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TRACKING EMOTIONS IN URBAN SPACE. TWO EXPERIMENTS IN VIENNA AND SIENA.

1. INTRODUCTION. – Emotions have a spatial and relational character: they are a means to understanding practices and interpretations of the surrounding environment. Indeed, humans perceive and evaluate environments emotionally: some places are experienced as risky or desolate, while others as attractive and exciting. The paper aims to study people's affective responses, that is their emotional feedbacks, to different urban environments by means of a mobile crowdsourcing approach, namely the free mobile application EmoMap, developed by Vienna University of Technology in 2014. The approach has been tested in Vienna and Siena for academic research and for learning purposes and two case studies have been developed to acquire people's affective responses elicited by different urban contexts and self-reported by users while walking through the city via GPS-enabled smartphones. The experiments explore two different spatial approaches to the collection and analysis of the affective responses. The first refers to three distinctive urban environments according to different levels of traffic and vegetation in Vienna, while the second aims at identifying which urban environments in Siena stimulate the emotional response and the different levels of comfort and discomfort.

The results show how these affective responses can be collected through a location-based application and how volunteered geographic information may provide a better understanding of human-environment interaction, taking into account the rather homogeneous participant group (young people, students). The paper also discusses how the relationship between emotions and place may have direct implications for the assessment of the subjective dimension of urban quality of life. The paper does not aim to define QoL but rather to show how the assessment of urban quality can be enriched by affective responses.

2. THE EMOTIONAL POTENTIAL OF CITIES. – Emotional geography commonly deals with the emotions that people feel for one another and, more broadly, for places, landscapes, objects in landscapes and in specific situations. These emotions are taken both as personal and varying according to demographic, social and cultural factors (age, education, ethnicity, etc.) and as a social construction. They have an interactional quality: space and time experiences are continuously shaped by emotions (perceptual environments) (Kaplan and Kaplan, 1989; Borst *et al.*, 2009). Here we refer to the emotional responses, namely the affective responses, that people (residents and city users) experience in different urban environments. *Affect* is the expression of a person's interaction with a stimulus which in this case is the urban

environment. Cities may be considered as emotional stimulators because they are made of signs: residents, or city users more generally, confer meaning on urban forms, colours, sounds and atmospheres in relation to the emotions aroused. Moreover, cities are a suitable theatre for the study of emotions due to the monumentality of the buildings (e.g. cathedrals, buildings, artifacts, etc.), the skyline, the specific functional properties (e.g. sport, religion, transport, etc.); at the same time cities are also the playground of more negative phenomena such as pollution, congestion and degradation, which may influence people's spatial behaviour and the affective responses. Thus, understanding what emotions are provoked by being in a familiar or unfamiliar place becomes relevant in this context: "At particular times and in particular places, there are moments where lives are so explicitly lived through pain, bereavement, elation, anger, love and so on that the power of emotional relations cannot be ignored (and can readily be appreciated)" (Anderson *et al.*, 2001, p. 18).

The "emotional" dimension which is produced by city users in everyday life and daily routines may be linked to the wider context of subjective evaluation of quality of life. Indeed, the notion of quality of life (QoL) in urban contexts is attracting growing interest in urban studies for several reasons, including the following: (a) cities have become the predominant living and working environment for a large proportion of the world's population (54% of the world population in 2016 according to World Bank Data), and for this reason, liveability in the city becomes crucial; (b) the quest for smart cities includes not only advanced technologies but qualitative aspects to achieve cities that are inclusive and good places to live (1); (c) the 'policy turn' in social sciences – and particularly in geography – needs to address how emotional relations shape society and space due to their important role in decision making processes; finally (d) the subjective and perceptual dimension of quality of life has been increasingly taken into account alongside traditional economic and social indicators.

The concept of quality of life in a city is widely debated and can be defined in different ways. In brief, it reflects the citizens' perception of their satisfaction with a wide range of urban attributes such as employment, public services, safety, environmental health and so on. Many surveys and general aggregated indices attempt to measure QoL, and recently attention has been given to subjective measures of satisfaction. Nevertheless, most of indices are valuable at a national level (such as the Gross National Happiness (2), the OECD Better Life Index (3) but less so at the level of a city and none of them include people's emotional evaluation of the urban environment itself. Similarly, other indices developed at urban level mainly rank cities around the world according to various social and economic factors that may contribute to Quality of Life (i.e Espon City Bench (4), Flash Eurobarometer, "Quality

(1) As Batty (2013, p.276) points out, cities become smart when also people are smart.

(2) The *Gross National Happiness* index (GNH) was conceived in 1972 (then updated in 2006) by the king of Bhutan and developed by the Centre for Bhutan Studies. The four pillars of GNH are the promotion of sustainable development, preservation and promotion of cultural values, conservation of the natural environment, and establishment of good governance.

(3) The *Better Life Index* (BLI) was developed by OECD and published in 2011, partially based on Stiglitz' work on "Beyond GDP" and includes a "life satisfaction" metric.

(4) The *Espon CityBench* is a urban benchmarking tool for comparing cities and city regions based on various themes such as demography, economy, quality of life or investment climate.

of life in European cities” No 419 [5]). Another example is UrBES -ISTAT index which has developed a survey in 14 Italian Metropolitan areas and 15 smaller municipalities and includes a measure of “subjective wellbeing” of social and economic conditions among the 12 variables (ISTAT, 2016). All these measurements make use either of survey data or official statistics which do not provide either timely information or granular scale observations of affective responses. In this context we show how aspects of urban quality can be addressed by collecting feelings of comfort and discomfort raised by everyday urban environments and recorded by people simply walking through the city: the convergence of emotional responses shows collective values perceived by people who chose places and routes according to their own affective response (6). The analysis of people’s affective responses to the urban environment contributes to a better understanding of people’s spatial experiences and behaviour, as well as enabling many smart-city oriented applications which have been recently developed such as navigation systems, public safety, traffic management, environmental monitoring, public health and urban planning.

In order to grasp the emotional response, our analysis takes advantage of new forms of data collection (location-based tools) and provision by the public (volunteered geographic information) which will be briefly addressed in the following paragraph.

3. THE CROWDSOURCING APPROACH TO EMOTIONS. – In the past, the harvesting of data on perceptions and emotional responses required a great deal of effort. The traditional methods for collecting such responses to environments are face-to-face surveys which are carried out at specific times and require high efforts and costs; besides they generally imply highly controlled conditions and the presence of investigators. More recently, the widespread availability and use of smartphones, and the rapid spread of Web 2.0 have enabled researchers to collect self-reported affective responses from large groups of people (Huang *et al.*, 2014; Resch *et al.*, 2015; Barrett *et al.*, 2007). Social science and geography in particular have started to apply the principle of “citizens as sensors”, that is, people contributing subjective observations by means of different sensors (Goodchild, 2007) and to explore the potential of volunteered geographic information which is more or less voluntarily produced by ordinary people (Capineri, 2016a). VGI has been defined as

a subset of user-generated content which carries specific spatial and temporal components: the widespread engagement of large numbers of private citizens, often with little in the way of formal qualifications, in the creation of geographic information, a function that for centuries has been reserved to official agencies. [...] I term this *volunteered geographic information* (VGI), a special case of the more general Web phenomenon of *user-generated content* (Goodchild, 2007, p. 2).

(5) *Flash Eurobarometer*, “Quality of life in European cities” (No 419), was conducted to get a picture of people’s opinions on a range of urban issues in 79 European cities; in four of these, an additional sample provided extra data, which allowed analysis of the perception of quality of life in “Greater Paris”, “Greater Lisbon”, “Greater Athens” and “Greater Manchester”. The survey was conducted in 28 Member States of the European Union, as well as Turkey, Iceland, Norway and Switzerland for two months on a sample of 40,798 respondents from different social and demographic groups.

(6) According to the American Psychological Association (2006) *affect* is the experience of feeling or emotion; it is a key part of the process of an organism’s interaction with stimuli (e.g. the environment).

VGI consists of a flow of data deriving from different tools and media (mobile phones, cameras, records of smartcard transactions, social platforms, check-ins, LB devices, etc.); they are digital footprints, or byproducts of human/machine interactions (Graham, 2013). Such digital footprints are produced by everyone who may potentially act as a sensor and provide, more or less consciously, valuable information (Haklay *et al.*, 2008; Sui, 2008) by applying local and sectorial knowledge since producers are “[...] equipped with some working subset of the five senses and with the intelligence to compile and interpret what they sense, and each free to rove the surface of the planet” (Goodchild, 2007). The phenomenon of user-generated content is part of a cultural change which very recently has led to the adoption of open access and collaborative approaches to information resources. This cultural turn has been defined as collective intelligence by the French philosopher Pierre Levy (1994) who explains that “l’intelligence collective tente précisément d’articuler d’une nouvelle manière l’individuel et le collectif dans un nouvel espace du savoir” (p. 33). This collective intelligence is not only the pooling of individual and personal dimensions but it has a relational and participative dimension which de Kerchove (1997, 2014) defined as connected intelligence to focus on the Web as an emotional and cognitive environment.

Indeed VGI is a particularly valuable source for studying emotional responses due to its experiential and perceptual nature which can be distilled both to achieve a better understanding of beliefs, practices and habits and eventually challenge the dominant narratives because VGI is built on the understanding of the social world mediated by people’s conversations and contributions, thus its social practices (Elwood, 2008).

Recent literature shows many applications of VGI dealing with different topics related to urban environments, such as the management of disaster relief (Zook *et al.*, 2010), the identification of tourist flows (Girardin *et al.*, 2008), the evaluation of the attractiveness of urban space (Crandall *et al.*, 2009; Teobaldi & Capineri, 2014), the dynamics of urban cores (Aubrecht 2011; Jiang & Jia, 2011; Sagl, Resch, Hawelka, & Beinart, 2012); the definition of cities’ boundaries from geocoded social media data (Jiang & Miao, 2015); participatory urban planning (Campagna *et al.*, 2015; Capineri, 2016b); public transport management (Attard *et al.*, 2016) and even people’s affective responses in different urban contexts (Huang, Gartner, 2016; Huang *et al.*, 2013; Resch *et al.*, 2015).

The individual-level contents from the crowdsourced information provide qualitative information which was unreachable in the past through traditional direct investigations (surveys, interviews, etc.) or official data (census). The employment of qualitative information is not new in geography, as it was the pillar of the perception and behavioural approach (Claval, 1974), but the innovative aspects are, in addition to the quantity and the scale (from global to local and vice versa), the granularity of topic and the timeliness that VGI allows. VGI data potentially contain lots of information about people’s experiences and activities in various environments (annotations, photos, etc.), which is a new and significant source for studying people’s spatial experiences in different contexts (Capineri, 2016a). The experiments developed in Vienna and Siena will show that quantitative data and qualitative information provided by the public through sensors play an important

role in emphasising the capacity of places to evoke emotions of comfort and discomfort, how emotions occur in everyday life (Thrift, 2004, p. 60).

3. **METHODOLOGY: THE EMO MAP APPLICATION.** – Literature on structuring or modelling people’s affective responses shows many approaches, but this paper focus on the affective responses evoked by urban environments. These affective responses to environments are experienced as attributes or qualities of environments, which are commonly described with affect-related adjectives such as *boring*, *safe*, and *beautiful* (Russell, 2003; Barrett *et al.*, 2007).

The experiment carried out for this contribution has employed a mobile crowdsourcing approach to acquire people’s affective responses via GPS-enabled smartphones, developed by the EmoMap project at Vienna University of Technology (Klettner *et al.*, 2013). In the EmoMap project, two slightly different mobile applications were developed, based on existing theories on affect and emotion (Russell, 2003; Barrett, 2006). At the first step, both applications ask users to rate their “level of comfort” (i.e. the valence dimension (7) in their current environment on a 7-point Likert scale, from uncomfortable (“1”) to comfortable (“7”). At the second step, the first application (“EmoMap 1”, available for Android) allows users to optionally provide further ratings about their affective responses, particularly on the aspects of safety, attractiveness, diversity, and relaxation (Huang *et al.*, 2014; Huang and Gartner 2016). The second application (“EmoMap 2”, available for Android and iOS) adopts a slightly different approach: instead of giving ratings, users are asked to select of a subset of adjectives from a list of environment-related emotional adjectives, which was introduced by Russell and Pratt to describe the affective quality of places. The list contains the following 21 emotional adjectives (Russell and Pratt, 1980): exciting, active, majestic, festive, enjoyable, beautiful, comfortable, peaceful, sleepy, desolate boring, insignificant, depressing, unstimulating, disgusting, ugly, frustrating, harsh, frightening, hectic, forceful. At the last step, both applications collect/ask some additional contextual information, i.e., company (“with whom?”), familiarity with the current place (“first time here?”), and time. Each affective response is then annotated with GPS location obtained from user’s smartphone.

These mobile applications were implemented to enable people to report their affective responses to environments anytime and anywhere. To help users locate themselves, both applications show the current location (obtained from GPS on smartphones) as a marker in an OpenStreetMap. Figure 1 shows some screenshots of the “EmoMap 2” (Fig. 1).

To encourage people’s active contributions, “EmoMap 1” was promoted to students in Vienna (Austria) and to an urban walking community (<http://www.wildurb.at/>) in Vienna, and “EmoMap 2” was promoted to students in Siena (Italy) (8). Users were asked to contribute their ratings anywhere and anytime they want in their daily life.

(7) The valence dimension is the user’s positive-to-negative evaluation of the experienced state.

(8) A similar experiment was carried out on 15 July 2015 during the Foss4G Europe 2015 conference which involved 94 participants (conference participants and general public) who contributed with 244 emotional responses.

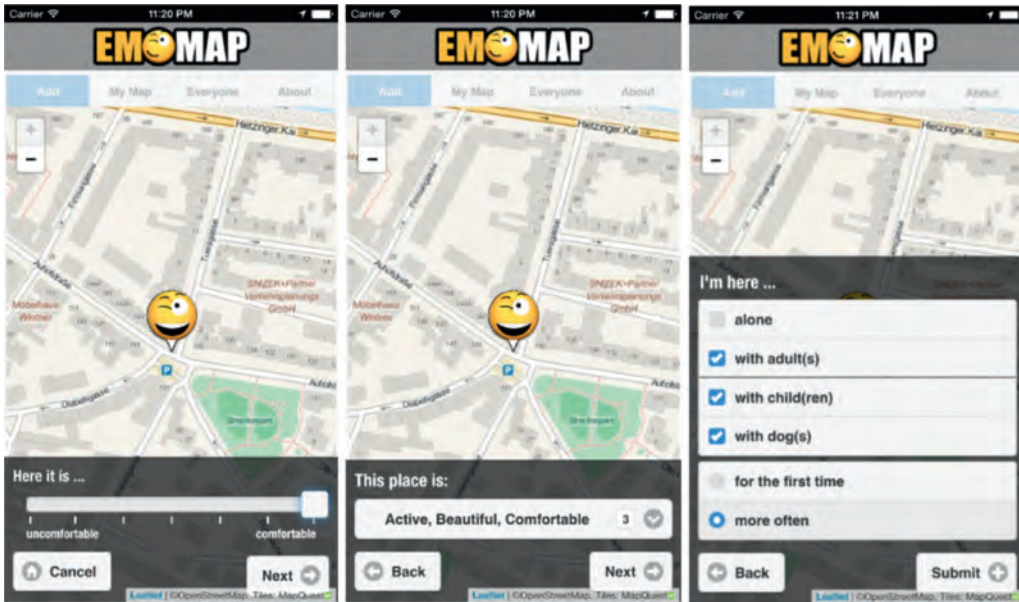


Fig. 1 – Screenshots of the mobile application for collecting people’s affective responses to environments. The marker in the centre of each map denotes the current location. Users can also move the marker to adjust their location. Please note that we explicitly ask users to focus on the environment (“Here it is ...”).

Source: OpenStreetMap and Contributors, CC-BY-SA.

4. EMOTIONS AT WORK: TWO CASE STUDIES. – The EmoMap applications were tested in two case studies which show two different spatial approaches in the evaluation of emotional responses: the Vienna case study approached emotion in three distinctive urban settings according to their level of traffic and vegetation (green areas); the Siena case study aimed at identifying both the urban stimulators, that is specific sites (e.g. monuments, public spaces, facilities, etc.) on which the collection of emotions converged and how these sites were described through the emotional adjectives provided by the Emomap application.

4.1 *Vienna case study: green areas vs traffic areas.* – The first case study, which is here briefly presented (9), used the collected affective data to study the impact of environmental characteristics on people’s affective responses in Vienna.

In one year (2013), more than 3500 contributions were collected from more than 200 people. Most of contributions (98%) were located in the city of Vienna (Austria). The analysis focused on the area surrounding Vienna University of Technology, mainly due to the diverse environmental settings within this area. The area was subdivided into three distinctive urban scenes according to their level of traffic and vegetation: A) green urban area (urban-green), B) urban area with light or no traffic (pedestrian lanes and one-lane street, urban-light traffic), and C) urban

(9) For more details regarding the case study and the data analysis, refer to Huang and Gartner (2016) and Klettner *et al.* (2013).

area with heavy traffic (roads ranging from two to three lanes, urban-heavy traffic). These three urban settings are compared according to the participants' reported level of comfort (Fig. 3). The results (Fig. 2) suggest that the level of comfort ratings differ significantly between the three environmental settings.

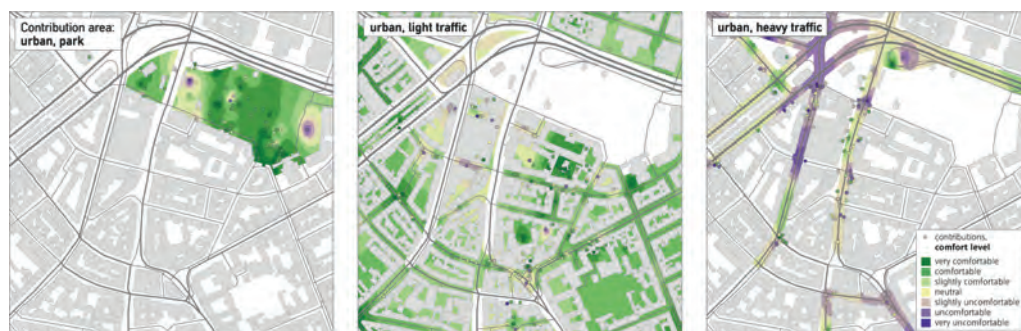


Fig. 2 – Level of comfort in three urban scenes (green urban area, area with light or no traffic, area with heavy traffic). Colours indicate values of the “level of comfort” ratings, with green being comfortable, yellow neutral, and purple being uncomfortable.

Source: OpenStreetMap and Contributors, CCBY-SA.

As Figure 2 highlights, urban green areas show the most positive ratings among the three urban settings, followed by areas of urban-light traffic. Urban areas with heavy traffic, on the other hand, show highly negative ratings. However, we argue that in order to draw a clearer conclusion, more research should be done on this aspect, e.g., a further classification of the study area, consideration of other contextual factors (such as time), and validation of the quality of the affective data collected.

4.2 Urban emotion stimulators in Siena. – The second case study was developed at Siena University and involved 50 students from the courses of development geography and sociology in 2016. The experiment was organised in three phases:

- the explanation of the EmoMap application as a tool for collecting crowd-sourced geographic information on affective responses to the urban environment;
- data collection: students were asked to record their emotions for two weeks anytime and anywhere they wished;
- data analysis: the data were downloaded and students analysed them during a GIS laboratory.

As in the case of Vienna, the contributors' demographic features were very homogeneous: they were of similar ages (19-23) and highly motivated due to course requirements (the EmoMap experiment was part of the course activities). The number of contributors was rather small and so the discussion of the results must be considered valuable particularly from a methodological point of view rather than from the statistical significance of the data collected; the limited number of the users and their homogenous demographic features (young people) also reduces

the comparability and interpretability of the ‘sensed’ data. Nevertheless, some interesting inferences can be drawn from the results of the experiment. The analysis of the emotional responses was organised as follows.

First, data were downloaded: 163 emotional records were obtained referring to 84 different locations in the Siena urban area out of which only 20 had been recorded more than twice.

The distribution of the geocoded emotions shows a concentration in Siena’s historic centre and in specific sites like the University buildings and in some recreational sites (e.g. Fortezza, football stadium, Via Banchi di Sotto). This pattern highlights students’ urban spatial practices around three main place typologies: the famous “iconic/historic” sites (e.g. Piazza del Campo), the working places (e.g. the university buildings) and the recreational ones (e.g. sport facilities and shopping sites) (Fig. 3).

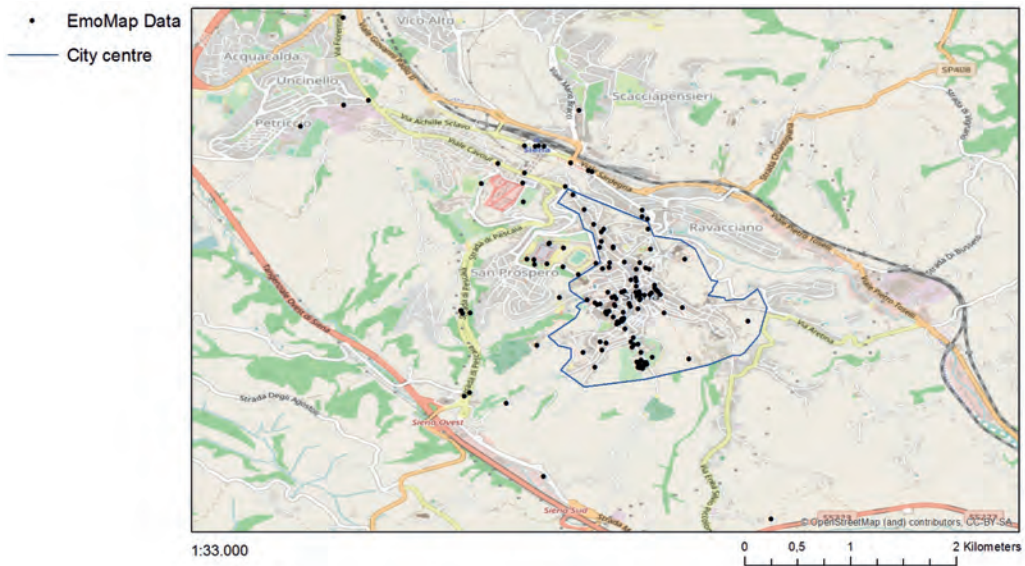


Fig. 3 – The distribution of emotional responses collected in Siena urban area (2016).

Source: Ladest Lab, Università di Siena.

The affective responses (> 2 responses) collected converged on specific sites which have different functional features. They highlight the main emotional stimulators in Siena which can be classified as follows (Tab. I):

Tab. I – FUNCTIONAL CLASSIFICATION OF THE EMOTIONAL STIMULATORS IN SIENA.

<i>Emotional stimulators/functional features</i>	<i>Quota</i>	<i>Locations (main examples)</i>
Historic sites	23 %	Piazza del Campo in Siena, the Cathedral
University buildings	19 %	Rettorato, Department building
Shopping roads	14%	Via Banchi di Sotto, Via di Città
Transport infrastructure	13%	Railway and bus stations, roundabouts, parking areas
Open public spaces	9%	Squares, churches
Green areas	9%	Public gardens and parks (e.g. Valli Verdi)
Private homes	8%	
Sport facilities	4%	Football stadium, gym
Cinemas & theatres	2%	

Source: authors' elaboration.

Such general typologies highlight the places of everyday student life: the famous artistic sites (such as Piazza del Campo and the Cathedral) which are in a central position of the urban areas; the university facilities (the Department building where lectures take place); public services like transport (railway and bus station); pedestrian roads like Via Banchi di Sotto where the shopping facilities are concentrated; the recreational sites (parks, cinemas, theatres) and private homes.

EmoMap also enabled to analyse the users' "familiarity" with the urban context. 90% of contributors declared they had visited the sites "more often" and not "for the first time" which demonstrates that they expressed their emotions in places they were familiar with. As regards company, the majority of recordings were taken while alone (50%) or with adult companions (41%); the remaining 9% of the participants were either with dogs or children.

With respect to the level of comfort, 76% of the recordings showed high levels (ratings 5 to 7), 9% medium (ratings 4) and 15% low (ratings 1-3). This result reveals that Siena, from the point of view of the student-contributor, is generally perceived as a town where people feel comfortable.

Nevertheless, it is interesting to note that low levels of comfort were recorded at transport facilities and in sites such as the "quintessentially cosmopolitan" artistic places (Urry, 2005) (e. g. Piazza del Campo, Banchi di Sotto) were overcrowding is often perceived negatively.

The emotional adjectives used to describe sites in Siena are mainly positive as the following table shows (Tab. II).

Tab. II – FREQUENCY OF THE EMOTIONAL ADJECTIVES (%).

<i>Positive</i>	<i>Quota</i>	<i>Negative</i>	<i>%</i>
Enjoyable	15%	Hectic	6%
Beautiful	14%	Harsh	6%
Active	12%	Unstimulating	3%
Peaceful	10%	Boring	3%
Comfortable	8%	Desolate	3%
Majestic	7%	Frustrating	2%
Exciting	4%		
Festive	5%		

Source: authors' elaboration.

A more precise analysis of the emotional composition can be obtained by observing the co-occurrence of the adjectives used (Tab. III):

TABLE III- MOST FREQUENT CO-OCCURRENCE BETWEEN EMOTIONAL ADJECTIVES.

<i>Emotional adjectives</i>	<i>Co-occurrence</i>
Enjoyable	beautiful, majestic, active, peaceful, comfortable, exciting
Festive	active, beautiful, enjoyable
Harsh	active, hectic
Unstimulating	boring, harsh, hectic, frustrating
Ugly	desolate, harsh

Source: authors' elaboration.

Then the analysis has linked emotions to the *locale* (10) in order to put into context the groups of emotional descriptors used for each site. If positive responses combine beauty with enjoyment and peace but also with the grandeur of the monuments (“majestic”, “exciting”) and with the hustle of the crowd (“active”) (Fig. 4 and 5), the negative emotions reveal a perception of discomfort either with too much liveliness (“hectic”, “harsh”) which probably refer to the typical overcrowding of tourist sites and shopping streets or with more basic sites like the railway station or the Fortezza (Fig. 6 and 7). In detail, figure 4 shows an overview of all the affective responses within the study area. In general, emotional responses are mostly positive. The mean value of these “level of comfort” ratings is 5.19 with a standard deviation of 1.49, on a scale of 1 (“very uncomfortable”) to 7 (“very comfortable”). Contributors mostly perceived the as “Enjoyable”, “Beautiful”, “Active”, “Peaceful” and “Comfortable”.



Fig. 4 – Overview of emotional responses in Siena (2016). Left: “Level of Comfort” ratings: Colours of the markers indicate values of the “level of comfort” ratings, with green being comfortable, grey being neutral, and red/yellow being uncomfortable (Map data: OpenStreetMap and Contributors, CC-BY-SA). Right: tag cloud of the environment-related emotional adjectives (created from <http://www.wordle.net>).

Source: authors' elaboration.

(10) The notion of locale has been defined by J. Agnew (1987) as the settings (either informal or institutional) in which social relations are constituted.

If we consider one of the most frequently “experienced” sites, figure 5 shows the affective responses around Piazza del Campo. As the map shows, the responses are mostly positive. The mean value of these “level of comfort” ratings is 5.78 with a standard deviation of 1.16, on a scale of 1 (“very uncomfortable”) to 7 (“very comfortable”). Contributors mostly perceived the study area as “Enjoyable”, “Beautiful” and “Majestic”.



Fig. 5 – Emotional responses around Piazza del Campo. Left: “Level of Comfort” ratings (Map data: OpenStreetMap and Contributors, CC-BY-SA). Right: tag cloud of the environment-related emotional adjectives (created from <http://www.wordle.net>).

Source: authors' elaboration.

The results of the experiment also show that some places arouse a mixture of feelings, as in the case of the railway station (Fig. 6). The map shows few positive affective responses - the mean value of these “level of comfort” ratings is 4.69 with a standard deviation of 1.06, on a scale of 1 (“very uncomfortable”) to 7 (“very comfortable”) but the contributors mostly described the area less positively as “Harsh”, “Active”, and “Hectic”.



Fig. 6 – Emotional responses around Siena Railway Station. Left: “Level of Comfort” ratings (Map data: OpenStreetMap and Contributors, CC-BY-SA). Right: tag cloud of the environment-related emotional adjectives (created from <http://www.wordle.net>).

Source: authors’ elaboration.

Finally, figure 7 shows the emotional responses around Siena University. As the map highlights, the responses are mostly positive. The mean value of these “level of comfort” ratings is 4.39 with a standard deviation of 1.50, on a scale of 1 (“very uncomfortable”) to 7 (“very comfortable”) and the contributors perceived the study area as “Active”, “Peaceful”, “Enjoyable” but also as “Boring”, and “Frustrating”.



Fig. 7 – Emotional responses around Siena University. Left: “Level of Comfort” ratings (Map data: OpenStreetMap and Contributors, CC-BY-SA). Right: tag cloud of the environment-related emotional adjectives (created from <http://www.wordle.net>).

Source: authors’ elaboration.

By placing emotions in the urban functional context, we avoid the risk of neglecting the wider meaning that gives rise to emotional convergences as shown by the simple frequency of the emotional adjectives (Dittmer, 2010); moreover, the extraction of emotions highlights citizens' perspectives, preferences and dislikes which can be used by planners to adopt a more integrated, timely and human-centred approach (Resch *et al.*, 2015; Capineri, 2016b). In conclusion, the experiment, despite the limited data sample used, shows how volunteered geographic information collected by means of location-based services can contribute to discovering the unique relationship between people and place which here takes the shape of the many emotions felt by participants experiencing different urban environments in the Siena urban area.

5. CONCLUSIONS. – Literature has shown that humans perceive and evaluate environments emotionally, and these affective responses to environments influence daily behaviour and decision-making in space. Data on this aspect are often scarce, outdated and generally not collected at a granular scale; in this respect the crowdsourcing approach and the employment of location-based services demonstrate to be a valuable analytical method. This paper presented our recent efforts towards these aspects.

As regards methodology, the employment of location-based services implies that the data captured are shaped by the technology used and by the ontology of the data collection model included in the software used; in this way the production of space depends on the code (Graham and Shelton, 2013). In the case of EmoMap the data collected are not unstructured as most of the Big Data deriving from social networks but follow the emotional model (level of comfort; emotional adjectives, familiarity etc.) thus avoiding the risks of dealing with a deluge of data which is often difficult to organise and interpret with a traditional geographical approach (Kitchin, 2013, p. 265). Along this line, the experiments presented in the paper show that VGI data analysis requires contextual and domain specific knowledge. The information collected with the EmoMap application has capitalized the informal knowledge of the producers and become a collector of multiple emotional responses which highlight the many relationships with a certain place.

The two case studies have shown that different environments were described differently and raised different emotional responses. It must be observed that subjective data are extremely time and context-dependent in that one's opinion about the same environment may vary through the day (morning, afternoon, evening), or according to location (home, work, driving, etc.), and cultural context. It also relevant to note that the users engaged in the experiments were rather homogenous (young people, mainly students), so the results obtained are obviously biased by the demographic features of the sample: for a more finely tailored analysis a larger and more diversified group of user should be engaged. Nevertheless, the results are interesting since they reveal the "emotional sticky places" in the urban space: emotional clusters which collect the added value generated by the producers. They record appreciation or contempt, happiness and unhappiness: in short the emotions are the sense of place engineered by the Web 2.0 applications because VGI contributors are engaged in knowledge production processes, which are grounded

in social structures and norms, and in turn, physical place (Hardy *et al.*, 2012; Lus-sault, 2007). When Doreen Massey in her *Global sense of place* (1991) described Kilburn Road in London and its variegated features (the bridge, the newspaper kiosk, the Indian shop, etc.), she explained that a place has “multiple identities; they can either be a source of richness or a source of conflict, or both”.

Finally, due to the complex nature of emotions, we are aware that more contextual information should be collected in the future to better correlate people’s emotional responses and the environmental quality of different places. To address this issue, also data quality techniques should be considered to contribute to a better understanding of “why” people feel comfortable/uncomfortable at particular places.

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SUMMARY: Emotions have a spatial and relational character: they are a means to understanding practices and interpretations of the surrounding environment. The paper explores people's affective responses to different urban environments by means of a mobile crowdsourcing approach (EmoMap, developed by Vienna University of Technology in 2014). The approach has been applied in Vienna and Siena. The first case study has collected emotions in three distinctive urban environments according to different levels of traffic and vegetation in Vienna; the second show case identifies emotional stimulators in Siena and different levels

of comfort and discomfort. The results show how volunteered geographic information may provide a better understanding of human-environment interaction and the relationship between emotions and the subjective dimension of urban quality of life.

RIASSUNTO: *Tracciando le emozioni in ambito urbano. Due esperimenti a Siena e Vienna.* – Le emozioni hanno un carattere spaziale e relazionale: sono un mezzo per comprendere comportamenti e percezioni dell'ambiente circostante. Infatti, gli ambienti che ci circondano vengono percepiti e valutati emotivamente: alcuni luoghi sono considerati rischiosi o frustranti, altri come attraenti ed emozionanti. Il contributo mira a studiare le risposte affettive (affective response) delle persone, ovvero le risposte emotive, in diversi ambienti urbani attraverso un approccio di crowdsourced che utilizza una applicazione *mobile location-based* (EmoMap) sviluppata dalla TU di Vienna nel 2014. L'approccio è stato sperimentato a Vienna e Siena sia in ambito di ricerca e di didattica. Due di studio sono stati sviluppati per analizzare le risposte affettive degli utenti in contesti urbani diversi. Le risposte sono state generate dagli utenti mentre camminavano in città e tracciate con il Gps dei telefoni cellulari. I due esperimenti esplorano due approcci spaziali diversi: il primo si riferisce a tre ambienti urbani a Vienna, distinti in base a diversi livelli di traffico e di verde pubblico, mentre il secondo analizza diversi ambienti a Siena come stimolatori emotivi in base alle specifiche funzioni dei luoghi.

RÉSUMÉ : *L'observation des émotions dans les zones urbaines. Deux expériences à Sienne et à Vienne.* – Les émotions ont un caractère spatial et relationnel: elles sont un moyen de comprendre les comportements et les perceptions de l'environnement. En fait, les environnements qui nous entourent sont perçus et évalués émotionnellement: certains endroits sont considérés comme risqués ou frustrants, d'autres comme attrayants et excitants. La contribution vise à étudier les réponses émotionnelles (réponse affective) des personnes, ou des réponses émotionnelles, dans différents environnements urbains à travers une approche participative qui utilise une application basée sur la localisation mobile (EmoMap) développée par l'UT de Vienne en 2014. Cette approche a été expérimentée à Vienne et à Sienne aussi bien dans la recherche que dans l'enseignement. Deux études ont été développées pour analyser les réponses affectives des utilisateurs dans différents contextes urbains. Les réponses ont été générées par les utilisateurs qui se promenaient en ville et suivaient le Gps des téléphones mobiles. Les deux expériences explorent deux approches spatiales différentes: la première se réfère à trois environnements urbains à Vienne, distingués par différents niveaux de trafic et de vert public, tandis que la seconde analyse différents environnements à Sienne en tant que stimulateurs émotionnels basés sur les fonctions spécifiques des endroits.

Keywords: emotions, affective responses, location-based services, Siena, Vienna

Termini chiave: emozioni, risposte affettive, location-based services, Siena, Vienna

Mots-clé: émotions, réponse affective, localisation mobile, Sienne, Vienne

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