

DAB+ emergency broadcasting and warnings

- **DAB+ radio broadcasting can play a critical role in times of emergency**
- **DAB+ emergency warning feature enables real time messaging to alert communities of emergency and recovery situations**
- **Deployment of the DAB+ emergency warning feature requires the establishment of implementation protocols developed with relevant authorities**

Introduction

Public emergencies can be caused by weather, geological factors, accidents, health issues or terrorist attacks. Global climate change is increasing the frequency of such events. Support is particularly important in rural and remote areas where infrastructure can be limited and significantly impacted by natural disasters.

Broadcast radio's strengths make it uniquely helpful in times of emergency: free to air, reliable, robust, portable, in vehicles - and congestion is not an issue. Broadcast radio systems are designed to be robust to ensure reliable operation even in the most demanding situations.

Emergency warnings via DAB+ can provide critical, real-time messaging - alerting communities of impending disaster situations and providing a coordinated source of information in recovery situations during and after the incident.

Included in this factsheet:

- How DAB+ can provide critical support in emergency situations
- DAB+ emergency warning features and preferred implementation
- Deployment scenarios

What are emergency warnings?

An emergency warning is a message to alert the community of an impending emergency. Radio broadcasters are critical providers of information in emergency situations and have an inherent duty of care commitment to the public. The quantity of that information is dependent on the circumstances. For example, regular updates can be provided on a factory fire or toxic spill regarding access to affected areas and support measures. For events that affect a wide area such as floods or cyclones, continuous information can be provided on what to do to be safe, where to go and not to go, where to find stores and provisions, the status of service outages and so on.

The amount of time available to warn communities is dependent on the incident. For example, as shown in Figure 1, cyclones and some flood events can be predicted days in advance as they are slow moving and predictable. Bushfires can have hazardous environment warnings days in advance

but only hours or minutes of warning time when they occur. Terrorist attacks, earthquakes and volcanic eruptions often occur with no warning time at all.

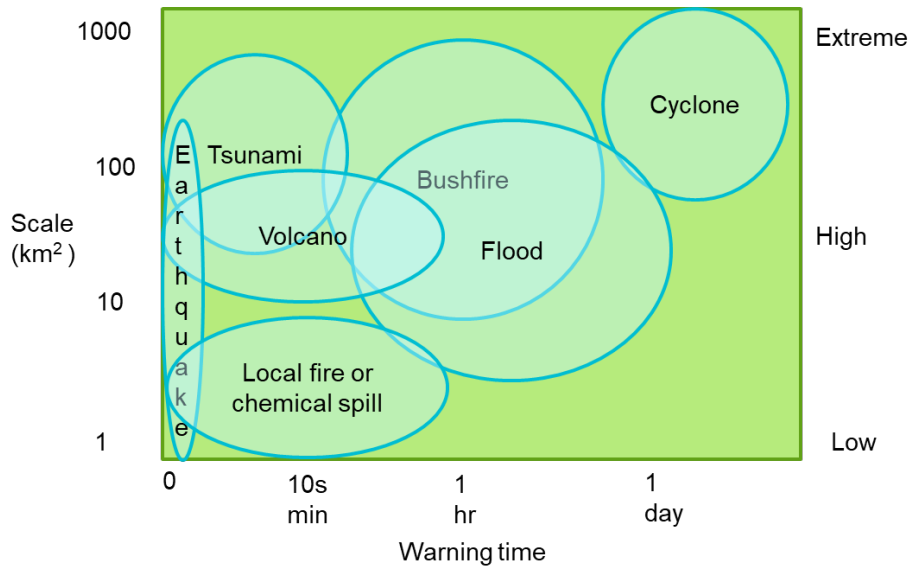


Figure 1: Example warning times for different types of events

Who initiates emergency warnings?

Emergency warnings are generally issued by an official organisation such as a government department with the responsibility and capabilities to detect and respond to emergency situations. Such bodies often receive input from the impacted community who provide “on the ground” observations in rapidly developing situations.

Some countries have an existing emergency warning network which can be activated by the relevant authority, and includes a website, a mobile App or an audible alarm and speaker system.

While emergency warning alerts and information can be provided via mobile phone networks, these are often the first information source to fail in an emergency due to congestion and power failures.

How can DAB+ help in an emergency?

The DAB+ emergency warning feature – Alarm Announcement Switching (AAS) - provides the ability to redirect DAB+ receivers to play out a predefined radio service which delivers emergency information, advice and directions.

This AAS emergency warning feature is appropriate for urgent situations where warning messages need to reach audiences as soon as possible, for example, within tens of minutes. For longer warning periods, e.g. over one hour, it is more appropriate to warn the public about a situation verbally via the radio commentator.

When the emergency situation has subsided AAS is deactivated, and receivers return to their previously selected service.

An EU Directive (EECC¹) effective from December 2020 requires that all in-vehicle radio receivers in Europe must include digital terrestrial radio. The DAB+ Minimum Requirements technical standard² requires that all receivers include the AAS feature. As Europe drives the receiver market and most receivers delivered to other parts of the world are derived from those products, the AAS feature will effectively be included in receivers worldwide from 2020.

While verbal warnings are the backbone of emergency warning communications, the increasing availability of radio receivers with multimedia capabilities and colour screens allows the display of images such as maps of affected areas and critical information such as the location of shelters or supplies, as shown in the example image in Figure 2. This feature is supported by the growing number of car models which include DAB+ as standard.



Figure 2: Example map image showing bushfire affected areas and escape routes

DAB+ can also be used to provide ongoing emergency information after an initial warning of the event has occurred. An example is the “pop-up service” that provided full-time public information during the floods in Brisbane, Australia in 2011³.

DAB emergency warning implementation

Implementation of the DAB+ emergency warning system varies between countries. Generally, multiple organisations are involved, as shown in Figure 3, and a consensus on emergency management procedures is needed to ensure timely and correct use of DAB+ emergency warning features.

¹ EECC means European Electronic Communications Code

² ETSI TS 103 461, section 8

³ https://en.wikipedia.org/wiki/2010%E2%80%9311_Queensland_floods

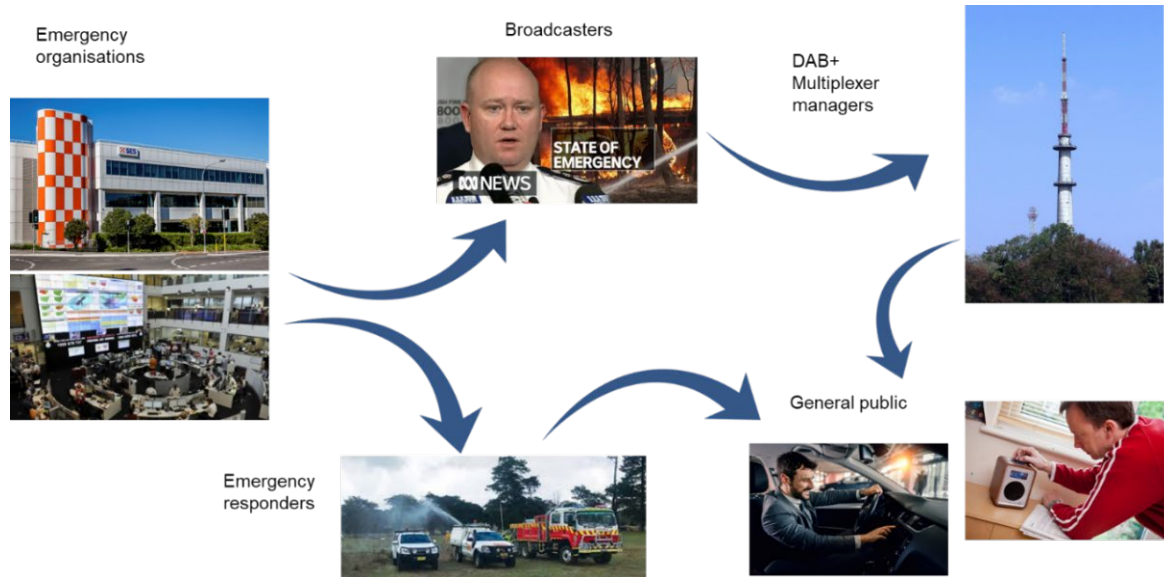


Figure 3: Example information flow showing the involvement of multiple organisations

A DAB+ ensemble (also known as a multiplex) is a grouping of programme and data services (usually about 18) which is processed and transmitted. The DAB+ Minimum Requirements technical standard states that the AAS feature must operate on the current ensemble and not rely on being able to switch to another ensemble. This ensures that both public service and commercial broadcasters are coordinated.

Alarm Announcement Switching should be controlled by the managers of the multiplex systems under direction from the relevant emergency service organisation and with the full cooperation of broadcasters.

The pros and cons of DAB+ Emergency Warning options

There are several ways that Emergency Warnings can be delivered. Broadcasters are proactive in times of emergency, and where there is sufficient warning of an impending public emergency, they will provide suitable verbal information. When the warning time is short, verbal information is augmented with the DAB+ AAS feature to help ensure that all possible listeners receive the emergency information. This is done on all ensembles in the area affected by the emergency.

Another option is to use the feature known as Other Ensemble (OE) switching, where a receiver can be instructed to switch to a service on an alternative ensemble. This is not recommended as OE switching has been implemented in only a limited number of receivers.

A further option is the possibility of implementing Automatic Wake-up of receivers. This requires a receiver to remain in standby mode and to regularly wake-up parts of the receiver to check for AAS switching messages. While this is technically feasible there are no current implementations of DAB+ receivers with this feature, and to do so would require significant engineering to bring to market. This feature would result in higher power consumption which can be an issue for battery powered receivers.

Warning mode	Description	Pros	Cons
Regular broadcasts	<ul style="list-style-type: none"> • Audio report broadcast over the air via regular channels • May have associated text and image metadata 	<ul style="list-style-type: none"> • Universally available • No incremental costs 	<ul style="list-style-type: none"> • Does not work when no one is listening to the radio or in stand-by mode. • Requires all services to provide the Emergency Warning
Alarm announcements – same ensemble	<ul style="list-style-type: none"> • Service switches automatically to the nominated Emergency Service on each ensemble. • audio, text and optional SlideShow images. 	<ul style="list-style-type: none"> • Part of ETSI / WorldDAB minimum spec since August 2020. • No financial cost to implement. • Only one service per ensemble need carry the Emergency Warning. 	<ul style="list-style-type: none"> • Low installed base pre-2020.
Alarm announcements – other ensembles	<ul style="list-style-type: none"> • Service switches automatically to the nominated Emergency Service on another multiplex. 	<ul style="list-style-type: none"> • Single emergency service could reach broader audience (not just same ensemble). • Only one service in an area need carry the Emergency Warning. 	<ul style="list-style-type: none"> • Not part of ETSI / WorldDAB minimum spec. • No installed base (limited incentive for manufacturers to deploy, incremental engineering cost to implement). • Requires widespread demand to implement cost effectively.
Wake-up functionality (uses alarm announcements signalling)	<ul style="list-style-type: none"> • Radio in standby wakes up on regular basis and searches for emergency warnings. 	<ul style="list-style-type: none"> • Emergency Warning Service can be effective even when no one is actively listening to the radio. 	<ul style="list-style-type: none"> • Wake-up and search consumes energy; trade-off between frequency of waking and battery life / energy consumption. • No installed base, requires widespread demand to implement cost effectively.

Example scenarios

Bushfire

A bushfire is reported to the emergency services who assess it as being out of control and potentially lethal. The emergency services inform the DAB+ broadcasters of the situation and request an immediate emergency warning announcement via the DAB+ ensembles which cover the affected area. The multiplex managers receive the emergency warning request and coordinate with broadcasters to provide the necessary audio and visual messaging, including, for example, the image shown in Figure 4. The multiplex managers then activate the emergency warning at the agreed time using Alarm Announcement Switching. When the danger has subsided or when the emergency services deem the warning to be sufficiently communicated, the emergency warning is terminated and receivers return to their previously selected service.



Figure 4: An example image for a bushfire alert

Earthquake

A major earthquake has occurred in a highly populated area and many buildings have collapsed and are on fire. There was no warning, and emergency services are reacting to the situation. The emergency service coordinators contact broadcasters and multiplex managers to activate the earthquake recovery plan, and broadcasters immediately prepare for real-time situation reporting and advice. The DAB+ Alarm Announcement Switching feature is activated to switch all services to a single information service until the situation is under control. The audio messages are supplemented with maps showing the locations of relief shelters and food and water supply points. The broadcasting service remains the only source of advice and support for many days while the failed power systems and mobile phone networks are repaired.

Summary

DAB+ includes an emergency warning feature - Alarm Announcement Switching - which redirects receivers to a specific service. This feature can be used when rapid notification is required, typically of the order of minutes to an hour ahead of a disaster or immediately after a disaster has occurred.

The use of the emergency warning mechanism needs to be carefully managed and used in collaboration with the relevant authorities. Broadcasters, network service providers and emergency services work need to collaborate to formulate and agree when and how the mechanism is to be used.