Web Mapping technologies for the valorization of slow tourism: the Via Regina project

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Abstract

The practice of slow tourism denotes a sustainable way of living the territory based on environmentally-friendly forms of transportation, the appreciation of nature and the rediscovery of local history and cultural identity. Technological advancements in ICT, mostly in the domain of GIS, nowadays represent an essential mean to give new insights to this kind of activities. This work presents a rich implementation of Free and Open Source Software (FOSS) Web Mapping technologies to valorize slow tourism in the charming naturalistic area of Via Regina. This is an ancient cultural route overlooking Lake Como (Northern Italy) and defining a system of slow mobility paths – ideal for hiking and/or biking – which spans the mountainous region at the border between Italy and Switzerland. First, a mobile app is developed which allows tourists to report a wide range of points of interest while travelling around the paths. Along with a huge amount of other geospatial data (e.g. the authoritative data provided by local administrations and the paths surveyed by hikers associations), this crowdsourced information is made available within a standard 2D Web viewer. Services for routing as well as the computation of terrain profiles of paths are also implemented. Finally a virtual globe-based platform provides 3D data visualization while also offering a set of collaborative functionalities. Besides proving the efficiency of FOSS, the work provides a modern reinterpretation of the slow tourism concept which, along with the current technological possibilities, can simplify and at the same time enrich the travellers' experience.
Keywords: crowdsourcing, GIS, mobile, slow tourism, virtual globe, Web Mapping

1 Slow tourism

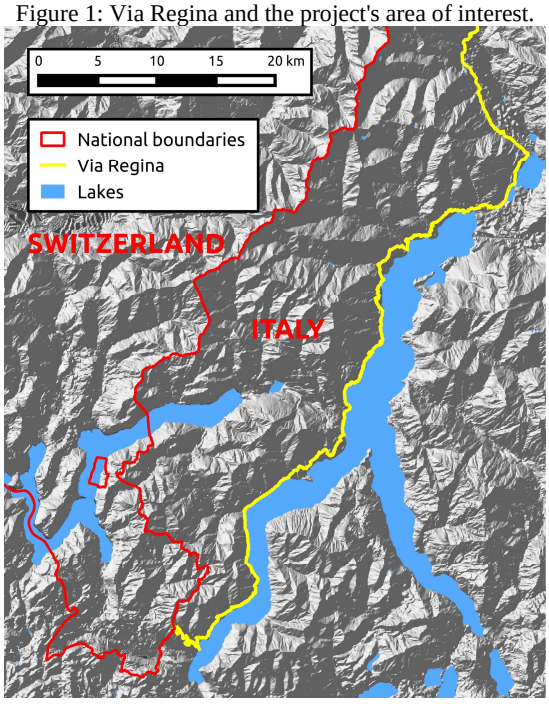
The idea of slow tourism was recently shaped within the more general context of sustainability and sustainable development, defined as a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [17]. The related concept of sustainable tourism was coined in response to the impressive growth of the tourism industry since the second half of the past century [18], which, being based on a mass-process model, began to generate negative effects in the host communities. Therefore, sustainable tourism includes the activities (both conventional and alternative) which are compatible with and can contribute to sustainable development [10] and was defined as a tourism addressing the needs of the visitors, the host communities, the environment and the industry, taking into account its current and future economic, social, and environmental impacts [16].

Derived from the slow food movement [12], the concept of slow tourism emerged as a special case of sustainable tourism which contrasts the traditional, massive practices of tourism through the promotion of environmentally-friendly forms of transportation that involve shorter trips and longer stays [5]. The philosophy behind slow tourism pursues the enjoyment of the territory while at the same time emphasizing how essential is to respect it. Choosing to travel by public transportation or hiking, biking and riding horses, slow tourists make a unique experience of tranquillity and peace which allows them on one side to appreciate nature, and on the other side to discover or deepen the knowledge of local culture, in terms of e.g. people lifestyle, history, art, architecture, religion and cuisine. Thus, slow tourism experience proves to be a relaxing time instead of a stressful interlude between home and destination [6]. At last, even local communities can benefit from this model in terms of both a conscious and respectful development of the territory and the creation of new entrepreneurial opportunities.

1.1 The Via Regina project

This paper is focused on the slow tourism case study related to

Figure 1: Via Regina and the project's area of interest.



Via Regina (literally the "Queen Road"), i.e. the road which overlooks the West coast of Lake Como in Northern Italy (see Figure 1). The historical importance of this route, linked to the more well-known Via Spluga and Via Francisca with whom it forms a continuum, dates back even to the old Roman times.

Over the centuries Via Regina has constituted a fundamental trade and pilgrim route throughout Europe. What's more, from this road a dense system of soft mobility paths departs which span the mountainous region at the border between Italy and Switzerland. Besides its unique beauty from the naturalistic perspective, this area allows to draw a rich cultural picture of its territory and people including their history, art, and habits.

But despite being highly suitable for slow tourism activities, the potential of the Via Regina area has not yet been caught in a proper way. From this evidence the Interreg project "The paths of Regina – Crossborder paths linked to Via Regina" was started with the primary objective of rediscovering and promoting the cultural identity of the territory [3]. The project involves a variety of partners from both Italy and Switzerland (including universities, cultural associations, local agencies and administrations) which bring into play a wide range of disciplines and expertise including cultural heritage, landscape design, and geomatics.

2 Web Mapping for slow tourism

Along with the traditional environmental, social and economic dimensions of sustainability, literature also acknowledges the important role played by technology [2]. In turn, GIS tools – and specially Web Mapping solutions – nowadays represent a crucial element in any kind of project valorizing slow tourism.

Although paper maps are still a vital source of information for slow tourists, the context of GeoWeb 2.0 [11] has opened new perspectives which were mostly unexplored till a decade ago. Technological advancements like the introduction of AJAX [7], the massive use of GPS and the diffusion of OGC standards for Web Mapping interoperability [13] have ushered in the era of neogeography [15], where users could become producers (and no longer pure consumers) of geospatial data. In this phase, defined by Plewe [14] as the third generation of Web Mapping after those of GeoWeb 1.0 and the transition towards GeoWeb 2.0, applications became interactive and usable like their desktop counterparts.

This is still today the most common kind of available Web Mapping applications, which however do not go beyond the traditional 2D data visualization. Examples of slow tourism-related applications of this kind include e.g. slow itineraries in the Italian parks (http://www.parks.it/itinerari/Eindex.php); GiroParchi, showing nature trails through the Gran Paradiso National Park and the Mont Avic natural Park in Val d'Aosta Region, Italy (http://www.giroparchi.it/en/map/wrap); the Contrat de Rivière Haute-Sûre Web viewer, developed within an Interreg project between Belgium and Luxembourg (http://www.crhs-sig.eu/mapserver_crhs/index.php?lang=en); Via Alpina, focused on a number of slow tourism routes along the Alps (http://www.via-alpina.org); the Swiss national portal for slow tourism (http://map.wanderland.ch/?lang=en); a Web viewer on the European most interesting slow tourism routes (http://maps.peterrobins.co.uk/routes.html) and another one on Via Francigena (http://www.viefrancigene.org/en/map).

However the most distinctive feature of GeoWeb 2.0 is user participation, which was the enabling factor for neogeography and is traditionally associated with Goodchild's definition of Volunteered Geographic Information or VGI [8]. Advanced Web Mapping solutions can integrate data crowdsourced by users, who can be therefore much more involved in the applications themselves. Examples of this kind in the field of slow tourism are MapMyHike (http://www.mapmyhike.com), a crowdsourced platform collecting hiking paths from people (uploaded even through a mobile app); PisteCiclabili, where users can upload tracks of Italian bike trails (http://www.piste-ciclabili.com); and GPSaCavallo, focused on horseback routes (http://www.gpsacavallo.com).

Another element shaping the most recent nature of GeoWeb 2.0, that Plewe [14] regarded as the fourth generation of Web Mapping, is the 3D approach to geospatial information over the Internet enabled by virtual globes [4]. Literature on 3D Web Mapping applications is rich but still in its infancy, and – to the authors' knowledge – no specific applications for the valorization of slow tourism exist. Users can sometimes – like in the case of slow itineraries in the Italian parks mentioned before – only exploit a link to view the KML/KMZ of the paths on top of Google Earth virtual globe.

3 Web Mapping in the Via Regina project

Against the state of the art drafted in Section 2, the project on Via Regina sought to implement the following Web Mapping tools:

- a Web platform to upload and share geospatial data;
- a mobile app to upload and share field-collected data;
- standard Web geoservices for data dissemination;
- a Web viewer for data 2D visualization;
- a Web platform for data 3D visualization.

All these solutions, which are individually presented in the following, were developed using FOSS4G (Free and Open Source Software for Geospatial). This choice was due on the one hand to the availability of mature, robust and performing FOSS4G products in the field of Web Mapping, and on the other hand to the authors' exhaustive experience in building advanced FOSS4G-based applications.

3.1 Participative upload of geospatial data

The geospatial data of interest within the Via Regina project can be differentiated into two categories: those derived from official sources and those uploaded or collected by users. The former mainly consist of administrative data and field surveys of both paths (including the historical route of Via Regina, see Figure 1) and the points of interest along them. Surveys were performed by cultural associations involved in the project and produced data compliant with the minimal data model (shared between Italian and Swiss partners) defined. The second kind of data is instead a result of user participation, which happens through two distinct channels.

First a Web platform built on GeoNode (http://geonode.org) was implemented in order to provide all the project partners with an immediate chance to Web-publish and visualize their geospatial data. The Web platform allows any registered user

to upload data (as shapefiles and GeoTIFFs) which, thanks to GeoNode's incorporation of GeoServer (http://geoserver.org), are directly published as standard WMS/WFS layers. The platform allows also users to create custom maps (i.e. Web viewers) exploiting WMS layers from the same server as well as from external ones. This gives the project partners (even those with no programming expertise) a notable opportunity to easily navigate, query and print their own layers and maps.

The second way to stimulate user participation to the project was instead the creation of an Android app which allows users to report interesting elements (e.g. historical/cultural points of interest, morphological elements, tourism services and even dangers) they come across during the slow travel experience. In contrast to the Web platform described above, this app was conceived for the general public, i.e. not only for people and associations involved in the Interreg project but for any tourist travelling in the Via Regina area. From the technical point of view, field data collection is managed by the Open Data Kit (ODK) suite (http://opendatakit.org, [9]), mainly consisting of an Android app (ODK Collect, see Figure 2) that dialogues with a central server (ODK Aggregate). This server is in turn linked to a PostgreSQL database (http://www.postgresql.org), whose PostGIS spatial extension (http://www.postgis.org) allows then GeoServer to read and Web-publish data again as WMS/WFS layers.

In detail, the app guides users in the provision of the needed information about the element to be reported: date, user type, name, type and classification of the element, position (through the GPS and/or an interactive map), picture of the element, and optionally also audio and video records (see Figure 2). In addition to Android devices, the same report can be performed directly from desktop devices (e.g. personal computers) thanks to the integration of the Enketo Web framework (https://enketo.org) with the ODK Aggregate server.

The app was successfully tested during a number of mapping parties (see e.g. Figure 3), i.e. daily events organized within the project to discover local territories and traditions as well as to advertise the project activities.

3.2 2D Web Mapping

As previously mentioned, Web Mapping solutions were first developed to achieve a traditional 2D data visualization. The software used to develop 2D Web viewer interfaces within the project were the open source JavaScript libraries OpenLayers (http://openlayers.org), GeoExt (http://geoext.org) and ExtJS (http://www.sencha.com/products/extjs), which constitute the cutting-edge open source Web Mapping technology and offer quite unlimited customization capability.

First a number of 2D Web viewers were built to visualize all the data collected during and after the project mapping parties. Figure 3 shows e.g. the data uploaded by the participants to the mapping party in Cernobbio, a city renowned worldwide which is located at the Southern end of Via Regina. The map shows both the points of interest reported with ODK Collect and also other georeferenced data (technical sheets, drawings, and photos) uploaded after the mapping party using Enketo. Each point can be queried to access user-collected information (see Figure 3).

Besides these simple viewers offering limited functionalities (mainly data visualization and query), a primary Web viewer for the whole project area was also developed (see Figure 4) which provides some more advanced features. Users can now interact with the viewer by also printing the area of interest as well as by exploiting some external services reachable from the interface. As an example, users can draw a line on the map to ask for the computation of the terrain profile along it (see Figure 4). This is returned after a call to a Web Processing Service (WPS) built using ZOO (http://www.zoo-project.org). Moreover the viewer offers an integrated OpenStreetMap-based geocoding service and can even provide users with routing functionalities along the project paths, implemented through the pgRouting extension (http://pgrouting.org) of the PostgreSQL/PostGIS database.

Among the geospatial data available within the viewer, it is worth noticing the presence of accommodations, restaurants and attractions sites. These layers, which are of considerable importance in the context of slow tourism, were retrieved from the popular TripAdvisor (http://www.tripadvisor.com) and Booking (http://www.booking.com) portals by exploiting their APIs (see Figure 4).

3.3 3D Web Mapping

As mentioned above, Web Mapping solutions which reach up to the third dimension represent one of the main innovations

Figure 2: Screenshots showing some steps of the report of an element through the developed Android mobile app.

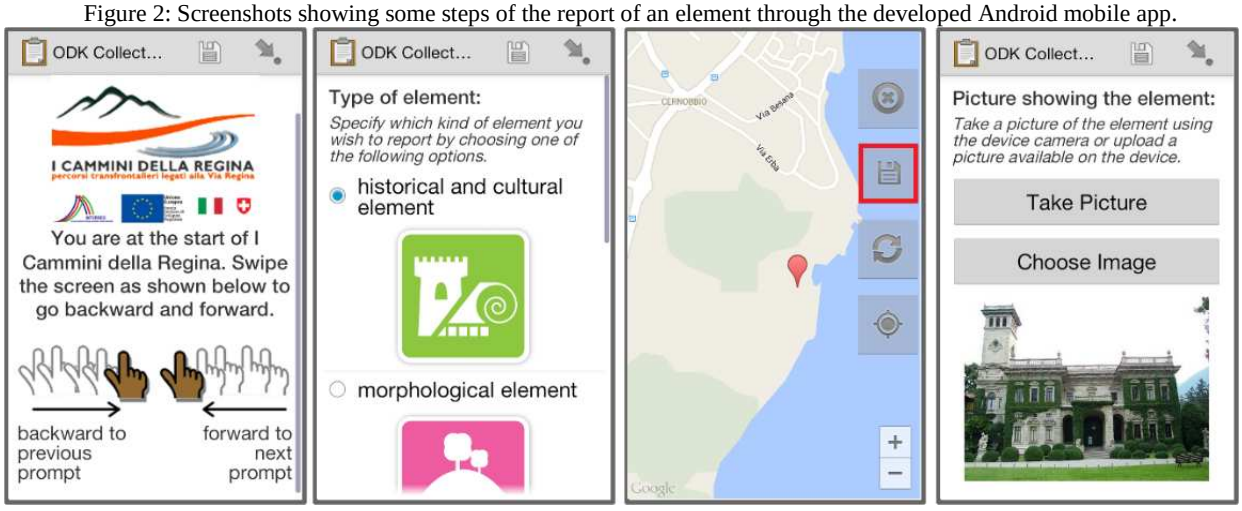


Figure 3: 2D Web viewer showing the data collected during the mapping party in Cernobbio.

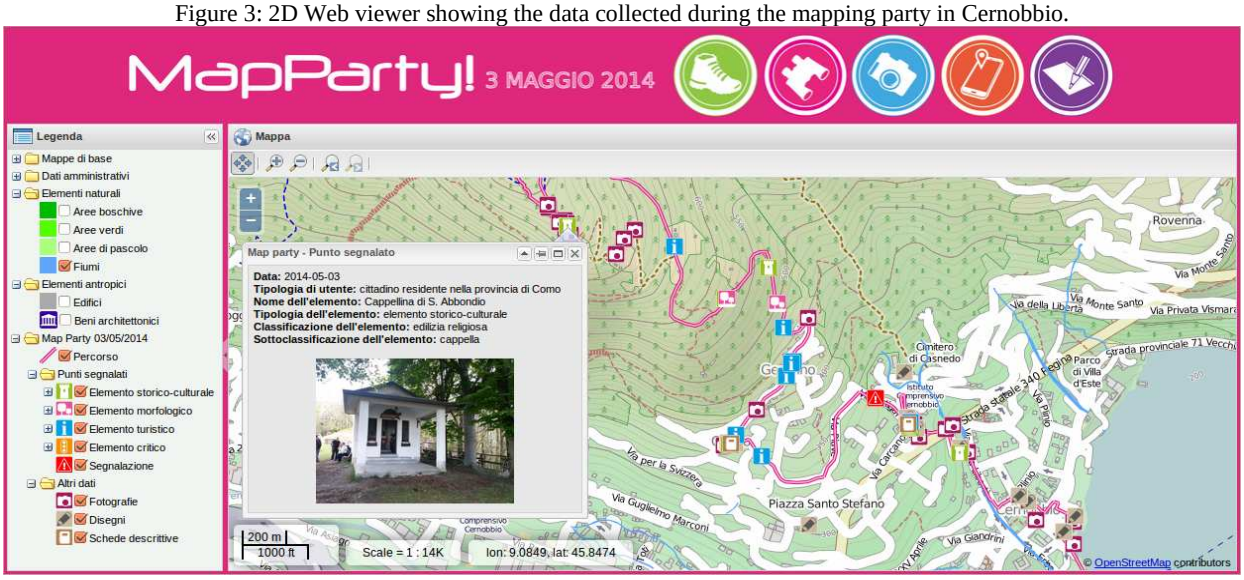
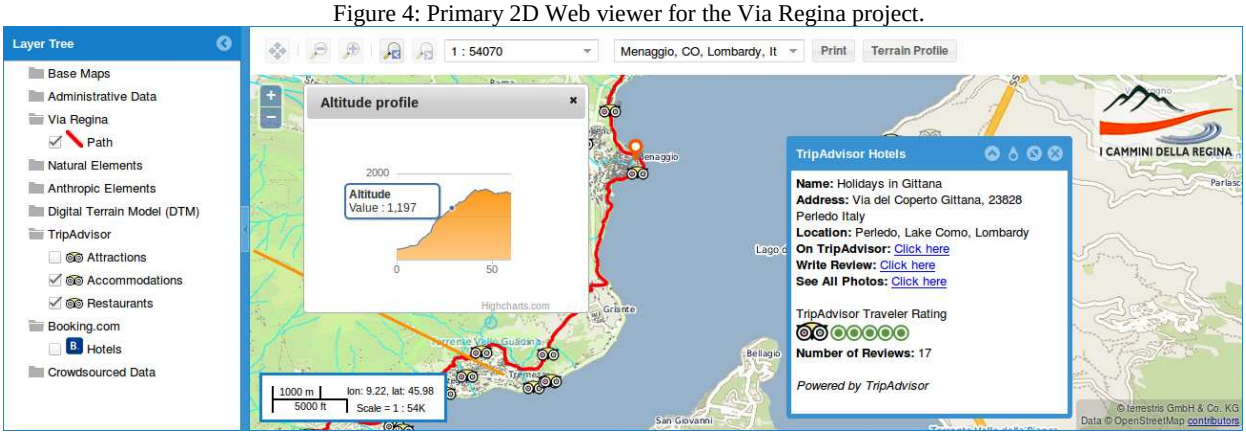


Figure 4: Primary 2D Web viewer for the Via Regina project.



of the Via Regina project. Data 3D visualization was achieved through a customization of the PoliCrowd 2.0 Web platform (http://geomobile.como.polimi.it/policrowd2.0). In turn, this is an open source application developed on top of NASA World Wind virtual globe (http://goworldwind.org), which provides a highly-customizable Java Software Development Kit (SDK) suitable to create advanced 3D Web Mapping applications.

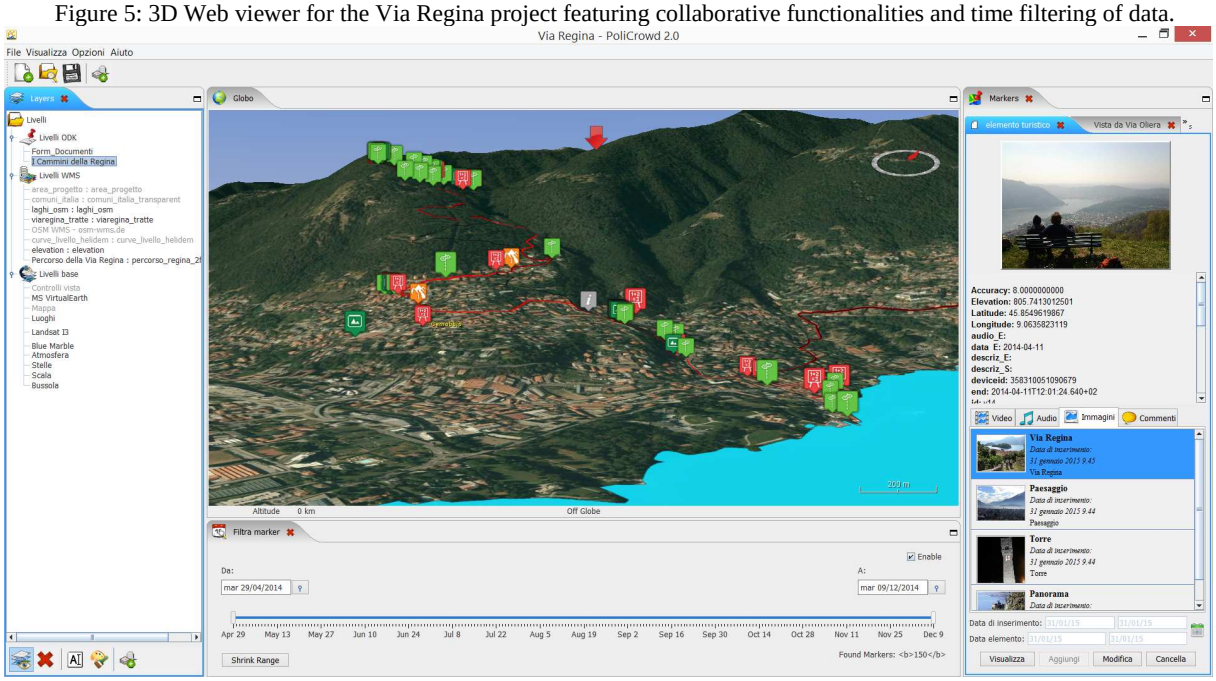
The architecture of PoliCrowd 2.0 consists of a client side component, providing 3D visualization and available as a Java Web Start (JWS) Application, and a server side component build upon a GlassFish server (https://glassfish.java.net) and again a PostgreSQL database. The two components interact through a Restful Web Service protocol.

The PoliCrowd 2.0 platform was customized to include by default all the WMS layers which are also available on the project 2D Web viewer (see Subsection 3.2). Exploiting the participative and multi-thematic nature of PoliCrowd 2.0, the platform allows users to connect to the ODK Aggregate server of the project and retrieve the crowdsourced data, whose representation style can be fully customized using the built-in icon libraries (see Figure 5). Users can even add other layers published by any WMS and ODK Aggregate server in order to customize their 3D projects. Finally, projects can be saved in order not only to be re-openable from their creators, but to be also shared with all the other users of the platform thanks to an interactive catalog. Another customization option within the platform concerns comments and multimedia contents (i.e. images, audios, and videos) that any user can add to any point of interest retrieved from an ODK Aggregate server (see Figure 5). In other words these "social" functionalities allow users to collaboratively create and add new information, thus exploiting their local knowledge to increase the overall value of the slow tourism 3D platform. Finally a temporal slidebar (see Figure 5) allows to filter the point data retrieved from ODK Aggregate servers in order to visualize the evolution in time of their submissions.

4 Conclusions

As a result of globalization, tourism has recently evolved into a mass-process phenomenon whose normal practice nowadays sees people undertake long-distance travels in few days, perhaps visiting – usually in a hurry – only well-known tourist spots without a comprehensive knowledge and appreciation of the territory. Slow tourism represents the complete opposite to

Figure 5: 3D Web viewer for the Via Regina project featuring collaborative functionalities and time filtering of data.



this vision, being thus a challenging model to be proposed to current society. Communities of slow travellers are typically small in number and highly composed of adults and seniors.

Therefore, new and innovative tools are required for a proper promotion of slow tourism which could also attract younger generations. Web Mapping solutions constitute the technologies having the greatest potential impact. This study described the Web Mapping products developed in the frame of a project focused on Via Regina, a historically fundamental route outlining a system of slow mobility paths at the border between Italy and Switzerland.

Traditional 2D Web Mapping techniques, representing the highest results in today's similar projects, were extended in terms of functions and user involvement. The development of a mobile application allows anyone to personally contribute to the project by sharing data collected during slow tourism experiences. This crowdsourced information becomes then available in real-time – together with the official data – on the project Web viewer, thus stimulating the birth of an active community of travellers which can autonomously enrich and update the system. Participative functionalities, typical of the current GeoWeb 2.0 trends, were even extended by creating a collaborative virtual globe-based 3D platform where users can easily build their own maps by selecting customized layers and styles. Exploiting the third dimension (and even the fourth as time is another system component) and being intuitive and easy to use, the platform provides a more realistic data access which in turn increases user experience.

It is worth noticing first that the implemented Web Mapping solutions make full use of FOSS4G. Open source technologies allowed on one side to build the products on existing, cutting-edge tools, and on the other side to produce outputs which can be – in turn – reused or extended. Secondly, the exploitation of open standards from OGC ensures full interoperability of all the services developed.

All in all, the technological solutions developed within the Via Regina project should provide new ways of interpreting the practice of slow tourism which keep up with the current state-of-art of Web Mapping tools. Technology is obviously just one of the required factors to make a slow tourism project successful [1], but it is crucial to achieve innovation. Besides slow travellers, local communities are also expected to take advantage from the Web Mapping technology in terms of respect and valorization of their territories as well as creation of new entrepreneurial opportunities.

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