following activities:

- organize and carry out measures for personal and reciprocal protection (self-protection, self-help and reciprocal aid)
- maintain facilities to protect against hazards (shelter and other facilities)
- procure the means and equipment for personal and collective protection in the case of accidents,
- implement measures of protection and rescue.

Evacuation of vulnerable and affected population is carried out, if it is not possible with other measures to ensure their safety. If the risk is serious and imminent, head of intervention determines the area of evacuation in accordance with the nature and extent of hazard. Evacuation points are intended only for those residents who, after notice for evacuation cannot move by their own, with their own or public transport.

Damage assessment and mitigation of consequences

Damage assessment begins by a decision of the national Administration for Civil Protection and Disaster Relief. National and regional damage assessment commissions are evaluating the damage the event caused and preparing proposals for disaster recovery. Victims gather evidence of the damage they have suffered and submit evidence to the commission for evaluation and approval. Commission estimates property damage and other consequences of accidents, based on the methodology prescribed.

On the municipal level, the Mayor leads the disaster relief and together with the Municipal Council, in accordance with the provisions of the Public Finances, decides about the use of municipal funds for disaster relief.

On the national level, the Government of the Republic of Slovenia leads the disaster relief of major accidents. The use of state resources for the elimination of consequences of major accidents is decided by the National Assembly of the Republic of Slovenia.



2.4. Plan for Mobilization and Communication of Protection and Rescue Providers

The Plan for Mobilization and Communication of Protection and Rescue Providers specifies organization, communication and the activation of forces and rescue units also in the event of a landslide, wild fire and earthquake in the area of the Municipality of Ajdovščina. It defines emergency response and action activities in the event of all natural and other disasters.¹ In addition, it provides a detailed list of responsible people in the municipality of Ajdovščina with their active contact numbers in case of emergency.²

2.5. Recommendations Regarding the Institutional Preparedness

Wind Risk Project Action D.3. recommends measures to improve the preparedness of the Municipality of Ajdovščina in the case of strong wind. The report summarizes the Protection and Rescue plan and describes characteristics of the strong wind, scope and levels of planning, protection, rescue and relief concept, available services, assets and resources, observation, warning and alarming system, activation of leadership, forces and resources. administration and management, protection, rescue and relief, personal and reciprocal protection and damage assessment and mitigation of consequences.

To sum up, for a successful protection, rescue, relief, prevention, mitigation and disaster recovery, in the case of strong wind, it is necessary to:

- act in accordance with the Municipality of Ajdovščina Protection and Rescue Plan,
- act in accordance with the Municipality of Ajdovščina Plan for Mobilization and Communication of Protection and Rescue Providers,
- make sure that the participants in traffic are informed about the traffic conditions,
- take care of prevention: for example, maintain the infrastructure installations and therefor minimize the possibility of interrupted supply of electricity, plumbing and telecommunication connections,
- organize health care for people at risk and, and in accordance with the scale of the event to carry out the evacuation and setting up shelters (tents, caravans, containers), or perform relocation,
- inform and educate the public about the current events,
- in the case of infrastructure installations damage (electricity, water, telecommunications, sewer, roads, care), immediately proceed to their repair.

The report also touches the updated Natural and Other Risk Assessment in the Municipality of Ajdovščina (2016) and shortly presents Plans for Mobilization and Communication of Protection and Rescue Providers. These documents include recommendations for organizational measures and they demonstrate systematic linkages with the emergency units responsible for civil protection and disaster relief and early warning systems.

¹ Municipality of Ajdovščina: Natural and Other Risk Assessment in the Municipality of Ajdovščina, May 2016, p.3.

² Municipality of Ajdovščina: Plan for Mobilization and Communication of Protection and Rescue Providers, July 2014, p.44-57.



3. Civil Protection and Emergency Response Procedures in Germany and the City of Essen

3.1. Responsible Institutions in Civil Protection in Germany

In the Federal Republic of Germany, civil protection takes place at three administrative and geographical levels; the national level (federal state), the regional level (Bundesländer) and the local level (counties and country free cities like the City of Essen).

Predominantly, civil protection belongs to the constitutional responsibilities of the 16 federal states (Bundesländer) of Germany. The Bundesländer have specific laws in which the responsibilities are separated into those of the municipalities, the counties and the federal state. In Germany and the Bundesland North-Rhine Westphalia, wind related hazards are understood as natural hazards, which are covered by the North-Rhine Westphalian 'law on fire safety, rescue and emergency services' (Gesetz über den Brandschutz, die Hilfeleistung und den Katastrophenschutz, BHKG). The BHKG therefore is the most important legal basis for civil protection on the regional and local level (cf. §1 BHKG).

The national level, i.e. the federal state comes into play in case of large-scale disasters. In such cases, the Federal Government coordinates the activities of the 16 Länder and e.g. supplies them with information and financially supports them so that necessary investments into buildings and technical infrastructure of emergency response can be preceded.

The actual emergency management, i.e. also disaster preparedness and response, lies within the responsibilities of the counties and country free cities like the City of Essen. The responsibility of the counties and country free cities is a) to prepare disaster prevention plans and b) to guarantee for the necessary technical equipment and personnel. On top of that, the municipalities are responsible for fire protection and management and are asked to set up local fire prevention plans. All levels closely collaborate with relief organizations and fire brigades. (Cf. Website BMI 2016b, Website BMI 2016c)

The following figure gives an overview of all institutions relevant for civil protection in Germany. Subsequently, a more detailed description of the most important institutions of each administrative level is given. For an in-depth description on civil protection (and its connections with spatial planning) in Germany, please see Wind Risk Prevention Project Report C.7/C.8.



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Figure 3: Institutions in civil protection in Germany



Source: own depiction; see also Wind Risk Prevention Project Report C.7/C.8.



3.1.1. National Level – Disaster Response

In Germany, the national level of civil protection is responsible for disaster response actions. The main institution responsible for civil protection on the national level is the Federal Ministry of the Interior (BMI) and its executive agencies. (Cf. Website BMI 2016a) For the purpose of crisis management the BMI has a Communications, Command and Control Centre, which is the contact point for all matters of internal security, and national (as well as international) civil protection at ministerial level. This Control Centre has the tasks of sharing information among the Federal State, state security authorities and executive agencies. (Cf. Website BMI 2016b)

The executive agencies reporting to the Federal Ministry of the Interior are the Federal Office of Civil Protection and Disaster Response (BBK) and the Federal Agency for Technical Relief (THW) (cf. Website BMI 2016c). The BBK sees itself as a national service center for institutions and authorities at all administrative levels, as well as for organizations working in civil protection (cf. Website BBK).³

The Federal Agency for Technical Relief (THW) operates according to the Act on the Federal Agency for Technical Relief (THW-Gesetz). The operations comprise the management of disasters, public emergencies and large-scale accidents. The agency starts their operation at request from any administrative level or on behalf of the Federal Government. (Cf. Website BMI 2016d) The THW can be understood as “a cornerstone of civil protection in Germany [that] helps in case of natural disasters and accidents” (Website BMI 2016d).

Regarding resources, the THW consists of 668 local units, operated by volunteer forces. During and after a storm event, tasks of the THW are e.g. to clear roads from branches or to pump out flooded basements. (Cf. Website BMI 2016d)⁴

3.1.2. Local Level – Emergency Preparedness and Response

On the local level, there are three main groups of actors involved in emergency preparedness and response; the local administration, the emergency response units and the population i.e. inhabitants of a city.

For the local administration it is, respectively, the country administrator or major of a country free city who is responsible for several actions. The most important action is the constitution and administration of a ‘mission control’ and an ‘action committee’. The ‘mission control’ is responsible for the operative-tactical risk management in case of an emergency or disaster. The main tasks of the ‘mission control’ are to coordinate the action forces, to coordinate and distribute resources and to define measures to be conducted. According to the BHKG, fire brigade units, ambulance corps and emergency services constitute the ‘action committee’. The ‘action committee’ is usually (on request) supported by approved aid agencies (e.g. the German Red Cross). The ‘action committee’ is coordinated by the ‘mission control’. (Cf. §33f. BHKG)

Similar to the other Wind Risk Partner countries, municipal volunteer fire brigades may be requested in case of severe disasters. A prerequisite for volunteer assistance is, according to §3 (1) and (4) BHKG, a constant training and education of volunteer forces through the fire brigade. Furthermore, in case of severe damages, fire brigade units from other counties can be requested in order to help with civil protection actions in another (cf. §39 (1) BHKG).

³ For detailed responsibilities of the BBK please see Wind Risk Prevention Report C.7/C.8.

⁴ For further institutions involved in civil protection in Germany please see Wind Risk Prevention Report C.7/C.8.



The third group of actors relevant at the local level is the group of adult citizens. If instructed so by the action committee, e.g. the fire brigade units, any adult person is obligated to aid in case of an emergency in form of resources or manpower. (Cf. §43 (1-3) BHKG)

3.2. Early Warning and Disaster Preparedness

In Germany, the German Meteorological Service (DWD) is legally responsible for warning management. The DWD is an executive agency of the Federal Ministry of Transport and Digital Infrastructure (BMVI) and provides weather forecasting and warnings/alerts, which are a major component of disaster preparedness. (Cf. §4 (3) DWDG; Website BMVI 2016)

Warning procedures in Germany base on a three-tier system and can be described as follows. Ahead of a weather event, the DWD gives a preliminary weather alert, which bases on modeling and interpretation of meteorologists to several national, regional and local institutions. (Cf. DWD 2013: 3)

The German warning management system 'SatWas' is satellite-based and operated by the DWD. 'SatWas' functions as the official weather alert platform for the federal government, the Länder and the official public-sector broadcaster (TV and radio). (Cf. Website BBK BUND 2015) A second warning system 'FeWIS' is especially operated for Germany's emergency response units and accessible by fire brigades, the THW, the federal police, the Federal State Ministries of the Interior and aid agencies.

Warnings of the first tier are spatially unspecific and given out by the early warning system ('SatWas' and/or 'FeWIS') 48-120 hours and at maximum five days ahead of a possible event. Warnings of the second tier take place 12-24 hours before an event. Warnings of the second tier come with warning reports and advance information but are still spatially unspecific, i.e. valid for the whole country. Warnings of the third tier are detailed, official weather alters, which are spatially specific relating to counties/administrative districts. These tier-three warnings are published 12 hours or less ahead of an event. In comparison to 'SatWas', 'FeWis' additionally gives out hourly information on possible magnitude and extent of an event so that emergency response units are able to prepare 48 hours ahead of an event. (Cf. DWD 2013: 11-13)

3.3. Emergency Intervention Procedures in case of wind-related disasters

In case of wind-related disasters, all administrative levels are involved in emergency management and emergency intervention procedures. For example, the Federal Government supplies the Länder with information and financial support while the Länder pass both (information and money) on to the counties and municipalities that are hit by the event; weighted according to the storm's impact. Moreover, the approved aid agencies may be requested in order to support the emergency response process. (Cf. BMI 2016b, BMI 2016c) Nevertheless, emergency intervention mainly lies within the responsibilities of the local level, i.e. the counties and country free cities.

In the recovery phase, i.e. immediately after a wind-related disaster until up to several years, damages are estimated and removed. In the case of the City of Essen and summer storm Ela, institutions like the city's parks commission Grün und Gruga take over and conduct clearing works. In severe cases, the Armed Forces (Bundeswehr) may be requested in order to secure safety and order, as was done by the City of Düsseldorf after summer storm Ela.

3.4. Recommendations Regarding the Institutional Preparedness

One major aspect of effective civil protection is that all involved institutions are prepared towards the upcoming challenges, meaning they know their responsibilities and tasks and have a good communication and cooperation amongst them.

Summer storm Ela in June 2014 in the City of Essen exemplified an overall well-working civil protection system in Germany. Nevertheless, each event brings new lessons learned and leaves room for improvement. The following recommendations are drawn regarding institutional preparedness and emergency management in case of summer storms in Germany:

- **Constant assessment and improvement of the warning management.**
Ahead of summer storm Ela, the German Meteorological Service provided weather alerts in accordance with the standard three-tier warning procedures. Unfortunately, in comparison to winter storms, storm tracks of summerly thunderstorms are hardly predictable. This is why the magnitude of Ela became visible just a couple of hours before the storm hit. As this circumstance only leaves a short time window for reaction, further research is needed on both enhancing modeling techniques as well as behavioral protection measures.
- **Facilitation of good communication and cooperation between institutions.**
Regarding good emergency management, communication and cooperation between all actors involved is crucial. Accordingly, both 'mission control' and 'action committee' have a central function throughout the whole intervention process and need to be sustained or even strengthened. Each city should therefore review internal and external communication and cooperation procedures and p.r.n. enhance these.
- **Provision of adequate financial means for emergency preparedness and management.**
Financial means are a relevant factor for conducting good emergency preparedness and management procedures. In the case of summer storm Ela, the federal state of North-Rhine Westphalia set up immediate financial support for all municipalities and distributed it according to damage extents. Although short-term support was given by the federal state, long-term financial support was rather poor. In consequence, the City of Essen had (and still has) to pay for prevention measures (e.g. clearance and planting procedures), slowing down prevention and preparedness processes. It can therefore be recommended that federal state financial support is prolonged and extended to mid and long-term perspective.
- **Enabling of smooth emergency operations.**
Regarding emergency operations, a smooth handling is essential in order to prevent further damages. There are three recommendations that can be given in order to smoothen emergency operations:
 - i.) **Keeping driveways of emergency response units' buildings free of trees:**
Summer storm Ela revealed that in some cases emergency response units were not able to conduction their operations as trees blocked the driveways of the garages. It can be recommended to clear these driveways of any nearby trees, e.g. by choosing a radius which is based on the height of an average tree. The City of Essen has successfully applied this method in other contexts (securing roads close to forests) with a radius of 30 m.
 - ii.) **Equipping fire brigades with adequate training and devices:**



So far, German fire brigades are insufficiently equipped with devices for wind-related emergency operations. This problem became evident during summer storm Ela because the fire brigades did not dispose of a great enough number of chainsaws and also of an insufficient amount of fuel tanks in order to refill the chainsaws. The recommendation of increasing the number of devices of course goes hand in hand with the necessity for an adequate training of all fire fighters.

iii.) Prioritization of city roads for adequate clearance procedure:

Any disaster requires a plan on how to efficiently deal with damages. This especially applies to the priority in which clearance procedures should be conducted. Therefore, a recommendation is to prioritize city roads beforehand, so that emergency response units know where to start their actions. For summer storm Ela the City of Essen drew on existing prioritization strategies from the field of winter road maintenance (thawing salt plans). A strategy can e.g. be to first clear a north-south as well as an east-west axis and to quickly clear driveways to health facilities like hospitals.⁵

- **Enabling of smooth preparedness and prevention measures.**

After a hazardous event, further prevention and preparedness measures are to be taken in order to increase the degree of preparedness before a next event. During this time, measures and strategies of prevention and preparedness are needed. In the following, three recommendations to the field of prevention and preparedness towards summer storms are drawn:

i.) Implementation and maintenance of systems for systematization and monitoring of damages and clearance procedures:

A monitoring system of all damages is a good option to systemize both damages as well as clearance activities. Grün und Gruga, Essen's parks commission, implemented a GIS-based city tree cadaster, which is constantly fed with information on damage types, status of clearance procedures and new plantings.

ii.) Considering climate resistance of tree species in case of replacement plantings:

For all replacement plantings it should be considered that climate change brings stress factors for trees, which differ throughout the tree species. The City of Essen therefore plants in accordance with the FLL guidelines (see Wind Risk Prevention Project Report D.5, chapter 2.2.4), which are freely accessed online.

iii.) Conduction of periodical tree inspections for ensuring road safety:

A regular inspection of city trees helps to identify infested trees, which have a higher risk of falling in case of a storm event. It can therefore be recommended to conduct periodical tree inspections, e.g. as proposed by the FLL (cf. FLL 2010), especially after an extreme storm event.

- **Secure long-term evaluation and monitoring for prevention and preparedness measures.**

With every extreme event that takes place there are new lessons learned that help to improve institutional preparedness and emergency management. It is essential to evaluate and monitor prevention and preparedness measures in order to secure a long-term improvement of the overall system.

⁵ For more detailed recommendations on clearance procedures please see Wind Risk Prevention Reports D.5 and D.7.



4. Civil Protection and Emergency Response Procedures in Croatia and the Central Dalmatia

Organization and activities of civil protection and protection and rescue in Croatia is regulated by Constitution of Republic of Croatia, Law of civil protection (before 2015 Law on protection and rescue), Assessment of vulnerability and other sub laws. Vulnerability assessment, and protection and rescue plans are delivered on national, regional and local level. National vulnerability assessment and protection and rescue plans serve as a basis for regional documents, while regional assessments and plans are basis for local level vulnerability assessment and protection and rescue plans.

On national level, vulnerability assessment was last delivered in 2009. The national vulnerability assessment deals with wind related events in the chapter on hazards of natural causes, among which we can find hazard of storms and hurricane. The strong wind can cause damages which are recognized in all areas of the country, but wind conditions are different for coastal, mountain and valley parts of Croatia. Also different winds are present in different seasons. Measures proposed in this document are mostly preventive measures.

Protection and rescue plan on the national level was delivered in 2010 and forms basis for protection and rescue plans on regional and local levels.

The system of civil protection in Croatia is organized at the local, regional and national level, and linking the resources and abilities of participants, task forces and citizens in a single unit to reduce the risk of disaster, providing rapid and optimal response to threats and hazards occurrence and mitigating the effects of major accidents and disasters.

4.1. Responsible institutions in Civil Protection

Measures and activities in the system of civil protection carried out by the following participants:

- Croatian Government,
- Central state administration body in charge of civil protection (The State Administration),
- Government bodies and other state bodies,
- The Croatian Armed Forces and Police,
- Local and regional (regional) governments.

Measures and activities in the system of civil protection carried out by the following operational power system of civil protection:

- a. the headquarters of civil protection,
- b. operating power firefighting,
- c. operational forces of the Croatian Red Cross,
- d. the operational forces of the Croatian Mountain Rescue Service,
- e. Associations of citizens,
- f. troops and commissioners of civil protection,
- g. coordinators at the site,
- h. legal persons in the system of civil protection.



Forces for protection and rescue in Croatia are organized in a rather complex manner following the conceptual method of using all available resources. Protection and rescue forces consist of legal and natural persons, preventive resources, executive bodies of local and regional government, central bodies of national dictatorship and operative forces for protection and rescue.

Protection and rescue headquarters are organized in cities, municipalities, regions and on national level.

Protection and rescue is based on following activities:

- Observation and assessment of activities and situations that can lead to catastrophe and accidents;
- Prevention, organization and preparedness of measures and activities for incensement of preparedness;
- Continuous organization, preparing and training of protection and rescue forces;
- Alerting of civilians and dissemination of guidelines regarding possible threat;
- Early warning of civil protection forces;
- Activating of operative forces;
- Caring out protection and rescue tasks and activities in cooperation with responsible bodies of other states and international organizations based on international contracts.

The system of civil protection includes measures and activities (prevention, planning, organizational, operational, regulatory and financial) which regulate the rights and obligations of participants, organization and functioning of all parts of the system of civil protection and the connection of institutional and functional resources participants mutually complement each other in a single unit to reduce disaster risk and to protect and rescue people, material and cultural goods and environment on Croatian territory from the effects of natural, technical and technological major accidents and disasters, eliminating the consequences of terrorism and war destruction.

National level protection and rescue plan from natural, technical and technological causes proposes measures and actions for

- early warning,
- preparedness, organization and growth of operative forces,
- protection and rescue measures in cases of hazardous events.

Extreme weather conditions, primarily drought, hail, heat waves, storm and hurricane storm and strong wind, snowfall and other weather events are categorized as extraordinary events when power, intensity, consequences and incidence of force significantly exceed average values. These phenomena are more frequent and with greater intensity, occurring mainly as a result of global climate change, and on the Croatian territory, statistically speaking, the cause of the serious damage, mostly to material goods and the environment and to return to a multi-year follow-up of their frequency and amount of damage.

The natural causes are usually rarely causing human casualties, so they do not represent a priority interest for protection and rescue system, although strong and relatively short events can cause significant disruption to the normal way of life for families, individuals, certain population groups (eg, farmers) local communities and the economy in their area. Therefore, the system of protection and rescue is engaged during the events of this phenomena when responding with operational forces of protection and rescue after an emergency event and when mitigating and eliminate the consequences.

Extraordinary events of this kind to the fullest extent are local coverage, and affect mostly smaller areas. This is the reason why mainly from operational to tactical importance to the system of protection and rescue, and only rarely require the involvement of strategic levels of protection and rescue system, particularly for the duration of an emergency when responding operational forces of protection and rescue. The strategic level of protection and rescue system, based on the principles of solidarity, the operational and tactical levels of the system mainly include the reconstruction after the emergency and to the provision of financial assistance when damages exceed the financial possibilities of local communities and populations.

Table 2: Stakeholders of protection and rescue in preventive, reacting and recovery phases

Type of event	Prevention	Planning and reacting/cooperation	recovery and reconstruction
Storms and hurricanes with effect on transport, energy and buildings	DHMZ (State hydrological and meteorological service)	<ul style="list-style-type: none"> - central government body responsible for transport - central government body responsible for economy - central government body responsible for construction 	In most cases, no significant recovery activity is necessary, and therefore will remain on the response of the leading bodies, except when plans specify different. In case of large-scale consequences law on natural disaster applies.

Source: Protection and rescue plan

4.2. Early Warning and Disaster Preparedness

Early warning is based on prediction and assessment of high probability of occurrence of hazardous event. In the case of high probability, endangered communities are imposed to change of routine and start of activities in case of disaster.

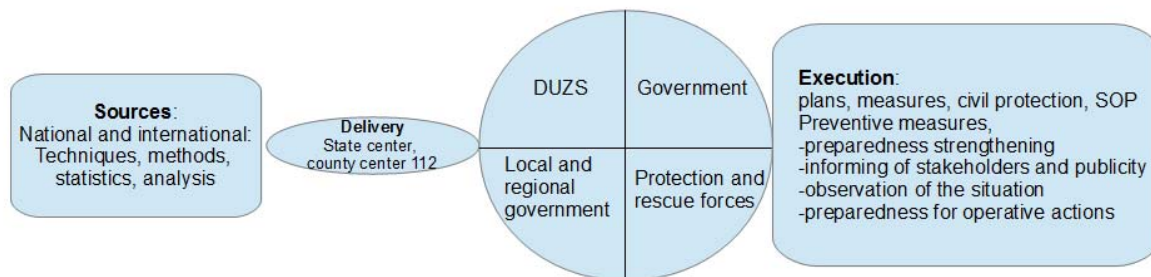
Good early warning system depends on good prediction and good communication channels. That is why activities of scientific communities are important in assessment of probability of occurrence of disastrous events. On the other hand, good function of communication channels from responsible decision makers, operative forces and general public is essential in preparedness for the events.

The information flow in early warning system is shown in Figure 4. The sources of predictions are national and international models and techniques and method for statistical analysis and data analysis based on which warnings are issued.

Warning is delivered to state and regional stakeholders: national protection and rescue directorate, public authorities, local and regional government and other protection and rescue forces.

The alarmed bodies then carry out measures and plan for protection and rescue, civil protection, standard operative procedures, protocols.

Figure 4: Information flow of early warning



Source: Protection and rescue plan

The national protection and rescue plan, among risks of natural causes, deals with risk from extreme weather conditions. Warnings are responsibility of Meteorological and hydrological service. Warnings are given on the basis of national and international models (METLAB, ECMWF, EU-METNET, WMO, EUMET-SAT), meteorological observations, data transfer and analysis. It is important to say that final decision on whether to give warning or not is decision of expert in duty, and not on strictly defined thresholds.

4.3. Emergency Intervention Procedures in case of wind-related disasters

Operative action in case of extraordinary events caused by extreme weather conditions includes following activities:

- timely delivery of information to relevant institutions about possible emergence of extreme time event, type of event, and areas that are most likely to be affected,
- informing citizens about the procedures and measures for health protection, life and property protection (systems of public warning used are local radio, Internet, and other suitable methods of transferring instructions on procedures essential for survival during the event as well as measures to be implemented after its completion),
- advising on the implementation of measures of personal and mutual protection,
- preparedness of emergency services, according to their functional areas,
- activities of the leaders of local and regional (regional) self-government,
- activation of Staff of protection and rescue and civil commands protection of local and regional (regional) governments,
- operation of other operational and rescue forces, according to plans for protection and rescue, the requirements of the leaders of units local and regional (regional) governments, with the harmonization of staff protection and rescue.

In addition to the prior review of operational activities, the State Protection and Rescue Directorate in cooperation with other central bodies state administration, administrative organizations and scientific institutions:

- discusses the procedures for obtaining a warning about the possibilities of the emergence of extraordinary events caused by extreme weather conditions, their delivery and use,
- adopts standard operating procedures and instructions for citizens' activities on the strategic level of protection and rescue.

Carriers of planning protection and rescue at the operational and tactical levels are required to apply preliminary data and measures while creating their own protection and rescue plans, plans civil protection and standard operating procedures.

Wind related disastrous events are relatively rare and do not cause damages as other hazards, so are not considered priorities in civil protection. Such events risks can be reduced by imposing urban planning, building norms and organization rules as preventive measures and civil protection only deals with interventions during the event.

4.4. Plan for Mobilization and Communication of Protection and Rescue Providers

Protection and rescue plan proscribes preparedness, activation, mobilization and growth of operative forces. Preparedness of protection and rescue providers includes preparedness of staff, material, communication and transportation means and proscribed procedures. Preparedness time for operative forces is 1 to 3 hours. Activation is use of prepared operative forces. The mobilization is the planned action of calling members of task forces who are deployed to specific solutions, particularly people allocated to civil protection and duty staff divided into finished operating power. Mobilization is the act of merging people with equipment and resources, while taking into account the priorities, dynamics and places of forces and means gathering.

Physical persons and protection and rescue forces mobilization is not planned, because they are self-activated. Every person is legally obliged to give help in case of emergency and people are included in self-protection and protection of family members immediately. Legal people mobilization is more flexible and depends on specific situation and danger to specific activities. Table with response time of mobilization of specific forces is given in Table 3.

Table 3: Time of mobilization of operative forces for protection and rescue

No.	Civil protection and operative forces	Time of reaction	
		Min	Max
1	Physical people	Immediately	
2	Legal people	1 hour	Several days
3	Leaders of public local and regional self-government	Immediately	15 minutes
4	Operative forces of public local and regional self-government	30 minutes	2 hours
5	Central government body	30 minutes	8 hours
6	Departments and units of corporate and central government bodies that deal with protection and rescue in its regular activities	Immediately	3 hours
7	Firefighting headquarters and unit	Immediately	1 hour
8	Departments and units of State directorate for protection and rescue (DUZS)	Immediately	2 hours
9	Headquarters for protection and rescue		
	- operational and tactical levels	30 minutes	4 hours
	- strategic level	2 hours	6 hours

10	Services, headquarters and units of civil protection	30 minutes	12 hours
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Source: *Protection and rescue plan*

There is no specific mobilization plan in case of wind related events.

4.5. Recommendations Regarding the Institutional Preparedness

Extraordinary Events of this type are complex causes the formation, but also demanding height damage caused, although a formal legal point of view, usually cannot be categorized as events which the Croatian Government may declare a disaster and major accident. The current Law on Protection from Natural Disasters is regulated by way of participation of local communities and state financing damage from natural disasters.

Legal provisions require a thorough reconstruction, and should establish a new overall solution at the state level. It is necessary to systematically cover all extraordinary events caused by extreme weather conditions on the way to treat the full, and that based on this approach ensure equal access to any extraordinary event of this kind. Special emphasis should be focused on pushing methodology of establishing ways for timely implementation of preventive measures, the construction of the necessary infrastructure and operational rescue capacity, investing in early warning systems, their construction, upgrading and development, protection and informing citizens especially in the more engaged role of the insurance industry in the proceedings compensation for damages after emergency.

Certain extraordinary events caused by extreme weather conditions can be mitigated, in terms of consequences, by planning and implementation of appropriate preventive measures, organizational modules and timely preparation, including information of individuals and local communities. So, depending on the specific conditions of each individual event, relatively successfully and investments acceptable economic power and interests of local communities, within especially elaborated and implemented conditions consequences of the events of this kind can be controlled.

Enhancement of the institutional preparedness and emergency plans can be achieved on following aspects:

- preparedness,
- fast response,
- communication.

Better preparedness can be achieved by engagement of additional forces in periods of the year when more wind related events are expected. Periods when additional forces are required can be predicted because occurrence of high wind in Croatia, especially in Dalmatia is seasonal and periods of the year when wind is more destructive are known.

Preventive measures as most stressed out measure in documents can be revised and upgraded with more recent scientific discoveries and results of wind force analysis.

Fast response can be enhanced by better cooperation between state meteorological service and amateur meteorological organizations that can offer better coverage of observational data.

Use of traditional communication means can be enhanced by use of modern communicational tools, such as social media, internet, messaging applications.



5. Conclusion

Wind Risk Project Action D.3. recommends measures to improve the preparedness of all studied area in Slovenia, Germany and Croatia in the case of strong wind. The report summarizes the civil protection and emergency response procedures in all three countries, with emphasis on institutions and civil protection responsible, warnings and preparedness, emergency intervention procedures and also provides recommendations regarding the institutional preparedness.

To sum up, for a successful protection, rescue, relief, prevention, mitigation and disaster recovery, in the case of strong wind, it is necessary to:

- act in accordance with the municipal and national Protection and Rescue Plans,
- act in accordance with the municipal and national Plan for Mobilization and Communication of Protection and Rescue Providers,
- take care of preparedness and prevention measures: for example, maintain the infrastructure installations and therefor minimize the possibility of interrupted supply of electricity, plumbing and telecommunication connections, implement and maintain systems for systematization and monitoring of damages and clearance procedures, consider climate resistance of tree species in case of replacement plantings, conduct periodical tree inspections for ensuring road safety,
- secure long-term evaluation and monitoring for prevention and preparedness measures,
- provide weather alerts in time for participants in traffic, elderly people and children, civil protection forces, etc.,
- inform and educate the public about the current events,
- make sure the communication and cooperation between institutions involved in civil protection runs smoothly and is in time of disaster wind event enhanced,
- organize health care for people at risk and, and in accordance with the scale of the event to carry out the evacuation and setting up shelters (tents, caravans, containers), or perform relocation,
- provide adequate financial means for emergency preparedness and management,
- in the case of infrastructure installations damage (electricity, roads, water, sewer, telecommunications), immediately proceed to their repair,
- enable smooth emergency operations by keeping driveways of emergency units' buildings free of trees and other obstacles, equipping fire brigades with adequate training and devices and prioritizing city roads for adequate clearance procedure.

The report also shortly presents Plans for Mobilization and Communication of Protection and Rescue Providers in Croatia and Slovenia study areas. These documents include recommendations for organizational measures and they demonstrate systematic linkages with the emergency units responsible for civil protection and disaster relief and early warning systems. They also reveal the importance of technical, financial and logistical factors in protection mechanisms.



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