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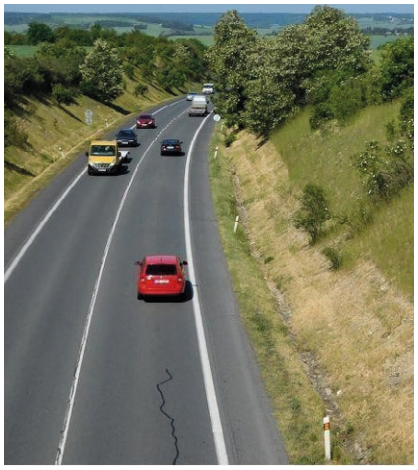
Danube Transnational Programme

TRANSGREEN



Tool for registering animal-vehicle collisions

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Part of Output 3.2 Planning Toolkit

TRANSGREEN Project “Integrated Transport and Green Infrastructure Planning in the Danube-Carpathian Region for the Benefit of People and Nature”

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Authors

Jan Kubeček
(Transport Research Centre, The Czech Republic)

Zuzana Křivánková
(Transport Research Centre, The Czech Republic)

Jiří Sedoník
(Transport Research Centre, The Czech Republic)

Ivo Dostál
(Transport Research Centre, The Czech Republic)

Layout and graphic design:

Alex Spineanu
(Graphic designer, Romania)

Marián Špacír
(SPECTRA Centre of Excellence EU)

with the support of Catalina Murariu
(WWF Romania)

English proofreading:
Private Language School BS SCHOOL, Ondrej Straka, BSBA

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Upon the identified needs of Romanian users, the GIS experts from the Transport Research Centre also prepared the mobile application, which serves as a supplement for the web app to simplify collecting of data in field.

The authors would be glad for any comments or improvements proposals. Do not hesitate to contact them at gis@cdv.cz .

About TRANSGREEN

TRANSGREEN means a better connected Carpathian region with transport infrastructure that takes nature into account. The project aims to contribute to safer and environmentally-friendly road and rail networks that are being developed in the Czech Republic, Hungary, Romania, Slovakia, and Ukraine. www.interreg-danube.eu/transgreen

Output 3.2 Planning Toolkit consists of the following parts:

- Wildlife and Traffic in the Carpathians - Guidelines how to minimize the impact of transport infrastructure development on nature in the Carpathian countries
- TRANSGREEN Policy Recommendations on integrated road and rail transportation planning in the Carpathians
- State of the Art Report and Gap Analysis in the field of environmentally-friendly transport infrastructure development
- Keeping Nature Connected – Environmental Impact Assessment (EIA) for Integrated Green Infrastructure Planning
- Public Participation – Scheme for an integrated linear transport infrastructure development/ planning
- Tool for registering animal-vehicle collisions

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1 INTRODUCTION

Fauna mortality caused by animal-vehicle collisions (AVC) on roads and railways is the most evident and well-known negative impact of transport infrastructure on wildlife. Out of the five primary ecological effects (some of which may only be apparent long-term), the fauna mortality is the most visible and perspicuous evidence of habitat fragmentation to the relevant authorities as well as to the general public.

The degree of threat to the individual species depends on the size of population and the species occurrence. Common widely spread species traffic mortality was thought for a long time to be estimated only a small percentage of their total mortality, but with rising intensities on roads began to appear evidence (such as study from Martolos et al., 2014) that the share of traffic mortality is more extensive even in this species group. In the case of more sensitive and rarer species,AVC represents much greater proportion (e.g. 40%) of total mortality, which makes it a significant factor possibly threatening the survival of local populations.

To such sensitive species belong (Iuell et al., 2003):

- Rare species that move long distances and are forced to overcome transport infrastructure while doing that (e. g. otter, large carnivores)
- Species exhibiting daily or seasonal migratory movements between local habitats (e.g. amphibians, some ungulate species)
- Birds, especially raptors and owls that are attracted to prey around road verges or by road-kills
- Some species of bats

The concentration of fauna casualties on roads and railways in general depends on environmental factors such as temperature, precipitation or time of the day, on ecological factors associated with affected species (breeding, dispersal, seasonal migrations, food supply etc.) and also on location, landscape context of the infrastructure, its width, traffic value, as well as crop rotation in its surroundings.

The issue of AVC is also a safety concern for drivers. Crashes with large mammals are the most critical due to the animal body sizes and the respective impact consequences. But in majority of the animals below, a certain body size usually does not cause traffic crashes and therefore only evidence of their carcasses along roads can provide information about the extent of this issue. And only a comprehensive and systematic collection of data on fauna causalities will provide a sufficiently large information base for identification of the most critical spots.

Identified critical spots are places where efforts to reduce fauna casualties should be aimed. However, the measures are typically made only for the reasons of traffic safety, which rather involves larger species, while smaller ones are often neglected. Proper way to solve this issue is a matter of landscape planning and this should focus not only on blocking the access of the animals to the infrastructure, but especially on providing safe movement/migration corridors and steppingstones, safe passages and guidance to the safe passages. It should also address all relevant species, and not forget about the safety of smaller species.

Due to the extent and frequency of AVC occurrence, the data collection cannot be done without public participation. There is, therefore, a need for widely accessible applications which would contain as many as possible data sources on AVC and roadkill in one place. The AVC topic is a long-term activity and the volunteers have to be motivated to collect data for a longer period of time.

One possibility is to focus on people who commute regularly on the same road. An interesting feature in this sense is therefore the possibility of "adopting a road" which is offered by three applications: California Roadkill Observation System (http://www.wildlifecrossing.net/california/), a technologically similar application for Maine (USA) (http://www.wildlifecrossing.net/maine/) and a Belgian application "Animals under wheels" (https://waarnemingen.be/vs/start).

The Belgian application contains an enormous amount of data, but the majority of them are not related to the roadkill topic, but to observations of animals within Belgium. An Austrian roadkill application (https://roadkill.at) is fully focused on volunteers with no geographical constraint concerning data input. No registration is needed here, but only data including photos can be uploaded. Only a basic functionality is provided by an application used in Ireland (http://www.biology.ie/home.php?m=npws). A lack of data homogeneity (both temporal and spatial) is still the primary issue in data collected by volunteers.

A better situation, from the data-completeness (spatial homogeneity) viewpoint, is with general traffic crash records where animals were involved. A certain portion of data, specifically that when police or an insurance agency collaborate, are well-documented. In the majority of these data sets, only large mammals were involved as other species only seldom cause traffic crashes. Large mammals are an important part of the Swedish application http://www.viltolycka.se/ which has network-coverage and provides basic statistics concerning killed species.

Smartphone applications have already been recognized as an important means of data collection. Several smartphone applications have recently been developed for this kind of data input (e.g. for Android: Alberta wildlife watch, EWT Road Watch South Africa, Project Splatter).

Many applications only collect data. Belgian and Swedish applications also conduct certain online data analyses. Both of them produce graphs and basic aggregated data statistics for selected species. These additional features provide important information to web page visitors.

The most complete source of animal-vehicle collisions and roadkill data in the Czech Republic is Srazenazver - www.srazenazver.cz (Bíl, M. et al., 2017). This application combines both the important sources of data in one place: official crash data from the state-wide system of traffic incidents, which secures spatial homogeneity and data added by volunteers. It is not only a web-map page as many of the above-mentioned, but a complex system built on a PostGIS spatial database (PostGIS, 2016) where automatic online analyses are performed. It also includes additional functions such as: visualization of previously analysed data, near real-time data analyses, data exports, generating reports, administration and hunting-area administration.

The TRANSGREEN Roadkill application was developed by the Srazenazver authors. It is based on the Srazenazver engine, but adjusted to the needs of Romanian users, who were very helpful in the developing of the app. The application is very intuitive and user friendly. We have used our experience and improved the taxonomy list. We have put a lot of effort to the mobile application to be as simple to use as possible.

2 How to use

The TRANSGREEN Roadkill application consists of two parts – Web map application and Mobile application. Both come in Romanian and English language.

The mobile application serves as the data input. The user can send data from the field by 3 clicks (in the easiest way). First, he/she selects the animal group. In this moment the GPS position and date/time is stored. Then he/she selects the specific animal. Now he/she can send the data to server.

Besides, it is possible to add photo or other details, such as exact/estimated collision's date or note. If the animal is not among icons proposed by the app, it is possible to use the autocomplete list of all Romanian species.

If the user doesn't have the data connection in the field, the sending data is delayed till the internet connection (through the Wi-Fi) is settled.

The user can log in (after registering in the Web map application). It is not necessary, but only the registered user has the rights to edit or delete his/her own records in the Web map application.

The Web map application serves as the data presentation tools. Data is visualized by map and table. t is possible to add new record by the form also. The registered users can administer their own data.

IMPORTANT NOTE! When monitoring fauna traffic mortality, it is often necessary to enter the roadway. Especially on motorways it can lead to the risk of an accident. Safety rules according to the laws of a given country must always be respected during the entire monitoring process.

3 Web map application

The application could be found on **https://road-kill-registration.green-web.eu** and is embedded in the CCIBIS website.

It has the following functionalities:

It is administrated and hosted on the Transport Research Centre servers. The software requirement is as follows: PostgreSql/PostGIS, php, php NetteFramework, HTML, CSS, JQuery.

In this moment there is no automatic validation of data entered by users to have app as accessible and user friendly as possible. However, we are prepared to change the user rights policy (only registered users will be able to input data), if there will be any attempts of misusing (by inserting apparently fake data).

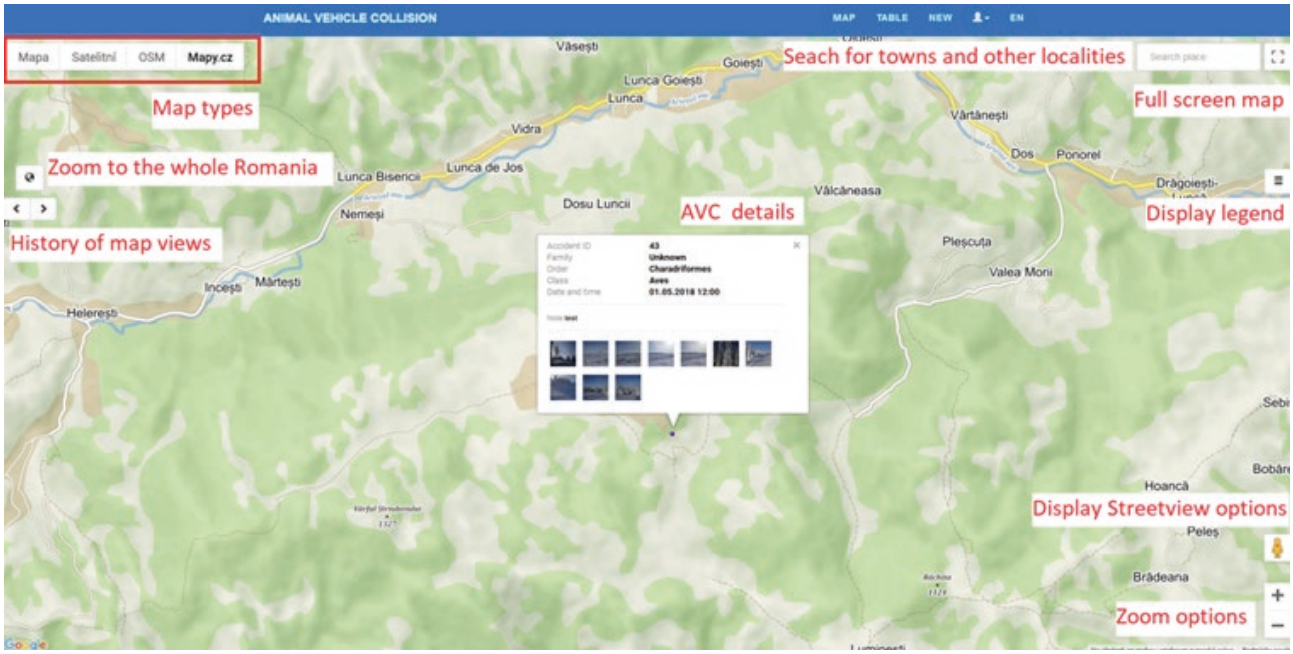
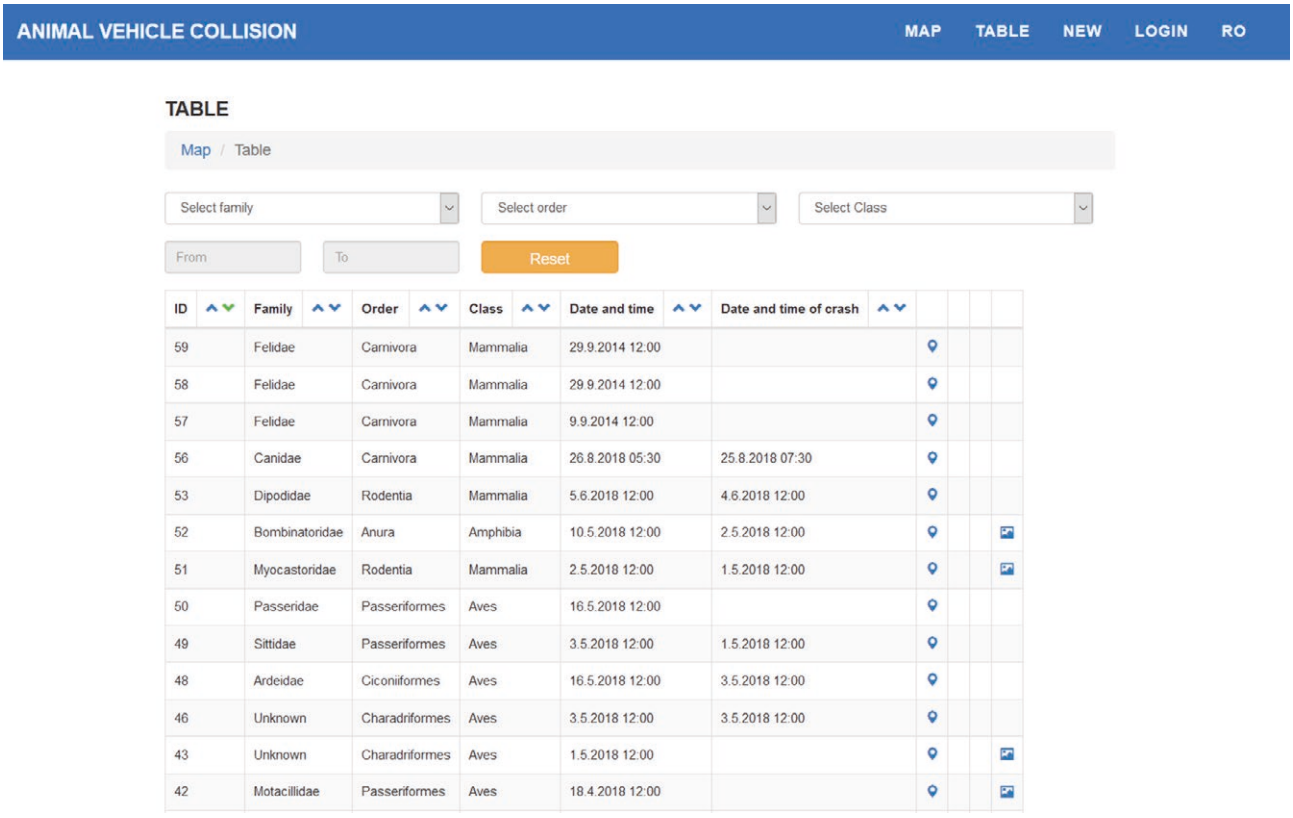


Fig. 1 Map with accidents.



ID	Family	Order	Class	Date and time	Date and time of crash
59	Felidae	Carnivora	Mammalia	29.9.2014 12:00	
58	Felidae	Carnivora	Mammalia	29.9.2014 12:00	
57	Felidae	Carnivora	Mammalia	9.9.2014 12:00	
56	Canidae	Carnivora	Mammalia	26.8.2018 05:30	25.8.2018 07:30
53	Dipodidae	Rodentia	Mammalia	5.6.2018 12:00	4.6.2018 12:00
52	Bombinatoridae	Anura	Amphibia	10.5.2018 12:00	2.5.2018 12:00
51	Myocastoridae	Rodentia	Mammalia	2.5.2018 12:00	1.5.2018 12:00
50	Passeridae	Passeriformes	Aves	16.5.2018 12:00	
49	Sittidae	Passeriformes	Aves	3.5.2018 12:00	1.5.2018 12:00
48	Ardeidae	Ciconiiformes	Aves	16.5.2018 12:00	3.5.2018 12:00
46	Unknown	Charadriformes	Aves	3.5.2018 12:00	3.5.2018 12:00
43	Unknown	Charadriformes	Aves	1.5.2018 12:00	
42	Motacillidae	Passeriformes	Aves	18.4.2018 12:00	

Fig. 2 Table with records.

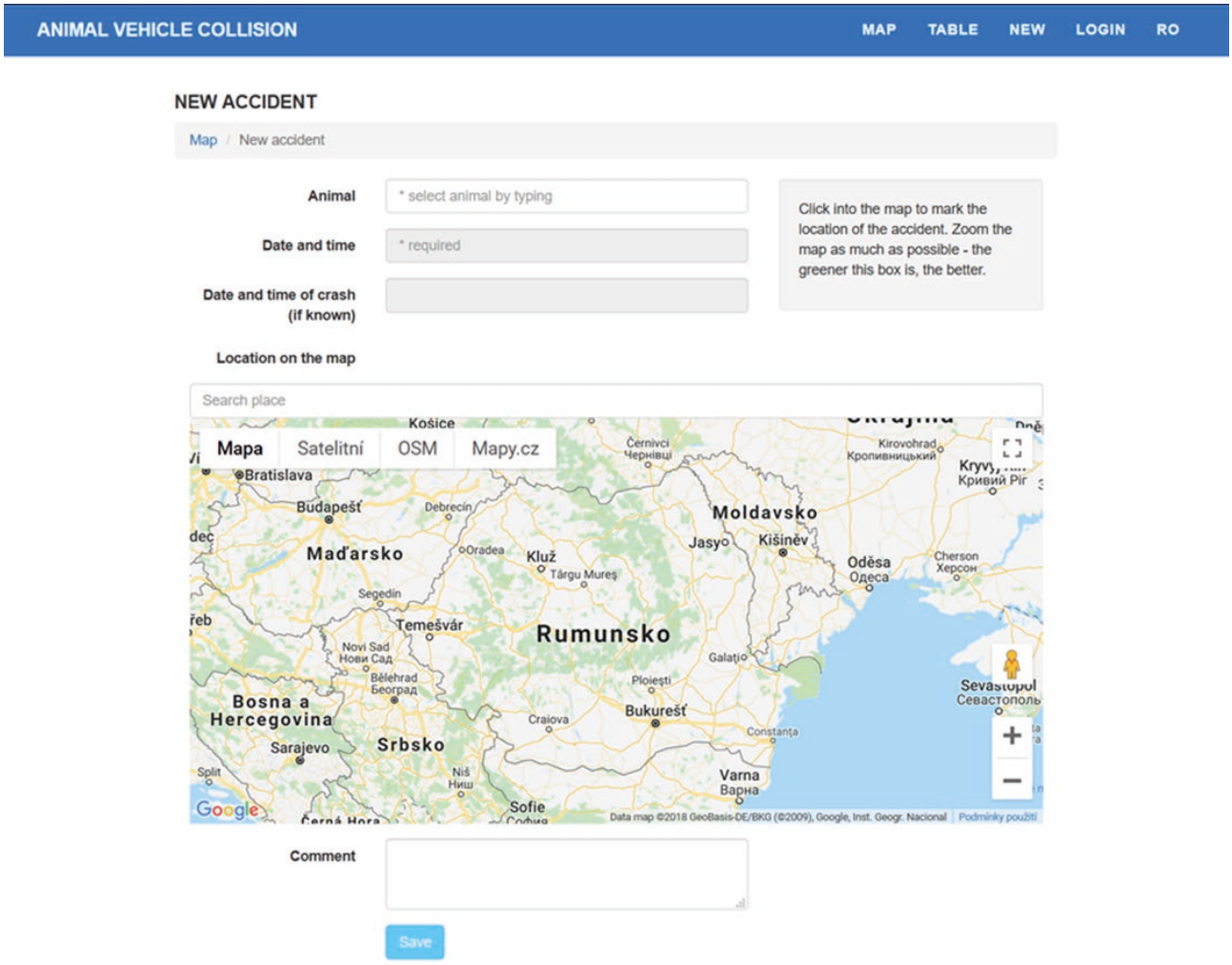


Fig. 3 New accident form.

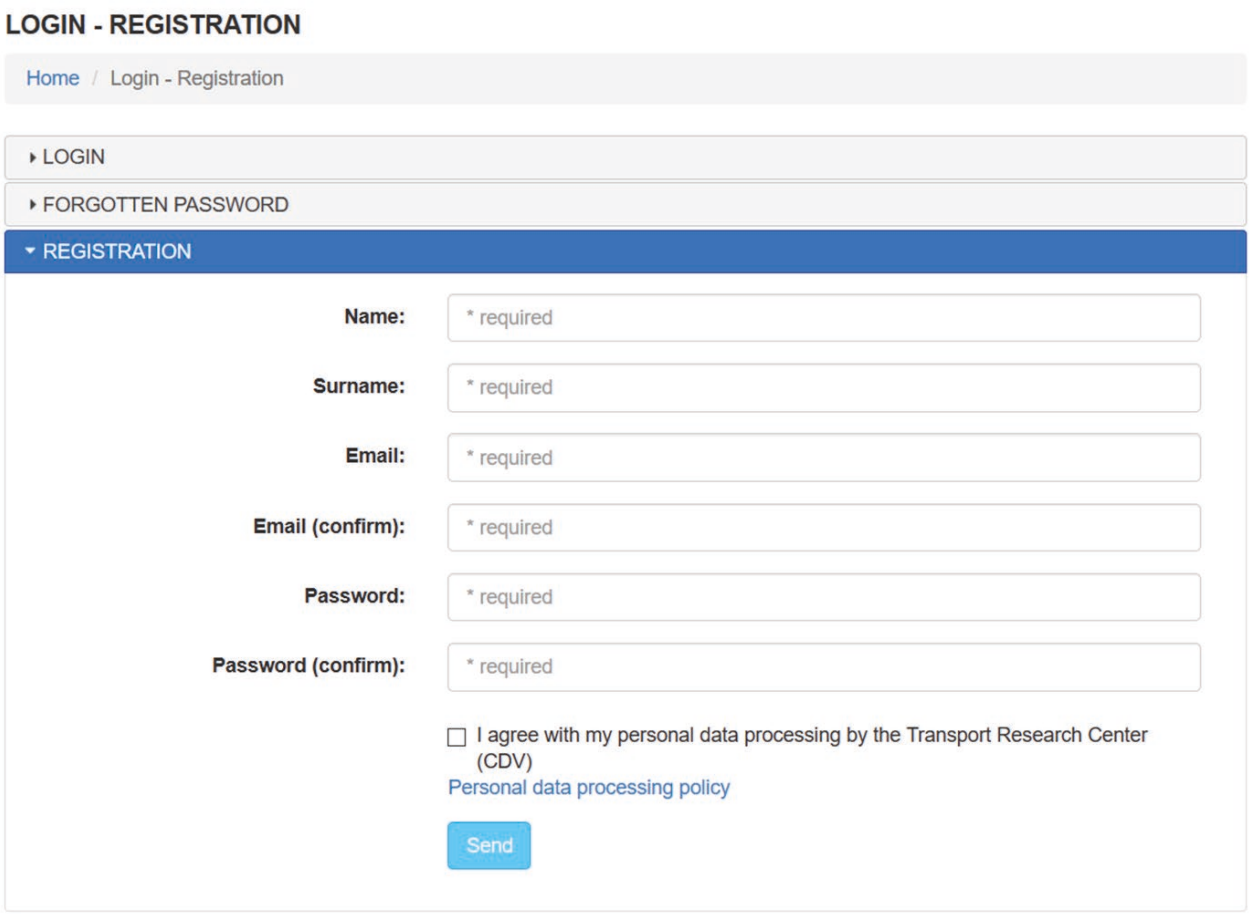


Fig. 4 Login form.

4 Mobile application

Besides of the web application there was created mobile application for Android also.

The mobile app has this logic structure:

Screen 1 – Pictograms with animal categories

- Fox = Fox
- Badger = Badger
- Hare+Rat = Rodents
- Hedgehog = Insectivorous mammals
- Beaver = Aquatic rodents
- Weasel = Small carnivores
- Wild cat = Medium carnivores
- Bear = Large carnivores
- Roe deer = Herbivores
- Chamois = Other herbivores
- Bat + bird = Bats and Birds
- Frog = Amphibians
- Snake = Reptiles
- Cow = Domestic animals
- Question mark = Unknown

Taping on a pictogram will record the current date, time and location

Fig. 5 Screen 1.

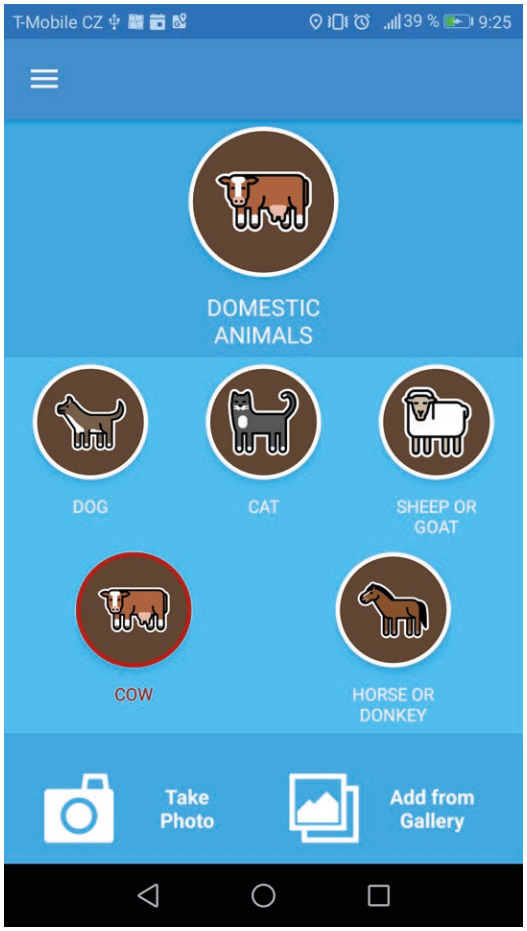


Fig. 6 Screen 2.

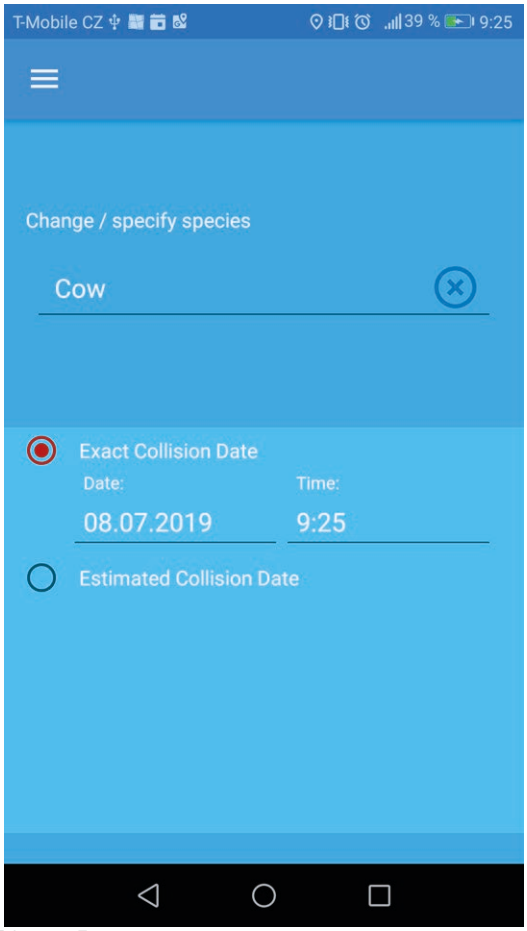


Fig. 7 Screen 3.

Screen 2 – Pictograms with animal subcategories

- 3 (or 6 – if 2 rows) pictograms for each category
- button for Taking photos
- button for Add photos from gallery
- button for Save
- button for Add details

Screen 3 – details

- button Add details later

  - a reminder message could be displayed on the screen of the mobile
- species from a List by using autocomplete (like in web app)
- exact time of crash – if known
- estimated date of crash (today/1-3 days ago/4-7 days ago/older than a week)
- note
- button Save

  - forwarding to Login screen – explanation that with Registering/Login the user can up-date his own login in the web app also

  - button Continue without login

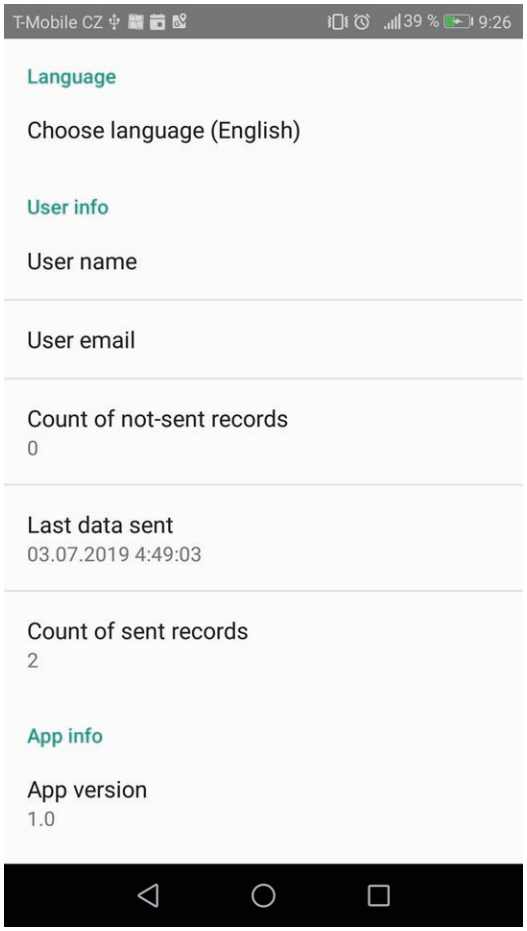


Fig. 8 Screen Settings.

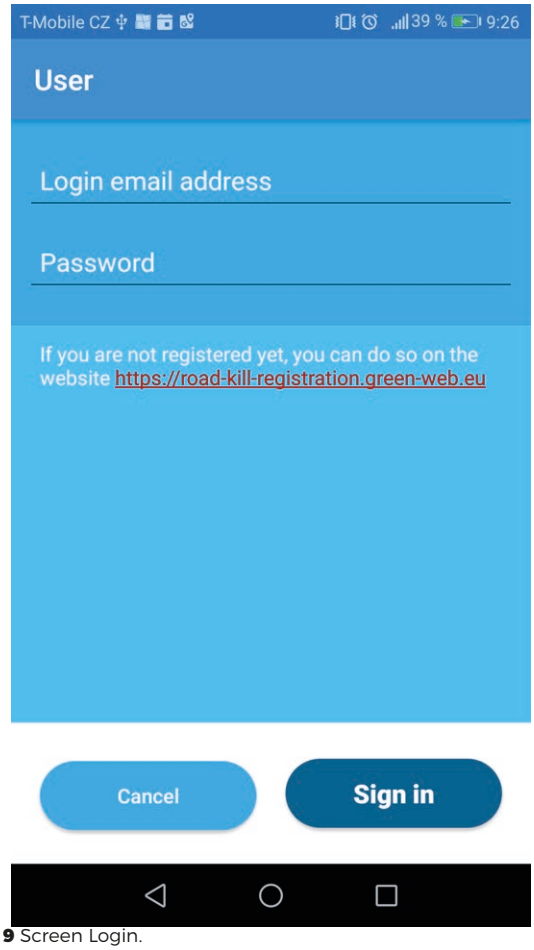


Fig. 9 Screen Login.

Screen 4 – Settings

- choose language (RO/EN)
- user info
- user's records info
- app info
- use wifi for sending the collision to the server
- save the photos made by using this app in the phone also
- link to login screen

Screen 5 – Login

- login
- link to the web application
- available before Saving from screen 3 or from Settings

5 References

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Hungary – CEEweb for Biodiversity
Romania – Association "Milvus Group", WWF Romania
Slovakia – National Motorway Company, State Nature Conservancy of the Slovak Republic, SPECTRA – Centre of Excellence of EU – Slovak University of Technology in Bratislava

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