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Improving road safety knowledge in Africa through crowdsourcing: the African Road Safety Observatory

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Abstract

Africa is the worst performing continent in road safety: the fatality rate, 26.6 per 100.000 inhabitants, is almost three times that of Europe's and fatalities per capita are projected to double from 2015 to 2030 (WHO, 2015). This is mainly due to the fact that Emerging Economies are experiencing increases in traffic, for which their traffic systems are not sufficiently prepared.
On one hand, there is a significant demand for data and knowledge to be used for road safety-related decision making. On the other hand, there is a substantial lack of a reliable and detailed knowledge on road casualties in terms of the number of road accidents and fatalities occurring and, on the factors, leading to road accidents or affecting their consequences.
When official data are poor or missing these could be integrated with other sources. The objective of this paper is to describe the African Road Safety Observatory (African RSO), a participative web portal developed in the field of the "SaferAfrica – Innovating dialogue and problems appraisal for a safer Africa" project, funded by the European Union's Horizon 2020 program.
The African RSO combines traditional functions of analyzing and sharing road safety performance data and provide knowledge and information, with the more innovative ones: a Dialogue Platform and the crowdsourcing tool.
The Dialogue Platform is dedicated to experts and stakeholders and aims at encouraging and facilitating a constructive engagement and dialogue on road safety in Africa, producing knowledge to inspire road safety funding, policies and interventions in Africa and providing recommendations to update the African Road Safety Action Plan and the African Road Safety Charter.
The crowdsourcing tool allows African citizens to report and highlight road safety needs, to share opinions as well as to discuss solutions in their own Countries.

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1. Introduction

Road traffic injuries remain a major public health problem, especially in low- and middle- income countries (WHO, 2011). Africa is the worst performing continent in road safety: the fatality rate, 26.6 per 100.000 inhabitants, is almost three times that of Europe's and fatalities per capita are projected to double from 2015 to 2030 (WHO, 2015). There is a significant demand for data and knowledge in order to be used for road safety related decision making(Persia, Gigli, & Usami, 2015). However, based on a recent survey in 23 African countries (Thomas et al., 2017), in most countries such information is poorly available. There is a substantial lack of detailed knowledge on road casualties in terms of their number as well as associated factors leading to road accidents or affecting their consequences. Under conditions of scarcity and/or low quality data availability, decisions may be affected by other contingent factors not necessarily leading to efficient solutions.

This problem has been addressed by the SaferAfrica project, a Horizon 2020 project aiming at establishing a Dialogue Platform between Africa and Europe to create the favourable conditions and opportunities for the effective implementation of actions for road safety and traffic management in Africa. Among the key objectives of the SaferAfrica project is the support to policy makers and stakeholders with evidence on critical risk factors, related actions and good practices drawn from high quality data and knowledge.

Within the SaferAfrica project, a pan-African road safety data and knowledge centre is developed, namely the African Road Safety Observatory (RSO) (Yannis et al., 2018). The African RSO (www.africanroadsafetyobservatory.org).works as an interactive space where relevant road safety needs facing African countries can be highlighted, while experiences presented, and solutions discussed. The online portal, available for any device, includes freely accessible knowledge resources and tools - such as statistics, maps, reports, and fact sheets – as well as dialogue and crowdsourcing functions with a view to enabling experts, institutional stakeholders and end users to take part.

The objective of this paper is to describe the African Road Safety Observatory (African RSO), and more specifically the crowdsourcing tools adopted in SaferAfrica. These would complement the existing road safety data providing more in-depth information about specific situations in a country and supporting decision making.

1.1. Crowdsourcing for road safety

The term crowdsourcing was used for the first time by Jeff Howe in his article "The Rise of Crowdsourcing for Wired Magazine", in June 2006 (Sharma, 2010). In general, crowdsourcing is the practice of engaging a *crowd* or group for a common goal. One of the main contexts in which crowdsourcing can be employed is the resolution of difficult or complex problems, or innovation from design to products or to reach better decision-making choices. During the last decade several new terms were proposed to identify the involvement of the public in different disciplines. Some are focused on the spatial nature of the data such as web mapping, volunteered geographic information and GeoWeb, some on a specific activity, e.g. public participation in scientific research, while others are more general, like, citizen science, crowdsourcing and user-generated content. A recent study explored the popularity trends of several similar terms showing how the two terms "crowdsourcing" and "GeoWeb" are those with the highest search volumes in the last years (See et al., 2016).

The crowdsourcing web tools are constantly evolving, offering increasingly interesting features. In the following some examples of road safety related crowdsourcing are reported linked to: Collecting data (e.g. reporting traffic problems, real-time weather events reporting) and Developing new content (e.g. Google Maps, Wikipedia, Amazon's Mechanical Turk) and Collaboration to decision making or to develop or improve something (e.g. design a website, design a logo, design furniture etc.).

In transport applications, crowdsourcing for data collection is quite popular and relies on the use of mobile devices (e.g. smartphones) acting as sensors to fill a gap where traditional traffic monitoring sensors do not exist or are not

available for real time reporting. In their study, Smith and Harris (2016) identified through a survey to public and private transport related stakeholders a number of potential information needs for transport related information, both real-time and not real-time. Information related to road safety have been highlighted in red and pertain real time events reporting (i.e. road accidents, weather or road conditions, dangerous drivers) and infrastructure mapping and rating (Smith & Harris, 2017).

Extending the context of social media, but still using the citizens as sensor, Aubry et al. (2016) proposed the *CrowdOut* tool, a mobile service allowing reporting traffic offenses and any other events related to vehicle traffic in the city(Aubry, Silverston, Lahmadi, & Festor, 2014). When a CrowdOut user is witnessing a road offense (high speed, illegal parking, etc.), he can report it through the CrowdOut service, and this offense report will be shared in real time to the users' community. Basically, a user may specify the type of offense, take a picture with his smartphone and add it to the report to illustrate it. A similar tool is Mobile Roadwatch (Park et al., 2017), a mobile app that helps citizen record traffic violation with their smartphones and report the recorded videos to the police.

Many cities around the world are implementing community engagement programs to give citizens a voice on how the city can be managed and how its future can be planned. This of course may include also road safety decision making processes. Recently, Niederer and Priester (2016) analyzed a sample of 40 tools in the city of Amsterdam, which allow citizens to work collaboratively in order to improve the urban environment. The analysis concluded that there is a large growth of this initiative since 2010 (Niederer & Priester, 2016). Fernandes et al. (2018) examined 17 initiatives developed with the objective of promoting citizen participation. They found that for most of the tools it is possible to make comments and discuss and also to propose new discussion topics. These aspects seem to be important for motivation to participate. Only half of the analysed tools allow solution proposals, and in all the tools that enable the insertion of the proposed solutions, the citizen has the option to evaluate them. Regarding the scope, there is clearly a greater distribution of the tools in municipal and federal contexts (Fernandes et al., 2018).

1.2. SaferAfrica crowdsourcing

Collecting feedbacks and road safety needs of an African country from its citizens can support assessing the general road safety needs at country level, especially considering the poor availability and reliability of road safety data in many Africa countries. To this end, SaferAfrica will engage with a wide range of audiences, which can be differentiated into 3 main target groups (Tegas, V; De Angelis, M; Tripodi, 2016):

- The primary target group gathers scientific, technical and institutional end users within the project and on the Dialogue Platform.
- This secondary target cluster includes national and international authorities, decision makers, policy makers and funders (national authorities in Africa, international bodies like World Bank, African Development Bank and Islamic Development Bank).
- The last target group corresponds to the society in general. This means that the awareness about the project should be promoted so that all the citizens can be informed, involved and engaged.

Given the continental scope of the SaferAfrica project, the planned crowdsourcing action would address general (country level) needs and problems of African citizens. More in detail, SaferAfrica crowdsourcing will be used to:

- Collect opinions and road safety needs of an African country from African citizens;
- Report general road safety issues at country level;
- Propose ideas to improve road safety in the country of origin.

2. SaferAfrica crowdsourcing tools

In the following paragraph a brief description of the SaferAfrica crowdsourcing tools is provided. These are: *a reporting tool, the dialogue platform, web surveys and the webinars*. It should be noted that between these tools there is a strong interconnection as the findings gained from e.g. the citizens through web surveys can be then discussed among stakeholders using the Dialogue Platform.

2.1. Reporting tool

Crowdsourced data can be in terms of perceived road safety issues, needs and suggestions to improve road safety in a country. Residents, closer to the existing problems, act like sensors in a country filling the gap of the lack of information available. The reporting tool of the African Road Safety Observatory is targeted to African citizens and road safety stakeholders. Due to its nature as a mean to involve a multitude of people, the tool is provided in three languages (English, French and Portuguese) and can be easily reached by both desktop and mobile devices (tablet or smartphone) using an internet connection to get the largest number of users. Participation is promoted by dissemination through social media campaigns and the active involvement of African road safety stakeholders.

After registering into the portal, anyone can report a road safety problem or propose a solution to improve road safety in his/her country by locating a placeholder onto the African map (Fig. 1). Proposals and reports are classified in five main categories according to the five pillars of the African Road Safety Action Plan (AU-UNECA, 2010): Road Safety Management, Unsafe Roads, Unsafe Vehicles, Risk behavior of road users, Poor post-crash care.

All reports are mapped and published in a dedicated section so that they can be easily explored through filters, moreover users can also leave comments stimulating the discussion on proposals and reports left by other users.

Fig. 1 Crowdsourcing reporting form (*Left*); Example of Questionnaire available from the African RSO (*Right*)

2.2. Web Surveys

In contrast to the reporting tool, web surveys are more specifically targeted to African road safety stakeholders since, in most cases, they required a background in road safety topics. Surveys addressed different issues such as providing opinions on recommendations to be adopted within the African Road Safety Action, data collection priorities, travel habits and transferability of international road safety good practices in African Countries. A survey's example is provided in Fig. 1.

After developing a survey questionnaire, this is then embedded in a dedicated page of the African RSO. Survey questionnaires can be accessed in several ways: though a related Consultation space in the Dialogue Platform web tool (Usami et al., 2018), by providing the page link to potentially interested stakeholders by e-mail or sharing it on social media. Anyone who visits the page can fill out the questionnaire. After the end of the survey/consultation answers data are easily exported on a spreadsheet through the Google Form functionality and then analysed.

2.3. Dialogue Platform

SaferAfrica project aims at establishing a Dialogue Platform between Africa and Europe focused on road safety and traffic management issues. The Dialogue Platform is a forum for discussing the evidence and the

recommendations coming from the SaferAfrica project and to foster their adoption in the fields of road safety and traffic management, capacity building and road safety interventions.

More than 190 African Stakeholders coming from 54 African countries are participating in it in January 2019.

At the core of the Platform there is a Management Board composed by high level members, including ten top-level international Institutions, active in the field of road safety, namely European Commission, World Bank, African Development Bank, Federation Internationale de l'Automobile (FIA), United Nations Economic Commission for Africa (UNECA) World Road Association (PIARC), World Health Organization (WHO), International Road Transport Union (IRU), International Traffic Safety Data and Analysis Group (IRTAD).

The technical/operational level is organized in Working Groups (WGs) representing African lead agencies, other key stakeholders and the SaferAfrica project team. The representatives will be decision makers at a policy making level and involved in road safety activities not only at a country level but also regionally (e.g. SADC/ECOWAS etc.). Through the Working group, dialogue and regular contact among lead agencies, research institutions and other key entities can be stimulated and encouraged.

The WG will promote the development and exploitation of MoU between road safety agencies within a country but also between countries. These will be policy driven MoU and serve toward unifying the approach to road safety and road safety management at a country, corridor or regional level. Examples of such issues may include policy with respect to speed management, vehicle standards, driver licensing, alcohol limits etc.

These two levels are closely interconnected to foster the appropriate match between African road safety policy evolution, application, knowledge enhancement, and institutional delivery capacity. The activity of the Platform will also focus on the reinforcement of the endogenous African capabilities through the dissemination of the EU knowhow. The Dialogue Platform is operating through periodic workshops (twice per year) and online thanks to the Dialogue Platform web tool hosted in the African Road Safety Observatory. Additionally, a Platform Secretary oversees coordinating all the activities and the interactions between the various levels.

The interactions in the DP webtool works especially with consultations. A consultation can be a virtual discussion area on a specific topic, a survey or an interest or consultation group on a specific topic. For every consultation, it is possible to invite multiple users (MB members and/or stakeholders) and define specific access rights and rules. Usually, a consultation is defined by a target audience, a consultation period, an objective/discussion topic and a description about how to participate in the consultation. Once joined to a consultation space a user can work on projects, discuss topics or just share information with other users by posting, commenting, following and connecting with other DP users. Two consultations were launched in the platform: *Consultation on Road Safety Data Collection in Africa* and *Consultation on Recommendations to improve Road Safety in Africa*. The first survey relates to a number of recommendations that should be adopted by African countries to improve the existing road safety data collection systems. The second one relates to a number of recommendations possibly to be adopted within the African Road Safety Action Plan, reported in SaferAfrica deliverable D3.1 Assessment of the Action Plan and of regional instruments (Mignot et al., 2018).

2.4. Webinars

A session of the web-portal is dedicated to SaferAfrica webinars, used to promote in a relatively short time period (30 minutes) SaferAfrica key findings so as to foster the dialogue with the experts and the African stakeholders. Participation to webinars is open by registration to the event in a dedicated page of the African RSO web portal. Each webinar consists of a presentation of a specific topic followed by a questions/answers session. Users are also able to continue the discussion through the Dialogue Platform or within the African RSO web site. So far, four webinars have been delivered and further 5 webinars are planned. Among the topics discussed there are:

- existing methods of road safety data collection (best practices, methods, and tools), drawn awareness to the discrepancies often found between official national data and WHO estimates, and provided suggestions on how to bridge these.
- "Road Safety Data in Africa" including SaferAfrica recommendations and guidelines for a minimum set of harmonized road safety data collection procedures and standard definitions aiming to improve African data collection systems.

- "Vehicle standards, an approach for Africa" dealing with the impact of the vehicle fleet to road safety and the importance of international frameworks on vehicle standards to improve the fleet.
  All the SaferAfrica Webinars delivered up to now are available on the African Road Safety Observatory.

3. Some Results

The objective of this chapter is to present some preliminary results providing some insight of the current road safety situation in some African countries based on crowdsourced data. As already mentioned, using the crowdsourcing tool of the African RSO, African citizens can report a road safety-related problem in their country by locating it into a map or propose a solution to improve road safety.

According to the data collected up to February 2019, 35 feedbacks have been received from 17 African Countries – 21 reports and 14 proposals. The majority of them came from Cameroon (21%), Ethiopia (13%), Guinea (13%) and Zambia (13%). For this analysis, French and Portuguese feedbacks were translated into English.

When reporting a problem (or a solution), users can assign a category choosing the most appropriate from: Road Safety Management, Unsafe Roads, Unsafe Vehicles, Risky behaviour of Road Users, Poor post-crash care. As shown in the Fig. 2 the two most reported categories are Risky behaviour of Road Users and Unsafe Roads.
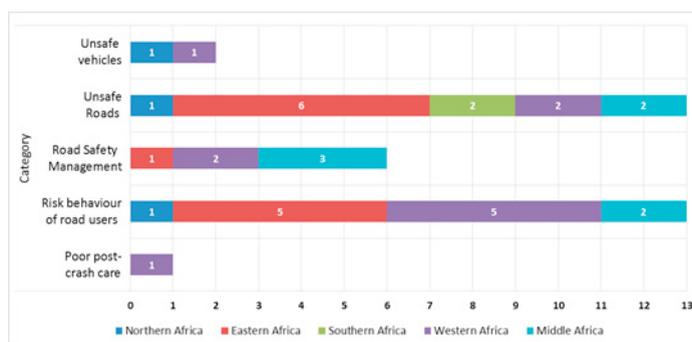

Fig. 2 Distribution of feedbacks by category

Safer Roads. In this pillar the majority of the problems reported concern poor road conditions such as lack of median barriers, pedestrian crossings, footpaths and cycling facilities, inadequate traffic signs, road markings and absence of any kind of traffic-calming measures which lead to a high accident rate and injury risk.

User Behavior. Drivers are reported to not respect traffic rules and are often distracted by other passengers or pedestrians. The inappropriate use of socio technological gadgets (e.g. smartphones, earpiece, car stereos) has been also highlighted. Some drivers were not trained in a proper, well licensed driving school. For example, in Nigeria some women are trained by their husbands rather than by driving school. Passengers and drivers neglect using seat-belts, cyclists prefer to ride without helmets. In Zambia, an observation study undertaken by the Zambia Road Safety Trust (ZRST) in Lusaka revealed *an astonishing number of parents who allow their children to travel in cars without restrained in seatbelts or properly restrained, placing their lives and safety at risk. According to the Zambia police, over 1598 children suffered serious traffic injuries in 2014 – that's almost three children per day in preventable road accidents*. Some feedbacks complain about pedestrians and cyclists behavior, disregarding the rules, walking/riding on the roadway, crossing at unauthorized (or simply unidentified) places, creating a high risk of accidents. This reflects in some way a simplistic and resigned sense that road safety is a problem due to noncompliance of road users to traffic law.

Unsafe Vehicles. Poverty prompts drivers to overload their vehicles to make extra money as well as lack of public transport which create another substantial problem of overloaded vehicles. For example, in Cameroon a survey of the young schoolchildren who use two motorized wheels revealed that when there are many of them on a motorcycle, they pay half price. The "motorcycle taximan" also wants to earn a little more, therefore, he often does not drive off until the number of passengers on the motorcycle reaches 4 and more.

Post-crash care. Along with these issues low-level post-crash data, lack of adequate capabilities in the health sector and medical post-crash help, high pollution were also raised. For example, in Guinea, for lack of an appropriate response, when a traffic accident occurs, it is the witnesses or at least bystanders who provide assistance to the victims. These "people of good will" who are not initiated into first aid actions dangerously manipulate the victims, thus compromising their chance of survival. Even if a toll-free number exists, this is often ineffective and is used for other types of rescue, such as fires, drownings, etc. As for the data sources (Police, Gendarmerie, Fire Brigade, Hospitals, etc.), they are totally disconnected from each other.

Road Safety Management. Lack of government policies that will compel road users to adhere to safety guides, incomplete alignment of policies and laws and insufficient funding, poor institutional coordination, lack of funds to implement the recommendations, corruption, and lack of campaign in Road Safety only exacerbates the already complicated situation in African countries.

The suggestions and proposals on how to improve the situation are based on a priority to establish road infrastructure safety management procedures. The implementation of car-free pedestrian zones, clearly marked zebra crossings, footpaths on both sides of all streets, pedestrian and cycle traffic lights, intersection modifications, cycle streets, cycle lanes and cycle paths in order to save lives according to European experience could be a solution to the majority of problems in Unsafe Road sector. There should be adequate advocacy, sensitization and awareness campaigns on drug abuses, alcoholism using traditional rulers, schools, mosque, churches, motor- parks, markets and road shows. Vehicle owners should be mandated to pass through driving schools and obtain driving license before driving any type of motor vehicles on roads. The development of public transport for those who cannot afford the luxury of taking a city taxi and who is compelled to use overloaded vehicles is a way to improve this poser.

The absence of a leading road safety management agencies in African countries is felt at the root of the fuzzy institutional governance with conflicting interests. Indeed, there are scattered road safety structures at different levels without real collaboration and coordination. In general, it is clear to everyone that without a coordinated management in the field of road traffic and safety it will be impossible to achieve the expected results in improving road safety in African countries.

4. Discussion and Conclusions

Collecting opinions and road safety needs of an African country from African citizens could be a useful support for assessing general perceived road safety needs at country level, especially considering the poor availability and reliability of road safety data in many Africa countries. The SaferAfrica crowdsourcing tools provide the opportunity to collect valuable information on the risks existing on African roads and even ideas to improve road safety in a country thanks to direct witnesses of these problems. These data are better suited for identifying overarching problems related to safety management at a country level rather than identifying specific projects at a local level.

According to the preliminary analysis of crowdsourced data collected, African countries suffer problems in all the five main sectors: Unsafe Roads (lack of median barriers, pedestrian crossings and footpaths and cycling facilities, inadequate traffic signs and road markings), Risky behaviour of road users (neglect of seat-belt and helmet usage, disrespect of road rules, usage of psycho-active substances and alcohol on the road), Road Safety Management (Lack of government policies, incomplete alignment of policies, poor institutional coordination), Unsafe vehicles, Poor post-crash care (low-level post-crash data, lack of adequate in post-crash help, high pollution).

Even if there are some drawbacks, data are subjective, limited in amount and unstructured (Miller & Goodchild, 2015; Tripodi & Persia, 2015), all this information provides insight of specific risky situations to be addressed in one or more countries.

Limitations of data could also highlight a generalized underlying problem. For instance, in some feedbacks a "blame the victim" vision has been observed in the sense that there is a convincement on human error contributing most to crash causation. A culture based on shared responsibility for the management of all elements of the road traffic system is still missing so that common road user errors resulting in an accident are perceived. This needs to be addressed to introduce a Safe System culture in the country (Johnston, 2010).

Another use of these data could be performing quality assurance of Police data collection, checking if these risk factors are recorded and if the same conclusions are gained basing on the Police data analysis.

A further analysis is the assessment of the existing strategic documents at local, country, regional and continental level (i.e. the Africa Road Safety Action Plan and the African Road Safety Charter) to check if the underlined road safety problems have been addressed.

The proposals to improve the current situation are on the development of a unified system of road traffic management, which will include prompt control of roads and vehicles, carry out campaigns to improve road traffic education among all segments of the population and enhance the collaboration between institutions and agencies.

The SaferAfrica approach also provides a way to consider this data in policy making. The findings of the analysis are summarized and discussed within regional or specific Working Groups with the aim of drafting .

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