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Civil Protection Early Warning System Model

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TRANSCPEARLYWARNING

INTERREG ADRION Programme
2014-2020

TRANSCPEARLYWARNING
Establishment of "TRANSnational Civil Protection EARLY WARNING System" to improve the resilience of Adrion territories to natural and man-made risks

Sustainable Region

Enhance the capacity in transnationally tackling environmental vulnerability, fragmentation, and the safeguarding of ecosystem services in the Adriatic-Ionian area

Civil Protection Early Warning System Model

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I.S.I.
Industrial Systems Institute

Contents

Abbreviations

ACPDR	Administration of the Republic of Slovenia for Civil Protection and Disaster Relief
BMC	Civil Protection Base (Baza e Mbrojtjes Civile)
CCS	Rescue Coordination Center
CFD	Functional Centers
COC	Municipal Operations Center
COM	Mixed Operational Centers
COR	Regional Operations Center
CP	Civil Protection
DI.COMA.C.	Command and Control Directorate
DPPEC	Department of Civil Emergency Planning and Management (Departamenti I Planifikimit dhe Perballimit te Emergjencave Civile)
DPRR	General Directorate of Roads (Drejtoria e Pergjithshme e Rrugeve)
DPUK	General Directorate of Water Supply and Sewerage (Drejtoria e Pergjithshme e Ujesjelles Kanalizimeve)
EW	Early Warning
EWS	Early Warning Systems
GSCP	General Secretariat of Civil Protection
HGSS	Croatian Mountain Rescue Service
KESH	Albanian Electroenergetic Corporation (Korporata Elektroenergjitike Shqiptare)
NCPA	National Civil Protection Agency
NGO	Non-Governmental Organization
NOCCE	National Operational Center for Civil Emergencies
PKEC	National Plan on Civil Emergencies (Plani Kombetar per Emergjencat Civile)
PVD	Ministry of Local Government and Decentralization (Ministri I Pushtetit Vendor dhe Decentralizimit)
QKO	National Operational Center (Qendra Kombetare Operacionale)
QBO	Joint Operations Center (Qendra e Bashkuar Operacionale)
SOR	Regional Operations Room


civil
protection

• Executive Summary

This report aims at delivering a conceptual model for the EUSAIR Civil Protection Early Warning System; it provides the necessary concepts and semantics for the envisaged Civil Protection Early Warning System Platform, which is a main output of the TransCPEarlyWarning project.

The report is part of the effort of activity on **Modeling of Civil Protection Early Warning System** of TransCPEarly-Warning. It builds upon the work of previous activities on *Survey of Early Warning Regulatory Frameworks and Systems, and Evaluation and Assessment of current Early Warning Regulatory Frameworks and Systems,* and closes the work of the *Innovative Transnational Network for Civil Protection Early Warning.*

The produced conceptual model is an important element to be utilized in the context of the *Civil Protection Early Warning Platform linked to the EU Civil Protection mechanisms,* especially for the elaboration of its main output *Innovative Early Warning Platform Tool for supporting Civil Protection networking in ADRION.*

The work presented in this report is led by the Industrial Systems institute of the ATHENA Research Center, Greece with contribution of all project consortium. The Industrial Systems Institute has undertaken the task of analyzing the different Civil Protection Early Warning processes and systems in the partner countries in order to conceptualize the overall process.

Furthermore, work has been done relevant to terminology comparisons. Finally, the conceptual model has been revisited in view of the individuated processes at national level offering a validation of the model.

• Introduction

Climate change has already had observable effects with significant net damage costs bound to increase over time [1]. The greenhouse effect and the increase in the planet temperature especially affect two types of risks, wildfires and floods, which are the primary targets of the TransCPEarlyWarning project. Vulnerability of the ADRION territory to such risks is increasing, mandating actions to mitigate the risks.

Harmonization of the Civil Protection Early Warning processes in ADRION macro-region can strongly contribute to this end, helping the different countries better address the relevant challenges. In this context, it is essential to understand the concepts implemented by the Civil Protection Early Warning processes and systems in the different countries, leading to a conceptual model that will be applicable in the area as a whole.

The scope of the current report is to present such a conceptual model targeting two of the main risks that ADRION macro-region faces: *forest fires* and *floods*. An analysis of the model enforcement in the different countries of the ADRION macro-region provides the model validation.

The report is structured in five chapters:

1. The first chapter presents some background knowledge on process modelling and semantics.
2. The second chapter presents the methodology that has been followed for the collection of information related to the Civil Protection Early Warning processes and systems in the ADRION macro-region territories.
3. The third chapter presents the main core of the report: the conceptual model for Civil Protection Early Warning System in ADRION. The focus of the model is on the two aforementioned predominant risks: wildfires and floods.
4. The fourth chapter presents the analysis of the conceptual model with an eye on the specific Civil Protection Early Warning processes and systems in the different partner territories. Instantiation of the model is provided for the different partner countries, contributing to the conceptual model validation.
5. Finally, the last chapter draws some conclusions and enrolls into a discussion with reference to the model and its utilization in the next project steps.


EUROPEAN
CIVIL PROTECT

1. Background Knowledge

1.1. What is a model

In order to create a model of the real world, we can adopt the meaning triangle [2] from semiotics as depicted in the following figure. The left part depicts the meaning triangle for an individual, whilst the right one if for a specific domain as adopted from [3].

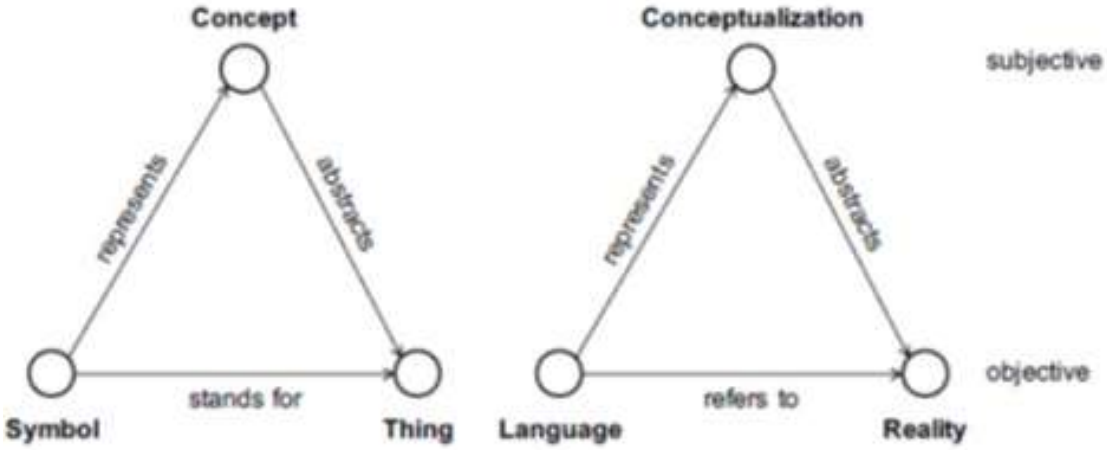


Figure 1 The meaning triangle for and individual (left) and for a specific domain (right)

The triangle on the left consists of three vertices:

- The *symbol* or *sign*, which is the representation of an object and is used to help us express our concepts
- The *thing* or the *object*, which is something that can be observed and identified.
  It can be either concrete or abstract.
- The *concept* is a subjective thought in our mind.

The set of all the concepts and the relations among them that are extracted from a specific domain is called the *Conceptualization*. In order to express the overall conceptualization, we need a language (right triangle). A conceptualization that can, among others, model a system, provides a particular view of reality that serves a specified purpose.

Systems can be described [4] like objects that have the following properties:

- a *composition:* a set of elements of some kind,
- an *environment:* a set of elements of the same kind,
- a *structure:* a set of influence bonds between the elements in the composition and between the elements in the compositions and in the environment.

The concept of production, the production of goods or services from the elements of the composition and the delivery to the elements of the environment, was added by Dietz [5]. According to Dietz, three categories of systems can be identified i) concrete systems, ii) conceptual systems, and iii) symbolic systems.

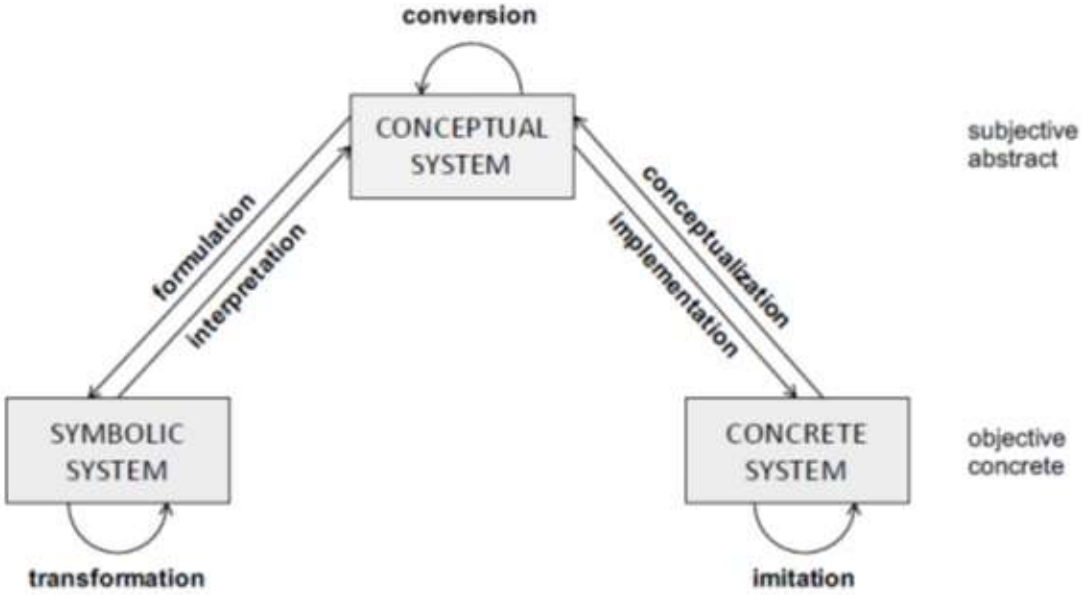


Figure 2 The model triangle [4]

The conceptualization of a concrete system is a *conceptual system* (Figure 2), while the implementation of a conceptual system is a *concrete system*. A symbolic system is represented with the use of some formal language or notation. Finally, a conceptual model of a symbolic system is called an *interpretation* of the system.

1.2. Model requirements

REQ01: *describe the CP processes, actors and actions with description languages*

The processes, the actors and the actions have to be described in a formal manner that would guarantee the clear definition of the participating entities and the interactions between them in a way that would ensure the implementation of the model on the Early Warning System Platform (EWSP).

REQ02: *enable the adaptability of the implementation to different scenarios or business processes associated with civil protection*

The model should fit and adapt to different use cases and scenarios of Civil Protection processes.

REQ03: *ensure the consistency of the data processed by the system*

The model should satisfy properties of consistency (i.e., non-contradictory relations among entities) and data integrity (during operations like transfer, storage or retrieval data are maintained identical).

1.3. Knowledge Modeling Primitives

Each Knowledge representation technique includes the appropriate tools in terms of modelling primitives to formalize domain knowledge. Such primitives may be classes, relation, attributes, etc. In the section below, the knowledge modelling components per knowledge representation (KR) technique are presented.

First order logic and frames KR techniques

Six different kinds of primitives are utilized in order to model knowledge ontologies using first order logic and frames. More specifically these primitives are:

- Classes: they represent either concrete or abstract concepts.
- Relations: they represent types of connections between concepts in a particular domain. In most cases, these connections model binary relations where the first argument is the domain of the relation and the second is the range. Inheritance relations are most often used to organize taxonomies.
- Classes may have attributes. There is a difference between attributes and relations since the range of attributes is a data type and the range of a relation is a concept.
- Functions: they constitute a special case of relations.
- Formal Axioms: the model cases or sentences that are always true. They are used as building blocks for inferring new knowledge.
- Instances: they represent elements or individuals.

KR techniques in Description Logic

Description logic (DL) can be divided into two categories, the TBox and the ABox. In the TBox, all the definitions of concepts and roles are included, while in the ABox are included the instances. There are three kinds of entities that are used to model ontologies using description logic:

- Concepts: in the context of DL they represent classes of objects. They can be either primitive (include only the necessary conditions for the individual) or defined (include necessary and sufficient conditions that have to be met by the individual).
- Roles: they are used to represent binary conditions between the concepts and properties of the concepts. In addition, special types of relations can be utilized to represent functions in DL.
- Individuals: they represent instances of concepts and their properties, meaning the values of their roles.

It must be noted that formal axioms in DL are included in concepts or roles.

KR techniques in Software Engineering

Unified Modeling Language (UML) can be used for modeling ontologies. It is a very popular modeling tool amongst engineers, has a standard graphical representation and is supported by a wide variety of available development tools and environments.

In UML diagrams, classes are represented by boxes with three separate parts. The first part contains the name of the class, the second contains the attributes of the class and the third part the operations of the class. However, operations are not used in ontologies. There is no difference between class and instance attributes. The cardinalities of each attribute are represented using the (Object Constraint Language) OCL and are attached as notes.

Relevant instances are connected to classes via dashed arrows while aggregation of classes is depicted by diamond head arrows. Associations, which are binary relations between classes, are specified via solid arrows and

can be restricted by the relevant cardinalities. Extra classes have to be created for the representation of higher arity relations.

1.4. Process Modeling

Process models represent processes of the same nature that can be grouped into a model. As described in the previous chapters, a process is the implementation of the process model and, vice versa, the process model is how the process is anticipated to be executed. The goals of a process model are:

- **Descriptive**
  - Monitor and tracking of the actual process.
  - Provide the appropriate view to an external observer for determining the improvements that have to be made.
- **Prescriptive**
  - Definition of the processes and the way they could be implemented.
  - Establishment of a set of rules, guidelines and design patterns that would lead to the desired process performance.
- **Explanatory**
  - Provision of the appropriate explanations about the process.
  - Exploration and evaluation of the different possible courses of action based on rational arguments.
  - Establishment of a connection between the processes and the requirements that the process has to fulfill.
  - Definition of points where reporting data can be extracted.

If the domain of the processes is an enterprise/organization, the processes are called *business processes* and accordingly the act of modeling is called business process modeling. There are three types of business processes:

- **Management** processes that define the governance of the organization.
- **Operational** processes that include the core business process which add value to produced product or service.
- **Supporting** processes that support the operational processes.

1.5. Business Process Model and Notation

The Business Process Model and Notation (BPMN) [6] is the de facto industry standard concerning the techniques for depicting business process models and is maintained by the Object Management Group (OMG). It provides a graphical notation for specifying business processes in a Business Process Diagram based on a flowcharting technique very similar to activity diagrams from Unified Modeling Language (UML). Its main objective is to provide a notation scheme comprehensible to both business and technical users. In addition, one of the major advantages of this standard is that it can serialize the visual models into computer readable formats, like XML. The process models can also be constructed in XML without the need of the visual model.

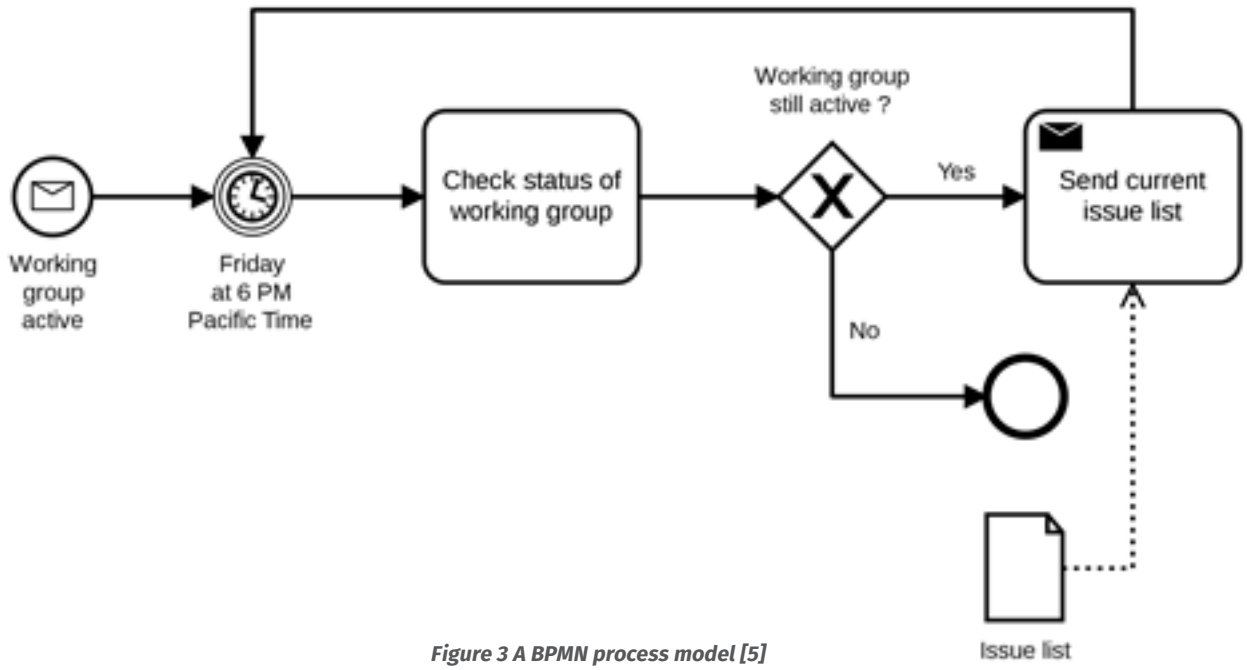


Figure 3 A BPMN process model [5]

BPMN includes four different types of elements:

- Flow objects: they include events, activities, and gateways.
- Connection Objects: they include sequence flows, message flows, and associations.
- Swim lanes: they include pools and lanes.
- Artifacts: they include data objects, groups, and annotations.

Below, we present the individual elements of each of the four types in more detail.

Events

An Event is a trigger that starts (start event), completes (end event) or modifies (intermediate event) a process and denotes something that happens. Events are represented with circles containing other notations, depending on the event type. They may include timer, error, message, signal, cancel, link escalation, custom action, etc. They are also classified as catching (e.g., the incoming daily fire risk map) and throwing (e.g., the completion of a sub task).

Activity

Activities are represented with rounded-corner rectangles and describe the kind of work that has to be done. It can be either atomic or compound.

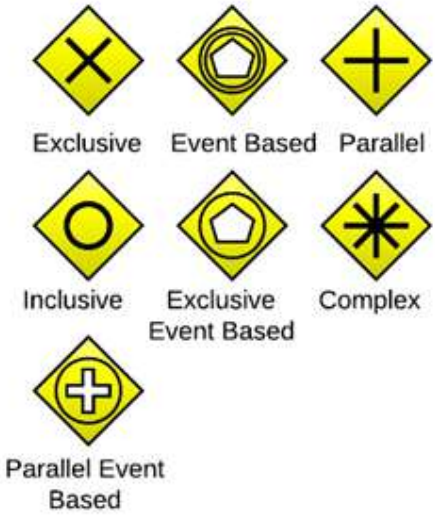
A task activity is a type of activity that cannot be broken down to further business processes. A sub-process is a compound activity and is used to conceal business process details. A transaction is a sub-process in which all

contained activities must be treated as a whole. Finally, the call activity signal sa point in the process where a global activity or global task I reused.

Gateway

It is represented with a diamond and signals the forking and merging of paths depending on the examined condition. The following types of gateway can be defined:

- Exclusive: it creates alternative paths in the process but only one of the paths can be followed.
- Event based: the condition examined is based on the evaluation of an event.
- Parallel: it creates parallel paths without any condition.
- Inclusive: it creates alternative flows where all paths are evaluated
- Exclusive Event based: same as the exclusive but the evaluation criterion is an event.
- Complex: it models complex synchronization behaviors.
- Parallel Event Based: an event, without evaluation, triggers two parallel paths.



Sequence Flow

It shows the order of activities to be performed. It is depicted as a straight line with an arrow.

Message Flow

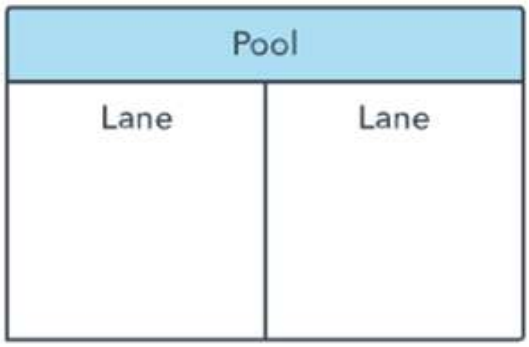
It represents messages that move along pools or distinct organizations such as departments. It is depicted as a dashed line with a circle at the start and an arrow at the end.

Association

It is represented with a dotted line and links an artifact or text to an event, activity or gateway.

Pool and swimlane

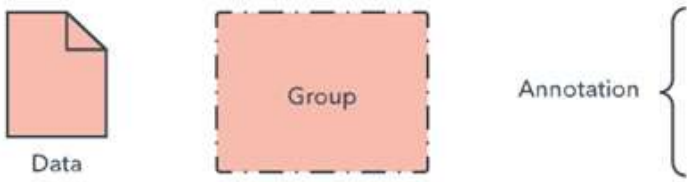
A pool depicts major actors of a process. Pools may not be in the same department or company. Swimlanes are parts of a pool and define the activities and flows for certain participants.



Artifact

Artifacts are used for storing additional information that the developer needs to store in the diagram. There are three types of artifact:

- Data objects depict data necessary for the activity.
- Groups logically combine activities but don't change the flow.
- Annotations provide additional information to the diagram.



2. Methodology

2.1. Ontological model

A Civil Protection Early Warning System essentially comprises a collection of processes in which information is exchanged between several actors in a predefined and organized fashion. The flow of information is time-dependent in most cases and involves several stakeholders with different responsibilities. Each stakeholder has a special reaction, dependent on the type of message he receives. It is obvious at this point that an EWS is a complex system that presents several challenges when trying to understand and integrate it into a web platform.

An extra degree of complexity is added when taking into account not just one but several different Early Warning Systems from the different partner countries. These countries have different organizational structures and follow different processes when dealing with the early warning part of a natural disaster. The number of involved actors can also vary greatly and the information flow does not always follow the same path.

Taking all the above into consideration, it is evident that the system has to be modelled in order to create a concrete base capturing the general principles behind the Early Warning Systems of the involved countries. An ontological model fits this purpose precisely, offering a formal specification of the terms in a specific domain and the relationships between them [7]. The main goal of the model at hand is to support the sharing of a common understanding of the structure and flow of information of the EWS among project partners.

The model attempts to answer to questions such as:

- What messages are created and exchanged in the system?
- Which stakeholders are involved in various steps of the process?
- What levels of administration the various stakeholders belong to?
- How does the information flow from level to level and to which direction?
- Are there any time related constraints in the process workflow?

The model answers these questions in a formal manner, easily reproducible and exchangeable between system agents and at the same it provides the basis for the implementation of a unified platform that can host the Early Warning Systems of all the partners. In order to achieve this, the system also answers another set of questions, such as:

- What are the differences among the actors involved in EWS of each country?
- How flow of information differs among countries?
- Are countries utilizing the same levels of administrative stakeholders in the process execution and information flow?

2.2. Information collection process

In order to collect the necessary information from the partners, we use the following sources:

- previous project deliverables as a source of information

- templates for the collection of more detailed information by the partners
- meetings (technical project meetings & bilateral ones) to clarify open issues

The creation of a model that describes a process workflow demands a good knowledge of all the aspects of the system described. To this end, the first and most important step is the collection of information about the system in question. The challenge in this procedure lies in the fact that several systems from different countries need to be analyzed and added to the model. This process requires that all the partners establish a common "language" of names of concepts and relations among them.

First, information was collected from all partners on the Civil Protection and Early Warning frameworks in their countries concerning the legislative frameworks of both the Civil Protection mechanism and the Early Warning System in place. The general structure of the Civil Protection mechanism and its organization into different administrative levels was analyzed, and the EWS of each country was broken down into the different procedures in place and the tools used to achieve the goal of early warning. This information is presented in detail in deliverable - "Status report on Early Warning Regulatory Frameworks".

While the first set of information answers questions like who does what in each country during the early warning process, elaboration was needed in order to be able to pinpoint the exact differences between the different partner mechanisms in place. A preliminary comparative analysis of the information gathered was followed by the creation of an evaluation template for each partner, aiming to highlight points of interest and clarify the specific differences among the partners in terms of legislation, organization, governance approach on the Civil Protection system. Moreover, more detailed information was collected about the Early Warning Systems on fires and floods, which are the two use cases considered by all partners as the most important ones. The result of the evaluation is presented in - "Evaluation report of national early warning Regulatory Frameworks".

Terminology when talking about natural disasters is critical so that everyone refers to and understands the same thing when using a certain term. Several glossaries exist that provide definitions on terms related to natural disasters and emergencies. In order to provide a common background to refer to throughout the project, an attempt was made to relate the terms of two of the most commonly used glossaries (EM-DAT and UNDRR) with the terms used in the participating countries. A comparative template was presented to all partners, where the exact meaning of each term was compared to the nationally used term and possible differences in meaning were highlighted. This provided the model with the exact terminology to use when defining classes and properties as described in the following section.

Up to this point, the accumulated information produced useful results but, it still was about a relatively higher abstract level of generality regarding the procedures followed by each partner country. An ontological model requires more in-depth information that covers all aspects of the procedure in detail. To this end, a specific Early Warning System was selected to be studied thoroughly and form the concrete basis for a step-wise approach to other systems. The Greek Early Warning System on forest fires (code name "IOLAOS") [8] was selected, because an in-depth documentation of the system and the related procedures was available. Knowledge was extracted from the Greek plan on fires concerning the different levels of Civil Protection administration that are involved in Early Warning, the participation and responsibilities of different types of stakeholders and the exact flow of information through the system. A prototype was created based on this knowledge.

Based on the analysis of the Greek EWS on fires, a template was created for the gathering of detailed information on each county's Early Warning System on both fires and floods. The goal of the template was to extract very detailed knowledge about the systems of the partner countries, in order to identify similarities and differences among the systems that would lead to further modifications of the prototype.

Throughout this procedure, several open issues were detected regarding the level of detail of the information collected from each partner. To resolve this issue two different types of meetings took place:

- technical project meetings of the consortium, where the pending issues were pointed out and explained to all partners
- bilateral meetings between the team responsible for the model and each partner, where specific questions about missing information or issues that needed clarification were discussed (and this was proven a more precise and fast procedure).

Several rounds of meetings took place during the different phases of information collection. The end product was used to create the model as presented below.

2.3. Creating the model

Several steps are involved in the making of an ontological model. Firstly, after defining the scope and domain of the model (in this case, the Early Warning System process from the point of the creation of an early warning message or alert to the relay of the message to all relevant stakeholders from the one end of the system to the other), an enumeration of the important terms that need to be included is performed. This is a crucial step, as it leads to the creation of the predominant characteristics of the system, which are the classes and their respective hierarchy. More information on classes is presented in the conceptual model in the next chapter.

After defining the classes of the model and their layered type dependencies, the properties that describe characteristics of each class are developed and linked to the appropriate class. The final step of setting up an ontological model is the definition of the model instances, which consists in defining specific use cases with actual values. The combination of the model and its accompanying instances form the knowledge base of the system that can be used to extract information, present the system to all actors and run process scenarios related to the procedure modelled.

Creating a model is an iterative procedure by definition. After the creation of the prototype, based on information extracted from the Greek Early Warning System on fires "IOLAOS", several iterations have altered the model, in order to either include more information or to allow the model to include the differences presented by each partner. This last part makes it necessary to import a certain level of abstraction into the model, as different countries have different levels of administration and responsibilities are distributed in different ways among acting bodies in the partner countries. A mapping of the different actors and their responsibilities is also included in the model, where applicable.

3. Civil Protection Early Warning Conceptual Model

This chapter presents in detail the developed project conceptual models (i) for forest fires, (ii) for floods.

3.1. Forest Fire Conceptual Model

For the purposes of modeling the fire early warning procedure (FEWP) a new ontology was developed in the project. This ontology aims to describe the actors involved in the FEWP, the messages that are exchanged and the actions taken before a fire breaks out or during its early stages. Afterwards, this ontology is exploited to model the FEWP as a business process with the Business Process Model and Notation standard for creating a graphical representation that depicts how the information flows and the responses of the different parties involved. More specifically, the FEWP is viewed as the dissemination of predefined **messages** between predefined **actors** that trigger a series of **communication events**. The complete list of the classes created to accommodate the information for all the above is presented with the help of the following tables:

Type	Administration Level	Name
ACTORS	CENTRAL BODIES	CIVIL (PROTECTION OPERATIONAL CENTER)
		CENTRAL PROVIDER OF METEOROLOGICAL DATA (SCI_TEAM)
		CENTRAl CIVIL PROTECTION COORDINATING BODY/CENTRAL FIRE BRIGADE
	2nd LEVEL ADMINISTRATION	2L_CIVIL
		2L_CP_CENTER
		2L_ OFFICERS
		2L_DEPTS
		2L_UNIT_DEPTS
		2L_MEDIA
	3rd LEVEL ADMINISTRATION	3L_CP_CENTER
		3L_AUTH
	ORGANISATIONS	MINISTERS' OFFICES
		FIRE SERVICE
		COAST GUARD
		NATIONAL DEFENCE GENERAL STAFF
		MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE
		MINISTRY OF HEALTH / EMERGENCY HEALTH SERVICE CHAPTER
		ELECTRICITY DISTRIBUTION NETWORK OPERATOR
		INDEPENDENT POWER TRANSMISSION OPERATOR
		MINISTRY OF ENVIRONMENT AND ENERGY
		EMERGENCY SERVICES
		OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)
MEDIA		webpage
		facebook
		blog
		tv
		radio
		newspapers

Table 1: Actors and Media

Message	Features of message	Explanation
RegularWeathMap	{**form:** typed, digital, telephone, **legal features:** legally signed}	Fire Danger Estimation Map
EWM	{**form:** typed, digital, telephone, **legal features:** attached Fire Danger Estimation RegularWeathMap}	Special Fire Warning Message
OBS_FIRE	{**form:** typed, digital, telephone, **legal features:** Regular-WeathMap showing the location of the fire}	Message about an observed fire

Table 2: Message types

Communication Event	Features of Event	Explanation
SCI_TEAM_TRANS _RegularWeathMap _ WEB	**sender:** Sci_Team, **message:** RegularWeathMap, **means:** Means, **time:** <12.30, **date:** Date, **receiver:** webpage	The central scientific body of the country (SCI_TEAM) produces the daily weather report (RegularWeatherMap) with estimations about forest fire danger and uploads the report on one or more dedicated sites
SCI_TEAM_TRANS _RegularWeathMap _ CPCB	**sender:** Sci_Team, **message:** RegularWeathMap, **receiver:** CPCB, **means:** fax, email, **date:** X, **time:** <12.30	The central scientific body of the country (SCI_TEAM) produces the daily weather report (RegularWeatherMap) with estimations about forest fire danger and sends the report to the body that coordinates the civil protection activities in a country (CPCB)
ACTOR_TRANS _RegularWeathMap _ORGS	**sender:** ACTOR, **message:** RegularWeathMap, **receiver:** ORGANISATIONS, **means:** email, **date:** X, **time:** T	An Actor sends the regularly produced fire danger report to a set of organisations concerned such as the Police, the Health Services, the Electricity Suppliers etc. This is communication at the top organisational level. Our model is not concerned with the distribution of the message within these organisations. In different countries, different actors are responsible for initiating a line of warning messages. Such are the SCI_TEAM, the body that coordinates the civil protection activities in a country (CPCB) and the Fire Brigade. The variety of these authorities makes it cumbersome to define a separate set (and entity) of "initiators".
CTOR_TRANS _RegularWeathMap _2L_CIVIL	**sender:** ACTOR, **message:** RegularWeathMap, **receiver:** 2L_CIVIL, **means:** email, **date:** X, **time:** T	An Actor sends the regularly produced fire danger report to the 2nd level Civil authorities if such exist in the country. It is assumed that there are several 2L_CIVIL
ACTOR_TRANS _RegularWeathMap _2L_CP	**sender:** ACTOR, **message:** RegularWeathMap, **receiver:** 2L_CP_CENTER, **means:** email, **date:** X, **time:** <13.30	An Actor sends the regularly produced fire danger report to the central quarters of the second level of Civil Protection Administration in a country (2L_CP_CENTER). It is assumed that there are several 2L_CP_CENTERs in each country if the country uses such a level of administration. Here we are concerned with the CP administration which may not be parallel with the political administration of the country.
ACTOR_TRANS _RegularWeathMap _2L_ORGANISATIONS	**sender:** ACTOR, **message:** RegularWeathMap, **receiver:** 2L_ORGANISATIONS, **means:** email, **date:** X, **time:** T	An Actor sends the regularly produced fire danger report to the 2nd level organisations such as the fire brigade and the police

Communication Event	Features of Event	Explanation
2L_CP_CENTER_TRANS_RegularWeathMap_2L_AUTH	**sender:** 2L_CP_CENTER, **message:** RegularWeathMap, **receiver:** 2L_OFFICERS, **means:** email, **date:** X, **time:** T	The 2nd level of administration CP offices (2L_CP_CENTER) communicate the regular weather broadcast map (RegWeathMap) to the officers of the corresponding civil administration in a country where such administration exists
2L_CP_CENTER_TRANS_RegularWeathMap_MEDIA	**sender:** 2L_CP_CENTER, **message:** RegularWeathMap, **receiver:** MEDIA, **means:** email, **date:** X, **time:** T	The 2nd level of administration CP offices (2L_CP_CENTER) communicate the regular weather broadcast map (RegWeathMap) to the regional media
ACTOR_TRANS_RegularWeathMap_3L_AUTH	**sender:** ACTOR, **message:** RegularWeathMap, **receiver:** 3L_AUTH, **means:** email, **date:** X, **time:** T	An Actor communicates the regular weather report to the officers of the municipal administration and civil protection
ACTOR_TRANS_RegularWeathMap_3L_CP	**sender:** ACTOR, **message:** RegularWeathMap, **receiver:** 3LEVEL_ CP_ CENTER, **means:** email, **date:** X, **time:** <13.30	An Actor sends the regularly produced fire danger report to the central quarters of the third level of Civil Protection (CP) Administration in a country (3L_CP_CENTER). There are several 3L_CP_CENTERs in a country that uses this level of administration. Here we are concerned with the CP administration which may not be parallel with the political administration of the country.

Table 3: Communication Events related to the dissemination of the daily danger estimation map

Communication Event	Features of Event	Explanation
ACTOR_TRANS_EWM_2L_CP	**sender:** ACTOR, **message:** EWM, **receiver:** 2L _CP_ CENTER, **means:** mobile, email, **date:** X, **time:** T	An Actor sends a fire danger warning (EWM) to the 2L_CP_CENTER of the areas that are in danger.
ACTOR_TRANS_EWM_ORGANISATIONS	**sender:** ACTOR, **message:** EWM, **receiver:** ORGANISATIONS, **means:** email, **date:** X, **time:** T	An Actor sends a fire danger warning (EWM) to a set of organisations in the areas that are in danger (the central quarters of the relevant organisations in the endangered areas) such as the Police, the Health Services, the Electricity Suppliers etc. Our model is not concerned with the distribution of the message within these organisations.
ACTOR_TRANS_EWM_3L_CP	**sender:** ACTOR, **message:** EWM, **receiver:** 3L_ CP_CENTER, **means:** email, **date:** X, **time:** T	An Actor sends a fire danger warning (EWM) to the central quarters of the third level of CP administration (3L_CP_CENTER) of the areas that are in danger.
2L_CP_CENTER_TRANS_DANG_MES_2L_OFFICERS	**sender:** 2L_CP_CENTER, **message:** DANGER MESSAGE, **receiver:** 2L _OFFICERS, **means:** email, fax, sms, **date:** X, **time:** T	The 2L_CP_CENTER headquarters communicate the fire danger message (EWM, observed fire) to the officers of the corresponding civil administration in a country where such administration exists

Communication Event	Features of Event	Explanation
2L_OFFICERS_TRANS_DANGER MESSAGE	**sender:** 2L_OFFICERS, **message:** DANGER MESSAGE, **receiver:** 2L_DEPTS, **means:** email, **date:** X, **time:** T	The appointed officer of 2L_CP_CENTER communicates a danger message (EWM, observed fire) to the depts that are directly related to the headquarters of 2L_CP_CENTER.
	sender: 2L_OFFICERS, **message:** DANGER_MESSAGE, **receiver:** 2L_UNIT_DEPTS, **means:** email, fax, sms **date:** X, **time:** T	The appointed officer of 2L_CP_CENTER communicates a danger message (EWM, observed fire) to the depts that are related to the UNITS of 2L_CP_CENTER.
2L_CP_CENTER_TRANS_DANG_MES_MEDIA	**sender:** 2L_CP_CENTER, **message:** DANGER_MESSAGE, **receiver:** 2L_MEDIA, **means:** email, fax, sms, **date:** X, **time:** T	The 2L_CP_CENTER headquarters communicate the fire danger message (EWM, observed fire) to the media of 2L_CP_CENTER in a country where such administration exists
3L_CP_CENTER_TRANS_DANG_MES	**sender:** 3L_CP_CENTER, **message:** DANGER_MESSAGE, **receiver:** 3L_AUTH, **means:** email, **date:** X, **time:** T	The 3rd level of administration CP offices communicate a danger message (EWM, fire observation) to the officers of the municipal administration

Table 4: Communication Events related to the dissemination of the special early warning message for high risk areas

Communication Event	Features of Event	Explanation
CPCB_TRANS_OBS_FIRE_CIVIL	**sender:** CPCB, **message:** OBSERVED FIRE, **receiver:** CIVIL, **means:** mobile, email, **date:** X, **time:** T	The body that coordinates the civil protection activities in a country (CPCB) sends a fire observation message to the country's civil protection center (CIVIL)
ACTOR_TRANS_OBS_FIRE_2L_CP_CENTER	**sender:** ACTOR, **message:** OBSERVED_FIRE, **receiver:** 2L_CP_CENTER, **means:** mobile, email, **date:** X, **time:** T	The appointed Actor informs the central second level CP administration (2L_CP_CENTER) about an observed fire
ACTOR_TRANS_OBS_FIRE_REG_ORG	**sender:** ACTOR, **message:** OBSERVED_FIRE, **receiver:** ORGANISATIONS, **means:** email, **date:** X, **time:** T	The appointed Actor informs related local organisations at the appropriate level about an observed fire
ACTOR_TRANS_OBS_FIRE_DEC_ADM	**sender:** ACTOR, **message:** OBSERVED_FIRE, **receiver:** 3L_CP_CENTRAL, **means:** email, **date:** X, **time:** T	The appointed Actor informs the concerned central third level CP Administration (3L_CP_CENTER) about an observed fire in the countries where such an administration level exists

Communication Event	Features of Event	Explanation
ACTOR_TRANS_OBS_FIRE_MUNICIPALITY	**sender:** ACTOR, **message:** OBSERVED_FIRE, **receiver:** 3L_AUTH, **means:** email, **date:** X, **time:** T	The appointed Actor informs the concerned third level authorities (3L_AUTH) about an observed fire in the countries where such an administration level exists
2L_CP_CENTER_TRANS_DANG_MES_2L_OFFICERS	**sender:** 2L_CP_CENTER, **message:** DANGER MESSAGE, **receiver:** 2L _OFFICERS, **means:** email, fax, sms, **date:** X, **time:** T	The 2L_CP_CENTER headquarters communicate the fire danger message (EWM, observed fire) to the officers of the corresponding civil administration in a country where such administration exists
2L_OFFICERS_TRANS_DANGER MESSAGE	**sender:** 2L_OFFICERS, **message:** DANGER MESSAGE, **receiver:** 2L_DEPTS, **means:** email, **date:** X, **time:** T	The appointed officer of 2L_CP_CENTER communicates a danger message (EWM, observed fire) to the depts that are directly related to the headquarters of 2L_CP_CENTER.
	sender: 2L_OFFICERS, **message:** DANGER_MESSAGE, **receiver:** 2L_UNIT_DEPTS, **means:** email, fax, sms **date:** X, **time:** T	The appointed officer of 2L_CP_CENTER communicates a danger message (EWM, observed fire) to the depts that are related to the UNITS of 2L_CP_CENTER.
2L_CP_CENTER_TRANS_DANG_MES_MEDIA	**sender:** 2L_CP_CENTER, **message:** DANGER_MESSAGE, **receiver:** 2L_MEDIA, **means:** email, fax, sms, **date:** X, **time:** T	The 2L_CP_CENTER headquarters communicate the fire danger message (EWM, observed fire) to the media of 2L_CP_CENTER in a country where such administration exists
3L_CP_CENTER_TRANS_DANG_MES	**sender:** 3L_CP_CENTER, **message:** DANGER_MESSAGE, **receiver:** 3L_AUTH, **means:** email, **date:** X, **time:** T	The 3rd level of administration CP offices communicate a danger message (EWM, fire observation) to the officers of the municipal administration

Table 5: Communication Events related to the dissemination of the message about an observed fire

3.2. Flood Conceptual Model

This section presents the TransCPEarlyWarning model's classes and object properties on which the Ontology for floods is built. The TransCPEarlyWarning Floods Ontology is designed and developed to conceptualize the knowledge of flood hazard and the flood forecasting and warning signs.

The elements of the TransCPEarlyWarning Floods Model which should be used for civil protection activities execution are the actors, the messages transferred from the actors to the destinations and the classes which transfer the messages.

The TransCPEarlyWarning Floods Ontology's actors and destinations for the early warning response due to floods are the Instigators and the Bodies at Central level, 3rd Level Administration, 2nd Level Administration and the Organizations level.

ACTORS /DESTINATIONS	ACTORS /DESTINATIONS DESCRIPTION
INSTIGATORS	CENTRAL PROVIDER OF METEOROLOGICAL DATA
CENTRAL BODIES	CIVIL PROTECTION OPERATIONAL CENTER (CPOC)
	CENTRAl CIVIL PROTECTION COORDINATING BODY (CCPCB)
	PRESS AND PUBLIC RELATIONS OFFICE OF GENERAL SECRETARIAT OF CIVIL PROTECTION
	EMERGENCY PLANNING AND RESPONSE DIRECTORATE OF GENERAL SECRETARIAT OF CIVIL PROTECTION
	CENTRAl CIVIL PROTECTION COORDINATING BODY/CENTRAL FIRE BRIGADE
2nd LEVEL_ADMINISTRATION	2nd LEVEL CIVIL PROTECTION CENTER (2L_CP_CENTER)
	2nd LEVEL OFFICERS (2L_OFFICERS)
	2nd LEVEL DIRECTORATES (2L_DEPTS)
	2nd LEVEL DEPARTMENTS (2L_UNIT_DEPTS)
3rd LEVEL_ADMINISTRATION	3rd LEVEL CIVIL PROTECTION CENTER (3L_CP_CENTER)
	3rd LEVEL AUTHORITIES (3L_AUTH)
ORGANISATIONS	MINISTERS' and GENERAL SECRETARIES' OFFICES
	FIRE SERVICE
	DIRECTORATE OF OPERATION, MAINTENANCE AND OPERATION OF TRANSPORT INFRASTRUCTURE WITH CONSESSION AGREEMENT (D17) / GENERAL SECRETARIAT OF INFRASTRUCTURES / MINISTRY OF INFRASTRUCTURE AND TRANSPORT
	DIRECTORATE OF FIXED TRACK INFRASTRUCTURE, MAINTENANCE AND SAFETY (D14) / MINISTRY OF INFRASTRΘCTURE AND TRANSPORT
	AIRPORTS ADMINISTRATIONS
	COAST GUARD
	NATIONAL DEFENCE GENERAL STAFF
	MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE / PUBLIC HEALTH EMERGENCY PREPAREDNESS DIRECTORATE
	MINISTRY OF HEALTH / EMERGENCY HEALTH SERVICE CHAPTER
	MINISTRY OF HEALTH / NATIONAL ORGANISATION OF PUBLIC HEALTH
	ELECTRICITY DISTRIBUTION NETWORK OPERATOR (EDNO)
	INDEPENDENT POWER TRANSMISSION OPERATOR
	MINISTRY OF ENVIRONMENT AND ENERGY
	OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)
	POLICE

Table 1 lists the TransCPEarlyWarning Flood Ontology's actors.

In addition to the daily weather forecast bulletins, the official body of a country for weather forecasting, such as heavy rainfall, strong storms, etc. issues Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, which determine the evolution of weather phenomena spatially and temporally. These bulletins are sent to the official central body which coordinates the civil protection activities in a country. Sequentially, the central body transmits a special warning message to the destinations and simultaneously issues press releases to the media, in order to inform the public about the occurrence of severe or even dangerous weather phenomena and to provide more specific instructions for taking measures to protect themselves from possible dangers arising from flood phenomena.

Message type	Message explanation	Features of message
EDEK_EDEPEKF	Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena	{**form:** typed, digital, fax to an updated list of recipients, **legal features:**)
EWM	Special Flood Warning Message	{**form:** typed, digital, fax to an updated list of recipients, **legal features:** attached EDEK and EDEPEKF}
EWA	Warning announcements with appropriate instructions	{**form:** typed, digital, press release posted on website, **legal features:** attached EDEK and EDEPEKF})

Table 2 lists the TransCPEarlyWarning Flood Ontology's Messages and their features.

Class	Class explanation	Object properties
INSTIGATORS_TRANS_DANG_MES	The national meteorological service of the country (NMS) produces the Extraordinary Weather Deterioration Bulletins (EDEK) and the Extraordinary Weather Forecasts of Dangerous Weather Phenomena (EDEPEKF) with estimations about the occurrence of severe weather phenomena, such as heavy rainfall, strong thunderstorms, etc. and sends them to the centers that coordinates the civil protection activities in a country (CPOC/CCPCB)	**sender:** INSTIGATORS, **message:** DANGER_MESSAGE, **receiver:** CENTRAL_BODIES **means:** email, **date:** X, **time:** T
CENTRAL_BODIES_TRANS_DANG_MES	The centers that coordinate the civil protection activities in a country (CPOC/CCPCB) sends the special flood warning message (EWM) with the Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, as attachments, to the Civil Protection (CP) Directorate of the 3rd level Administration in a country that are going to be in danger (3L_CP_CENTER). There are several 3L_CP_CENTERs in a country that uses this level of administration. Here we are concerned with the CP administration which may not be parallel with the political administration of the country.	**sender:** CENTRAL_BODIES, **message:** DANGER_MESSAGE, **receiver:** ACTORS **means:** email, **date:** X, **time:** T
	The centers that coordinate the civil protection activities in a country (CPOC/CCPCB) sends the special flood warning message (EWM) with the Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, as attachments, to the Civil Protection (CP) Directorate of the 2nd level of Administration in a country that are going to be in danger (2L_CP_CENTER).	**sender:** CENTRAL_BODIES, **message:** DANGER_MESSAGE, **receiver:** ACTORS, **means:** email, **date:** X, **time:** T
	The centers that coordinate the civil protection activities in a country (CPOC/CCPCB) sends the special flood warning message (EWM) with the Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, as attachments, to a set of organizations in the areas that are in danger (the central quarters of the relevant organizations in the endangered areas) such as the Police, the Health Services, the Electricity Suppliers etc. Our model is not concerned with the distribution of the message within these organizations.	
	The press office of the body that coordinate the civil protection activities in a country issues warning announcements with appropriate instructions, for informing the public located in the areas in danger, with the aim of taking self-protection measures	**sender:** CENTRAL_BODIES, **message:** DANGER_MESSAGE, **receiver:** MEDIA **means:** MEANS, **date:** X, **time:** T

Class	Class explanation	Object properties
ADMINISTRATION_ TRANS_DANG_MES	The 2L_CP_CENTER headquarters communicate the special flood warning message (EWM) with the Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, as attachments, to the officers of the corresponding civil administration in a country where such administration exists	**sender:** AGENT, **message:** DANGER_MESSAGE, **receiver:** DESTINATIONS, **means:** email, **date:** X, **time:** T
	The appointed officer of 2L_CP_CENTER communicates the special flood warning message (EWM) with the Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, as attachments, to the depts that are directly related to the headquarters of 2L_CP_CENTER.	
	The appointed officer of 2L_CP_CENTER communicates the special flood warning message (EWM) with the Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, as attachments, to the depts that are related to the UNITS of 2L_CP_CENTER.	
	The 3rd level of administration CP offices communicate the special flood warning message (EWM) with the Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, as attachments, to the officers of the municipal administration	

Table 3 lists the TRANSCPEARLYWARNING Flood Ontology's classes.

4. Conceptual model instantiation and validation

The chapter presents the model instantiation in the different countries. The model instantiation provided an opportunity to validate the model according to the processes applicable in the countries of the Adriatic Ionian.

4.1. Forest Fire Conceptual Model Instantiation

4.1.1. Bosnia & Herzegovina

An instantiation of our conceptual model for the case of Bosnia can be found in the tables below:

Type	Administration Level	Name	Instance
ACTORS	CENTRAL BODIES	CIVIL (PROTECTION OPERATIONAL CENTER)	Federal Administration of Civil Protection
		CENTRAL PROVIDER OF METEOROLOGICAL DATA (SCI_TEAM)	Federal Hydrometeorological Institute
	2nd LEVEL ADMINISTRATION	2L_CIVIL	CP Herzegovina – Neretva Canton headquarters
		2L_CP_CENTER	Civil Protection Operation centre of Herzegovina – Neretva Canton
		2L_ OFFICERS	Government of HNC
	3rd LEVEL ADMINISTRATION	3L_CP_CENTER	Municipal / city civil protection services
		3L_AUTH	Mayors
	ORGANISATIONS	FIRE SERVICE	Fire services of municipalities (professional fire brigade)
		ELECTRICITY DISTRIBUTION NETWORK OPERATOR	Utility services
		EMERGENCY SERVICES	Emergency Service, Public enterprises that manage forests, Public companies that manage protected areas
		OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)	Volunteer Fire Department

Table 1: Actors and Media

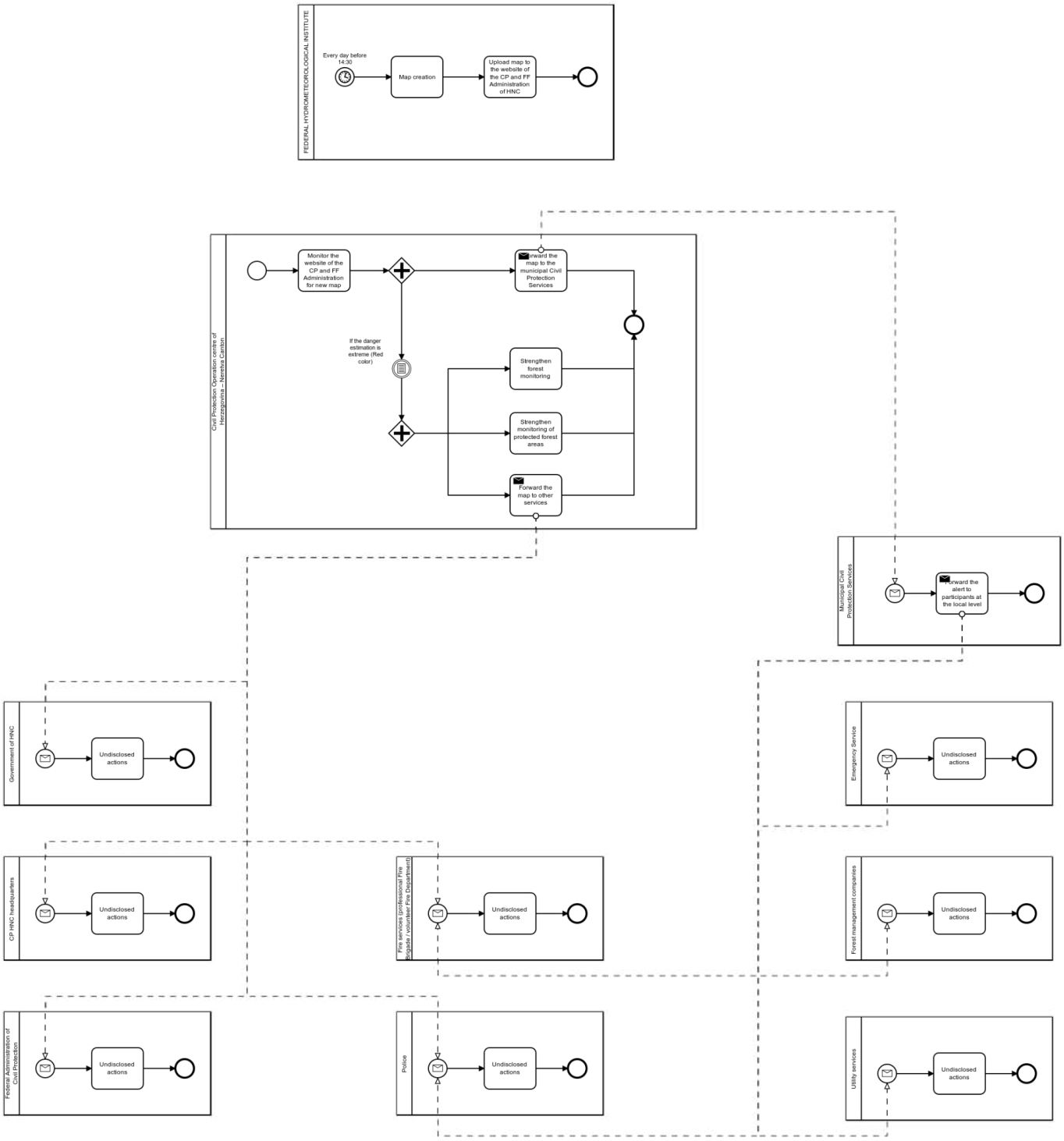
Communication Event	Instance
SCI_TEAM_TRANS _RegularWeathMap _ WEB	**sender:** Federal Hydrometeorological Institute **message:** RegularWeathMap **means:** upload to web **time:** <14.30 **date:** Daily **receiver:** HNC webpage
2L_CP_CENTER_TRANS _RegularWeathMap _2L_AUTH	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap **receiver:** Government of HNC, CP HNC headquarters **means:** email, fax phone **date:** X **time:** T
ACTOR_TRANS _RegularWeathMap _3L_CP	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap, **receiver:** Municipal Civil Protection Services, **means:** email, fax, phone **date:** X, **time:** <15.30

Table 2: Communication Events related to the dissemination of the daily danger estimation map

Communication Event	Instance
ACTOR_TRANS _EWM_ORGANISATIONS	**sender:** Civil Protection Operation center of HNC **message:** RegularWeathMap **receiver:** Fire services of municipalities / cities (professional fire brigade, volunteer Fire Department), Police, Federal Administration of Civil Protection, Public enterprises that manage forests, Public companies that manage protected areas **means:** email **date:** X, **time:** T
ACTOR_TRANS _EWM_3L_CP	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap, **receiver:** Municipal Civil Protection Services, **means:** email, fax, phone **date:** X, **time:** <15.30
2L_CP_CENTER_TRANS _DANG_MES_2L_OFFICERS	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap **receiver:** Government of HNC, CP HNC headquarters **means:** email, fax phone **date:** X **time:** T

Table 3: Communication Events related to the dissemination of the special early warning message for high risk areas

The aforementioned procedure can be translated as the following BPMN diagram:



4.1.2. Croatia

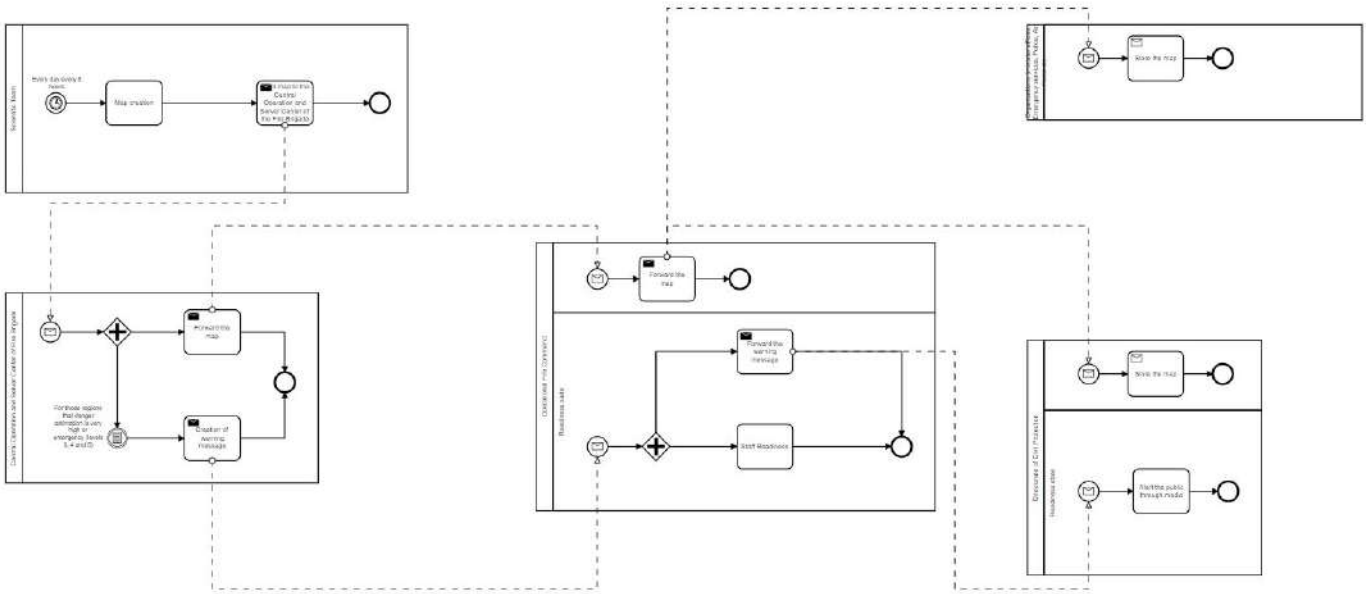
The following tables represent an instance of the model for forest fires in Croatia.

ACTORS /DESTINATIONS	ACTORS/DESTINATIONS DESCRIPTION	CROATIA
CENTRAL BODIES	CIVIL PROTECTION OPERATIONAL CENTER	Central operation and server centre (fire brigade)
	CENTRAL PROVIDER OF METEOROLOGICAL DATA	DHMZ (Croatian Meteorological and hydrological service)
	SCIENTIFIC TEAM	HR_SCI_TEAM
	CENTRAl CIVIL PROTECTION COORDINATING BODY/CENTRAL FIRE BRIGADE	Operational fire command
2LEVEL_ADMINISTRATION	2L_CP_CENTER	District operational centers
ORGANISATIONS	MINISTERS' OFFICES	offices
	FIRE SERVICE	Fire Brigade in Split / Split-Dalmatia County Fire Brigade
		Kaštela, Sinj, Omiš, Hvar operation centers
		Operational Fire Command (Divulje)
	MINISTRY OF HEALTH	Emergency Medical Service
	EMERGENCY SERVICES	Croatian Mountain Rescue Service
	OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)	volunteer organizations
	POLICE	police
MEDIA	SOCIAL MEDIA	social media
	TV	TV
	BLOG	news portals

MESSAGES	Message type	Message explanation	Features of message
WEATHER_MAP	RegularWeathMap	Fire Danger Estimation FireRIskMap	{**form:** typed, digital, telephone, **legal features:** signed by Head of Scientific Team}
DANGER_MESSAGE	EWM	Special Fire Warning Message (for areas at risk level 3,4,5)	{**form:** typed, digital, telephone, **legal features:** attached Fire Danger Estimation RegularWeathMap}
	OBS_FIRE	Message about an observed fire	{**form:** typed, digital, telephone, radio, **legal features:** RegularWeathMap showing the location of the fire}

COMMUNICATION EVENT	CLASS	INSTANCE
AGENT_TRANS _REGULARMAP	SCI_TEAM_TRANS _RegularWeathMap_ CPCB	**sender:** DHMZ, **message:** RegularWeathMap, **receiver:** Central operation and server centre, **means:** web interface, **date:** X, **time:** every 8 hours
	ACTOR_TRANS _RegularWeathMap_ORGS	**sender:** Operational Fire Command, **message:** DANGER MESSAGE, **receiver:** {Ministers' offices, air forces, Police, MoD, Croatian Mountain Rescue Service, Civil protection units from the county, Ministry of Health / Emergency Medical Service, Other involved parties (e.g. volunteer organizations)
ADMINISTRATION_TRANS _DANG_MES	2L_CP_CENTER_TRANS _DANG_MES_MEDIA	**sender:** Directorate of Civil protection, **message:** DANGER_MESSAGE, **receiver:** Social media, TV, news portals, **means:** email, **date:** X, **time:** T

The aforementioned procedure can be translated as the following BPMN diagram:



4.1.3. Greece

An instantiation of our conceptual model for the case of Bosnia can be found in the tables below:

Type	Administration Level	Name	Instance
ACTORS	CENTRAL BODIES	CIVIL (PROTECTION OPERATIONAL CENTER)	KEPP
		CENTRAL PROVIDER OF METEOROLOGICAL DATA (SCI_TEAM)	GR_Sci_Team
		CENTRAL CIVIL PROTECTION COORDINATING BODY/CENTRAL FIRE BRIGATE	ESKE (ΕΣΚΕ)/199
	2nd LEVEL ADMINISTRATION	2L_CP_CENTER	CRETE_REG_CP
		2L_ OFFICERS	CRETE_REG_GOVERNOR CRETE_LOCAL_VICE_COVERNOR CRETE_PRES_REG_COUNCIL CRETE_CP_VICE_GOVERNOR CRETE_2L_COORD
		2L_DEPTS	Environment and Space design Agricultural economy Veterinary Public Health Social Security Development Planning Finances
		2L_UNIT_DEPTS	Regional Protection Technical Works Health Public Health Agriculture
		2L_MEDIA	Press Office Social Media of Region
	3rd LEVEL ADMINISTRATION	3L_CP_CENTER	CRETE_DEC_ADMIN_CP
		3L_AUTH	CRETE_MUNICIPALITIES MAYORS VICE_MAYORS
	ORGANISATIONS	MINISTERS' OFFICES	Offices
		FIRE SERVICE	ESKE/199 PE.KEs DISTRICT_FIRE SERVICEs
		COAST GUARD	REGIONAL COAST GUARDs LOCAL PORT AUTHORITIES
		NATIONAL DEFENCE GENERAL STAFF	Central Government
		MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE	Central Government
		MINISTRY OF HEALTH / EMERGENCY HEALTH SERVICE CHAPTER	LOCAL EMERGENCY HEALTH SERVICE CHAPTERs
		ELECTRICITY DISTRIBUTION NETWORK OPERATOR	REGIONAL DEPTS OF POWER TRANSMISSION OPERATOR
		INDEPENDENT POWER TRANSMISSION OPERATOR	Central Government
		MINISTRY OF ENVIRONMENT AND ENERGY	Central Government
		POLICE	POLICE _HEADQUARTERS GENERAL REGIONAL POLICE DEPTS DISTRICT_POLICE DEPTS

Type	Administration Level	Name	Instance
MEDIA		webpage	webpage
		facebook	facebook
		blog	blog
		tv	tv
		radio	radio
		newspapers	newspapers

Table 1: Actors and Media

Communication Event	Features of Event
SCI_TEAM_TRANS _RegularWeathMap _ WEB	**sender:** GR_Sci_Team **message:** RegularWeathMap **receiver:** www.civilprotection.gr **means:** upload **date:** X **time:** <12.30
SCI_TEAM_TRANS _RegularWeathMap _ CPCB	**sender:** GR_Sci_Team **message:** RegularWeathMap **receiver:** ESKE **means:** fax, email **date:** X **time:** <12.30
ACTOR_TRANS _RegularWeathMap _ORGS	**sender:** ESKE **message:** RegularWeathMap **receiver:** {FIRE SERVICE, COAST GUARD, NATIONAL DEFENCE GENERAL STAFF, MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE, MINISTRY OF HEALTH / EMERGENCY HEALTH SERVICE CHAPTER, ELECTRICITY DISTRIBUTION NETWORK OPERATOR (ΔΕΔΔΗΕ), INDEPENDENT POWER TRANSMISSION OPERATOR, MINISTRY OF ENVIRONMENT AND ENERGY, OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS), POLICE} **means:** email **date:** X **time:** <13.30
ACTOR_TRANS _RegularWeathMap _2L_CP	**sender:** ESKE **message:** RegularWeathMap **receiver:** CRETE_REG_CP **means:** email **date:** X **time:** <13.30
2 L _ C P _ C E N T E R _ TRANS _RegularWeathMap _2L_AUTH	**sender:** CRETE_REG_CP, **message:** RegWeathMap, **receiver:** {CRETE_REG_GOVERNOR, CRETE_PRES_REG_COUNCIL, CRETE_CP_VICE_GOVERNOR, CRETE_LOCAL_VICE_COVERNOR(1-4), CRETE_2L_COORD} **means:** email, fax, sms **date:** X **time:** <13.30
ACTOR_TRANS _RegularWeathMap _3L_AUTH	**sender:** CRETE_DEC_ADMIN, **message:** RegularWeathMap, **receiver:** {ALL CRETE_MUNICIPALITIES, ALL MAYORS, ALL VICE MAYORS}, **means:** email, **date:** X, **time:** <13.30
ACTOR_TRANS _RegularWeathMap _3L_CP	**sender:** ESKE, **message:** RegularWeathMap, **receiver:** CRETE_DEC_ADMIN_CP, **means:** email, **date:** X, **time:** <13.30

Table 2: Communication Events related to the dissemination of the daily danger estimation map

Communication Event	Features of Event
ACTOR_TRANS _EWM_2L_CP	**sender:** ESKE, **message:** EWM, **receiver:** CRETE_REG_CP, **means:** mobile, email, **date:** X, **time:** TC
ACTOR_TRANS _EWM_ORGANISATIONS	**sender:** ESKE, **message:** EWM, receiver: CRETE_{FIRE SERVICE-PEKE, REGIONAL POLICE DEPT, REGIONAL COAST GUARD, NATIONAL DEFENCE GENERAL STAFF, MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE, LOCAL EMERGENCY HEALTH SERVICE CHAPTER, REGIONAL DEPT OF ELECTRICITY DISTRIBUTION NETWORK OPERATOR (ΔΕΔΔΗΕ), INDEPENDENT POWER TRANSMISSION OPERATOR, MINISTRY OF ENVIRONMENT AND ENERGY, OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)}, **means:** email, **date:** X, **time:** <13.30
ACTOR_TRANS _EWM_3L_CP	**sender:** ESKE **message:** EWM **receiver:** CRETE_DEC_ADMIN_CP **means:** email **date:** X **time:** <13.30
2L_CP_CENTER_TRANS _DANG_MES_2L_OFFICERS	**sender:** CRETE_REG_CP **message:** DANGER MESSAGE **receiver:** {CRETE_REG_GOVERNOR, CRETE_PRES_REG_COUNCIL, CRETE_CP_VICE_GOVERNOR, CRETE_LOCAL_VICE_COVERNOR(1-4), CRETE_2L_COORD} **means:** email, fax, sms **date:** X **time:** T
2L_OFFICERS_TRANS _DANGER MESSAGE	**sender:** CRETE_REG GOVERNOR **message:** DANGER MESSAGE **receiver:** {Environment and Space design, Agricultural economy, Veterinary, Public Health, Social Security, Development Planning, Finances} **means:** email, fax, sms, **date:** X, **time:** T
	sender: CRETE_LOCAL_VICE_COVERNOR(1-4) **message:** DANGER_MESSAGE **receiver:** {Regional Protection, Technical Works, Health, Public Health, Agriculture} **means:** email, fax, sms **date:** X **time:** T
2L_CP_CENTER_TRANS _DANG_MES_MEDIA	**sender:** CRETE_REG_CP **message:** DANGER_MESSAGE **receiver:** Press Office Reg_Crete/Social media_Reg_Crete **means:** email, fax, sms **date:** X **time:** T
3L_CP_CENTER_TRANS _DANG_MES	**sender:** CRETE_DEC_ADMIN **message:** DANGER MESSAGE **receiver:** {SOME MUNICIPALITIES, SOME MAYORS, SOME VICE MAYORS} **means:** email **date:** X **time:** T

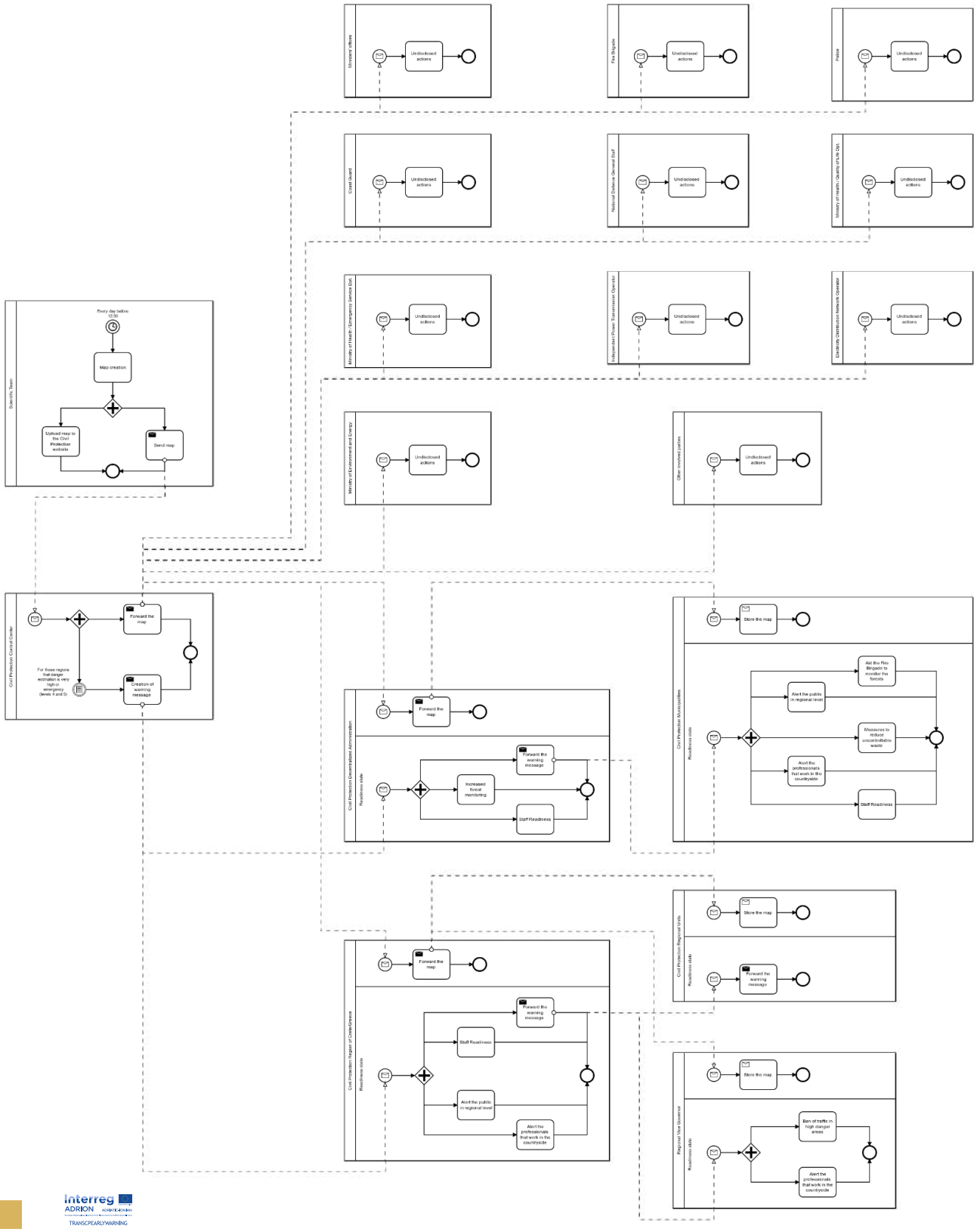
Table 3: Communication Events related to the dissemination of the special early warning message for high risk areas

Communication Event	Features of Event
CPCB_TRANS _OBS_FIRE_CIVIL	[**sender:** CRETE_PEKE, **message:** OBSERVED_FIRE, **receiver:** ESKE/199, **means:** mobile, email, **date:** X, **time:** T], [**sender:** ESKE/199, **message:** OBSERVED_FIRE, **receiver:** CRETE_PEKE, **means:** mobile, email, **date:** X, **time:** T] [**sender:** ESKE, **message:** OBSERVED FIRE, **receiver:** KEPP, **means:** mobile, email, **date:** X, **time:** T]
ACTOR_TRANS _OBS_FIRE_2L_CP_CENTER	**sender:** CRETE-PEKE **message:** OBSERVED_FIRE **receiver:** CRETE_REG_ CP **means:** mobile, email **date:** X **time:** T
ACTOR_TRANS _OBS_FIRE_REG_ORG	**sender:** CRETE_PEKE **message:** OBSERVED_FIRE **receiver:** {REGIONAL POLICE DEPT, DISTRICT POLICE DEPT, LOCAL FOREST SERVICE, REGIONAL COAST GUARD, LOCAL COAST GUARD, LOCAL EMERGENCY HEALTH SERVICE CHAPTER, REGIONAL DEPT OF ELECTRICITY DISTRIBUTION NETWORK OPERATOR, INDEPENDENT POWER TRANSMISSION OPERATOR, PARTIES (E.G. VOLUNTEER ORGANIZATIONS)} **means:** email **date:** X **time:** T
ACTOR_TRANS _OBS_FIRE_DEC_ADM	**sender:** CRETE_PEKE **message:** OBSERVED_FIRE **receiver:** CRETE_DEC_ADMIN **means:** email **date:** X **time:** T
ACTOR_TRANS _OBS_FIRE_MUNICIPALITY	**sender:** CRETE_PEKE **message:** OBSERVED_FIRE **receiver:** {SOME MUNICIPALITIES, SOME MAYORS, SOME VICE MAYORS} **means:** email **date:** X **time:** T
2L_CP_CENTER_TRANS _DANG_MES_2L_OFFICERS	**sender:** CRETE_REG_CP **message:** DANGER MESSAGE **receiver:** {CRETE_REG_GOVERNOR, CRETE_PRES_REG_COUNCIL, CRETE_CP_VICE_GOVERNOR, CRETE_LOCAL_VICE_COVERNOR(1-4), CRETE_2L_COORD} **means:** email, fax, sms **date:** X **time:** T
2L_OFFICERS_TRANS _DANGER MESSAGE	**sender:** CRETE_REG GOVERNOR **message:** DANGER MESSAGE **receiver:** {Environment and Space design, Agricultural economy, Veterinary, Public Health, Social Security, Development Planning, Finances} **means:** email, fax, sms, **date:** X, **time:** T
	sender: CRETE_LOCAL_VICE_COVERNOR(1-4) **message:** DANGER_MESSAGE **receiver:** {Regional Protection, Technical Works, Health, Public Health, Agriculture} **means:** email, fax, sms **date:** X **time:** T
2L_CP_CENTER_TRANS _DANG_MES_MEDIA	**sender:** CRETE_REG_CP **message:** DANGER_MESSAGE **receiver:** Press Office Reg_Crete/Social media_Reg_Crete **means:** email, fax, sms **date:** X **time:** T

Communication Event	Features of Event
3L_CP_CENTER_TRANS _DANG_MES	**sender:** CRETE_DEC_ADMIN **message:** DANGER MESSAGE **receiver:** {SOME MUNICIPALITIES, SOME MAYORS, SOME VICE MAYORS} **means:** email **date:** X **time:** T

Table 4: Communication Events related to the dissemination of the message about an observed fire

The aforementioned procedure can be translated as the following BPMN diagram:

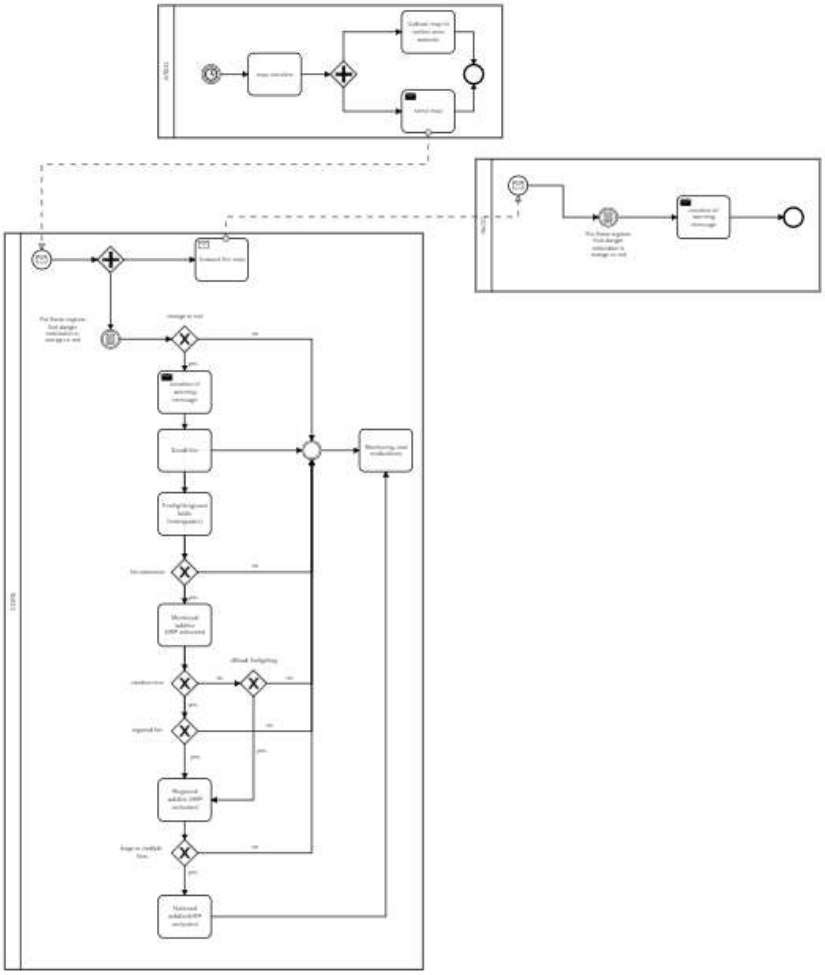


4.1.4. Slovenia

ACTORS /DESTINATIONS	ACTORS / DESTINATIONS DESRIPTION	SLOVENIA
INSTIGATORS	CENTRAL PROVIDER OF METEOROLOGICAL DATA	ARSO
CENTRAL BODIES	CIVIL PROTECTION OPERATIONAL CENTER (CPOC)	ACPDR
	CENTRAL CIVIL PROTECTION COORDINATING BODY (CCPCB)	CORS
2nd LEVEL_ADMINISTRATION	2nd LEVEL CIVIL PROTECTION CENTER (2L_CP_CENTER)	NOVA GORICA_RECO

Message type	Message explanation	Features of message
EDEK_EDEPEKF	Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena	{**form:** typed, digital, fax to an updated list of recipients, **legal features:**)
EWM	Special Fire Warning Message	{**form:** typed, digital, fax to an updated list of recipients, **legal features:** attached EDEK and EDEPEKF}
EWA	Warning announcements with appropriate instructions	{**form:** typed, digital, press release posted on website, **legal features:** attached EDEK and EDEPEKF})

Class	Object properties
INSTIG_TRANS_EDEK_EDEPEKF	sender: ARSO, message: RegularWeathMap, receiver: CORS, means: fax, email, date: X, time: CONSTR?
KEPP_ESKE _TRANS_EWM_2L_CP	sender: ARSO, message: EWM, receiver: AJDO_ReCO, means: mobile, email, date: X, time: T
KEPP_ESKE _TRANS_EWM_ORG	sender: ARSO, message: EWM, receiver: AJDO_{FIRE SERVICE-PEKE, REGIONAL POLICE DEPT, REGIONAL COAST GUARD, NATIONAL DEFENCE GENERAL STAFF, MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE, LOCAL EMERGENCY HEALTH SERVICE CHAPTER, REGIONAL DEPT OF ELECTRICITY DISTRIBUTION NETWORK OPERATOR (ΔΕΔΔΗΕ), INDEPENDENT POWER TRANSMISSION OPERATOR, MINISTRY OF ENVIRONMENT AND ENERGY, OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)}, means: email, date: X, time: <13.30
CCPB_TRANS_EWA_MEDIA	sender: NOVA GORICA RECO, message: RegularWeathMap, receiver: RADIO, NEWSPAPER AND TV MEDIA , means: email, fax, sms, date: X, time: T
2L_CP_CENTER_TRANS_EWM_2L_OFFICERS	sender: AJDO_RECO, message: DANGER MESSAGE, receiver: {MUNICIPALITY OFFICERS, RECO OFFICERS?} , means: email, fax, sms, date: X, time: T
2L_OFFICERS_TRANS_EWM_ 2L_UNIT_DEPTS	sender: MUNICIPALITY OFFICER, message: DANGER_MESSAGE, receiver: {MUNICIPALITY DEPTS}, means: email, fax, sms date: X, time: T




STOP

4.2. Flood Conceptual Model instantiation and validation

4.2.1. Bosnia & Herzegovina

An instantiation of our conceptual model for the case of Bosnia can be found in the tables below:

Type	Administration Level	Name	Instance
ACTORS	CENTRAL BODIES	CIVIL PROTECTION OPERATIONAL CENTER	Federal Administration of Civil Protection
		CENTRAL PROVIDER OF METEOROLOGICAL DATA (SCI_TEAM)	Federal Hydrometeorological Institute
	2nd LEVEL ADMINISTRATION	2L_CIVIL	CP Herzegovina – Neretva Canton headquarters
		2L_CP_CENTER	Civil Protection Operation center of Herzegovina – Neretva Canton
		2L_ OFFICERS	Government of HNC
	3rd LEVEL ADMINISTRATION	3L_CP_CENTER	Municipal / city civil protection services
		3L_AUTH	Mayors
	ORGANISATIONS	FIRE SERVICE	Fire services of municipalities (professional fire brigade)
		ELECTRICITY DISTRIBUTION NETWORK OPERATOR	Utility services
		EMERGENCY SERVICES	Emergency Service, Agency for watershed of the Adriatic sea, Water and underwater protection and rescue services
		OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)	Volunteer Fire Department

Table 1: Actors and Media

Communication Event	Instance
SCI_TEAM_TRANS _RegularWeathMap _ WEB	**sender:** Federal Hydrometeorological Institute **message:** RegularWeathMap **means:** upload to web **time:** <14.30 **date:** Daily **receiver:** HNC webpage

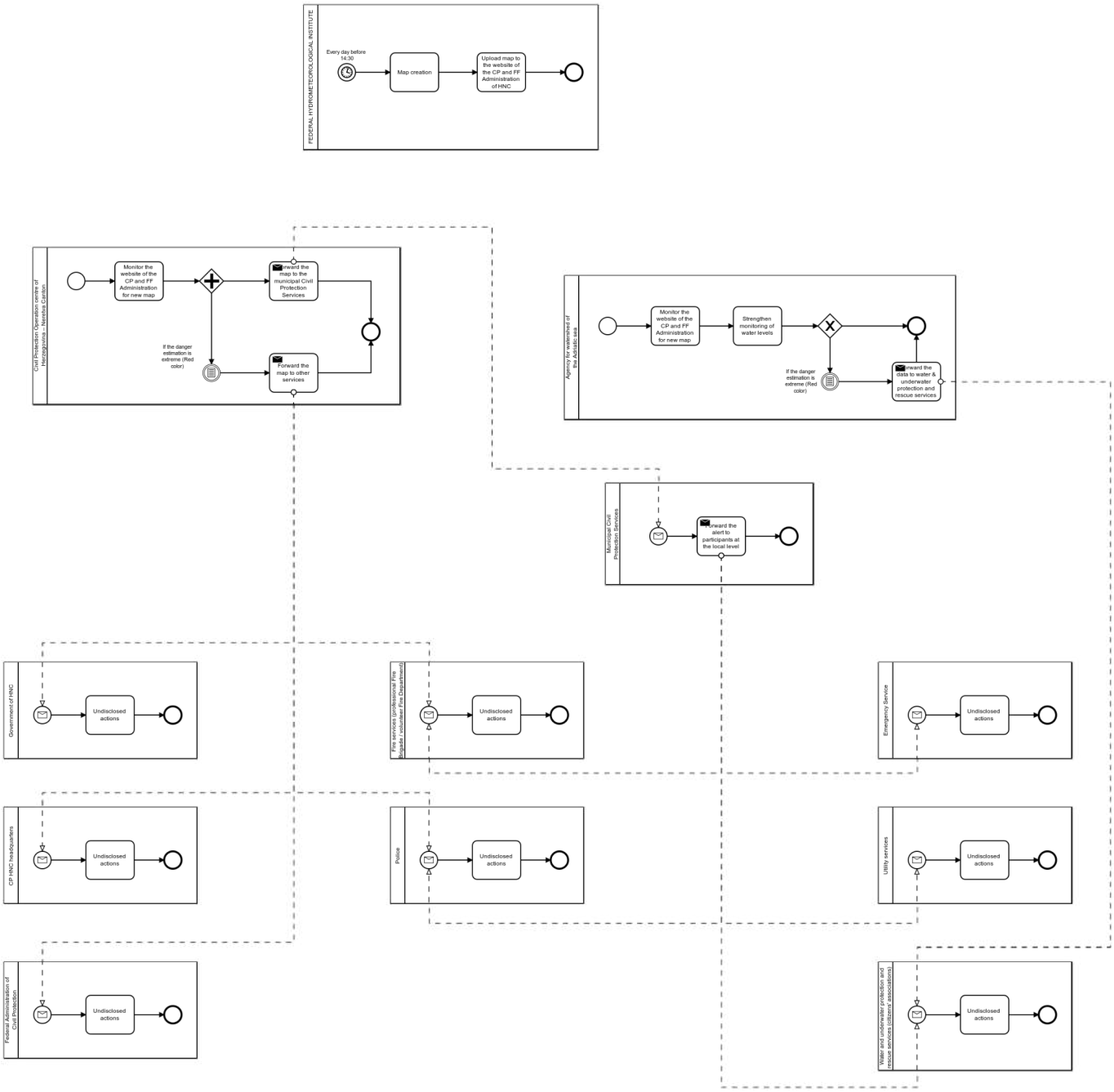
Communication Event	Instance
ACTOR_TRANS _RegularWeathMap _ORGS	**sender:** Federal Hydrometeorological Institute **message:** RegularWeathMap **receiver:** Agency for watershed of the Adriatic sea **means:** email, fax phone **time:** <14.30 **date:** Daily
2L_CP_CENTER_TRANS _RegularWeathMap _2L_AUTH	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap **receiver:** Government of HNC, CP HNC headquarters **means:** email, fax phone **date:** X **time:** T
ACTOR_TRANS _RegularWeathMap _3L_CP	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap, **receiver:** Municipal Civil Protection Services, **means:** email, fax, phone **date:** X, **time:** <15.30

Table 2: Communication Events related to the dissemination of the daily danger estimation map

Communication Event	Instance
ACTOR_TRANS _EWM_ORGANISATIONS	**sender:** Civil Protection Operation center of HNC **message:** RegularWeathMap **receiver:** Fire services of municipalities / cities (professional fire brigade, volunteer Fire Department), Police, Federal Administration of Civil Protection, Water and underwater protection and rescue services **means:** email **date:** X, **time:** T
ACTOR_TRANS _EWM_3L_CP	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap, **receiver:** Municipal Civil Protection Services, **means:** email, fax, phone **date:** X, **time:** <15.30
2L_CP_CENTER_TRANS _DANG_MES_2L_OFFICERS	**sender:** Civil Protection Operation center of HNC, **message:** RegularWeathMap **receiver:** Government of HNC, CP HNC headquarters **means:** email, fax phone **date:** X **time:** T

Table 3: Communication Events related to the dissemination of the special early warning message for high risk areas

The aforementioned procedure can be translated as the following BPMN diagram:



4.2.2. Croatia

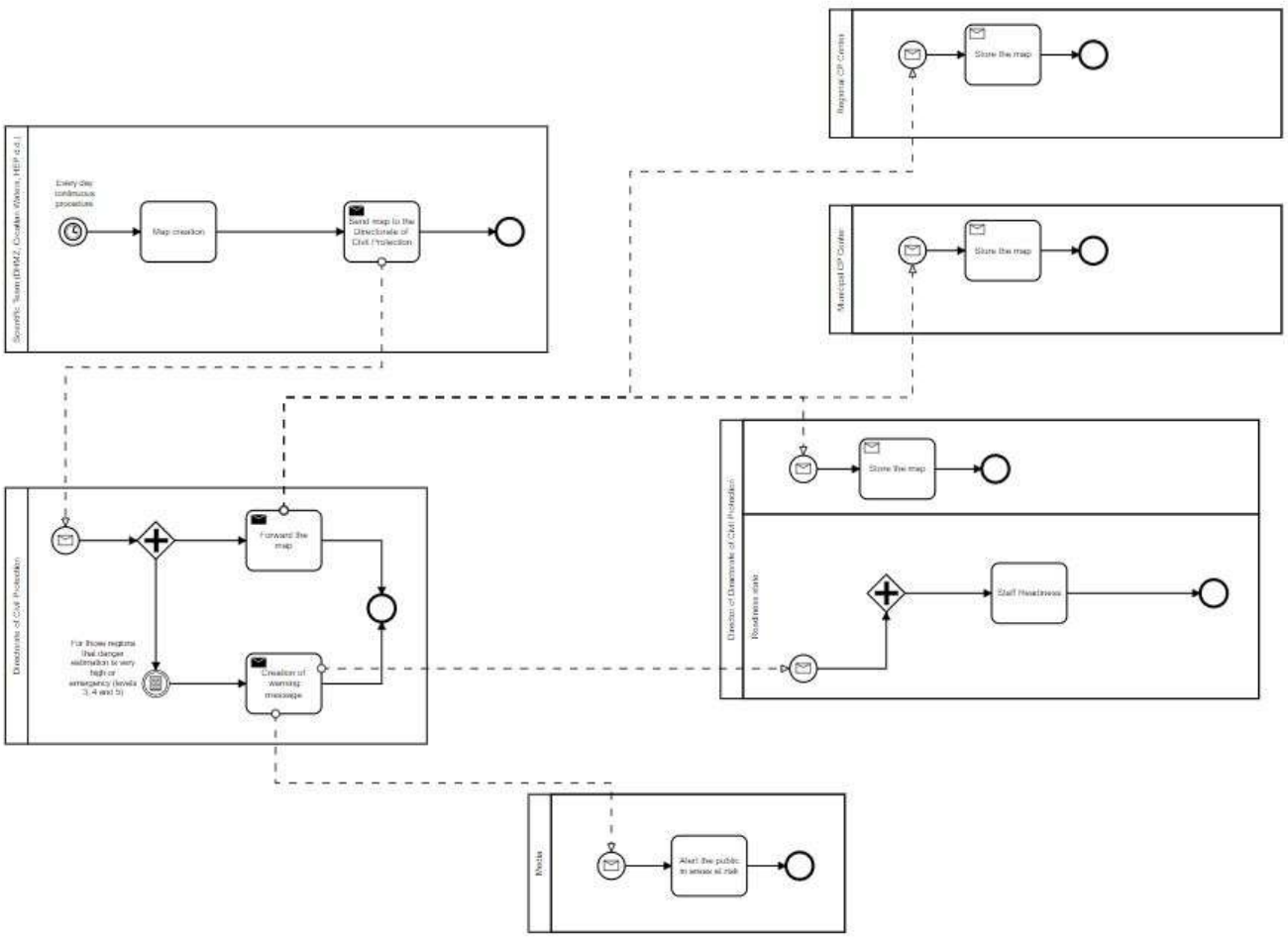
The instance of the model for the use case of floods in Croatia is contained in the following tables.

ACTORS/DESTINATIONS	ACTORS/DESTINATIONS DESCRIPTION	CROATIA
CENTRAL BODIES	CIVIL PROTECTION OPERATIONAL CENTER	Directorate for Civil Protection of the Republic of Croatia
	CENTRAL PROVIDER OF METEOROLOGICAL DATA	DHMZ (Croatian Meteorological and hydrological service)
	SCIENTIFIC TEAM	HR_SCI_TEAM: {DHMZ, HEP, Croatian Waters}
2LEVEL_ADMINISTRATION	2L_CP_CENTER	Regional_CP
2LEVEL_ADMINISTRATION	3L_CP_CENTER	Local_CP
ORGANISATIONS	MINISTRY OF INTERIOR	central
	RESPONSE SERVICES	112 TELEPHONE RESPONSE CENTER
	DECENTRALISED GOVERNMENTS	COUNTY_GOV, MUN_GOV, CITY_GOV
MEDIA	SOCIAL MEDIA	social media
	TV	TV
	BLOG	news portals

MESSAGES	Message type	Message explanation	Features of message
WEATHER_MAP	RegularWeathMap	Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena	{form: typed,digital, fax to an updated list of recipients, legal features:
DANGER_MESSAGE	EWM	Special Flood Warning Message	{form: typed,digital, fax to an updated list of recipients, legal features: attached EDEK and EDEPEKF}
	EWA	Warning announcements with appropriate instructions	{form: typed,digital, press release poseted on website, legal features: attached attached EDEK and EDEPEKF}

MESSAGES	Message type	Message explanation
INSTIGATORS_TRANS _DANG_MES	INSTIGATOR_TRANS_EDEK _EDEPEKF_CPOC_CCPCB	sender: HR_SCI_TEAM, message: EDEK_EDEPEKF, receiver: Directorate of Civil Protection, means: - date: X, time: continuous
CENTRAL_BODIES _TRANS_DANG_MES	CPOC_CCPCB_TRANS _EWM_2L_CP	sender: Directorate of Civil Protection, message: EDEK_EDEPEKF, receiver: 2L_CP_Center, means: - date: daily, time: T
	CPOC_CCPCB_TRANS _EWM_3L_CP	sender: Directorate of Civil Protection, message: EDEK_EDEPEKF, receiver: 3L_CP_Center, means: - date: daily, time: T
	CPOC_CCPCB_TRANS _EWM_ORG	sender: Directorate of Civil Protection, message: EWM, receiver:MUP, means: - date: daily, time: T
	CCPB_TRANS _EWA_MEDIA	sender: Directorate of Civil Protection, message: EWA, receiver: MEDIA , means: MEANS, date: X, time: T

The following diagram presents the BPMN relevant to the created instance.



4.2.3. Greece

The TransCPEarlyWarning Floods Ontology's actors and destinations for the early warning response due to floods in Greece are the Instigators and the Bodies at Central level, 3rd Level Administration, 2nd Level Administration and the Organizations level.

ACTORS / DESTINATIONS	ACTORS /DESTINATIONS DESCRIPTION	GREECE
INSTIGATORS	CENTRAL PROVIDER OF METEOROLOGICAL DATA	HNMS
CENTRAL BODIES	CIVIL PROTECTION OPERATIONAL CENTER (CPOC)	KEPP
	CENTRAL CIVIL PROTECTION COORDINATING BODY (CCPCB)	ESKE
	PRESS AND PUBLIC RELATIONS OFFICE OF GENERAL SECRETARIAT OF CIVIL PROTECTION	PPRO
	EMERGENCY PLANNING AND RESPONSE DIRECTORATE OF GENERAL SECRETARIAT OF CIVIL PROTECTION	EPR
	CENTRAL CIVIL PROTECTION COORDINATING BODY/CENTRAL FIRE BRIGADE	ESKE (ΕΣΚΕ)/199
2nd LEVEL_ ADMINISTRATION	2nd LEVEL CIVIL PROTECTION CENTER (2L_CP_CENTER)	CRETE_REG_CP
	2nd LEVEL OFFICERS (2L_OFFICERS)	CRETE_REG_GOVERNOR
		CRETE_LOCAL_VICE_COVERNOR (1-4)
		CRETE_PRES_REG_COUNCIL
		CRETE_CP_VICE_GOVERNOR
		CRETE_2L_COORD
	2nd LEVEL DIRECTORATES (2L_DEPTS)	ENVIRONMENT AND SPACE DESIGN DIRECTORATE
		AGRICULTURAL ECONOMY DIRECTORATE
		VETERINARY DIRECTORATE
		PUBLIC HEALTH DIRECTORATE
		SOCIAL SECURITY DIRECTORATE
		DEVELOPMENT PLANNING DIRECTORATE
		FINANCE DIRECTORATE
	2nd LEVEL DEPARTMENTS (2L_UNIT_DEPTS)	REGIONAL PROTECTION DEPT
		TECHNICAL WORKS DEPT
		ENVIRONMENT DEPT
		PUBLIC HEALTH DEPT
		AGRICULTURAL ECONOMY DEPT

ACTORS /DESTINATIONS	ACTORS /DESTINATIONS DESCRIPTION	GREECE
3rd LEVEL_ ADMINISTRATION	3rd LEVEL CIVIL PROTECTION CENTER (3L_CP_CENTER)	CRETE_DEC_ADMIN_CP
	3rd LEVEL AUTHORITIES (3L_AUTH)	CRETE_MUNICIPALITIES
		MAYORS
		VICE_MAYORS
ORGANISATIONS	MINISTERS' and GENERAL SECRETARIES' OFFICES	OFFICES
	FIRE SERVICE	ESKE/199
		CRETE_FIRE_BRIGADE
		DISTRICT_FIRE_SERVICES
	DIRECTORATE OF OPERATION, MAINTENANCE AND OPERATION OF TRANSPORT INFRASTRUCTURE WITH CONSESSION AGREEMENT (D17) / GENERAL SECRETARIAT OF INFRASTRUCTURES / MINISTRY OF INFRASTRUCTURE AND TRANSPORT	CENTRAL
	DIRECTORATE OF FIXED TRACK INFRASTRUCTURE, MAINTENANCE AND SAFETY (D14) / MINISTRY OF INFRASTRΘCTURE AND TRANSPORT	EYDE_Crete_Dodecanese
	AIRPORTS ADMINISTRATIONS	Hellenic Civil Aviation Authority
		FRAPORT REGIONAL AIRPORTS OF GREECE SA
	COAST GUARD	CG_ELAKT
		REGIONAL COAST GUARDs
		LOCAL PORT AUTHORITIES
	NATIONAL DEFENCE GENERAL STAFF	CENTRAL
	MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE / PUBLIC HEALTH EMERGENCY PREPAREDNESS DIRECTORATE	CENTRAL
	MINISTRY OF HEALTH / EMERGENCY HEALTH SERVICE CHAPTER	LOCAL EMERGENCY HEALTH SERVICE CHAPTERs
	MINISTRY OF HEALTH / NATIONAL ORGANISATION OF PUBLIC HEALTH	EODDY
	ELECTRICITY DISTRIBUTION NETWORK OPERATOR (EDNO)	REGIONAL DEPTS OF POWER TRANSMISSION OPERATOR
	INDEPENDENT POWER TRANSMISSION OPERATOR	CENTRAL
	MINISTRY OF ENVIRONMENT AND ENERGY	CENTRAL
	OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)	ORGANISATIONS
	POLICE	ESKEDIK_POLICE _HQ
		CRETE REGIONAL POLICE DEPTS
		DISTRICT_POLICE DEPTS

Table 1 lists the TransCPEarlyWarning Food Ontology's actors in Greece.

In addition to the daily weather forecast bulletins, the Hellenic National Meteorological Service issues Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena, which determine the evolution of weather phenomena spatially and temporally. These bulletins are sent to the KEPP/ESKE. Sequentially, the KEPP/ESKE transmits a special warning message to the destinations and simultaneously issues press releases to the media, in order to inform the public about the occurrence of severe or even dangerous weather phenomena and to provide more specific instructions for taking measures to protect themselves from possible dangers arising from flood phenomena.

Message type	Message explanation	Features of message
EDEK_EDEPEKF	Extraordinary Weather Deterioration Bulletins and Extraordinary Weather Forecasts of Dangerous Weather Phenomena	{**form:** typed, digital, fax to an updated list of recipients, **legal features:**)
EWM	Special Flood Warning Message	{**form:** typed, digital, fax to an updated list of recipients, **legal features:** attached EDEK and EDEPEKF}
EWA	Warning announcements with appropriate instructions	{**form:** typed, digital, press release posted on website, **legal features:** attached EDEK and EDEPEKF})

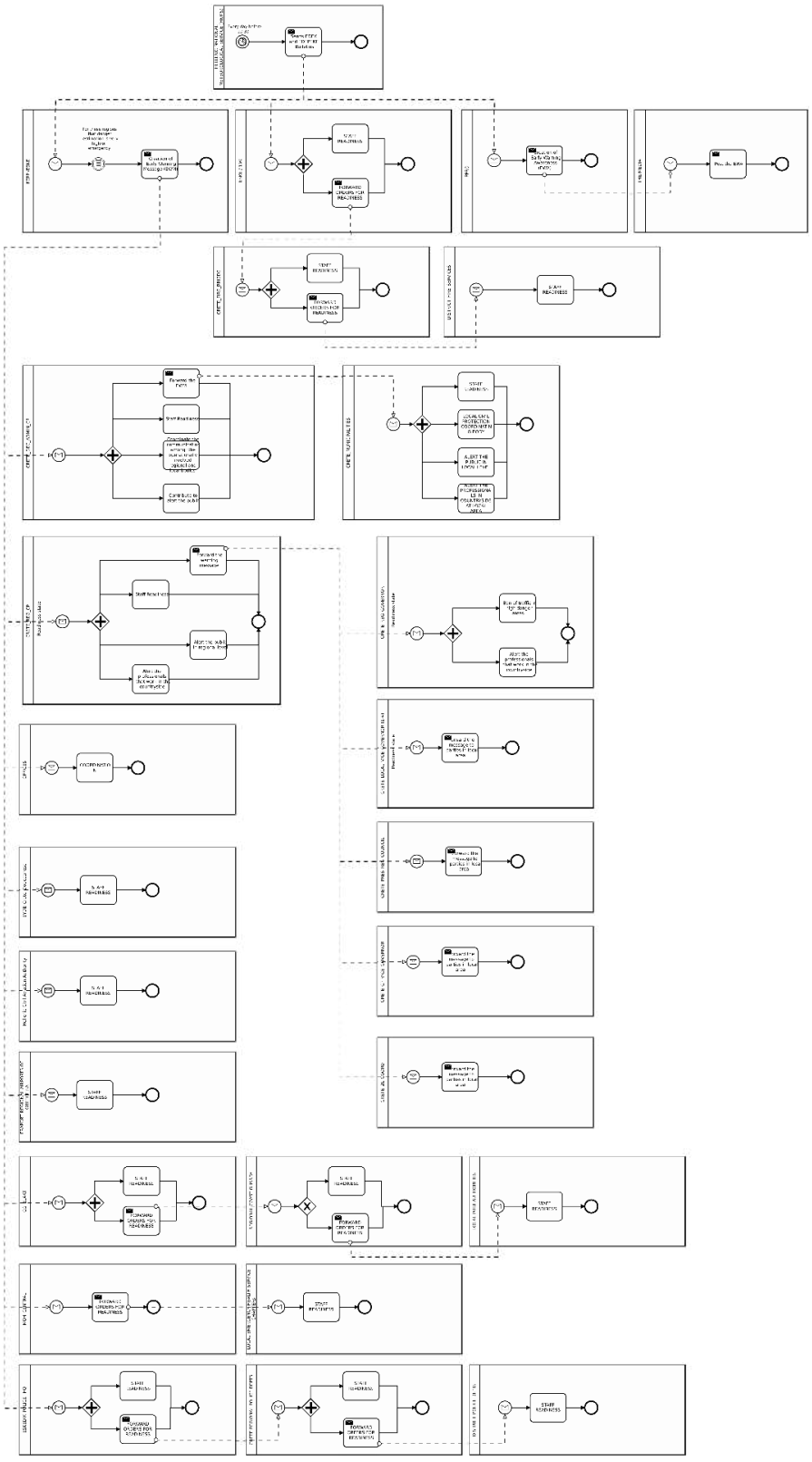
Table 2 lists the TransCPEarlyWarning Flood Ontology's Messages and their features in Greece

Class	Object properties
INSTIG_TRANS_EDEK_EDEPEKF	**sender:** HNMS, **message:** EDEK_EDEPEKF, **receiver:** KEPP_ESKE **means:** fax, email, **date:** X, **time:** T
KEPP_ESKE _TRANS_EWM_3L_CP	**sender:** KEPP_ESKE, **message:** EWM, **receiver:** CRETE_DEC_ADMIN_CP, **means:** fax, email, **date:** X, **time:** T
KEPP_ESKE _TRANS_EWM_2L_CP	**sender:** KEPP_ESKE, **message:** EWM, **receiver:** CRETE_REG_CP, **means:** email, **date:** X, **time:** T
KEPP_ESKE _TRANS_EWM_ORG	**sender:** KEPP_ESKE, **message:** EWM, **receiver:** OFFICES, ESKE/199, CRETE_FIRE_BRIGATE,DISTRICT_FIRE_SERVICES, ESKEDIK_POLICE_HQ, CRETE_REGIONAL_POLICE_DEPTS, DISTRICT_POLICE_DEPT, CG_ELAKT, REGIONAL COAST GUARD, LOCAL_PORT_AUTHORITIES, DIRECTORATE OF OPERATION, MAINTENANCE AND OPERATION OF TRANSPORT INFRASTRUCTURE WITH CONSESSION AGREEMENT (D17) / GENERAL SECRETARIAT OF INFRASTRUCTURES / MINISTRY OF INFRASTRUCTURE AND TRANSPORT, EYDE_Crete_Dodecanese, Hellenic Civil Aviation Authority, FRAPORT REGIONAL AIRPORTS OF GREECE SA, NATIONAL DEFENCE GENERAL STAFF, MINISTRY OF HEALTH / ADMINISTRATION OF PUBLIC HEALTH AND QUALITY OF LIFE, LOCAL EMERGENCY HEALTH SERVICE CHAPTER, REGIONAL DEPT OF ELECTRICITY DISTRIBUTION NETWORK OPERATOR (ΔΕΔΔΗΕ), INDEPENDENT POWER TRANSMISSION OPERATOR, MINISTRY OF ENVIRONMENT AND ENERGY, OTHER INVOLVED PARTIES (E.G. VOLUNTEER ORGANIZATIONS)}, **means:** email, **date:** X, **time:** T
CCPB_TRANS_EWA_MEDIA	**sender:** PPRO/CCPB, **message:** EWA, **receiver:** MEDIA **means:** MEANS, **date:** X, **time:** T
2L_CP_CENTER_TRANS_EWM_ 2L_OFFICERS	**sender:** CRETE_REG_CP, **message:** EWM, **receiver:** {CRETE_REG_GOVERNOR, CRETE_PRES_REG_COUNCIL, CRETE_CP_VICE_GOVERNOR, CRETE_LOCAL_VICE_COVERNOR(1-4), CRETE_2L_COORD}, **means:** email, fax, sms **date:** X, **time:** T
2L_OFFICERS_TRANS_EWM_ 2L_DEPTS	**sender:** CRETE_REG GOVERNOR, **message:** EWM, **receiver:** (ENVIRONMENT AND SPACE DESIGN DIRECTORATE, AGRICULTURAL ECONOMY DIRECTORATE, VETERINARY DIRECTORATE, PUBLIC HEALTH DIRECTORATE, SOCIAL SECURITY DIRECTORATE, DEVELOPMENT PLANNING DIRECTORATE, FINANCE DIRECTORATE}, **means:** email, fax, sms, **date:** X, **time:** T

Class	Object properties
2L_OFFICERS_TRANS_EWM_ 2L_UNIT_DEPTS	**sender:** CRETE_LOCAL_VICE_COVERNOR(1-4) **message:** EWM, **receiver:** (TECHNICAL WORKS DEPT, ENVIRONMENT DEPT, PUBLIC HEALTH DEPT, AGRICULTURAL ECONOMY DEPT}, **means:** email, fax, sms, **date:** X, **time:** T
3L_CP_CENTER_TRANS_EWM_ 1L_AUTH	**sender:** CRETE_DEC_ADMIN, **message:** EWM, **receiver:** {SOME MUNICIPALITIES, SOME MAYORS, SOME VICE MAYORS}, **means:** email, **date:** X, **time:** T

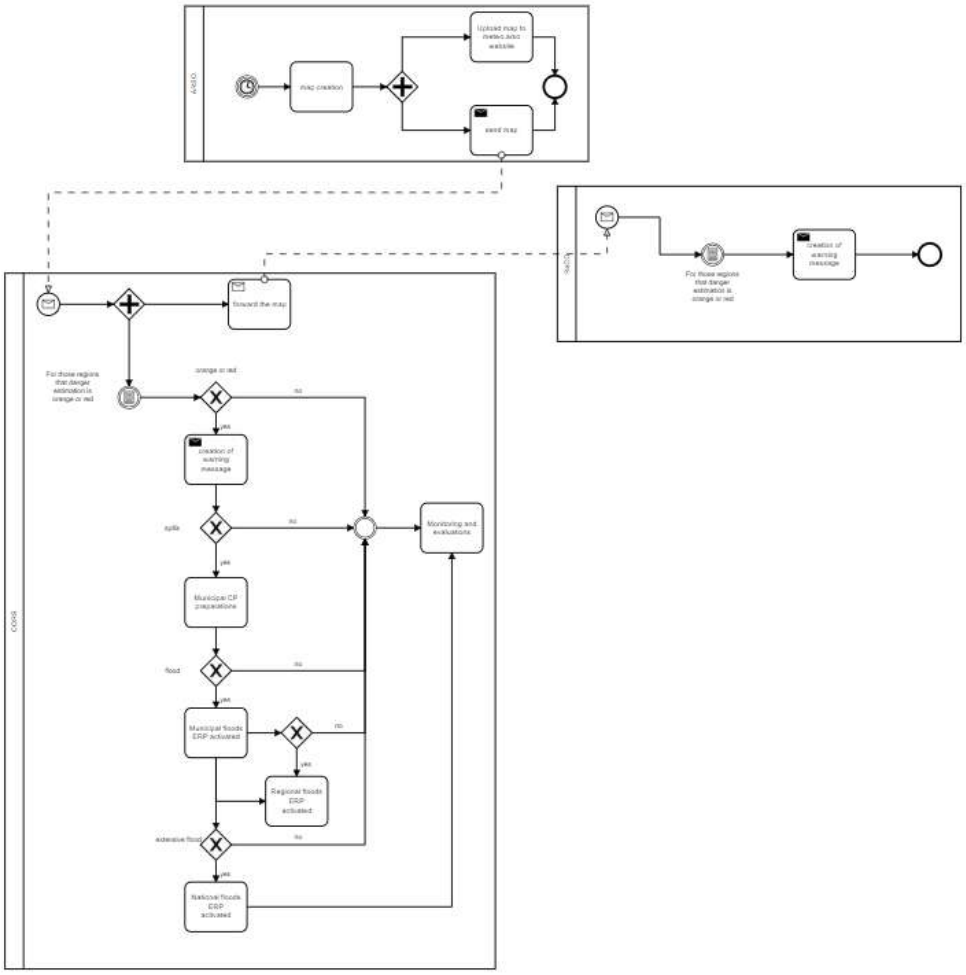
Table 2 lists the TransCPEarlyWarning Flood Ontology's classes in Greece.

The following diagram presents the relevant BPMN



4.2.4. Slovenia

The BPMN diagram for the Slovenian case relevant to floods is shown below



5. Conclusions and Discussion

Deliverable reports on the modelling effort undertaken by the TransCPEarlyWarning team with reference to the Civil Protection Early Warning processes associated with two predominant risks that ADRION territories face: forest fires and floods.

The basic outcome is a conceptual model that comprises three different layers of actors involved at Central Level, at 2nd level of Administration, and at 3rd level of Administration, as well as different organizations that have to be notified or somehow participate in the overall process. It might be the case that according to the administrative division in the different ADRION countries not all the defined administrative levels are involved in the process of a certain partner country, yet this does not affect the genericity of the model.

Different messages are necessary to be communicated between the actors. Such messages include the forest fire risk map, the observation of fire, or Early Warning Message in the case of wildfires, or weather deterioration bulletins, flood warning message, or flood warning announcement in the case of floods.

Finally, communication classes represent the transfer of messages between the different actors and organizations that are involved in the Civil Protection Early Warning processes.

The aforementioned conceptual model has been enforced indicatively in partner countries who were asked to validate it. The process involved populating the model with adequate instances of actors, messages and communication classes, so that national processes described in the relevant plans of the ADRION territories can be described by the TransCPEarlyWarning model. The process involved different sequences of iteration between the model building and validation procedure so that the final conceptual model is representative of a superset of Early Warning Civil Protection processes in ADRION.

Work donewill be continued, as the conceptual model has to be implemented in a machine readable / understandable format, e.g. OWL. This model provides a liaison to the implementation of the Civil Protection Early Warning Platform. Country specific BPMN diagrams will help implement the individual Early Warning processes in the partner countries forming the heart of the pilot testing activities envisaged.

REFERENCES

[1] United Nations Office for Disaster Risk Reduction,
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