POLICY BRIEF

Out of cars, onto the cycle paths: Aligning Granada's traffic infrastructure with the European Green Deal

Larissa Federmann[1], **Merle Wilhelm**[1], **Lena Strohmaier**[1], **Andrea Fiallos Rodriguez**[1], **John Middleton**[2]

[1]Department of International Health, Governance and Leadership in European Public Health Master, Faculty of Health Medicine and Life Sciences, Maastricht University, Maastricht, the Netherlands.*These authors contributed equally to this work*;

[2]Association of Schools of Public Health in the European Region.

Corresponding author: Larissa Federmann
Address: Universiteitssingel 60, 6229ER Maastricht, The Netherlands;
Email: l.federmann@student.maastrichtuniversity.nl

Abstract

If greenhouse gas emissions are not sharply reduced, air pollution, extreme weather events, and desertification in southern Spain will occur, along with many deaths, and collapses of the health system and the country's main economic sectors, agriculture, and tourism. The European Union adopted a strategy in 2019 with a series of environmental policy initiatives to protect the population from climate change hazards as 'the Green Deal'.This strategy provides funding opportunities for Granada, one of Spain's most polluted and climate change-vulnerable cities, to reduce its high emissions of harmful greenhouse gases from transport.

A spacious, well-connected, and safe cycling infrastructure is needed. New on-road cycle lanes and cycle paths with planted barriers to the car lane should be constructed. An e-bike sharing system can also enable people with special needs to cycle in the hilly city and drive tourism. Extensive participation opportunities and assessments of disparate impacts on access and health outcomes of different population groups need to be used to ensure that existing inequalities are not exacerbated.

Keywords: *Climate Change;Cycling;European Green Deal; Granada;Sustainabletransport.*

Introduction

Over the last 30 years, Europe has recorded the highest temperature increase in the world. According to the World Meteorological Organization (WMO)'s 2021 report, this increase is more than twice the global average(1). If this trend continues, the consequences of warming, such as forest fires, floods, or exceptional weather, will have negative impacts on ecosystems, the economy, and on society's health(1, 2).

The Intergovernmental Panel on Climate Change in 2022 has shown that Spain is one of the most vulnerable European countries to climate change, especially regarding water stress, wildfires, and more severe heat waves. Consequently, there is a greater risk of heat waves worse than the one in 2003, which caused around 6,500 to 8,600 deaths in Spain, and cost about 810 million euros in the agriculture sector alone (3, 4).

At the same time Spain is one of the five EU countries with the highest greenhouse gas emissions(5). Most greenhouse gases in Spain are emitted in the transport sector(6).

If greenhouse gas emissions are not reduced, Spain's health system will collapse in the coming decades and by the end of the century, southern Spain will become a desert(7, 8).

Furthermore, climate change can also lead to a decline in tourism, which will impact the Spanish economy enormously, considering it is the second most visited country in the world. Tourism constituted 11.7% of the country's GDP(9).

According to the Eurobarometer survey on mobility and transport(2020), the share of cycling in daily mobility as the main mode of transport is 8% on average in Europe(10). However, Spain has not yet reached this level, its share is 2%. In this study, electric scooters are also counted under bicycles. Thereby Spain is one of the three countries in the EU where, with over 70%, most car drivers can imagine switching to environmentally friendly modes of transport for their daily mobility(10).

Nevertheless, inter-modality, which describes movement by more than one mode of transport during a single journey, is a topical issue in most Spanish cities(10, 11). About 66% of the population support an alternative mobility policy to the one that gives priority to the car, although they are not culturally attached to cycling(10). The

latter became evident in the Barometer Report 2022 in Spain(12). Accordingly, a third of Spanish people consider the car the fastest way to move in their location. However, in comparison to other regions, more people cycle in Andalusia than the Spanish average. Furthermore, among regular cyclists, cycling is now the second most mentioned mode of transport after the car which shows its positive and potential impact(12).

Under the condition that the sustainable form of transport is less expensive than car use, students in particular can imagine driving less with their cars in the cities(10). As a university city, Granada has numerous student population and thus potentially a great willingness to change their mobility habits(13).

Through more sustainable mobility, the effects of the temperature rise due to climate change and air pollution, which affect Granada more than other cities in Spain, could be minimized. Granada is one of the three most polluted cities in Spain(14-16).The European Environment Agency estimates that 338 premature deaths in Granada in 2019, could have been prevented if the WHO air quality guidelines had been met(17, 18).Granada is located in a valley. It receives 350mm of precipitation per year, making it one of the cities with the least rainfall in Spain. This means there are few ways to remove pollutants from the atmosphere naturally(19).

As a response to climate change at a European level, in 2019, the European Commission approved a series of environmental policy initiatives: The European Green Deal. It aims to protect all living beings from climate change-related hazards. At the same time, this strategy seeks to strengthen the economy through rebalancing and creating new jobs(20).

In Granada, most of the greenhouse gases are emitted by the transport sector(19), which exacerbates the nitrogen dioxide (NO_2) levels in the atmosphere, a greenhouse gas that is highly harmful to health(17). NO_2 causes various lung and cardiovascular diseases(17, 21, 22).

Therefore, Granada's city council, Ayuntamiento de Granada, should make more efforts for a stronger reduction of greenhouse gas emissions from transport, aligning with the goal of the Green Deal's Sustainable and Smart Mobility

Strategyofreducing mobility-related greenhouse gas emissions by 90% by 2050(23).

Context

Transportin Granada

It is estimated that in Granada 79% of the population uses cars, while only 13% reach their destination by bicycle or by foot(24, 25). This is because the metropolitan street system in Granada is designed to favour motor vehicle access over other types of sustainable mobility (25). The city has only 15 km of bike lanes that are not connected and are not very functional(26).

In Granada, the Urban sustainable mobility plan was adopted in 2012, but the interventions introduced under the plan have only been partially successful(27).

The walkability of the city is high and the public transport network in the city of Granada is now excellent (25, 28). With around 97% of the population living within 240 meters of a bus stop. Besides the buses, which are partly replaced by low-emission electric buses (29), a High Capacity Line (LAC) and since 2017 a tram (Metropolitano) can also be used in Granada. The tram is considered successful due to 11 million users in the first year and an estimated annual saving of 3,234 tonnes of CO2 through 8,000 less-used vehicles in Granada every day(28, 29).

In contrast, interventions to promote cycling were just rarely implemented and showed little success(24, 30). The number of motorized private vehicles remains high, and the share of bicycles of all vehicles in transport has only increased from 4.6% to 4.9% between 2017 and 2021 (24, 26). One reason for this is insufficient funding, which has led to a limitation on low-cost interventions such as traffic signalling, safety-focused bicycle training, and traffic restriction in key areas (24, 31, 32).

The funding opportunities of the EU Green Deal should be used to close this funding gap and make cycling a more attractive option to the car.Because compared to private motor vehicles, bicycles emit virtually no CO_2 or NO_2 emissions during their operation(33).

Furthermore, there are health and economic benefits if more people use bicycles instead of private cars for urban journeys. On the

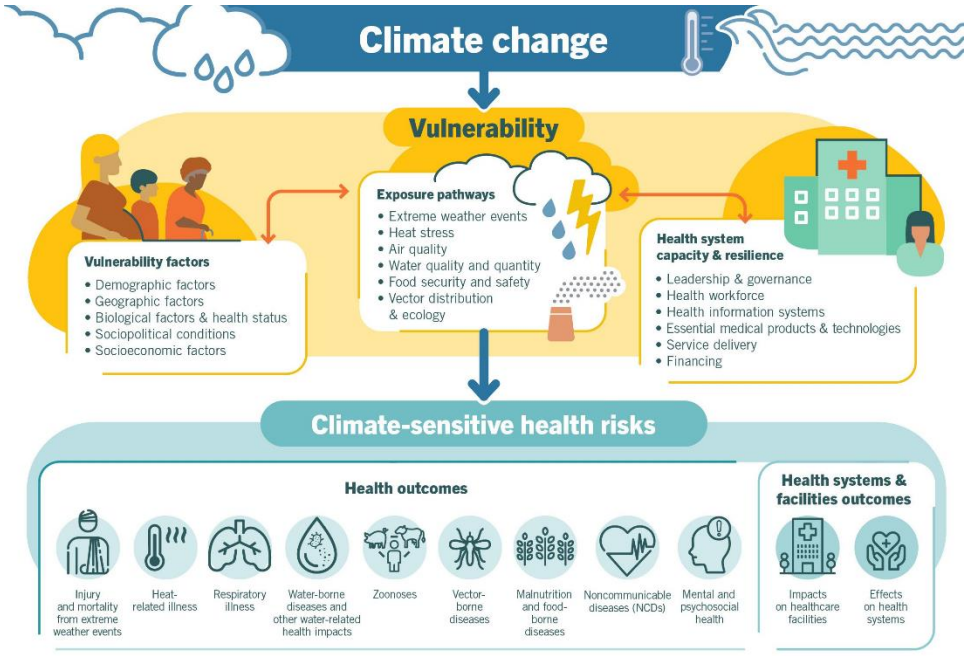
one hand, the expansion of the cycling sector will create more local jobs for lower-skilled workers than in the motorized transport sector(34). In 2021, almost 7,800 unemployed were registered with job applications in the areas of transport and communications or commerce and repairs(35). On the other hand, studies have shown that in cycling-friendly areas the economy of local shops, cafés, or other businesses can increase due to the higher frequency of visits by cyclists than by people using other means of transport.For example, the installation of protected bicycle lanes at 8th and 9th Avenues in Manhattan correlated with a 49% increase in retail sales(34).

The health benefits of switching from motorized transport to cycling are also extensive(36). Air pollution can be reduced by 2-4% for every 1% travelled by bicycle instead of motorizedvehicles(37). In addition, a meta-analysis showed that weekly cycling of 2.5h reduces mortality risk by around 10%(38). A large share of existing public health crises such as diabetes, obesity, and increasing rates of respiratory disease is exacerbated by car-centric urban design and planning (39).

Inequalities

The described adverse health effects of the climate crisis and transport infrastructure do not affect all population groups equally.Concerningthe impacts of climate change, inequalities cause disadvantaged groups to suffer disproportionately from the negative, which, in turn, leads to greater inequality(40). Because of their pre-existing multimodal inequalities, disadvantaged people are more vulnerable to damage caused by climate conditions. For example, their housing situation or reduced access to resources may leave them unable to protect themselves from environmental disasters. Ultimately, they have fewer opportunities to recover from or to cope with environmental consequences(40).Other important social determinants of healthare affecting the health of vulnerable people as a consequence of extreme metrological events according to their age, health status, and living conditions (see figure 1).

Figure 1. climate-sensitive health risks and their vulnerability factors(41)



In the city of Granada, 26% of the 230,000 residents are unemployed. Thereby, Granada has the third highest unemployment ratein Spain, and the province Granada is the third province with the lowest GDP in Spain(42). According to Bienvenido-Huertas et al., (43)Granada has a large combination of energy needs because of its variable climatic conditions and a relatively high proportion of people living in financial poverty. This is especially true given the current increase in gas and oil prices due to the Ukraine war(44).With rising gas prices, providing people with a safe and attractive alternative to driving allows more spending for recreational activities, which has a positive impact on both the health of the people and the local economy as well(39).

Thus, people from low-income neighbourhoods, which are situated mainly in the north of the capital, have a disproportionately higher mortality rate by Chronic Obstructive Pulmonary Disease (COPD) or ischemic heart disease than wealthier regions(45). Overall, in 2019, the main cause of mortality in the province was heart disease, accounting for 29% of the deaths, followed by cancer (25%) and respiratory diseases (11%) which are the diseases most related to air pollution(46).

Funding

There have been many attempts to promote bicycle use to address the presented issues, the latest one being a cycling strategy approved in 2021 with a budget of 5 million euros. However, 2 million euros will be used for road networks. Compared to other countries in Europe, Spain's budget for implementing bicycle lanes is limited(47).

Therefore, Granada's city council should use the funding opportunities of the Green Deal. A total of €1 trillion euros will be made available under the Green Deal. This funding will come from the EU's NextGenerationEU (NGEU) program and cohesion policy. As established, at least 30% to 37% (NGEU) of the money received by Member States must be invested in climate action. In addition, the InvestEUprogram stipulates that at least 30% of all public and private investments must be made under the Green Deal(48).

For achieving the goal of reducing greenhouse gas emissions from transport in Granada that are harmful to health and the environment, it is crucial to create a joint policy with the European Regional Development Fund (ERDF), which provides funds to poorer regions for connected and environmentally friendly transport infrastructure(49).

This funding provides an opportunity for Spain, one of the poorest countries in the EU, especially in Granada, a city in Spain's poorest region, Andalusia, to implement changes that will contribute to the mitigation of the climate change effects(50, 51).

Policy Options

The overall objective of the city council,Ayuntamiento de Granada, should be to transform the car-centred transport infrastructure into a cycling-centred one, align with the EU Sustainable and Smart Mobility Strategy, to address the problems described above.

As can be seen in Figure 2, there are only a few cycle lanes and paths in Granada, which are often disconnected and do not form a sufficient cycle network(28).

Figure 2.Granada's Cycling infrastructure(52)

red = cycle lane; blue = pacified lane; bright red = other municipalities;purple = cycle street

yellow = cycle-rail-bus-vmp (personal mobility vehicles); green = cycle path

However, the construction of cycle paths can significantly increase the proportion of cyclists(53). In Lisbon, for example, an extensive expansion of the cycling network in 2016 and 2017 increased the cyclists' volume by 3.5 times(54).

Considering the space constraints that are present in the historic areas of Granada, it would be suitable to use the existing car lanes for on-road bicycle lanes. The number of traffic accidents could also be reduced with this intervention. A study in North Carolina, for example, calculated a three to four times lower risk of bicycle accidents on on-road bicycle lanescompared to car lanes without bicycle lanes on the road (55). In Granada, almost 90% of the 60-70 bicycle accidents per year between 2015 and 2017 happened on roads without bicycle lanes(28). In a survey in Dublin with 1941 participants from the business sector, 56.4% stated that the implementation of connected on-road cycle lanes would encourage them to cycle to work in the future(56).

The use of cycle lanes is particularly high when there is a barrier to the car lane(57).

On roads with more space, plants could ideally be used as barriers. Indeed, vegetation along the cycle lane reduces the exposure of cyclists to air pollutants(58). In addition, plants along roadsides make cycling more attractive(59, 60).

An attractive cycling infrastructure promotes not only cycling but also e-biking. Especially people who cannot or do not want to ride a bike due to age or a hilly orography, like in Granada, use e-bikes as a climate-friendly alternative in transport(61). Due to the high initial costs of bicycles and e-bikes, it was beneficial that in 2017 the two global bike-sharing companies OFO and oBike stationed bicycles in Granada and oBike planned to expand their fleet to include e-bikes. However, both companies had major problems with vandalism and withdrew their bikes from Granada (28, 62).Nevertheless, the introduction of a new e-bike sharing system in Granada could also lead to an increase in tourist frequency at tourist locations (63, 64). There is sporadic evidence that interventions such as membership cards to accurately identify bike users can reduce the risk of vandalism (65). However, the evidence base on this is currently still insufficient, and further research is needed.

For the described infrastructural interventions to be accepted by the citizens of Granada and to address their needs, community participation is necessary.The perception of the transport infrastructure and social norms in the population, as well as the special needs of different population groups, must be identified (66). This is crucial becauseinterventions can quickly exacerbate existing inequalities. Several different methods for community participation can be used and should go beyond informing(67). In participatory processes, questions such as whether the 318 bike lots in Granada are sufficient for an expansion of the bicycle infrastructure or whether enough user-friendly charging stations for e-bikes are available, should be clarified (68). In addition, the question whether the transition from cycling to public transport is perceived as easy and comfortable in terms of multimodal transport could be also interesting to look at. Furthermore, the participants of the cycling training of the city council of Granada should be asked why the training could not increase their

cycling behaviour and how it can be improved(69).

Besides participation, it is also important to assess the impact of the interventions on different population groups in Granada. To assess how equitably distributed the expansion of the bicycle network is, the tool by Cunha and Silva(70)can be used, while a Health Impact Assessment is suitable for assessing the health impacts of the interventions(71).

Limitations

One of the limitations of the presented policy brief, is that the authors based their knowledge on published data and scientific surveys and therefore could not form a picture of the reality in Granada. Furthermore, the culture on cyclingisdifferent, which complicates possible reflections. The culture could also make it difficult to change people's attitudes towards cycling and encourage more people to use bicycles as a mode of transportation(10). In addition, cycling culture and infrastructure are constantly evolving and changing, thus it is important to check the most recent information available. It depends on various factors and is difficult to gather in a snapshot. At last, the proposed intervention must consider that the changes are not appropriate for all people. For example, blind people or people with no mobility capacity are more likely to still not be able to make their own mobility choices.

Conclusion

Harmful greenhouse gas emissions from motorizedtraffic are particularly damaging to the economy, environment, and health of the population in Spain and especially Granada.

Granada's city council should improve the cycling infrastructure. In narrow areas, there should be on-road cycle lanes, and in more spacious areas cycle paths with planted barriers to the car lane. It should be clarified how an e-bike sharing system can be set up that is safe from vandalism. Furthermore, the needs of the population should be included in the intervention planning and the impact of the interventions on different population groups should be analysed.

Conflicts of interest

None declared

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