

# habitat fragmentation due to transportation infrastructure



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## EDITORIAL

The IENE Governance Board elected the “Spanish Working Group on Habitat Fragmentation caused by Transport Infrastructure” as the winner of the IENE Project Award 2020. They appreciated the excellent work and impressive efforts that have been done by the National Working Group in the last 20 years.

The Working Group is composed by representatives of agencies and administrations in charge of infrastructures, traffic and the environment, both at national and regional levels. It belongs to the National Commission for the Natural Heritage and the Biodiversity, which is coordinated by the Subdirección General de Biodiversidad y Medio Natural as part of the Ministry for the Ecological Transition.

The Working Group was created in 1999, building on the work done during the Action COST 341 promoted by the Infrastructure and Ecology Network (IENE). Therefore, this year we are celebrating our 20<sup>th</sup> anniversary.

Since the late 80’s and during the 90’s, Spain experienced a strong development of transport infrastructures, especially highways, also building the first high-speed rail in the country. This steep increase in the number and density of transport infrastructures constituted a rising threat for biodiversity, which required of the awareness of the problem and the adoption of preventing and corrective measures.

The creation of the Working Group aimed to respond to such necessity. However, it was required to create a working methodology that help reducing the distance between the different disciplines involved (mainly environmental sciences and civil engineering), and relax the defensive attitude of both groups that tried to impose their criteria.

To solve this limitation, experienced since the very beginning, the Working Group adopted a methodology based on the language and the common understanding on the terms and concepts to be used in the group. Thus, we created a community of practice for long-term functional collaboration between disciplines aiming to reduce the fragmentation created by transport infrastructures including their design, construction and maintenance during their entire lifetime. The group uses proactive and inclusive messages, and active hearing to ensure a proper understanding. All statements and proposals are given the same importance irrespectively of their discipline (i.e. engineering and environmental sciences). This way of working, the publication of both electronic newsletters and technical publications, and the organization of public meetings on the topic were considered by the IENE Governance Board to elect us for their prize.

Despite the Working Group has contributed during these 20 years to increase and improve the actions taken to prevent and mitigate the impact of transport infrastructures, there are still many pending issues to be done in the near future. The language-based methodology implemented in the Working Group should continue spreading into the joint work that is being done between national and regional agencies, and constructing companies. Likewise, it is required a deeper awareness of the necessity of achieving a sustainable infrastructure network as a common goal for the whole society, vanishing the obstruction role traditionally given to environmentally friendly agencies and professionals. We expect this recognition helps highlighting the work that has been done by the Working Group, also promoting the creation of regional Working Groups that replicates our methodology, like the one currently running in Extremadura. These regional groups may include smaller administration (municipalities), companies and associations in closer contact with the territory, therefore being more effective in solving local conflicts and offering customized solutions.

We would like to share this prize with all these contributors from very different disciplines that helped our infrastructure network to be safer and more permeable to animal movement.

## WORKING GROUP

During the last year, the Working Group on Habitat Fragmentation due to Transportation Infrastructure has met twice (March and October) to make decisions on the progress of the two documents of technical prescriptions that are being developed. In the first meeting, the group agreed to publish the seventh volume of Technical Prescriptions entitled *Efectos de borde y efectos en el margen de las infraestructuras de transporte y atenuación de su impacto en la biodiversidad* (Edge effects of transport infrastructures. Mitigating its impact on biodiversity), which has been already published in the webpage of the Ministry. The second meeting focused on the contents of the second document that will develop guiding lines to promote the acquisition of high-quality data during monitoring studies evaluating the effectiveness of the corrective measures implemented in transport infrastructures. This document will include the analysis of almost 50 reports on the monitoring of more than 1000 crossing structures. This experience is used to improve further monitoring of transport infrastructures and especially in the design, execution, and documentation of studies aimed to evaluate the effectiveness of preventing, mitigating and compensating measures developed during the Impact Assessment Studies on infrastructures. The current state of the art of the discipline is also considered.

In collaboration with the Territory and Sustainability Department (Departament de Territori i Sostenibilitat) of the Catalonia Government (Generalitat de Catalunya), the working group organized the 5<sup>th</sup> technical meeting focused on animal mortality in transport infrastructures. This event was held in October 24-25 in Barcelona (see events).



**The consulting service** regarding habitat fragmentation due to transport infrastructures is still active. Any question on this topic can be sent to [habitat\\_infraestructuras@ebd.csic.es](mailto:habitat_infraestructuras@ebd.csic.es)

## NEWS

### Project LIFE SAFE-CROSSING in Andalusia

This is a European project aiming at implementing measures to reduce the impact of roads on key species in four European countries: Marsican brown bear (*Ursus arctos marsicanus*) and wolf (*Canis lupus*) in Italy; brown bear (*Ursus arctos*) in Greece and Romania, and Iberian lynx (*Lynx pardinus*) in Spain. One of the most important threats for these species is both direct mortality and population fragmentation due to transport infrastructures. Aiming to reduce these impacts, a previous project (LIFE STRADE) developed an innovative device that warns drivers and prevents wildlife from crossing roads. It uses thermic cameras, movement sensors, warning lights, speakers, and radar. When the device detect any animal approaching the road it activates the warning lights to alert the driver on the presence of an animal in the road, also suggesting to slow down speed. If the radar detects that the vehicle does not get slower, it activates speakers to scare away animals. Seventeen of these devices were installed in different roads resulting in a significant reduction of collisions, according to the project's final report. It also documented the low level of awareness of drivers on the collision risk. This experience was used to prepare and build the SAFE-CROSSING project with the following objectives:

Demonstrate the utility of collision prevention systems. In Andalusia, five of these devices will be installed in areas where Iberian lynx could benefit from them: two in the Doñana-Aljarafe population, and three in the reintroduction area of Guadalmellato.

Reduce the collision risk with Iberian lynxes.

Improve connectivity between lynx populations and facilitate the movements of individuals.

Increase driver's awareness on the collision risk they have by using the roads located in these areas.

This project has 13 partners including NGOs, private companies, and the public administration. From the European perspective, it considers 29 Natura 2000 protected areas (Site of Community Importance or SCIs). By reducing direct mortality and fragmentation due to transport infrastructures, the project will contribute to improve biodiversity conservation in the protected areas considered, as well as their connectivity.



Source of Information: Junta de Andalucía.

## New signaling in road EX-118 to mitigate lynx mortality due to vehicle-collision

The Iberian lynx was reintroduced in Extremadura during the last decade, and two breeding females have established in the area of Valdecañas-Ibores, where this action is being developed. In Extremadura, road kill is the main cause of lynx mortality, frequently because of speeding. In this area, a male called Plantago was recently road-killed in highway A-5. Two cubs (Picasso and Plutón) were also road-kill in May 2019 in Regional road EX-103. The collision point, the places where carcasses were found and injuries found in the two individuals suggested a high speed, much higher than the limit, established at 70 km/h.

To avoid new collisions, the Extremadura Regional Government (Department for Ecological Transition and sustainability and Department of mobility and infrastructures) has installed 6 panels and 5 signals in road EX-118 between Guadalupe and Navalmoral de la Mata to warn drivers on the presence of this endangered species and the high probability of crossing.

Other signaling has been used such as rumble strips to reduce speed, and big panels depicting lynxes together with speed limit. Accessing roads were also signaled in collaboration with the municipalities of Campillo de Llerena, Maguilla, Rubiales, Valencia de las Torres, Llera and Hornachos:

The Department of Ecological Transition and sustainability of the Extremadura Regional Government kindly ask drivers to comply with speed limits, thus reducing potential casualties with wildlife. This is especially important in the case of the highly endangered Iberian lynx, whose recent recovery is the result of a big effort made by the European Commission together with Spanish and Portuguese governments, as well as other organisms and regional authorities, including Extremadura.

Source of information: Junta de Extremadura.



## Experimental measures in regional road CL-615, from Palencia to Guardo to reduce wildlife-vehicle collisions

Castilla y León region has geographical and environmental conditions that, together with low population density and its clumped distribution facilitate wildlife growth and spread. Many of the regional roads cross natural areas where wildlife frequently invades roads, increasing the number of collisions, some of them of dramatic consequences.

During 2018, 490 collisions were recorded in the Province of Palencia, most of them in regional roads CL-615 from Palencia to Guardo and in CL-626 between Aguilar de Campoo and the limit of the province with León. For this reason, several measures were taken to reduce the number and severity of collisions in the regional road network. Some of the pilot actions developed in CL-615 were:

In the section from Km 38 to 50, vegetation of margins was mowed, and scent fences, wildlife reflectors, and ultrasonic whistles were installed, all of them aiming to move wildlife away from the road.

In the section between Km 19 and 23, scent fencing was also implemented together with game fencing at both sides of a free crossing area of 300 m, equipped with infrared sensors able to detect wildlife in the area and trigger flashing signs. The aim of this device is twofold: first to conduct wildlife to the sensorized crossing area, and second to detect the presence of wildlife in the road or nearby and warn drivers with time enough to prevent collisions. It is designed to be installed in areas where this problem has become recurrent. In detail, the system is composed by 4 main elements (see picture below):

Game and scent barriers overlapping in the 600 m closer to the crossing area. Scent barriers were extended 1.25 Km further. Their objective is to conduct wildlife to the crossing area.

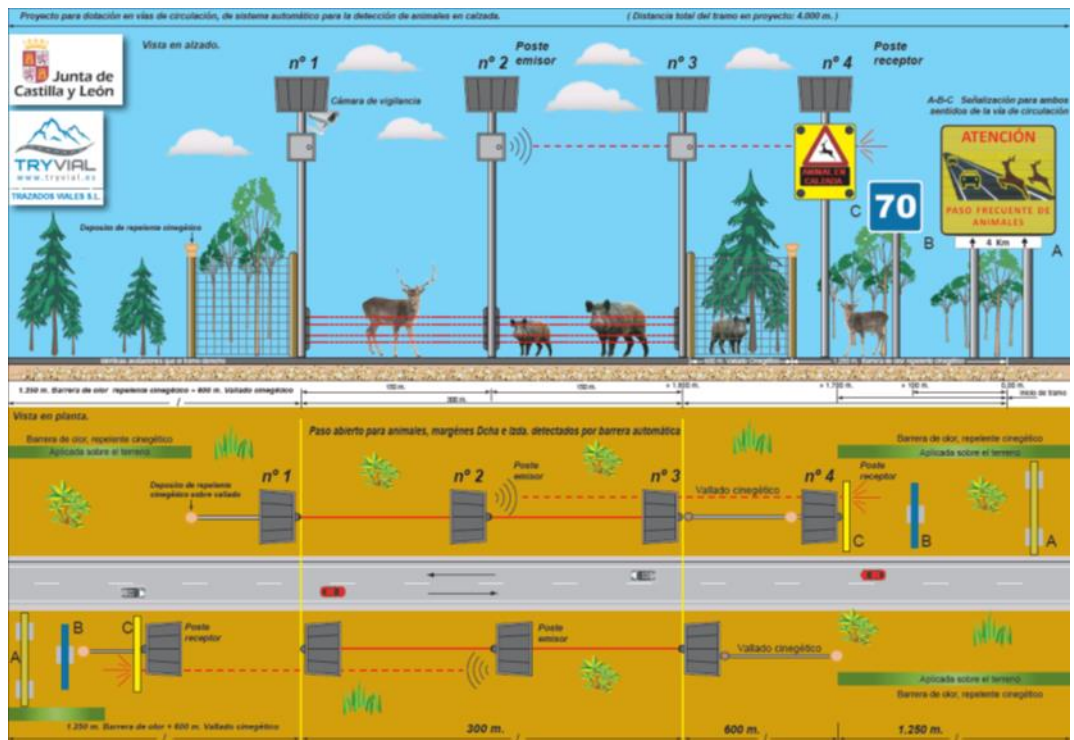
Sensor (red lines in the picture) detecting when a wild animal enters the risk area

Transmitting unit (nº 2, and nº 3) that processes the detection and activate signaling by radio.

Flashing signaling system (nº4) that receives the radio signal and activate flashing signs (see picture below).

This section was properly indicated at both sides by using reflecting yellow panels with the corresponding box indicating the size of the section (4 Km). Another sign indicating the suggested speed (70 Km/h) was also placed at both sides of the section.

Recently, the system has been updated by adding a thermic camera (nº 1) to the detecting system, also recording video files that would help analyzing the number of crossings as well as wildlife behavior.



Source of information: Junta de Castilla y León.

### **Final degree thesis of Rafel Roselló on habitat fragmentation by transport infrastructures is awarded with the Universidad, Conocimiento y Agenda 2030 prize**

The Carolina Foundation, the Spanish Agency for International Development Cooperation (AECID), and the Conference of Directors of Universities of Spain (Cruce Universidades Españolas) awarded the best Master and Degree thesis on topics considered among the 17 objectives of sustainable development (ODS) of Agenda 2030.

The work of Rafel Roselló, developed in the University of Balearic Islands evaluates the fragmentation status of protected habitat (Natura 2000) due to transport infrastructures in Mallorca. He identified 9 critic points within the road network where wildlife crossings structures should be implemented in order to improve connectivity between wildlife populations. He found, for instance, low connectivity values between three small SCI (Site of Community Importance): Puig de Galatzó, Fita del Ram y Port des Canonge in spite of their relative closeness. For this reason he suggested establishing an ecological corridor that increase connectivity with potential benefits for endangered wildlife species such as the Greek tortoise, the Balearic green toad, the Majorcan midwife toad, the Iberian hare, the Balearic hedgehog, as well as martens and genets.

Source of information: Editorial team.

### **Citizen-science platforms to record casualties in transport infrastructures**

The use of mobile apps to record the encounter with both animals and plants has become generalized. Even professional teams belonging to public and private companies are using these apps or have developed their own ones to record environmental information. In the meetings we have attended this year, including the Congress of the Spanish Society for the Study and Conservation of Mammals (SECEM), and the international Conference on Ecology and Transportation (ICOET), as well as during the technical workshop organized by the Working Group, many of the talks referred the use of these apps. Despite the most widespread ones aim at recording live animals and plants (inaturalist, e-bird, Natusfera), a surprising number of them also include road casualties as a source of information, suggesting a high awareness of the people.

Regarding this, we list below those apps that are being currently used in Spain to record casualties of wildlife in transport infrastructures:

ObsMapp (Android); iObs (iOS); WinObs (Windows), also available as webpage at [observation.org](http://observation.org). This app has been developed by Observation International in the Netherlands. It is one of the most exhaustive apps, including not only the possibility of register casualties, but also allows to create systematic surveys to be conducted repeatedly (see [Vercayie et al. 2018](#)). This is the app chosen by the SECEM to be used during its campaigns. Some SECEM members are currently collaborating with the app as National validation committee.

Atropellos (Android). Developed by the Society of Natural History of Ciudad Real.

[www.ornitho.cat](http://www.ornitho.cat). Developed by the Catalonian Institute of Ornithology (ICO), is a web portal that allows entering information on animal sightings. It includes a specific package devoted to road casualties. The Regional Administration of Catalunya has real-time, direct access to data recorded by this portal by means of a dedicated online interface. This helps them to identify road casualties hotspots. Likewise, regional rangers also get automatic and daily updated information on all recorded casualties.

Biodiversidadvirtual.org. It is one of the most important citizen-based platforms for biodiversity identification in Spain. Experts on different groups help the users in identifying the animal, plant or fungi uploaded to the platform as a picture. The platform has recently extended this service to pictures on road casualties.

During 2019, the NGO IAEDEN, best know for promoting the protection of Aiguamolls de L'Empordà as Natural Park in the 80's, launched a campaign aimed to get information on hotspots of animal mortality due to transport infrastructures in the region.

The NGO Colectivo Azalvaro in the Segovia Province also carried on a campaign on animal mortality in roads, using a web platform (<http://atropellosfauna.blogspot.com>). This campaign, initially focused on road AV-500 - SG500, is currently getting data on a provincial scope. This is accessible via <http://atropellosfauna.blogspot.com/p/base-datos.html>

Source of information: Editorial team.

### National survey on road casualties in Spain

During the Technical meeting "Wildlife mortality in transport infrastructures. Current knowledge and methodological advances" held in Barcelona in October 24-25 (see events) two forthcoming agreements promoted by the Ministry for the Ecological Transition were announced. Both agreements aim to evaluate animal mortality in Spanish roads.

The first agreement between the Ministry and the Spanish Council for Scientific Research (CSIC) would focus on establishing the methodological basis of the National survey, gather and analyze the resulting information, and carry on some scientific monitoring. The second agreement with three conservation societies (the Spanish Society of Ornithology -SEO-, the Spanish Association of Herpetology -AHE-, and the Spanish Society for the Study and Conservation of the Mammals -SECEM-) is devoted to conduct the survey on the basis of citizen-science. It was not possible to sign any of the agreements during 2019, but this is expected to happen during 2020.



Source of information: Editorial team.

## PUBLICATIONS

Ascensao, F. Mestre, F. and Barbosa, A.M. 2019. Prioritizing road defragmentation using graph-based tools. *Landscape and Urban Planning* 192. 103653.

<https://doi.org/10.1016/j.landurbplan.2019.103653>.

Barrientos R., Ascensao, F. and D'Amico, M. 2019. Inappropriate tourist behavior in protected areas can lead to wildlife road-kills. *Animal Conservation*. <https://doi.org/10.1111/acv.12547>

Ministerio para la Transición Ecológica. 2019. *Efectos de borde y efectos en el margen de las infraestructuras de transporte y atenuación de su impacto sobre la biodiversidad. Documentos para la reducción de la fragmentación de hábitats causada por infraestructuras de transporte 7*. Ministerio para la Transición Ecológica. 98 pp. Madrid.

Phillips, B.B. et al. 2020. Ecosystem service provision by road verges. *Journal of Applied Ecology* 2020; 00:1:1-14. DOI: 10.1111/1365-2664.13556

Schwartz, A.L. Shilling, F., and Perkins, S.E. 2020. The value of monitoring wildlife roadkill. *European Journal of Wildlife Research* 66. 18

Sousa Guedes, D., Ribeiro, H. and Sillero, N. 2019. An improved Mobile Mapping System to detect road-killed amphibians and small birds. *International Journal of Geo-Information* 8: 565. <https://doi.org/10.3390/ijgi8120565>

Spanowicz, A.G. and Jaeger, J.A.G. 2019. Measuring landscape connectivity: on the importance of within patch connectivity. *Landscape Ecology*. <https://doi.org/10.1007/s10980-019-00881-0>.

Topical collection on Road Ecology by the *European Journal of Wildlife research*, including, among others:

- Barrientos et al. 2019. Railway ecology vs. road ecology: similarities and differences. *European Journal of Wildlife Research* DOI: 10.1007/s10344-018-1248-0
- Fabrizio et al. 2019. Habitat suitability vs landscape connectivity determining roadkill risk at a regional scale: a case study on European badger (*Meles meles*). *European Journal of Wildlife Research* 65. doi: 10.1007/s10344-018-1241-7
- Van der Horst, S.T. et al. 2019. Road effects on species abundance and population trend: a case study on tawny owl. *European Journal of Wildlife Research* DOI: 10.1007/s10344-019-1325-z.

## PAST EVENTS

**International Conference on Ecology and Transportation.** September 22-26 2019. Sacramento, California. EE. UU. The Working Group on Habitat Fragmentation due to Transportation Infrastructures shared the results on the monitoring information that was analyzed. More [info](#).



**Seminar on typology and measuring wildlife crossing structures in transport infrastructures.**

October 2<sup>nd</sup> 2019. Held in the headquarters of the Ministry for the Ecological Transition, in Madrid. Attendants belong to both private companies and public administrations involved in impact assessment of transport infrastructures. Conclusions will improve further work especially regarding homogenization of monitoring methods.

**World Road Congress.**

Organized by the World Road Association in Abu Dhabi, United Arab Emirates. October 6-10 2019. More [info](#).

**Jornadas técnicas del Grupo de trabajo de fragmentación de hábitats causada por infraestructuras de transporte**

Entitled "Wildlife mortality in transport infrastructures. Current knowledge and methodological advances", this meeting was organized by the Ministry for the Ecological Transition and the Territory and Sustainability Department of the Catalan Regional Government. It was held in the Natural Sciences Museum of Barcelona on October 24-25, 2019. More [info](#).



Photo: Jacinto Román.

**II Iberoamerican Congress on Biodiversity and transport Infrastructures– CIBIV**  
Organized by the Metropolitan Technological Institute in Medellin (Colombia) in November 28-30, 2019. More [info](#).

**XIV Congress of the Spanish Society for the Study and Conservation of Mammals (SECEM).**

Organized by the Spanish Society for the Study and Conservation of Mammals and the Pyrenean Institute of Ecology (CSIC), it was held in Jaca (Huesca), in December 5-8, 2019. In spite of its more general scope, there were several presentation on wildlife mortality in roads and habitat fragmentation due to transport infrastructures. More [info](#).



## COMING EVENTS

**Winter Road Congress 2020**

Organized by the Finish Road Association in Tampere (Finland). February 2-3 2020. More [info](#).

**IENE 2020 International Conference**

Organized by the project LIFELINES. Linear Infrastructure Networks With Ecological Solutions. Évora (Portugal). April 6-9 2020. More [info](#).



**Euroasphalt & Eurobitume Congress**

The European Association of Asphalt and Pavements organize this event in Madrid (Spain). May 12-14, 2020. More [info](#).

**IUCN World Conservation Congress**

Held in Marsella (France) in June 11-19 2020. The manual "Guidance for connectivity conservation impacted by linear transportation infrastructure" is expected to be presented during the meeting. More [info](#).



**Intelligence on the move**

Organized by the International Road Transportation Unión, it will be held in Berlin (Germany). October 19-21, 2020. More [info](#).

As part of the European project COST 341 on Habitat fragmentation due to transportation infrastructure and its continuity by the Working Group actions, various resources have been created to contribute to the knowledge and mitigation of impacts of habitat fragmentation caused by transport infrastructures.

The following documents have been published:

- **COST 341. La fragmentación del hábitat en relación con las infraestructuras de transporte en España.** (Habitat fragmentation due to transportation infrastructure in Spain). Review of the state of the art, published in 2003.
- **COST 341. Wildlife and traffic. A European Handbook for Identifying Conflicts and Designing Solutions** 📄 (40 MB). Published in 2003 as a coda to Action 341, drawn up by experts from various European countries.
- **COST 341. Fauna y Tráfico. Manual europeo para la identificación de conflictos y el diseño de soluciones** 📄 (33 MB). Published in 2005; a translation of *Wildlife and Traffic*.
- Series **Documentos para la reducción de la fragmentación de hábitats causada por infraestructuras de transporte** (Documents for the reduction of habitat fragmentation caused by transport infrastructure).
  - **Nº 1. Prescripciones técnicas para el diseño de pasos de fauna y vallados perimetrales** 📄 (1,8 MB) (Technical prescriptions for the design of wildlife passages and perimeter fences). In 2008 the Catalan version was published **Prescripcions tècniques per al disseny de passos de fauna i tancaments perimetrals** by the Department of the Environment and Housing, Regional Government of Catalonia.
  - **N 1. Technical prescriptions for wildlife crossing and fence design. (Second edition, revised and expanded)** 📄 (5,5 MB). English version of the previous document. Published in 2016.
  - **Nº 2. Prescripciones técnicas para el seguimiento y evaluación de la efectividad de las medidas correctoras del efecto barrera de las infraestructuras de transporte** 📄 (2 MB) (Technical prescriptions for monitoring and evaluating the effectiveness of measures to correct the barrier effect of transport infrastructure). Published in 2008.
  - **Nº 3. Prescripciones técnicas para la reducción de la fragmentación de hábitats en las fases de planificación y trazado** 📄 (45 MB) (Technical prescriptions for the reduction of habitat fragmentation in planning and alignment phases). Published in 2010.
  - **Nº 4. Indicadores de fragmentación de hábitats causada por infraestructuras lineales de transporte** 📄 (31 MB) (Indicators of habitat fragmentation due to linear transport infrastructures). Published in 2010.
  - **Nº5. Desfragmentación de hábitats. Orientaciones para reducir los efectos de las carreteras y ferrocarriles en funcionamiento** 📄 (53 MB) (Habitat defragmentation. Guidelines to reduce the effects of operating road and railway networks). Published in 2013.
  - **Nº 6. Identificación de áreas a desfragmentar para reducir los impactos de las infraestructuras lineales de transporte en la biodiversidad** (Identification of areas to defragmentate to reduce the impacts of linear transport infrastructure on biodiversity). Published in 2014.
  - **Nº 7. Efectos de borde y efectos en el margen de las infraestructuras de transporte y atenuación de su impacto sobre la biodiversidad** 📄 (3.23MB). Publicado en 2019

For further information, see the [MITECO](#) and [IENE](#) sites.

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