Crime Mapping for Urban Planning – a Useful Tool for New Planning Times?

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1 ABSTRACT

Every new period of planning evolves its own gadgets and tools. Whereas the relation between crime and urban space has been part of research for almost 200 years, new techniques like geographic information systems and mobile communication devices could have huge effects for this topic. Data analysis and visualisation could be brought to a new level and furthermore, the data could be distributed immidiatly to citizens. In this context interactive Crime Mapping Systems emerged during the past decades. These online platforms visualize criminal events freely available on maps and become more and more popular for normal citizens looking to evaluate their area of town. Based on the historical development of this topic, data gathering and distribution are showing the impact of crime on urban areas and their population. Hence, such platforms will gain importance in planner's life and a critical evaluation about chances and risks from the point of spatial and urban planning is needed, which will be done in this paper. For this purpose different examples from the U.S. and Europe will be examined and compared. These systems will be analyzed in detail on the basis of the following three characteristics: data set, functionality and type of visualization. It is the aim of this paper to consider the feared and hoped effects of these platforms on urban areas, their population, local players and in particular urban planners. This includes the correlation between systems with public access and unpredictable effects for urban areas. Nevertheless, the paper will give some insights about the possible positive effects of crime mapping systems. The intention is to provide an approach, for the possible use of such platforms for urban planning while avoiding the described risks like as data data protection or the evocation of a generation of fear.

2 INTRODUCTION

The combination of crime data and urban areas is as old as traditional urban planning. This paper will give some insights about the relationship of crime in urban areas and how the circumstances have changed in the last decade and which are reasons for this new field of research. One of the key factors for the quality of life in urban areas is the subjective well-being of its inhabitants. Many circumstances influence this subjective impression (social and ecological issues for instance), but feelings about their sense of security are often considered as very dominant (Floeting & Seidel Schulze 2012, p.1). Due to the fact, that crime is mostly taking place in public areas, and the fear of crime is an important factor for the quality of life, there has to be a scientific debate for urban planners about crime mapping platforms in order to improve the urban environment, because an increased use of such platforms by public authorities could be observed. In the light of these developments, this examination aims to provide a critical analysis for its effects for cities and planners. From an urban planning perspective, some questions about the use of such system are obvious and should be handled in this paper:

(1) What is crime, which are the effects for citizens?

(2) What are interactive crime mapping systems and how will data be gathered?

(3) What are the chances for the use of such platforms from an urban planning perspective?

(4) What are the risks for the use of such platforms from an urban planning perspective?

(5) Considering chances and risks, under what conditions could such an approach be promising for urban planning?

2.1 Crime in urban areas

Already in 1829, Balbi and Guerry mapped different kinds of property crimes in France in correspondence to their educational level (Boba Santos 2009, pp.7-12) and drew their conclusion of possible connections. Nearly 100 years later, Park from the Chicago School did some research about "Social Ecology" and crime locations (Vogt 2001, pp. 11-12). Hence, monitoring crime in urban areas was and still is an essential issue for urban planning, because it's an important influencing factor for citizens well-being. Nevertheless, research was done particularly from urban sociology. Accordingly, the topic was only accessible for experts

for 180 years, (planners, city councils, scientists or the police). However, during the last 180 years, this was a topic which only experts (planners, city councils, scientists or the police) were able to access to relevant database.

As before, crime or especially the impression of urban crime is strongly connected with subjective impressions, which is part of urban research (Vogt 2001, pp. 11-12). From a terminological point of view, the explanation of crime is considered to be very complicated. Simplified, it is described as "something, which deviates from legal regulations" (Belina 2011, p.12). This deviance depends on the current political and social circumstances. This means, that an action (e.g. drinking alcohol in public) could be considered as crime in one specific place at a specific time, whereas the same act isn't necessarily seen as a crime in other countries with other circumstances. Besides the fact, that due to the mentioned problems, the statistical crime data gathering by the police is not able to entirely illustrate crime in urban areas realistically, many other problems have to be revealed: Unreported issues, reporting behavior, suspects- and offender statistics, and contradictory interpretations. These issues make a complex analysis of crime mapping systems for urban planning necessary.

2.2 State of research and planning methods

As previously mentioned, Balbi and Guerry have done some research almost 200 years ago (Boba Santos 2009, pp.7-12). The topic came back in the scientific focus about 100 years later, as the Chicago School did the research about "Social Ecology" and crime locations (Vogt 2001, pp. 11-12). Some investigations about this were also done for example in the context of the combination with mental maps (Matei et al., 2001). The research focus to crime mapping platforms is intensifying, because there has been an immense growth in numbers of such platforms, especially in Anglo-American countries. First of all, this was possible because of the new capabilities of GI-systems, which were able to analyze crime data very detailed and get useful data out of it. Even more important is the fact, that this data could be published through the web, which makes all of it accessible. This was despite of the uncertain complex interactions with the urban environment. Alone in the USA, there are more than 125 crime mapping systems. Great Britain for example empowers the public platform "police.uk", where various kinds of crime mapping data for the United Kingdom can be accessed. Furthermore, these services are getting more and more available through mobile devices. From a planning perspective, there are plenty of potentials for implementation. These embrace different spatial and urban planning issues as well as the urban sociology perception. As well important is the fact, that this data could be published through the web, which makes all of this data accessible for every citizen and other laypeople. Furthermore, mobile phones are making this data accessible everywhere, allowing users to contribute own crime data by User-Generated-Content (UGC). These mentioned topics are barely integrated in planning processes or researches yet. Hence, aim of this paper is a comparative analysis of the existing crime mapping systems and approaches and to assess the potential positive and negative effects of these platforms for urban areas as well as for planners.

2.3 Methodology

The paper examines the theme on the basis of the earlier mentioned research questions. In this regard, it first analyzes theoretical questions, such as the definition of criminality and its distinction to other forms of deviancy, its connection to the planning field, the challenges of the data collection and finally, the history of crime mapping. Secondly, the technical basis of the interactive crime mapping platforms is studied. Because of the diversity of different systems, three main categories were developed, in order to comprehensively illustrate all functions, types of visualizations and base data. In the next step the paper discusses the possible positive (hoped) and negative (feared) effects of such systems, based on these theoretical and technical facts. In both cases, effects for urban areas, their inhabitants, stakeholders and city planners will be illustrated. Although the paper was composed from a planner's point of view, especially the hoped positive effects will include and discuss numerous aspects, which derive from the perspective of the police. Finally the paper summarizes the assets and drawbacks in order to picture the proportion of chances and risks which come with the use of such plattforms in urban areas. Considering these results, a few recommendations will be outlined and possible future developments will be discussed.

3   EMPIRICAL STUDY CASES

The various forms of crime mapping platforms are almost as complex as the phenomenon of crime itself. Therefore the technical basis was analyzed detailed in three separated categories in order to ensure an essential comprehensibility:

- Data set
- Functionality
- Type of visualization

These three categories will be illustrated in the following on the basis of exemplary study cases.

3.1 Example A

The first category, respectively the first group of study cases is defined by the type of the underlying data set. It can be illustrated, that most of the platforms are based on police data, whereas only a few platforms use user generated content (UGC) for their visualizations. This general segmentation of base data in two groups is quite oversimplified. In fact, the data set relies profoundly on platform operators and their aims. In this context four types of data sets can be revealed, that are substantially affecting the platforms. As pointed out in the illustration below these four groups are: Systems operated by the police, systems operated on behalf of the police, independent systems using police data and independent systems generating own datasets.
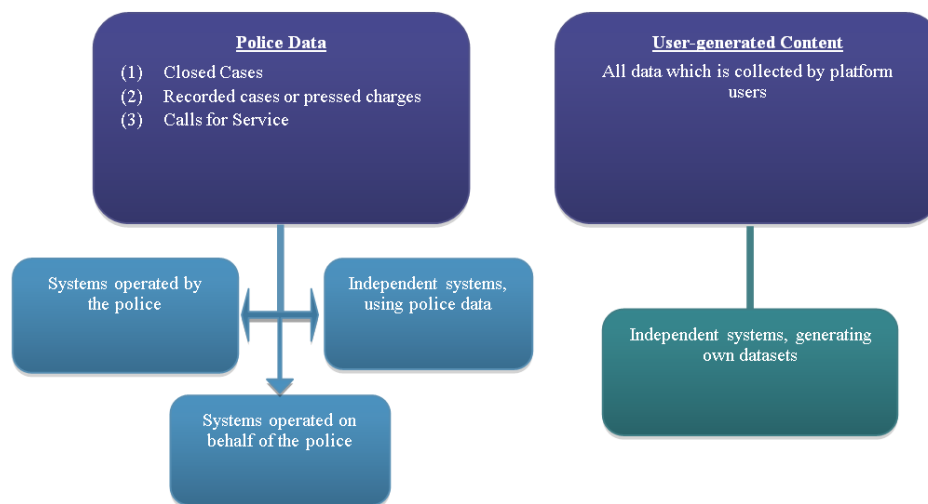

Figure 1: Types of base data

3.2 Example B

The second category examines the functionalities of crime mapping systems. Superficially, all platforms can be described as interactive, allowing users to investigate all designated areas in a freely scalable map-interface like Google Maps or Microsoft Bing. Furthermore all platforms offer a few tools to analyze the visualized crimes. In nearly all cases this includes the sampling of different kinds of crime, times of offences or areas of crime scenes.

However, some platforms provide much deeper analysis tools. The following example of the platform raidsonline.com, allows users to put further data layers such as population density or underemployment rate underneath the crime incidents. This gives the user to chance, to make multi-level analysis with results, which can be very valuable from an urban planning point of perspective. On the other hand it has to be mentioned, that correlations between additional information and crime incidents have to be checked carefully, in order to prevent misinterpretations.
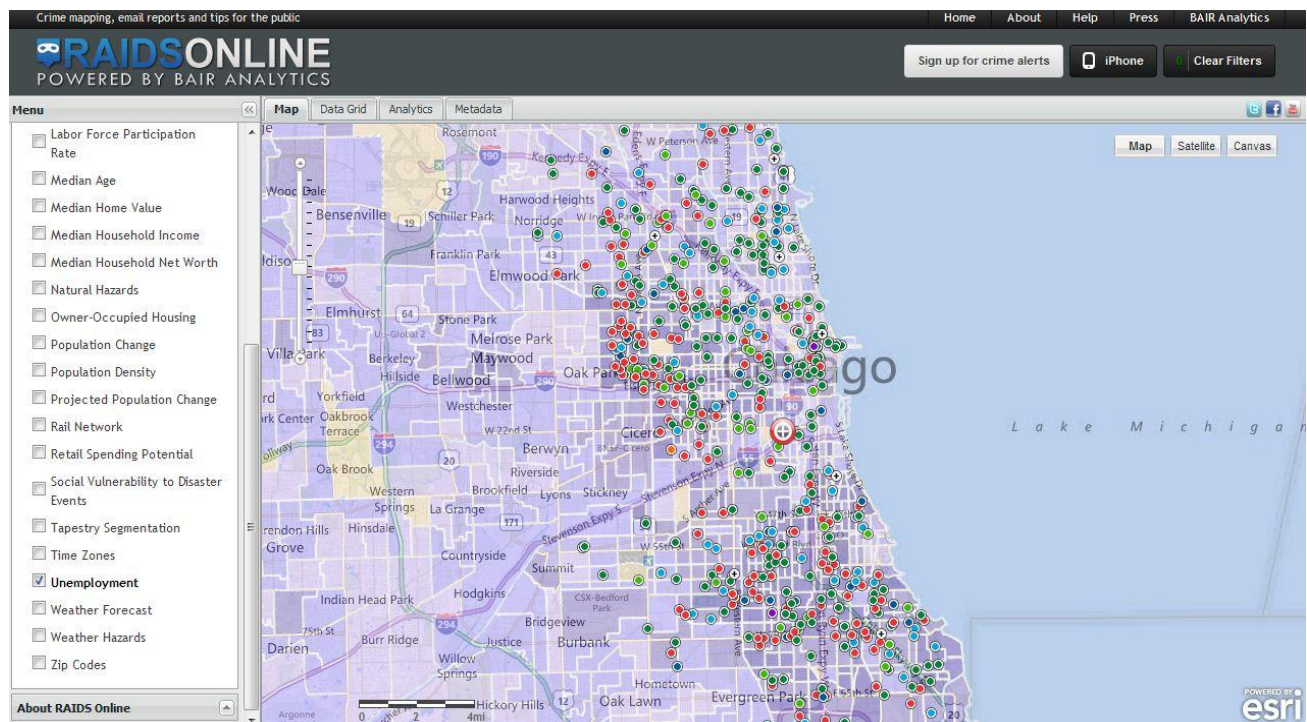
Figure 2: Combination of registered Crimes and further data layers

Other platforms also offer solutions for mobile phones. It has to be mentioned, that these solutions are not as detailed as the platforms for real computers, but usually they provide maps and functions that include the actual position of the user, allowing him to search for possible threats in the surrounding area. Very often the solutions for mobile devices are quite specific, which is on the one hand a limitation, but on the other hand a chance. The example aside shows an application (FindAPad for Windows Mobile) that displays free houses near by the location of the user and offers him information about crime incidents in

Figure 3: Example of the mobile phone app FindAPad

These two examples clarify the range of functions interactive crime mapping platforms are offering. However, there is an advancing number of mobile applications available for mobile devices. For the United States, there are already lots of iPhone applications like "Crimemapping.com Mobile for iPhone", "Crime Reports for iPhone", or "RAIDS Online for iPhone". These applications are also available in Asia ("CrimeMap for iPhone"). Some of them use data by public authorities like the police, but there are more and more applications, which enable the user to contribute data with their mobile devices.

3.3 Example C

The last case group examines the different types of visualizations of crime mapping systems. There are various kinds of visualizations, but here the focus is put on the three most common groups. Generally the visualization of the platforms can be divided into 3 classes, which implicate different pros and cons:

- Symbol Maps illustrate all crimes with an own symbol. Accordingly, these maps are easy to understand, but in the case of big map extracts it can get overloaded. This can be seen especially, when various kinds of different crimes have to be visualized.

- Graduated- Symbol- Maps add up all crimes of a certain area, generating a symbol for that area according to the amount of events. These types of maps are much easier to read, but in case of missing knowledge harder to understand.

- In contrast to the maps described above, the heat map does not visualize crime scenes punctual, but it illustrates the density of committed crimes. This approach leads to maps, which are easily to read, but also harder to understand. In programs to generate heat maps there are possibilities to modify the visualizations, which is good for customized solutions, but vulnerable for manipulation. This manipulation does not necessarily mean falsification, it can simply mean the specific configuration in terms of colours or radiuses.

The following illustration displays all three kinds of visualization types.
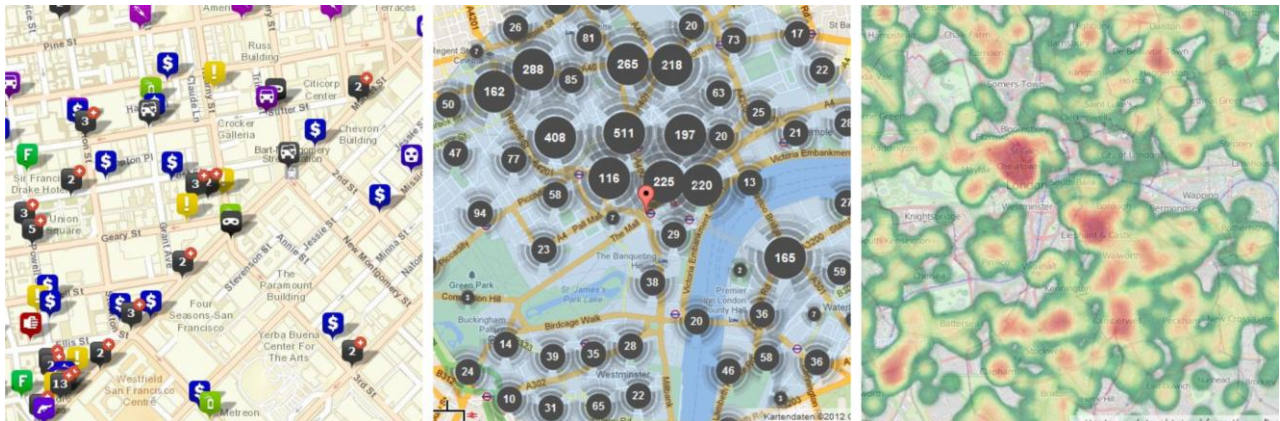

Figure 4: Visualization Types of interactive Crime Mapping Systems (Symbol Map, Graduated Symbol Map and Heat Map)

Furthermore, there is also the possibility to combine geospatial analysis and 3D-mapping (Wolf & Asche, 2009). However, it has to be stated, that visualizing 3D-content is very "eye-catching", but it can be very complicated for laypeople to understand and not to misinterpret the given data. Though there is no intense use of 3D-Heat Maps through crime mapping systems worldwide, which is the reason why there is no deeper analysis in this paper.

4 POTENTIALS FOR URBAN PLANNING

As previously mentioned, crime mapping tools offers a wide range for analysis approaches. Though, the use of such systems and the provision of this informations can be a two-edged sword. Hence, the described platforms will generate positive as well as negative effects for urban areas, their inhabitants, local stakeholders and also planners. In this context, the paper examines in two steps first the hoped positive effects and secondly the feared negative effects for cities and the named groups.

4.1 Chances

The positive effects can be seen from two different angles, first of all from the view of the police, secondly from the view of a planner. On the one hand, the aims of police departments should be considered, because they were the primary reason for the implementation of the platforms. Nevertheless, these hoped effects concern particularly urban areas and their inhabitants:

(1) Better information for citizens, reducing the fear of crime and the workload of the police

(2) Increased transparency of police work and more confidence of citizens

(3) The bond between citizens and local police departments will be strengthened, enhancing their cooperation

(4) Inhabitants will be empowered to independently avoid dangerous situations and to adopt prevention measures

On the other hand, further effects can be identified from a planner's point of view. Besides the urban areas and inhabitants, these effects additionally concern local actors and planners. However, they have to be reconsidered in their relation to the earlier mentioned aims of the police:

(5) Assistance in processes of urban and regional planning, e.g. in the preparation of development plans

(6) Benefits for other urban actors like the detection of trends and the identification of emerging problems

(7) The public could use the platforms as pressurizing medium

(8) Image promotion for slightly affected areas

(9) Crime Monitoring serves all stakeholders for early trend detection and it can be used, to test the effects of measures for crime reduction

A possible realization of such a tool for visualizing crime can be seen in the subsequent figure. The following map of the Stamen Design Group illustrates the desired results exemplarily for the city of San Francisco (Stamen Design, 2012). The example map visualizes crimes, which took place during the nightlife in a specific part of the city. This map can be used by several of the defined groups, fulfilling different of the hoped effects. In particular, citizens could avoid the highlighted crime hot spots during the nighttime which could lead into an improved cooperation between citizens and police, as it is described in point (3). Furthermore planners should include this information in their work and use them for more precise geo-localisation of urban problems as it is described in point (6). This could leads for example to reconsidering the concepts of illumination and visibility during nighttime in order to improve the subjective well-being of the citizens.
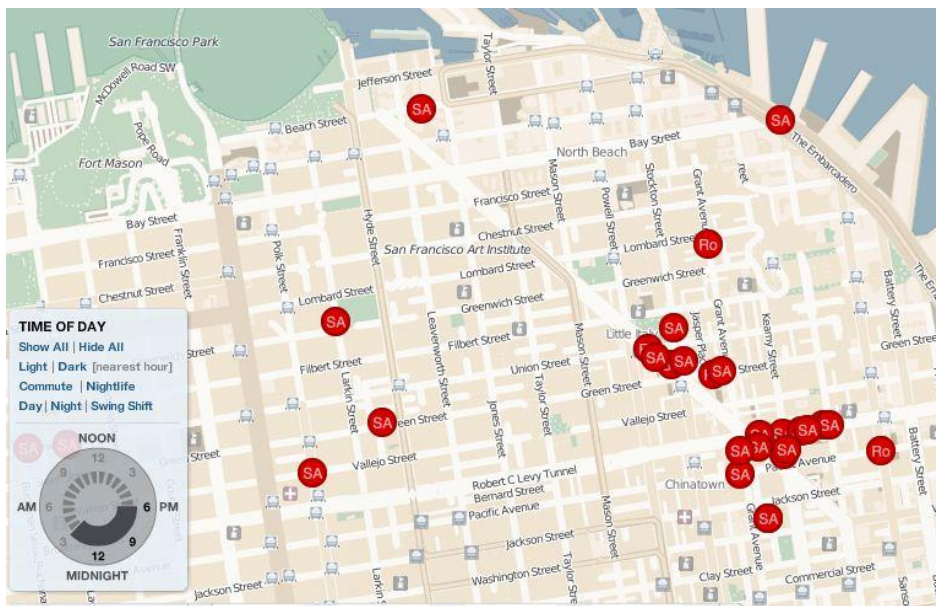

Figure 5: Registered crimes during nightlife

4.2 Risks

In addition to the discussed hoped effects, the paper considers possible negative effects. The feared consequences are also strongly correlated, alongside with the different positive effects. In this context misinterpretations are particularly relevant for the other outcomes, causing or intensifying many of them. This embraces the problem of stoking of fear (d) in the affected areas or the possibility to manipulate the user perception (b). Following problems could occur:

(a) Misinterpretations by users, due to a lack of expertise, a lack of information about the published data and visualizations that provoke misinterpretations

(b) Manipulations of the platforms by outsiders and operators, especially in the case of user-generated content. This will be even more relevant through the massive use of mobile communication devices, which enables their users to tag crimes in urban areas at every time at every place. Furthermore, through the easy use of geo-mash-ups, it is very easy to develop own crime mapping applications, which aren't under any kind of public or scientific surveillance

(c) Commercial use of the platforms, including severe consequences for the population (Example: Redlining of insurance companies or credit institutes)

(d) Crime- Mapping- Systems are stoking the fear of crime, like all other mass media

(e) Crime- Mapping- Systems are supporting the stigmatization of areas and their inhabitants.

(f) Criminals can use the platforms like all other people. They could use the published information to find possible victims and identify less controlled areas

(g) The platforms are not able to reduce crime, its just a displacement of the crime locations

(h) The platforms violate the individual right to decide which personal information should be published and which not, because of the effort to ensure absolute public safety

Especially the last point will be reflected in detail. It is impossible to publish geographically referenced crime data and to protect the victims of crimes at the same time. If a crime is referred to a specific location and is published in a crime mapping system, this means that it can be seen from the general public. Although there are some regulations about data privacy, if there is a specific place marked with a crime (or even more as area with a general high rate of criminality), it could be directly referred to this specific location and the people who are living there. This could lead to a negative image in terms of criminality and all its corresponding consequences. This stigmatization would have consequences for the whole neighborhood and could lead into affecting real estate prices for example. Whereas there is some legal regulation from services offered by public authorities, this won't be the case for data distributed by private companies and especially for UGC-crime data. How strongly privacy rights of single persons could be affected can be seen on the subsequent figure. "Homicide watch D.C." publishes personal data of murder victims like home addresses, personal photographies and the exact crime spot in order to "remember" them (Homicide Watch, 2012). According to this, the platform doesn't even have the aim to prevent any possible future crimes, but it violates the privacy of family members.
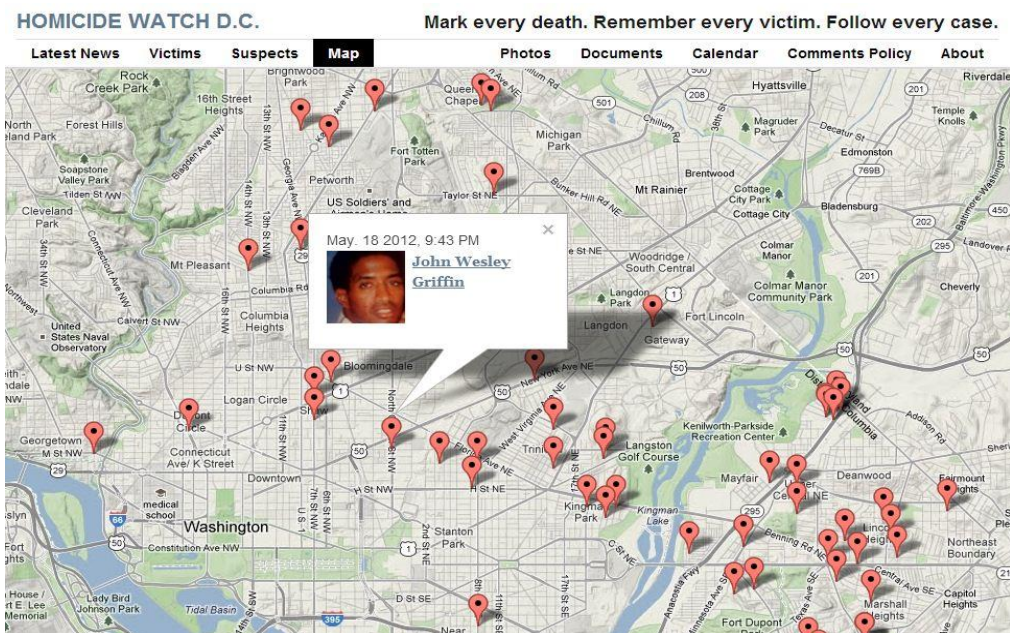

Figure 6: Visualization of homicide victims

Another example is given in the second illustration, which is visible below. All four maps visualize crimes for the same area in the city of London (Police UK, 2013). Actually, the last three maps show the same type of crime for the same time period. This example demonstrates how easy the offered maps can be misinterpreted or manipulated. This problem is very relevant, because there will be a communication between technical specialists (planners, employees of the city council) and laypeople. Hence, this could lead to massive misinterpretation on the citizens' side. Finally, the number of possible negative effects raises the question, what kind of institutions should decide about the handling of such sensitive data. The paper discusses this question, offering possible solutions to protect the privacy of victims, while taking advantage of the information the platforms provide.
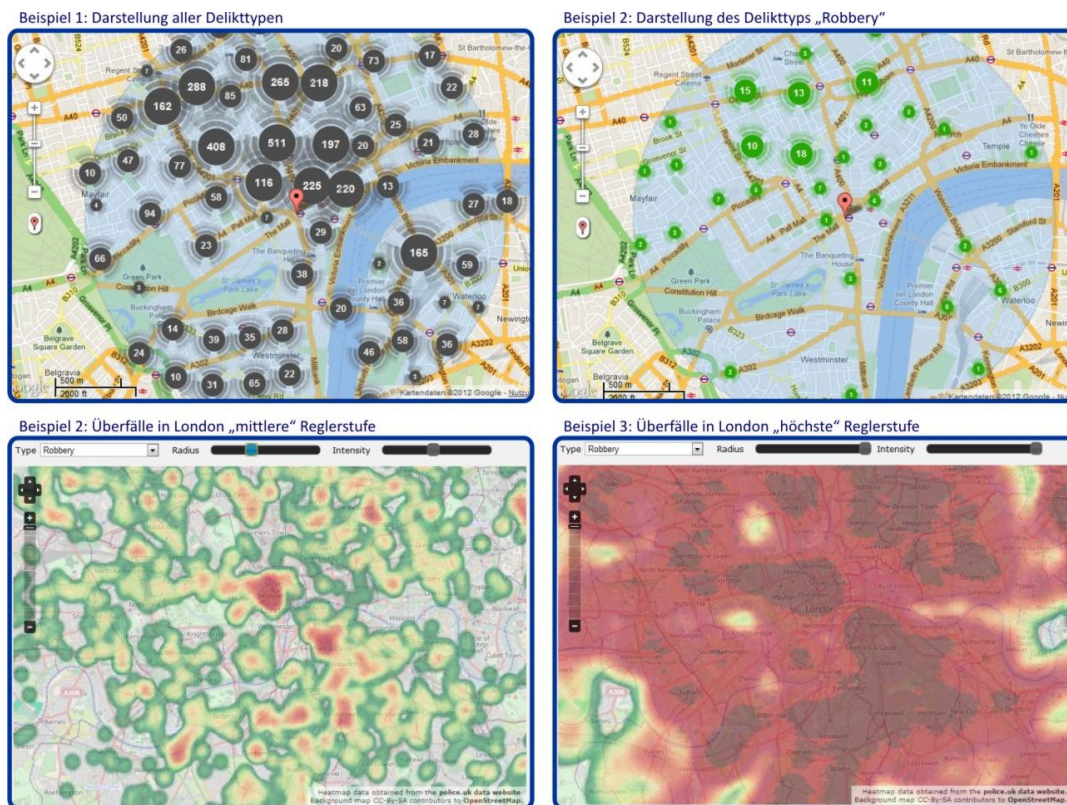
Figure 7: Examples for data misinterpretation and manipulation

5 CONCLUSION, RECOMMENDATIONS & FUTURE RESEARCH

In view of the dynamic developments in the crime mapping sector in the last years, the increasing prevalence of these tools and methods will continue. This is mostly due to the fact of the technological development for data processing and the possibility for accessing and contributing data via mobile phones. And of course, there will be a high demand for such service on side of the citizens. Due to that, there will be a relevant momentum in the development of such approaches in developing countries as well. This is where crime mapping systems meet urban areas with relatively high crime rates and a society that could rely on big promises of such systems. Hence, the mentioned feared negative effects of such platforms can be expected as much worse than in these countries.

From a planning perspective, these crime mapping tools provide a wide range of analysis possibilities though it has to be stated, that after evaluating the potentials and risks of crime mapping systems, it is very problematic to find a compromise in use of such systems by free availability for the public society. Furthermore, it is quite impossible to estimate all direct and indirect consequences, if crime related geodata will be made public for all citizens. As mentioned, monitoring urban crime is very complex and there has to be some contextual knowledge to deal with it. Usually this is not the case for all citizens. This problem is even more relevant due to the fact, that through data publishing via Internet, all of this data is theoretically accessible for all citizens – at every time and in every place. Furthermore, it is also possible for them to create their own "crime geodata" with their mobile phones, which could be seen by other citizens. If there is an open and unrestricted access to crime mapping data and systems, negative impacts like misunderstanding of visualizations, exaggerated fear of crime as well as data manipulation could occur. This is mainly because of the lack of knowledge in terms of crime research or geodata visualization. Though, there is a potential of crime mapping methods for urban planning, in the case of a restricted access for urban actors or tailored for citizens with the contextual knowledge. If there is a political will to embed these systems in public services of a city, the dependence on legal (data privacy regulations), social-cultural, political regulations has to be discussed. The use of such systems has to be considered wisely, particularly from an ethical point, in order to achieve a benefit for the society. Besides these official approaches, crime relevant data created by User-Generated-Content with mobile phones will also be more important in the future and there has to be a broad scientific debate how to deal with it in an urban context. Furthermore, crime mapping platforms driven by private companies should be seen very critically. Unrestricted publications of crime data through crime

mapping platforms could raise negative effects for the urban environment. Through stigmatization or other effects, self-amplifying effects could occur and lead for example to misled development in these quarters. There is also the possibility for planned manipulation of real estate prices for example. Such negative effects should be avoided by urban planning approaches if possible. Urban planners have to be aware of these topics and have to consider potentials and risks of crime mapping systems for public authorities, police and especially the citizens before an implementation of crime-mapping tools in the daily working routine. Although there is a potential for future planning approaches in order to detect new urban patterns and to prevent crime in urban areas, there will be also an ethical question to discuss, what kind of data is suitable for the public society and which should be better handled by experts. Hence, there has to be more research on these crime mapping systems as well as on its effects on urban areas.

6 ACKNOWLEDGEMENT

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