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The Basque Impact Weather Catalogue

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CONTENT

1. Motivation and Methodology

Motivation and context:

1. Improving the resilience of our societies against impact weather is a priority today and will increase in importance in the future as a consequence of increasing exposure and potential local increase of severe weather.
2. To continue advancing in the knowledge of local impact and its incorporation into Euskalmet's operational systems and processes is a must, for this purpose accurate information, focusing on impact, from past events must be collected, prepared and formally maintained.
3. There is a need to valorize the huge work that has been done in past years for the generation of adverse weather reports and other documentation related with high impact weather.
4. Availability of reliable and homogeneous information about impact weather useful for monitoring past and future evolution of CC at Basque level is mandatory.
5. Trusty and univocal information in relation to local natural hazards and particularly related with impact weather and climate should be available to the public as soon as possible.

1. Motivation and Methodology

Project: *Implementation of a catalogue of potential impact events in the CAE.*

The main **objective** of the project is to draw up and maintain a catalogue with homogeneous information in order to characterize events of potential impact that have affected the CAE during the 21st century, from the hydro-oceanic-meteo-climatic point of view.

During this project we have executed different tasks, in this presentation we will focus on:

1. Review of the state of the art.
2. Review and compilation of local data sources.
3. Definition of the catalogue structure.
4. Selection of cases to be included.
5. Filling in case forms.
6. Implementation of the catalogue.
7. Maintenance and revision process.

2. Results: 2.1. State of the art

- We proceeded to search for and analyze different catalogues or initiatives for the collection of severe weather episodes in order to detect good practices in the subject of impact weather.
- Different initiatives with a certain alignment with the objectives of this project have been reviewed.

Example of revised initiatives :

ECMWF SEC - Severe Event Catalogue
https://confluence.ecmwf.int/display/FCST/Severe+Event+Catalogue

ESWD European Severe Weather Database
https://www.eswd.eu/?&

EWSC - Extreme wind storms catalogue.
http://www.europeanwindstorms.org/cgi-bin/storms/storms.cgi

CatRaRE – German catalogue of heavy precipitation events.
https://www.dwd.de/EN/ourservices/catrare/catrare.html

ASSA - Australian Severe Storm Archive
http://www.bom.gov.au/australia/stormarchive/

BNSWWA - British National Severe Weather Warnings Archive
https://www.metoffice.gov.uk/research/library-and-archive/publications/national-severe-weather-warning-service

NIWA - New Zealand Historic Weather Events Catalogue
https://hwe.niwa.co.nz/

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2. Results: 2.2. Local data sources

- Different raw data sources and repositories are revised as potentially useful for the catalogue elaboration, not only from Tecnalia and Euskalmet but also, especially in the side of impact, from other sources (newspapers, local media webs, Twitter, emergencies interventions, and Spanish Insurance Consortium data)
- Main data used for characterization comes from previous works done in different context.
- If event has not been previously identified, new information and products are prepared based on available data from AWS, other observational sources, model analysis and impact data sources.

Main information sources :

MAIN DATA SOURCES
Severe weather reports
Euskalmet Analysis DDBB
Euskalmet Forecast DDBB
Euskalmet shift change tokens DDBB
Euskalmet Warnings DDBB
AWS DDBB
Euskalmet Annual reports
Scientific papers (Tecnalia. Euskalmet, others)
Insurance data (CCS)
Media information (newspapers,radio, tv, etc..)
Social networks (tweeter, etc..)
Other sources (Emergencies, 112,…)

2. Results: 2.3. Catalogue content

This catalogue is a space where we collect information about **environmental conditions** and **impact**. For this purpose data are structured in three main categories:

(1) **Context.** Different information related with synoptical and local hydro-meteo-ocean conditions are registered, including date, duration, spatial extension, event typology, measurement statistics data and a brief summary description of event. Other complementary context information is also included as internal control fields.

(2) **Hazard/Risk** where we include an ad-hoc classification of hazard type and risk type according to Euskalmet criteria.

(3) **Impact.** Where various aspects are considered in order to categorize impact considering social, economic and human health components. Among others severe weather warning level, economic damages, human fatalities or normal life disruptions are checked in order to stablish four impact indicators.

Context

- **Identification code**
- **Temporal characterization**
  - Date
  - Duration
- **Spatial characterization**
  - Political zones
  - Watershed zones.
  - Detailed political zones
  - Temp zones.
- **General conditions**
  - Brief meso-synoptic description
  - Brief registered ocean-hydro-meteo records summary description.
  - Impact Weather Headline
  - Weather type*
- **Internal control fields**
  - Severe weather report available
  - Analysis available
  - Forecast available
  - Warning issued
  - Present in annual report
  - Press release issued
  - CCS data available
  - Media information available (news online, press summary, etc..)
  - Social Networks (Tweeter, etc)
  - Other (general comments,..)

Hazard/Risk

- **Hazard type**
  - Severe Summer Convection
  - Severe Wind Storm
  - Severe CTD (Coastal Trapped Disturbance)
  - Severe NW Gale
  - Severe Active Frontal System
  - Severe Cut Off Low (Rain)
  - Severe Swell
  - Severe Heat Advection
  - Severe Cold Advection
  - Severe Winter Storm
  - Severe Fire Weather Conditions
  - Others
- **Risk type** (including colour codes)
  - RMC: coastal impact
  - RMC: navigation
  - RMC: “Galernas”
  - PREC: Intense
  - PREC: persistent
  - WIND: exposed
  - WIND: non exposed
  - TEMP: extreme high
  - TEMP: persistent high
  - TEMP: extreme low
  - SNOW
  - Forest fires
  - Others.

Impact

- **General impact Index (IIG)**
  - f(IIS,IIE,IIH)
- **Social impact Index (IIS)**
  - Minor sanitary incidents
  - Minor urban damages
  - Evictions and rescues
  - Outages (power, water, ..)
  - Transport incidents (road closures, traffic jumps, flight cancelation,..)
  - Emergencies interventions
  - 112 calls*
- **Economic impact Index (IIE)**
  - Euros paid by CCS
  - Claims accepted by CCS
  - Number Municipalities with accepted claims.
  - Number of Civil Works claims.
- **Human health impact Index (IIH)**
  - Number of injuries
  - Number of seriously injured
  - Number of deaths

2. Results: 2.4. Events selection

We focus in cases where hidro-ocean-meteorological factors directly or indirectly cause some degree of damages or relevant alteration of human activity in BAC during **21st century**.

- For this purpose we configure a preliminary list of episodes for its incorporation into the catalogue. The selection of candidates is based on the review of potential risk events considering :

  (1) official warnings issued

  (2) different documentation and studies available in Euskalmet (3) surpass of potential risk hydro-ocean-meteorological thresholds
- Final set are stablished after impact check based on the analysis of the available impact data sources (Insurance, Media, Social networks, 112, etc.).

It is important to note that within Euskalmet's current operational procedures, “real time” impact data collection and analysis is mandatory. Such data are included into the reports of adverse events and in the resource folders associated with each severe episode.

2. Results: 2.5. Form filling

Once the cases have been selected, the focus is placed on analysis and filling the case forms (**more than 420 from year 2000 until now**). Different fields, grouped into three large blocks (context, hazard/risk and impact), must be filled (see table)

It should be noted that this process began in 2021 (with the start of the project) incorporating different "historical" events retrospectively and implementing new specific routines in Euskalmet operational procedures for the collection of impact in a more systematic way than it had been doing until that moment (just for its inclusion in severe weather reports) .

	Severe weather report	Euskalmet Analysis DDBB	Euskalmet Forecast DDBB	Euskalmet shift change tokens DDBB	Euskalmet Warning DDBB	Euskalmet Annual report	Scientific papers (Tecnalia. Euskalmet, others)	Insurance data (CCS)	Media information (newspapers,radio, tv,etc..)	Social networks (tweeter, etc..)	Other sources (Emergencies, 112,...)
Temporal characterization	X	X	X	X	X		X				
Spatial characterization	X	X	X	X	X		X				
General conditions	X	X	X	X		X	X				
Internal control fields	X	X	X	X	X	X	X	X	X	X	X
Hazard type	X	X	X	X							
Risk type (including colour codes)					X			X	X	X	X
General impact Index (IIG)								X	X	X	X
Social impact Index (IIS)								X	X	X	X
Economic impact Index (IIE)								X			
Human health impact Index (IIH)									X	X	X

Data source contribution to each information category

2. Results: 2.6. Maintenance and revision

Catalogue maintenance and revision routines are established (a) to allow the catalogue to be updated as impact events occur and (b) to review its content.

(a) Maintenance: maintenance activities are those implemented for:

(1) improving aspects already included in the catalogue

(2) to include new events from the past or

(3) to include new present events as soon as possible as they occur. For this purpose, a series of work instructions are established, detailing what, how, who and when new episodes must be included.

It should be noted that in the medium term and depending on the resources available, we will extend the catalogue into the 20th century, which is a real challenge considering that Euskalmet has been active since 2003.

(b) Revision. revision activities are understood as those carried out to

(1) improve aspects already included in the catalogue or

(2) to include new concepts.

The key issue is the collection of **impact information**.

- Preliminary information is registered as it becomes available in near "real time“. Since surveillance staff (working 24x7) must be aware in real time about not only hidro-oceano-meteo conditions but also about impact during the course of a particular severe event. This information is summarized in the shift change sheets and recorded in the episode folder.
- This preliminary information is completed in different subsequent stages:

  (1) in the short term including information from the media and emergency interventions and

  (2) in the medium to long term with insurance data.

2. Results: 2.7. Catalogue implementation

The project has been managed with a **lean methodology**, including a **cyclo-iterative** philosophy of rapid results and successive revisions by contrast. This led us to define a field structure in an **excel** file, so that in the columns we keep the key fields for the characterization and classification of the events and in the rows each event.

This approach allows for a **quick incorporation of the information**, revision of the aforementioned fields, inclusion of new ones and a certain capacity for analysis with commonly used tools (Excel itself or different python and R scripts implemented for this purpose)

Impact indicators from insurance data are included when claims data are available, a set of R scripts are implemented for this purpose.

Once the development phase is over, a more robust solution is planned for operational purposes.

A **relational database** is going to be implemented and used to store all data in order to enable the catalogue to be updated and exploited conveniently. This solution seems to be adequate for our data structuration and characteristics in order to support concurrent access to data, to facilitate consults and to develop different analysis tools and resume dashboards.

Several **web tools** are going to be implemented to facilitate the loading and consultation of this database, in particular for:

(1) the filling in of forms (the incorporation and characterization of new events).

(2) exploitation of the catalogue (consultation of cases, comparative analysis, statistics, etc.).

3. Discussion

- ✓ **State of the art**. There are interesting initiatives in this area but we have not found anything definitive that can be used as a guide. Some initiatives of interest (e.g. Wind storm catalogue) are limited to a project timeline lacking the necessary continuity over time.
- ✓ **Local data sources.** There is a large amount of information generated by Euskalmet and Tecnalia in other contexts which, with a minimum of processing, could be useful. Some of this information would be much more accessible if it was structured originally in a database (episode reports, monthly, seasonal and annual bulletins, media, etc.).). It is not easy to systematize the collection of impact information.
- ✓ **Catalogue structuration**. The basic structure responds to our current needs, but is flexible enough for the incorporation of new fields in subsequent phases of revision. We have included indicators of different typologies, some of which are not univocal. Different impact indicators implemented (IIG,IIE,IIS,IIH) are segmented in 5 categories. Some indicators (control, precursors of others) are planned to remain internal and not of a public nature.
- ✓ **Case selection.** As the categorization of impact in the lower zone could be somewhat subjective, we decided to include all potentially impacting events. Note that segregation by degree of impact is immediate if necessary.
- ✓ **Form filling.** The difficulty increases substantially as the event to be catalogued is more distant in time and the lower and less generalized its impact is. It takes a lot of human resources, so it is advisable to automate as many processes as possible. It is advisable to involve the operational staff who “suffered” the event.
- ✓ **Maintenance and revision.** The catalogue is a living tool. It will be progressively extended to include events of the 20th century. New events are being incorporated in "real time". Open to include new fields, metrics and/or indicators.
- ✓ **Implementation**. Cyclo-iterative approach towards the final solution. Excel and R in early phases. Relational databases in operational phase combined with web tools for loading and querying. It is noted that the catalogue will soon be available for internal use and that in the near future the conditions for its use by the general public will be established.

4. Conclusions and future work

- A methodology has been stablished in order to maintain a severe weather catalogue focusing on impact at Basque Country level.
- A first (still incomplete) version of the Basque weather catalogue for XXI century is produced with more than 430 events.
- Huge work (not finished), despite Basque Country is a small extent territory and that in this moment we cover just XXI century.
- Not easy to focus on “historical” impact, sparse and non centralized data for damages, disturbances and fatalities must be considered.
- Seems to be a useful tool in order to put in perspective and valorise previous reports and internal documentation dealing with impact weather.
- Should became a future data source for climate change monitoring and an homogenous and consistent data set for different studies.
- The process of event selection based on impact is far for simple, as consequence we retain all analysed events even if its general impact indicator is set to very low or low level (Note that is very easy to segment consults just for moderate, high or very high impact events).
- Unless the amount of available material differs from case to case, a common information structure and minimum content is mandatory for all the registered events, in such a way that qualitative analysis based on extended reports and quantitative analysis based on data registered or estimated metrics are plausible.
- We have lay the foundations for the impact weather catalogue of the Basque Country, but we are aware that we still have a lot of work to do:
  - New hazards/risks/impacts will be included progressively.
  - A web interface is planned to be implemented in order to facilitate internal consults.
  - Mandatory to look for alternative sources of social network information (not only due to actual Tweeter politics).
  - In order to facilitate the fill in processes, automatization of different aspects are planned (objective weather types, warning data, severe weather reports, lighting and hail information, newspaper online full access, near real time 112 and emergencies data, ……).

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Thank you for your attention :
QUESTIONS ???

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