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EUPORIAS

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EUPORIAS

European Provision Of Regional Impact Assessment on a

Seasonal-to-decadal timescale

Deliverable D44*.2*

Plan to integrate prototypes into existing architecture and dissemination protocols

Deliverable Title	*Plan to integrate prototypes into existing architecture and dissemination protocols*	
Brief Description	*A plan to integrate the selected climate service prototypes into the architecture and dissemination protocols developed in existing portals such as EU FP7 CLIMRUN and ECLISE.*	
WP Number	44	
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		RE - Restricted to a group specified by the consortium, including the Commission services
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1 Executive Summary

The aim of Work Package (WP) 44 is to identify, develop, and maintain an interface which will allow an effective delivery of the climate services (prototypes) developed in WP 42 to both the general public and the relevant decision-makers. In this manner EUPORIAS goes beyond merely improving the reliability of the underlying prediction systems to enhancing the usability of these forecasts in practical applications.

The work package will therefore develop a services architecture that can act as an interface between the EUPORIAS climate service prototypes and existing climate adaptation portals. These services will be created, operated and tested with a selection of climate adaptation portals. In addition, to address the need not only to prepare for climate-related risks but also to manage these risks, these services need to be interfaced to impact management tools, like the land management App prototype. Finally, the services architecture will also be used to create a user-friendly web-based interface for end-users and the WP will use social media, for instance podcasts and YouTube videos, to reach a larger audience.

The purpose of this deliverable within this Work Package is to identify and formulate a suitable and flexible services architecture to be implemented for the EUPORIAS prototypes (as well as a plan for the development and delivery). This builds on the Deliverable 44.1 that provides an inventory of existing tools and portals and an overview of what the EUPORIAS climate service prototypes could usefully provide to the public. A general set of requirements are formulated and an API-based architecture is proposed to address these requirements.

2 Project Objectives

With this deliverable, the project has contributed to the achievement of the following objectives (DOW, Section B1.1):

No.	Objective	Yes	No
1	Develop and deliver reliable and trusted impact prediction systems for a number of carefully selected case studies. These will provide working examples of end to end climate-to-impacts-decision making services operation on S2D timescales.	X	
2	Assess and document key knowledge gaps and vulnerabilities of important sectors (e.g., water, energy, health, transport, agriculture, tourism), along with the needs of specific users within these sectors, through close collaboration with project stakeholders.		X
3	Develop a set of standard tools tailored to the needs of stakeholders for calibrating, downscaling, and modelling sector-specific impacts on S2D timescales.		X
4	Develop techniques to map the meteorological variables from the prediction systems provided by the WMO GPCs (two of which (Met Office and MeteoFrance) are partners in the project) into variables which are directly relevant to the needs of specific stakeholders.		X
5	Develop a knowledge-sharing protocol necessary to promote the use of these technologies. This will include making uncertain information fit into the decision support systems used by stakeholders to take decisions on the S2D horizon. This objective will place Europe at the forefront of the implementation of the GFCS, through the GFCS's ambitions to develop climate services research, a climate services information system and a user interface platform.	X	
6	Assess and document the current marketability of climate services in Europe and demonstrate how climate services on S2D time horizons can be made useful to end users.		X

3 Detailed Report

3.1 Introduction

To identify and formulate a suitable and flexible services architecture to be implemented for the EUPORIAS prototypes it is necessary firstly to understand the characteristics and architectures of the existing portals and the requirements that they would impose. Secondly, it is necessary to understand which results will be provided by the prototypes and the form in which these results will be made available. Finally, the interface needs to consider the application of the prototype information in other EUPORIAS activities.

In this document we formulate the main requirements of a suitable and flexible climate services architecture. An API-based architecture is then proposed to meet these requirements.

3.2 The characteristics and architectures of the existing portals

Information concerning the characteristics and architectures of the existing portals and the requirements that they would impose has been summarised in Deliverable 44.1 “An inventory of existing climate data portals and their requirements” and will not be repeated here.

The main outcomes of this inventory are:

- There are relatively few portals (Climate-ADAPT & climate4impact) that could host almost all prototypes and Climate-ADAPT is the only one that could host them all;
- Private company portals were excluded because of their data policy limitations;
- Many of the other portals are relevant for specific sectors or regions and it would be desirable therefore to formulate an architecture that would also allow appropriate prototypes to interface to these specific portals. The prototype leaders requested that their own preferences be taken into consideration;
- The potential interfaces are summarised in Table 2 of Deliverable 44.1, see appendix A;
- To interface with these platforms both administrative and technical requirements must be addressed. Taking the Climate-ADAPT portal as an example the administrative effort includes obtaining permission from the portal administrators, ensuring the EUPORIAS prototypes meet the stipulated criteria for case studies, undergoing a review and annotation by experts outside of EUPORIAS. The technical effort would include assessing a range of integration approaches ranging from links to a dedicated website, integration of EUPORIAS datasets into their database or the addition of a tool.

3.3 EUPORIAS prototypes and case studies

The EUPORIAS Climate Service prototypes and links to more detailed information are listed below:

- WINTER CONDITIONS AND ITS IMPACTS ON THE UK TRANSPORT NETWORK (More info)
- FOOD SECURITY IN ETHIOPIA AND THE LEAP MODEL (More info)
- LAND MANAGEMENT AND AGRICULTURAL PRACTICES IN THE UK (More info)
- RESILIENCE OF THE RENEWABLE ENERGY PRODUCTION (More info)
- RIVER MANAGEMENT IN TWO FRENCH BASINS (More info)
- HYDROELECTRIC ENERGY PRODUCTION IN SWEDEN (More info)

For each climate service prototype a dedicated website (referred to here as a 'microsite') is being developed for each prototype under Work Package 43.

To formulate these microsites; detailed information has been requested concerning the type of results and their form for the individual prototypes. At the time of writing, a complete specification of output and form of each prototype was not available however the main types of results were identified:

- maps
- text
- tables
- images
- videos
- podcasts
- links
- files

3.4 Relation to other EUPORIAS activities

Work Package 43:

Within Work Package 43 one of the dissemination deliverables is a mobile application to help access information produced by climate prototypes. Therefore the climate service architecture should also support mobile access to the prototype information.

EUPORIAS Case Studies:

During discussions at the 2015 EUPORIAS Annual Meeting, it became clear that there would be considerable interest and added value in disseminating the EUPORIAS case studies results. These case studies are not the EUPORIAS prototype climate services but supporting cases used within a number of work packages to show sector specific impact. The case studies and the responsible partners are listed below:

- Use of seasonal climate forecasts for water management in Spain (Individual case studies to be provided by CETaqua, AEMET and DHI);
- Transport related seasonal streamflow forecasting and drought EWS for the River Rhine (lead, DWD; primary stakeholder BAFG);
- PRO-SNOW (lead TEC);
- ForWINE - seasonal forecasting for wine (lead, UL-IDL; primary SOGRAPE); and
- A decision-support service for temperature related mortality in Europe (lead, WHO, IC3).

3.5 Formulation of general requirements

Based on the above introduction, the main requirements for the climate services architecture are:

- Flexible data structure to accommodate a range of data types, formats and interfaces as a data provider;
- Flexible interface to support several data types and to simplify developments against external interface requirements;
- Access to the prototype data for the prototype provider to provide a dynamic resource and ensure quality control;
- Controlled access to EUPORIAS prototype by external web sites and data portals to support dissemination and ensure data and quality control;
- Flexible and efficient interface with the climate prototype and case studies microsites;
- Interface to a mobile app associated with one of the EUPORIAS climate service prototypes to support EUPORIAS dissemination activities;
- Security must be integrated in the access layer since not all the information will be public;
- Provide feedback mechanisms to end users;
- Detailed information about the access layer usage will be stored;
- Stable access layer description documented and published for use by portal developers.

3.6 Proposed service architecture

In order to ensure flexibility in the data types, external portals, and external devices and to support efficient data exchange while ensuring proper control an API is proposed for the climate services. By providing an API to portal developers we can provide an abstracted interface, which hides the EUPORIAS prototype and case studies implementation details. In this way, portal developers can use a stable API, while EUPORIAS maintains flexibility in adding new or changed prototypes and case studies.

3.7 What is an API?

Wikipedia defines an API as follows

"*.. an application programming interface (API) is a set of routines, protocols, and tools for building software applications. An API expresses a software component in terms of its operations, inputs, outputs, and underlying types. An API defines functionalities that are independent of their respective implementations, which allows definitions and implementations to vary without compromising the interface. A good API makes it easier to develop a program by providing all the building blocks. The programmers then put the blocks together.*

In addition to accessing databases or computer hardware, such as hard disk drives or video cards, an API can ease the work of programming GUI components. For example, an API can facilitate integration of new features into existing applications (a so-called "plug-in API"). An API can also assist otherwise distinct applications with sharing data, which can help to integrate and enhance the functionalities of the applications. "

This is a rather broad definition of an API. For the purposes of this deliverable, this can formulated more simply. An API is a messenger service that controls how data requests are delivered to the provider you're requesting it from, and then delivers the response back. The advantages of using an API are that the exchange of data is well-defined but allows flexibility in terms of the devices and implementation.

Figure 1 shows a map of the interactions that the API should support. Essentially the various data types can be pushed onto EUPORIAS data stores by the prototype owners. The API ensures that these are well defined and they match to the designed database structures.

The content is then accessible from a number of websites and applications. The API ensures that these external applications can understand and interact.

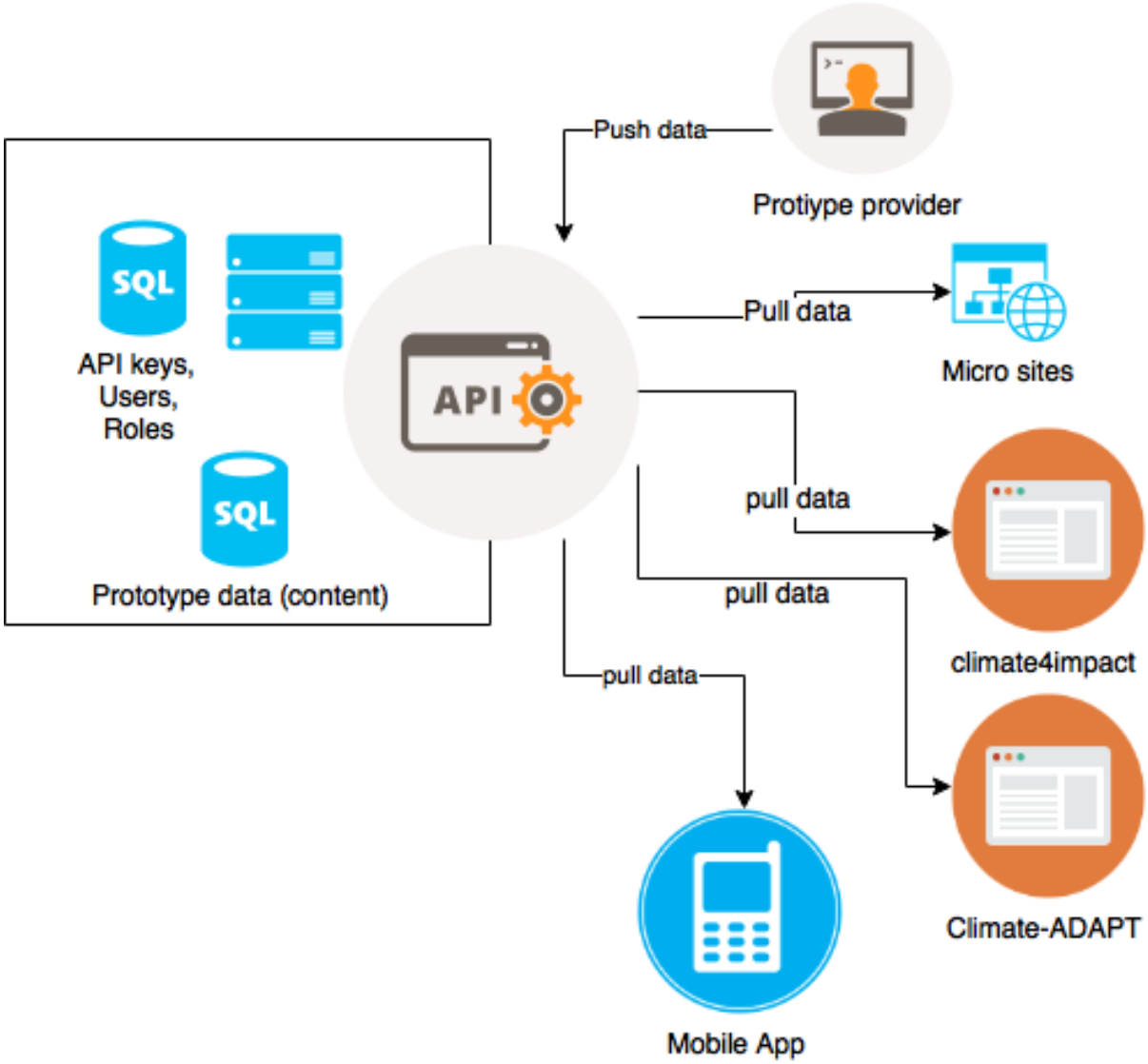

Figure 1: *Schematic of the interactions that the API should support*

3.8 Design specifications and constraints

Based on the generic requirements design specifications and constraints are specified. For the design and implementation of the API we will follow an Agile approach. The design specifications and constraints below are high level and will be detailed during implementation sprints.

- The developed API will be developed to support a set of Use cases:
  - Usage of the API to construct a prototype microsite;
  - External portal: climate4impact portal integration of a case study and a prototype;
  - The choice of microsite, case study and prototype depends on availability of the case study/prototype.
- The developed API will be used to support the development of a Mobile App (co-ordinated with WP43) – foreseen in the Land Use prototype (Met Office);
- RESTful API technology shall be used;

  - REST architecture style for designing networked applications. The idea is rather than using complex mechanisms such as CORBA, RPC or SOAP to connect between machines, simple HTTP is used;
  - The strength of REST is that queries can be submitted on any platform (Web, Mobile Phones, Windows, Linux, etc.) and since the response is text; it can be easily passed on any platform too;
  - RESTful API is based on standard HTTP requests.
- Input information from the prototypes and case studies shall also be provided through this API
  - API must be flexible to add new data types, it needed by a prototype/case study;
  - Mapping with the new data type and existing output data types shall be possible;
  - Addition of new data types should not need changes in the API functions used by portal / Mobile App developers.
- The API must provide clear, standardised error messages when errors occur;
- Performance: The API must be able to support multiple case studies, prototypes, portals and Mobile App requests simultaneously.

3.9 Technical Implementation

Based on the general requirements and design specification the following technical implementation is proposed.

- Provide a RESTful API, available over the Hypertext Transfer Protocol with the same HTTP verbs (GET, POST, PUT, DELETE, etc.). RESTful APIs are easy to consume (even with a web browser) and generalized clients and frameworks are present in all major platforms;

- Follow the HATEOAS (Hypermedia as the Engine of Application State) set of constraints since they ease the exploration of the API by providing links to other related API's endpoints;

- Provide documentation of all the available endpoints and the types of the expected parameters. Try to automate the generation of the documentation as much as possible, to ease the maintenance of accurate documentation;

- Store outcomes metadata and results in a database. Store files in the file system, keeping only the path in the database;

- Integrate OAuth2 security. Clients must provide credentials in order to fetch expirable tokens that will be provided in subsequent requests in the headers;

- Provide feedback mechanisms using the EUsurvey (https://ec.europa.eu/eusurvey) service. EUsurvey is an open software platform developed by the ISA program (Interoperability Solutions for European Public Administrations funded by the European Commission) that eases the development of online surveys to collect the

opinions of stakeholders on a specific issue. This platform will allow data providers to design feedback forms which will be linked to the API outcomes;

- Open development from a public GIT repository, such as: https://github.com/Predictia/euporias-api;
- Suggested implementation platform:
  - Java
  - MySQL + Hibernate + Spring Data JPA
  - Spring Data REST + Spring REST Docs
  - Spring Security.

4 Links Built

This Deliverable is built on the analysis carried out in report D44.1 and uses the input from the WP42 prototypes and case studies.
This deliverable will be used as base for the next milestones and deliverables in Work Package 44 (see **Figure 2**):

Deliverable:	**PM**	**Title**
MS37	PM 33	Release of first version of the Web interface for end users of climate services prototypes
MS38	PM 39	Second release of the Web interface for end users of climate services prototype
MS39	PM46	Final release of the Web interface for end users of climate services prototype
D44.4	PM 48	Service status and usage report
D44.5	PM 48	Report on Web interface for end users of climate service prototypes

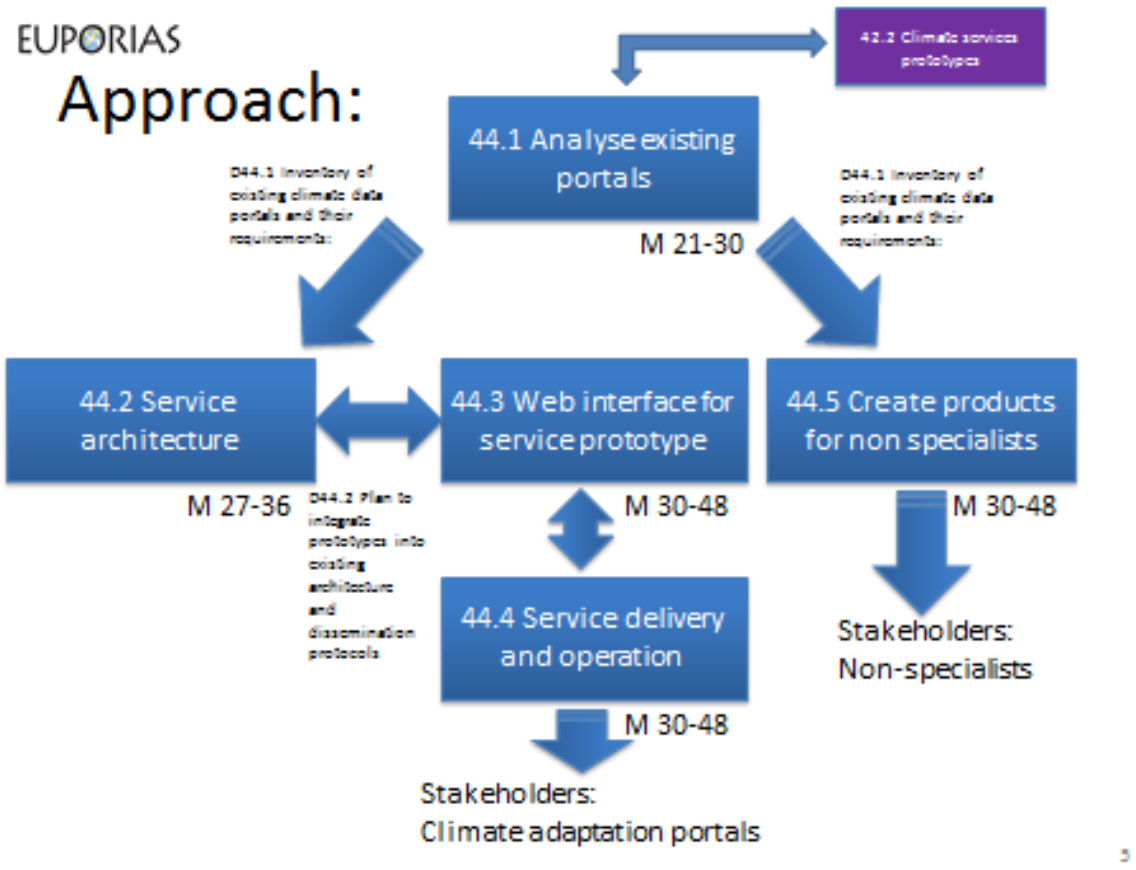

Figure 2: *Links to the other components of the Work Package*

Appendix A:
EUPORIAS Prototypes versus Climate Information Portals Matrix

Prototypes / Climate Portals	Winter conditions & its impacts on the UK transport network	Food security in Ethiopia & the LEAP model	Land manag. & agricu. practices in the UK	Resilience of the renewable energy production	River manag. in two French basins	Hydroelectric energy production in Sweden (SMHI)
DRIAS					X	
Uk Climate Projections	X		X			
Climate Change Knowledge Portal		X				
climate4impact	X		X	X	X	X
Climate Explorer	X			X	X	X
Climate.gov	N/A	N/A	N/A	N/A	N/A	N/A
Climate Adapt	X	X	X	X	X	X
GCM Data Portal		X	X			
Global Framework for Climate Services		X				
ECA & D						
The European Small Hydropower Association					X	X
MAGIC			X			