Open Community Data & Official Public Data in flood risk management: a comparison based on InaSAFE

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1 Introduction

Flood and – in general – natural hazards cannot be prevented; however, measures can be taken to mitigate their impacts and prevent them from becoming disasters. Disaster management has been defined as «(the) continuous process that aims at avoiding or reducing the impact of natural hazards» (Poser, Dransch, 2010). Poser and Dransch (2010) have also outlined the importance of using up-to-date and accurate information in all phases of disaster management, as the need of integrating information from many different sources including in-situ sensors, aerial and satellite images, administrative, statistics and socioeconomic census data. New Internet technologies have facilitated fast and easy data collection from the public, giving rise to the idea of using Volunteered Geographic Information (VGI) in disaster risk management.

The paper discusses the opportunities and challenges of using VGI for disaster management, with particular focus on information for the prevention phase. This case study is based on flood risk assessment in two recently flooded cities in Veneto, Italy. We used InaSAFE, a free hazard and risk modeling application integrated in QGIS as a plug-in. InaSAFE offers the capacity to compare hazard and exposure official data with community crowdsourced data. In the case study we compare the results obtained by InaSAFE when using as input the data describing buildings (as exposure layer) drew from OpenStreetMap and from official public data. The goal of this work is answering the following question: Can OSM be used to collect exposure data for DRM? The paper ends analyzing different data sources opportunities and limits.

2 Flood and Disaster Risk Management

Between 1998 and 2009, Europe suffered over 213 major damaging floods (including the catastrophic floods along the Danube and Elbe rivers in 2002), which caused some 1126 deaths, the displacement of about half a million people, at least €52 billion in insured economic losses and severe environmental consequences (EEA, 2010).

The strategic relevance of this issue has prompted the European Parliament to issue the Directive 2007/60/EC on flood risk assessment and management. Floods are natural phenomena, but it is possible reducing their likelihood and limit their impacts: this is the reason why flood risk management plans have been introduced in the European Community legislation, with their focus on prevention, protection and preparedness.

Flood risk management is a subcategory of disaster risk management (DRM), defined as «the systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards» (UNISDR, 2009). DRM includes five main stages, these being:

- RECOVERY: the restoration of basic social function;
- RECONSTRUCTION: the full resumption of socio-economic activities;
- MITIGATION/PREVENTION: the permanent reduction of the risk, minimizing both vulnerability and hazard presence;
- RELIEF: the set of activities implemented after the impact of a disaster in order to assess the needs, reduce suffering and limit the direct disaster consequences;
- PREPAREDNESS: the hazard reduction through measures that ensure the organized mobilization of personnel, funds, equipment and supplies within a safe environment.

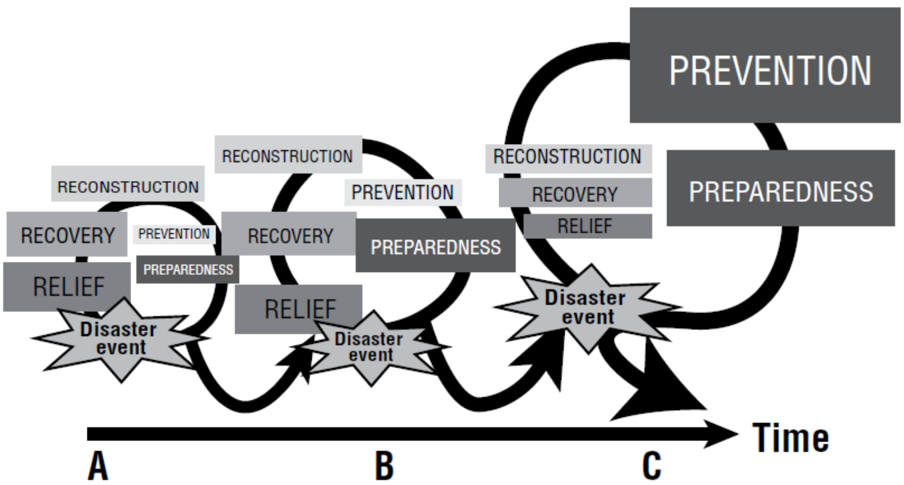

Figure 1: Disaster Risk Management evolution (UNCTAD, 20012)

In the past few decades, the focus has slowly shifted from disaster recovery and response to risk management and mitigation, and ways to reduce the

vulnerability of communities by strengthening their capacity to develop coping strategies (Birkmann, 2006). Figure 1 shows how disaster risk management has been portrayed differently over time. The size of the boxes indicates the importance given to each of the phases; the size of the circles indicates the time between two successive disastrous events.
Geospatial data and technologies (GD&T) are now an integral part of disaster risk management because both hazards and vulnerable societies are changing in space and time.

In the post-disaster phases GD&T plays a major role in rapid damage assessment thanks to optical, thermal and microwave satellite data, but also through crowdsourcing initiatives for collaborative mapping in emergency situations. Equally, in the pre-disaster phases GD&T contributes supporting hazard and risk assessments through remote sensing data, Digital Elevation Models (DEMs) and Interferometric Synthetic Aperture Radar (InSAR) data coupled with census and statistical datasets but also with participatory GIS and web-GIS to spread and collect information among inhabitants.

3 Volunteered Geographic Information for DRM

3.1 The VGI phenomenon

Geographic information provided voluntarily by individuals occupies an important and emerging role among GD&T. This phenomenon has been termed by Goodchild (2007) as “Volunteered Geographic Information” (VGI): WikiMapia, OpenStreetMap and Google Map Maker are examples of platforms used by volunteers to gather geographic information.

The VGI phenomenon has been possible thanks to some enabling technologies, among which Web 2.0, GPS and geocoding services, high quality graphics hardware and high capacity internet connection diffusion. It has become possible for citizens to determine their position accurately, and in turn to gain the ability to make maps from acquired data and eventually to develop cartographic design skills previously possessed only by trained cartographers (Goodchild, Glennon, 2010). The term neogeography has been coined by Turner (2006) to describe the breaking down of the traditional distinctions between expert and non-expert in the geographic information context, since all of the traditional forms of expertise can now be acquired through the use of technology. It is the same process that Butler (2006) called democratization of GIS and that Sui D. Z. (2008) called wikification of GIS, stressing the web-based mass collaboration component, which relies on free individual agents to come together and cooperate to improve an operation or solve a problem.

OpenStreetMap (OSM, https://www.openstreetmap.org), in particular, is an international project aiming to create a free and open map of the world, built entirely by volunteers surveying with GPS, digitizing aerial photography, and collecting existing public sources of geodata (HOT, 2015). The project is supported by the OSM Foundation, an international not-for-profit organization committed to encouraging the development and distribution of free geospatial data. In OSM, online volunteers and remote mappers contribute to create a detailed, precise and up-to-date map, whose underlying data are freely available, in the same sense of freedom that is characteristic of F/LOSS communities (Coleman, 2013), to modify and use under an open license[1] (MapGive, 2014).

3.2 VGI for humanitarian response (post-disaster phases)

Recent disasters have shown the great potential and usefulness of VGI (Goodchild, Glennon, 2010). The response to the 2010 Haiti earthquake demonstrated that non-professionals have significant potential to contribute to post-disaster information gathering (Soden, Palen, 2014). The response also showed that there is a great willingness by volunteers to contribute to such efforts (UNCTAD, 2012). For these same reasons, the U.S. Department of State’s Humanitarian Information Unit recently launched MapGive, an initiative that makes it easy for new volunteers to learn to map and get involved in online tasks (MapGive, 2014).

In general, the literature tends to highlight the role of VGI in the post-disaster phases (Goodchild, Glennon, 2010; HOT, 2015; Poser, Dransch, 2010; UNCTAD, 2012), typically in the immediate aftermath of the event for damage estimation, response planning or spatial data gathering (especially in places where base map data is often scarce, out of date, or rapidly changing). In some cases, in fact, OSM has provided the cheapest source of geographic information, and sometimes the only one available. The Humanitarian OpenStreetMap Team (HOT) has been created to address this need, it is a group – incorporated as a U.S. based 501c(3) non-profit organization – that coordinates the creation, production and distribution of free mapping resources to support humanitarian relief efforts through OSM. HOT acts as a bridge between the traditional humanitarian responders (World Bank – GFDRR[2]) and the OSM Community. The team works both remotely and physically in countries and the majority of the activities of HOT occur remotely: when an event occurs a search for existing data and available satellite imagery is performed with the

1 All the data that we used from OpenStreetMap are © OpenStreetMap contributors and are available under licensed under the *Open Data Commons Open Database License* (OdbL) which is available at http://opendatacommons.org/licenses/odbl/. Further informations can be found at the following page: http://www.openstreetmap.org/copyright (URLs accessed on March, 9th 2015).

2 Global Facility for Disaster Risk Reduction and Recovery (GFDRR).

goal of making this data freely available through the HOT Task Manager, a collaborative mapping platform designed to coordinate the mapping of an area by several remote volunteers. On these basis, the community of OSM is called to improve the map available for the given area. Sometimes, after the initial response, other activities are performed on the ground with the aim of training local people to participate in OSM. In this way the collection and reuse of data is enhanced. (HOT, 2015)

3.3 VGI for sustainable development (pre-disaster phases)

This capability to glean information remote people working on image data but also using ground and local knowledge enables the map to become a locally owned resources, thus proving a great advantage in all the phases DRM (Soden, Palen, 2014). VGI offers a great opportunity to enhance awareness because of the potentially large number of volunteers to act as ‘sensors’ observing important disaster management parameters in their local environment (Poser, Dransch, 2010).

Besides post-distaster management, this opportunity becomes even more important considering its application in the other DRM cycle phases, especially in prevention and in preparedness. We argue that crowdsourced data can be used for gathering data beforehand in order to succeed in a sustainable development.

A prime example of this has been the work of HOT in Indonesia to gather information about buildings. The focus has been data preparedness and disaster risk reduction in order to minimize the growing rate of exposure and the rising vulnerability. The work of HOT has been part of a broader framework of activities carried out by the World Bank - GFDRR and AIFDR[3] that developed an open source risk modeling software: InaSAFE (Indonesia Scenario Assessment for Emergencies).

InaSAFE is a plugin for QGIS, a free and open source desktop geographic information system (Quantum GIS Development Team, 2014). InaSAFE itself is free and open source, published under the GNU General Public License (GPLv3) that produces «realistic natural hazard impact scenarios for better planning, preparedness and response activities» (InaSAFE Project, 2014). It combines one exposure data layer (e.g. location of buildings) with one hazard scenario (e.g. the footprint of a flood) and returns a spatial impact layer along with a statistical summary and action questions useful to prepare a contingency plan: (a) What are the areas likely to be affected? (b) Which hospital / schools / roads / … will be closed?

3 Australia-Indonesia Facility for Disaster Reduction (AIFDR), a partnership for regional disaster reduction involving Australian (AusAID) and Indonesian (BNPB) governments designed to strengthen Indonesia's ability to reduce the impact of disasters.

Realistic hazard scenarios require scientific, sound and up-to-date data hazard information as well as up-to-date, scale appropriate exposure data and InaSAFE is designed to provide a simple but rigorous way to combine data from scientists, local governments and communities. Information on hazardous areas and people or assets location are usually provided by government departments: in this case, it is possible to import directly raster or vector layers. If the spatial data does not yet exist, InaSAFE external tools – such as the OSM downloader – allow to import data from this 'external' source quickly and easily. Its connection with OSM allows more detailed information to be collected, while being part of QGIS allows easy spatial analysis (InaSAFE Project, 2014).

4 Case study: InaSAFE application to compare exposure data

InaSAFE offers the capacity to compare hazard and exposure official data with community crowdsourced data, collected through the experience and knowledge of people. In this case study we will compare the results obtained by InaSAFE when using as input the data describing buildings, which will constitute the exposure data, obtained from OpenStreetMap and from official public data. The goal of this work is answering the following question: can OSM be used to collect exposure data for DRM?

InaSAFE allows to insert hazard data related to any type of natural disaster. We will focus our analysis on floods data given that this type of risk is relevant in Italy (CNR-IRPI, 2015), but this work could be extended to other types of risk.

4.1 Data collection and processing

InaSAFE combines exposure and hazard data layers. This case study employs as hazard data the extension of floods recorded in the recent past in Italy. Two shapefiles – both belonging to the Region of Veneto – has been analyzed:

- Data describing the floods occurred on 1 November 2010 in Vicenza (VI). This dataset was downloaded from the official website of the Municipality[4] and is depicted in fig. 3.
- Data describing the floods occurred on 26 September 2007 in Mestre (VE). This dataset has been produced by the emergency structure created for that specific event[5].This dataset is depicted in fig. 2;

These shapefiles do not contain the information about the height that water has reached, therefore it has not been possible to define thresholds and impact functions to determine when a building has to be considered damaged, but we were able only to tag buildings with a "flooded" or "not flooded" label.

4 http://www.comune.vicenza.it/file/87645-Alluvione_Novembre_2010.shp.zip (URL accessed on March 9th, 2015

5 "*Commissario Delegato per l'emergenza concernente gli eccezionali eventi meteorologici del 26 settembre 2007 che hanno colpito parte del territorio della Regione Veneto*" (O.P.C.M. 3621/2007). The website from where we downloaded the datasets was closed on December 31st, 2012, when the Italian Government declared the emergency to be over.

Figure 2 – 3: Hazard data layer no. 1 (L), flooded areas in Venezia on 26/09/2007, and no. 2 (R), flooded areas in Vicenza on 01/11/2010
[Datasets visualized in QGIS over a layer of satellite imagery from Bing – Bing Aerial layer: © 2015 Microsoft Corporation © 2010 NAVTEQ © Harris Corp Earthstart geographics LLC]

Regarding exposure, InaSAFE can handle just one exposure data layer at a time and many receptors could have been considered such as people, buildings and infrastructures. We decided to focus this case study on building footprints, employing two different spatial data sources:

- Official data, produced by the Region of Veneto and freely downloadable in vector format at 1:5.000 scale[6] (Carta Tecnica Regionale Numerica – CTRN);
- Open community data: extractions of OSM data on municipal basis have been downloaded (in PBF format[7]) from a web service provided by the Italian OSM community[8]. They have been imported in QGIS through the QuickOSM plugin.

The data processing followed different steps for the two data sources: we found that CTRN data required more attention and a more time-consuming processed to be utilized for our analysis.

CTRN data are organized in cartographic tiles, forcing us to search and select tiles in advance; furthermore, many shapefiles exist for each tile: we had to identify where building information were stored, download and merge them. We then removed from the resulting shapefile the entities not related to buildings: courtyards, steps, graveyards, gardens, etc.; finally we clipped the building data to the flood extent and we added a field (named “type”), which is required

6 http://idt.regione.veneto.it/app/metacatalog/ (Data have been downloaded on December, 2015)

7 The Protocolbuffer Binary Format (PBF) is primarily intended as an alternative to the XML format. It is used to support random access at the OSM 'fileblock' granularity, preserving the order of OSM entities, and tags on OSM entities.

8 http://osm-toolserver-italia.wmflabs.org/estratti/it/comuni/ (Data for the area of Venice have been downloaded on December 19th, 2015 and data for the area of Vicenza have been downloaded on December 15h, 2015)

by InaSAFE, copying in it building typologies from an already existent field (named “descrz”).
OSM data, instead, were downloaded in a unique file on municipal basis: no search, selection and merge operations were needed, but we had to select which geometry entities to import (“multipolygons”). Then we filtered out the entities not related to buildings as we have done for CTRN. Finally we clipped the building data to the flood extent and we added a field (named “type”), encoding in it building typologies: in this case, in order not to lose information about building typologies, we used multiple fields (“name”, “type”, “amenity”, “building”, “landuse”, “leisure”) as inputs for the encoding process. Some reclassification and harmonization of tags was required.

4.2 Data comparison and results

In this section we presents the results of the impact calculation we produces using InaSAFE. The system outputs a layer representing flooded buildings together with statistics of flooded buildings detailed for various building typologies. For each hazard dataset, we have repeated the same process using different exposure layers.

Figure 4: InaSAFE output layer no. 1: flooded building in Venezia using official (L) and OSM data (R)

Figure 5: InaSAFE output layer no. 2: flooded building in Vicenza using official (L) and OSM data (R)

As shown by the maps reproduced in fig. 4 and fig. 5, at small to medium scales, there are no visual remarkable differences between the output layers produced by InaSAFE: official and community data are comparable. This result can be explained considering the choice made by the administration of Region of Veneto to open part of its geographic information databases in 2011. CTRN data has been imported in OSM[9] and these data served as complete and solid basis for the community that than focused on improving the map. More significant differences can be detected at a larger scale. Here, the difference can be explained with the lack of updating of official data: the official datsets dates back to 1994 for Venezia and to 1999 for Vicenza. This is a considerable difference since OSM data is constantly updated. albeit unevenly and unsystematically. An example is shown in fig. 6, depicting the area of VEGA, the Venetian Science & Technology Park, built in the decade 1993–2004. While the official map still shows the pre-existing industrial buildings, OSM mappers have drawn the new layout of the area.

Figure 6: QGIS screenshot on VEGA area: official data layer (L); OSM data layer (in the middle) [© OpenStreetMap contributors]; Bing Aerial photograph (R) [© Microsoft Corporation]

Further differences between official and community data can be highlighted considering non-spatial statistics on building typologies.
Table 1 and 2 show that community data achieve a greater information granularity: OSM data contains a building types classification richer than what is available in the CTRN data. This greater detail can contribute to refine current disaster risk management results and methods, both in prevention and in emergency phases.

9 The import occurred in the last months of 2011, following a clear method that can be consulted at: http://wiki.openstreetmap.org/wiki/Veneto/Guide_e_documentazione/Import:_dalla_CTRN_Veneto_a_OSM (URL accessed on March, 9th 2015)

	BUILDING TYPE	OSM data			OFFICIAL data		
		TOTAL BUILDINGS	BUILDINGS FLOODED	%	TOTAL BUILDINGS	BUILDINGS FLOODED	%
VENEZIA (2007)	Bell Tower	16	0	0	15	0	0
	Chimney	8	2	25	14	5	36
	Church	122	31	25	109	29	27
	Civil building (undef.)	26448	8553	32	24515	8430	34
	Collapsed	33	1	3	115	18	16
	Commercial	18	1	6			
	Courthouse	1	0	0			
	Cultural heritage	89	1	1			
	Farm auxiliary	160	23	14	119	7	6
	Fire station	2	0	0			
	Hospital	3	0	0	8	0	0
	Hotel	11	2	18			
	Hut	12309	3872	31	12347	4041	33
	Inflate balloon tent				4	1	25
	Industrial	1893	643	34	1983	760	38
	Mall	7	0	0			
	Monument				3	2	67
	Museum	3	0	0			
	OTHER	30	3	10	89	10	11
	Parking (building)	3	0	0			
	Police station	1	0	0			
	Public building	21	1	5			
	Residential	49	17	35			
	Restaurant	3	0	0			
	Roof	1052	136	13	700	172	25
	School	93	33	35	87	32	37
	Silo	190	59	31	442	196	44
	Sports facility	19	3	16	57	8	14
	Squat	1	1	100			
	Storage tank	131	100	76			
	Supermarket	6	0	0			
	Theatre	4	1	25			
	Townhall	2	0	0			
	Train station	5	0	0	6	0	0
	Underconstruction	29	9	31	37	18	49
	University	7	0	0			
	TOT	**42.769**	**13.492**	**32**	**40.650**	**13.729**	**34**

Table 1: Absolute and percentage values of flooded buildings split by building typology in Venezia (2007) using OSM and official data.

VICENZA (2010)	BUILDING TYPE	OSM data			OFFICIAL data		
		TOTAL BUILDINGS	**BUILDINGS FLOODED**	**%**	**TOTAL BUILDINGS**	**BUILDINGS FLOODED**	**%**
	Bell Tower	38	10	26	52	12	23
	Church	362	57	16	409	65	16
	Civil building (undef.)	36063	3435	10	36933	3577	10
	Collapsed	3	0	0	117	14	12
	Commercial	51	4	8			
	Courthouse	3	0	0			
	Cultural heritage	58	10	17			
	Depot	33	0	0	38	0	0
	Ederle Camp	1	0	0			
	Farm auxiliary	746	92	12	775	92	12
	Fire station	2	0	0			
	Garage				2	0	0
	Hospital	152	17	11	165	17	10
	Hotel	3	2	67			
	Hut	4582	390	9	4753	407	9
	Industrial	2054	137	7	2375	157	7
	Inflate balloon tent				5	2	40
	Monument				9	3	33
	OTHER	12	0	0	1079	111	10
	Police station	26	0	0			
	Public building	10	1	10			
	Residential	25	1	4			
	Restaurant	63	7	11			
	Roof	10270	810	8	10547	852	8
	School	428	91	21	561	122	22
	Silo	212	10	5	429	15	3
	Sports facility	5	4	80	46	15	33
	Supermarket	2	0	0			
	Theatre	4	3	75			
	Toll booth				1	0	0
	Tower				19	0	0
	Townhall	19	5	26			
	Train station	14	0	0	18	0	0
	Train accessory building				7	0	0
	Under construction	23	1	4	78	2	3
	University	2	0	0			
	TOT	**55266**	**5087**	**9**	**58418**	**5463**	**9**

Table 2: Absolute and percentage values of flooded buildings split by building typology in Vicenza (2010) using OSM and official data.

During the identification of exposed assets from a flood risk point of view, the most sensitive building typologies available in the CTRN dataset are hospitals, schools and industrial buildings. Conversely, the civil building category is too broad and undefined to be considered useful: are these building inhabited? Which functions are contained?

OSM data help to answer these questions identifying residential buildings, public facilities (town halls, court houses, police stations, universities), commercial activities (hotels, restaurants, malls, supermarkets), cultural heritage sites (museums, theatres, historic buildings). Some OSM categories – as fire stations and storage tanks – may even be used to assess diffusion of

pollutants after a flood.
Flooded building percentages are homogeneous in both urban contexts despite the different data sources used (around 30% in Venezia, 9% in Vicenza). Our analysis with InaSAFE detects a difference in the total number of buildings available in OSM and CTRN data: in Venezia OSM detects more buildings than the CTRN, while in Vicenza the situation is the opposite. This difference may be explained with the fact that the two cities belong to different socio-economic contexts and they may have experienced different transformation dynamics, but this analysis would be outside the scope of this paper; we can give a more limited explanation noting again that OSM data are updated up to December 2014, while please CTRN date back several years (1994 for Venezia and 1999 for Vicenza) and for this reason we would have expected a greater number of elements in OSM data in both cases, while for Vicenza this is not the case. A more detailed analysis of CTRN data in the area has given some indications for this apparent shortage of buildings in OSM data, namely: (a) the presence of some errors in a cartographic tile of the CTRN and (b) during the import of CTRN data in OpenStreetMap building shapes have been simplified in OSM (fig.7).

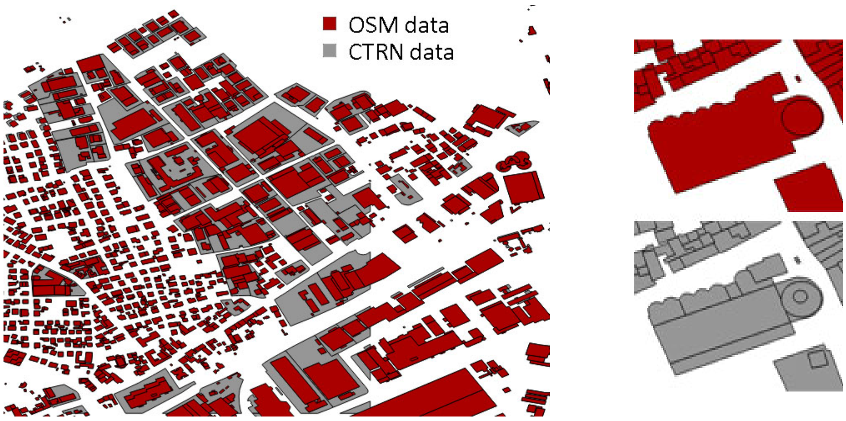

Figure 7: Large scale comparison of CTRN and OSM data in Vicenza showing fine-grained differences: errors in a cartographic tile of the CTRN (L) and examples of OSM simplified building geometries compared to CTRN data (R).

At the same time, it should be noted that OSM data are not complete. For example, while OSM data show that in Vicenza there are only 10 public buildings, 3 hotels and 2 supermarkets, we can assume that the actual numbers are higher.

4 Conclusions

This paper discussed the opportunities and challenges of using VGI for disaster risk management, focusing on its application for prevention and risk assessment rather than in response and post-disaster phases. The case study, based on flood risk assessment in two urban contexts of the Region of Veneto, Italy, has been used to compare different exposure data layers, targeted on buildings drew from regional official maps (CTRN) and OpenStreetMap (OSM).

Our aim was to investigate if OSM – at the state of the art now – could be used to collect exposure data in DRM. To the opening question, our analysis show that the answer is affirmative. The risk assessment profiles obtained with the two data sources are comparable and, in addition, OSM data granularity and richness is higher. OSM data are also easier to retrieve and process than CTRN data, thus simplifying the professionals task in huge or short term scopes.

Furthermore, we did not exploit the existing OSM data to their full potential: the quality of our results on buildings could be improved using other available information such as (a) information from OSM nodes encoding points of interest, and (b) information from OSM 'landuse' tags. This information could be used to refine the specification and detection of building typologies.

An example is shown in the figure below (fig.8). Note that only the buildings depicted in red have a defined OSM attribute associated to them. In this case we chose only some attributes ('amenity' and 'shop' tags) from the entire punctual OSM database. Nonetheless it is clear how information granularity could increase by mean of this simple geoprocessing step; here – for instance – exposure maps can be enriched with a new feature class: commercial destination at ground floor.

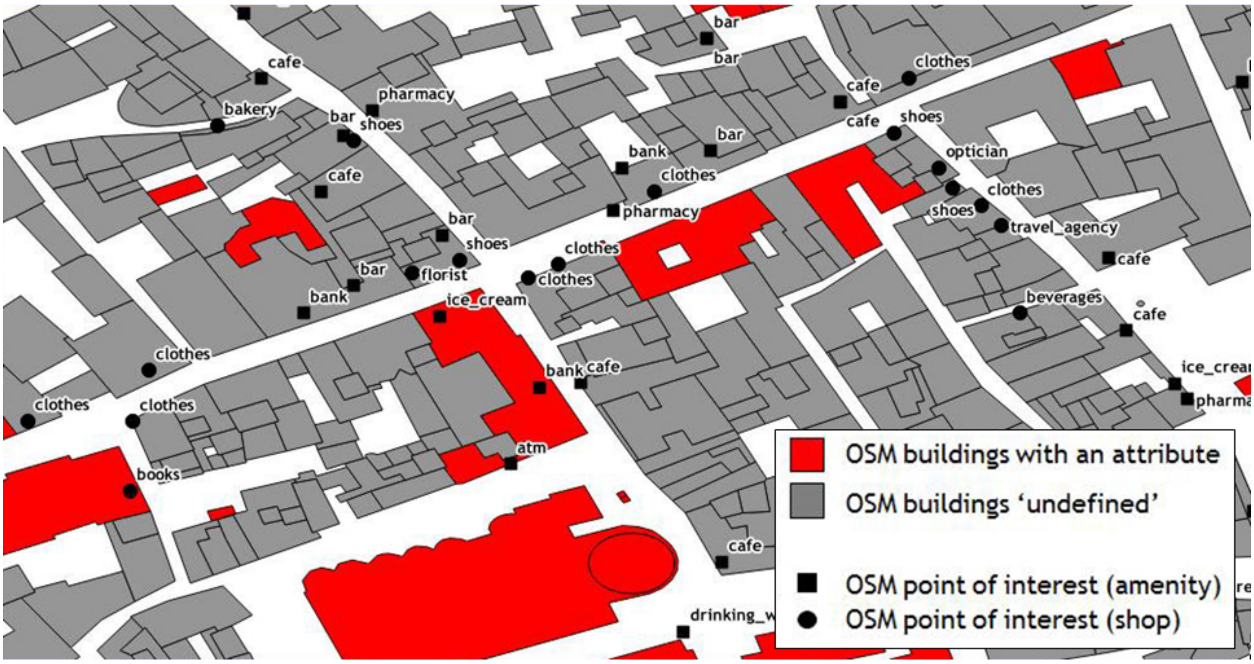

Figure 8: preliminary example on points of interest and buildings intersection

Another advantage related to using OSM data would be the possibility of improving its data: the institutions should foster the use of OSM by citizens and they should organize meetings with OSM mappers could be organized in order to identify some strategic elements for flood risk assessment in order to plan mapping campaigns, a practice already in use in the OSM community with the name of “mapping parties”. This practice has already shown its potential in international initiatives such as MapGive and the work the Humanitarian OpenStreetMap team.

Some of the elements that could be added to OSM and used to refine the building vulnerability assessment in flood events are:

- the existence of underground floors (which anyone can easily identify through the presence of basement windows, descendent stairs, parking/garage ramps, etc.). In this regard, we note that the existing OSM tag “layer=-1” it does not report the existence of underground elements by itself, but it is used to order overlapping objects such as intersecting roads;
- the land use of ground floors (retail/office, public service, residence, warehouse, etc.);
- the approximate height – in relation to the road – at which the most vulnerable urban land uses are located, due to the buildings shape and structure (pilotis, mezzanine floors, basements, etc.).

Through the practice of editing the map citizens would also gain a greater awareness about flood risk in their city and neighborhoods: spreading this culture of risk among citizens would fulfill a great, and usually neglected, need in flood risk management, whose benefits have already been shown in humanitarian post-disaster initiatives. In addition, even if this paper is focused on flood risk, InaSAFE can analyze hazard data related to any type of natural disaster and further work could extend this analysis to other types of risk.

To conclude, this case study has shown how the choice of the Region of Veneto to open its geodatabase has allowed the import of CTRN data in OSM. The community of OSM has taken advantage from this import, relying on map with higher spatial homogeneity, but in return they are updating continuously this data, that otherwise remains static and outdated thus eventually useless. In turn, regional and local authorities could take advantage from this update; more, they may even promote the use of OSM prompting their technical and operational staff (technicians, police, Civil Protection volunteers, etc.) to update OSM constantly and timely. We believe that this process would benefit all the communities interested in having accurate, up-to-data and reusable geospatial data.

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