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# Decarbonisation of the Public Transport Sector in Tirana.

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## Summary

The transport sector is one of the main contributors of air pollution, accounting for 25% of gas emissions in the European Union (EU). In Tirana, Albania, the transport sector plays a big role in pollution concentrations, affecting public health. Compared to other countries, the heavy industry and energy sectors in Albania are barely significant in terms of their environmental footprint, thus making the transport sector one of the main contributors to greenhouse gas (GHG) emissions.

To achieve significant cuts in emissions, and in line with the Paris Agreement's (PA) long-term goal, the decarbonisation of the transport sector is seen as a key priority in the international policy arena (New Climate Institute, Ecofys, Climate Analytics, 2016). All transport modes should contribute to the decarbonisation of the mobility system (European Commission, 2018). Transport accounts for 33% of energy consumption and 64.5% of oil consumption in the EU. In Albania, according to the National Agency of Natural Resources (NANR), the transport sector (primarily road transport) consumes 47% of the total domestic production of crude oil. Such a comparison is made to recognise the fact that Albania exports most of the crude oil extracted domestically and does not directly supply internal markets (especially the transport sector) due to poor refinery technologies. Tirana plays an important role in this respect, as there are more than 255,000 private vehicles (including private cars and light and heavy-duty vehicles), and at least 305 public transport buses.

This article addresses the decarbonisation of public transport sector as one of the ways to influence mobility policies at a local level. Taking into consideration evidence-based information on Tirana's air pollution and estimated emissions from the sector, the article also offers policy orientations for the Municipality of Tirana, aimed at promoting a climate neutral path for the public transport sector.

**Keywords:** Public Transport, Air Pollution, Climate Change, Mobility, Decarbonisation

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## Introduction

The technologies of the 21st century have diversified the means to obtain and produce energy. However, there is still a high dependence on fossil fuels. Nowadays, the $CO^2$ concentration in the atmosphere is around 555 ppm, and is expected to increase to between 750 and 1300 ppm by 2100 (IPCC, 2014). This will cause the global average temperature to rise between 2.2 and 3.7°C above the pre-industrial period (ibid.). Between 2030 and 2052, global warming is expected to reach the critical point of 1.5°C higher than the average global temperature recorded before the pre-industrial period. It is crucial to limit the rise of global temperature to this point, in order to prevent irreversible impacts on the earth's ecosystems. This threat was also stated by the members of *Talanoa Dialogue*[1] during the Conference of Parties (COP-24) event in Katowice, confirming that the next generation will face a climate emergency at a global scale without a transitional period or adaptation options.

Decarbonising the transport sector is crucial for the transition into a low-carbon society in line with the Paris Agreement (PA) and the long-term goal on stabilizing the average temperature up to 1.5°C (Rogelj & Luderer, 2015). Between 2007 and 2009, the urban population surpassed the rural for the first time in history, thus putting more pressure on urban areas in terms of infrastructure and services. Consequently, the increased transport demand resulted in a trajectory of $CO_2$ emissions expanding its footprint on a global scale. In order to mitigate such impacts, various studies and initiatives have been carried out, including the report of the International Transportation Forum (ITF) in 2018 titled, 'Policy Priorities for Decarbonising Urban Passenger Transport'. ITF acts as a technical and policy platform for its 59 members, including Albania. Through its policy recommendations, ITF has adequately imposed a pathway to a climate-neutral sector and orients strategic investments to facilitate the transition. The ITF report takes an inclusive approach towards the measures foreseen to be implemented on a large-scale by the Paris Agreement and the EU 2050 *Strategy for Going Climate Neutral*. The document takes into consideration technological burdens, economic implications, and three typologies of country profiles (high, medium, and low income). The final global aim is to completely phase out the usage of fossil fuels in the transport sector by 2050.

According to data from the Institute of Public Health (IPH) in Albania, the transport sector is negatively impacting the quality of life in large to medium cities such as Tiranë, Durrës, and Vlorë. Urban areas are experiencing enormous pressure from air pollution and increased heat, leading to psychological effects on the population and permanent disturbance from noise pollution (Instituti i Shëndetit Publik, 2014). Albania has also been attempting to adopt a strategy and legal framework in response to the ratification of the PA and the Kyoto Protocol. However, not enough progress has been recorded in terms of implementation, and it seems that no dedicated mitigation is taking place (European Commission, 2019). The EU Progress Report for Albania (2019), the National Transport Plan of Albania, the General Local Territorial Plan of Tirana, and Tirana's 2018-2022 Sustainable Development Strategy (SDS) all highlight that the three most pressing urban transport challenges in Tirana are: accidents and safety issues, inadequate public transport services, and a low accessibility rate to basic public services.

Recently, another document, the Green City Action Plan of Tirana, has tried to offer solutions for the above-mentioned problems. Yet, this document indicates that it is too early to initiate the discussion on decarbonising the public transport sector, as there are more urgent matters to be addressed such as: congestion, the improvement of the public transport service quality, and the diversification of transport

modes. It is clear that transport, urban, and environmental planners involved in the preparation of the above-mentioned documents did not necessarily seek to orient the public transportation sector towards climate neutrality that would have contributed to the incremental decrease of transport emissions rates, known as the decarbonisation path. Considering the general context, there might be two main reasons why a decarbonisation path is not clearly elaborated. The first reason is the absence of air quality monitoring and scientific benchmarking for the public transport sector in terms of pollution load on a yearly basis. Secondly, it is due to the low priority being assigned to the environmental sector at an institutional level, reflected in budget allocations; for instance, the 2019 national budget allocated for the environment was only 0.5% of all year-round state incomes (EkoLëvizja, 2018).

In this context, the aim of this article is to discuss the impact of the public transportation sector and possible pathways for its decarbonisation, making use of Tirana as a case study. Considering that an indicative baseline study on the actual urban passenger transport for Tirana has not yet been carried out, we are interested in understanding public transportation's footprint on the urban environment, making use of alternative sources of information.

The analytical approach comprises: local policy; institutional and technical analyses of the existing situation of the public transportation sector in Tirana; the classification of each bus of the urban fleet into Euro II-III-IV-V-VI ; the calculation of the year round emissions of $PM_{10}$[3], $CO_4$, $CO_2$[5], NOx[6], and HC[7] from each bus, referring to results from articles, studies, and the Directive 70/220/EC, Regulation 715/2007; and the costing of the emissions footprint, referring to the Australian and New Zealand Emission Trading Register.[8] A GIS tool is used to calculate the average distance that each bus travels to complete a full trip. Finally, in terms of the total number of working days per bus, a tolerance margin of 9.5% is used, since each bus has 35 days-off per year due to mechanical services.

## International Policies and Actions Addressing Emissions by the Transport Sector

The Paris Agreement has been translated into concrete actions (legal measures and investments), with the EU leading the way on a global scale. Specifically, European Parliament on Transport and Tourism (TRAN) and Environmental Committee of the European Parliament (EVI) have recommended a mandate of 100% Electric Vehicles (EVs) for new European car sales, potentially allowing the EV to significantly penetrate the market and offer an alternative for economic and job sustainability across Europe (International Transport Forum, 2018). In November 2018, the European Commission presented the EU 2050 long-term vision for a prosperous, modern, competitive, and climate neutral economy emphasising (among other key topics) the importance of orienting the transport sector towards zero-emissions:

"With 75% of our population living in urban areas, city planning, safe cycling and walking paths, clean local public transport, the introduction of new delivery technologies such as drones, and mobility as a service, including the advent of car and bike sharing services, will alter mobility. Combined with the transition to carbon-free transport technologies, reducing air pollution, noise and accidents, this will result in large improvements in the quality of urban living". (European Commission, 2018, p. 11)

In order to achieve the long-term goal of maintaining global warming below 1.5°C, the European Commission (EC) adopted the new $CO_2$ standards for cars and vans as part of the Mobility Package, as well as introduced them on trucks and heavy-duty vehicles for the first time. Additionally, in 2017 the EC launched the 'European

Battery Alliance' among all key industrial stakeholders, Member States, banks, and research institutes. Their main aim is to unlock synergies for a competitive, safe, sustainable, and totally recyclable battery industry, which addresses car batteries and the storage of renewable energy. The EU will deploy a fund of up to €4 billion into clean vehicles, public transport accessibility, recharging stations, etc. Finally, the EU revised the public procurement rules to orient all authorities, make it easier to purchase EV, and promote clean mobility (ibid.). Referring to the EU Directive 2018/2001 on the promotion and usage of energy from renewable sources, each member state should ensure that 37% of the gross final energy consumption sources comes from renewable energy. This share should proportionally affect each consuming sector.

## The Albanian Approach to Mitigate Climate Change Impact from the Transport Sector

Even though some Climate Change (CC) impacts are already being felt in Albania, the country is still in an early stage in terms of adoption, prevention, and implementation of mitigation measures (Gjoka et al., 2018). The overall resilience of the country is jeopardized by various factors such as: the apathy of central government institutions and agencies[9] in acknowledging the presence of climate change; poor monitoring and recording of leakages and emissions from any sector, (conducted by NEA and IPH as competent authorities) leading to an uninformed public-opinion as the public is not provided with evidence-based analyses on the subject matter; and last, but not least, central government authorities such as Civil Emergencies and especially the Ministry of Tourism and Environment continue to address climate-related emergencies on an ad-hoc basis (Duro, 2015). Although Albania has transposed 75% of the CAFE[10] EU programme into national legislation, implementation in terms of monitoring, control, and reporting stands at nearly 5% (according to the latest findings from SANE).[11] Referring to the transport sector, "Albania aims to increase the share of renewable combustion fuels up to 7% of the gross annual fuel consumption" (GoA, 2018, p. 32-34), which is higher than the 3% reported for 2017 and considered as a baseline share of consumption for the sector. However, electrification of public transport, even partially, is quite difficult to achieve, mainly due to financial implications and the required technical expertise. However, there are specific responsibilities and obligations for local governments to initiate planning for air quality management according to the Law no.162/2014 'On the Protection of Air Quality'. In addition, there is a great potential to reduce transport emissions by 11.5%, if appropriate measures are taken to embrace the EU Urban Agenda approach and integrate renewable energies into the mobility sector.

In November 2016, Albania adopted the National Transport Strategy and Action Plan and, in 2019, the National Plan for Air Quality Management through the Decision of Council of Ministers (DCM) No. 412, dated June 19, 2019 (GoA, 2019). Both national plans offer synergies and intend to deliver common measures in reducing the environmental impact from the public transport sector in urban areas. These plans also state that in order to mitigate air pollution resulting from public transport, all municipalities should develop Local Air Quality Management Plans (LAQMP) and Local Sustainable Transport Plans (LSTP). This would enable them to promote low carbon emitting systems and ensure a transitional phase-out of the actual public transportation fleet with new EV or Low Emitting Vehicles with combustion ignition engines that meet the Euro VI emission standards.

Currently only the Municipality of Shkodra, has initiated a process of preparing both an LAQMP and an LSTP. The Municipality

of Tirana has adopted an integrated approach to dealing with issues of air and transportation by preparing and approving a Green City Action Plan (GCAP), financed by the European Bank for Reconstruction and Development (EBRD) and the SDS in 2018. Both the GCAP and the SDS acknowledge that the concentration of $PM_{10}$, $PM_{2.5}$, and $CO_2$ in Tirana exceeds the daily exposure compared to national and EU standards, at 44%. The main pollution sources are ranked as follows: transport, low fuel quality, uncontrolled waste burning, and construction activities (Municipality of Tirana, 2018a).

Tirana aims to transform its transport systems to achieve sustainable mobility by focusing on public transport, cycling, and smart transport solutions (Municipality of Tirana, 2018b). However, the SDS does not address the EU trend on paving a decarbonisation path for the transport sector at large, or for Urban Passenger Transport specifically. It may potentially lead toward decarbonisation through smart transport solutions, but there is no indication of any specific goal for the reduction of emissions from the public transport fleet. As previously mentioned, it is common for dynamically growing cities, such as Tirana, to address congestion, transport modes, and safety, and not include measures on lowering vehicles' emissions or set targets for a climate neutral sector (International Transport Forum, 2018).

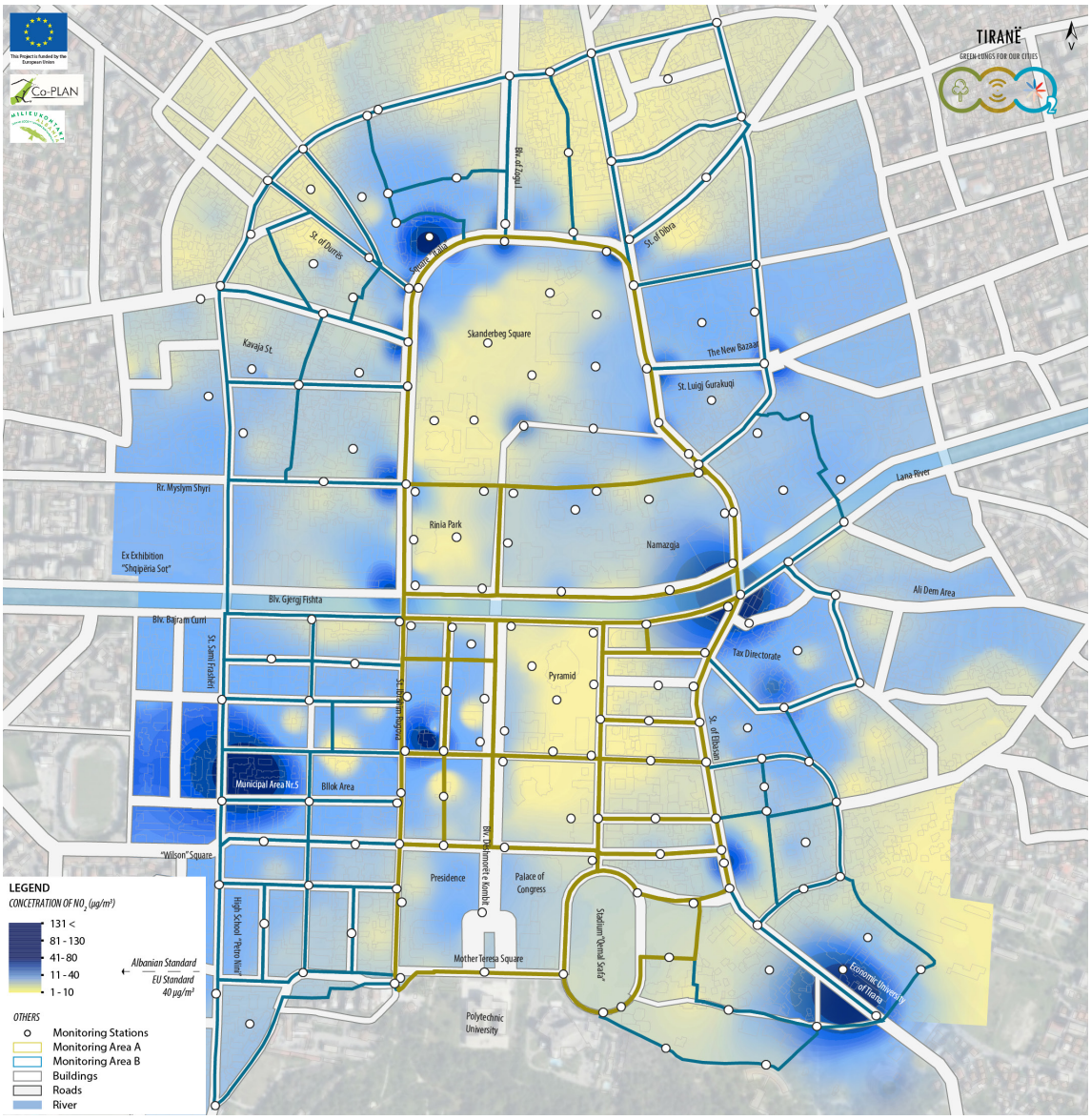
Additionally, the Municipality of Tirana has recently kick-started the process for the development of the Sustainable Urban Mobility Plan (SUMP) funded by the German Ministry for Economic Cooperation and Development, and implemented by GIZ.[12] The SUMP is assumed to be a step towards the improvement of the city's carbon footprint, where properly planned mobility can contribute to a decrease in traffic jams and improved flow of motorized transport. It should be acknowledged that nowadays, the local administration has been making a substantial effort towards creating a network of more than 30 km of dedicated cycling lanes, and more than 25 km of dedicated bus/taxi and emergency lanes on the urban road network of Tirana (Municipality of Tirana, 2018a). In order to assess the impact of these infrastructural improvements on the social behaviour and usage rate of bicycles in Tirana, GDi[13]-Albania is providing real time data through a monitoring process that detects cyclers from the existing street through Closed Circuit Television (CCTV). Preliminary figures indicate that there seems to be a slight increase in bicycle users and a slight decrease in urban cycling accidents (Daci, 2019).

Cycling in Tirana has become safer as long as the dedicated lanes are used. However, the introduction of bike lanes has a cost that goes beyond that of building the lanes. Their construction happened on previously pedestrian and parking space along the road network, therefore reducing the mobility space for pedestrians, and further increasing the demand for parking. The bike lane network has not led to a decrease in the use of private cars (ACP, 2018), nor has the new parking system[14] applied by the municipality in the last two years solved parking & traffic congestion. Hence, in a city with 175,000 private cars (ibid.), there are more than 6,000 physical public parking lots along the road sections and 14 public parking spaces that have a total capacity of 1,132 lots (Municipality of Tirana, 2018a). As a consequence, only 5% of the private fleet has access to public parking, while everyone else either has a private parking lot, or occupies public spaces in particular those within Tirana's neighbourhoods. Such mobility dynamics have diminished the comfort and attractiveness of walking and cycling, not only along the main streets, but also within neighbourhoods.

Walkability and cycling in Tirana is also conditioned by a combination of urban air pollution, noise exposure, lack of urban green areas, and numerous construction sites. Accompanying the process of increased mobility for cars/buses and

bicycles, walking in the city has been marginalised in Tirana, due to the exposure of pedestrians to environmental and safety risks. Furthermore, the Municipality of Tirana often claims that it supports the idea of the compact city, and as a result, it promotes city densification and infill development. Most of the land development that happened as a part of infill in the urban core from 2017 to 2019 caused the loss of 30 ha of public green areas (Green Lungs, 2019). This reduction and infill development lead to higher concentrations of pollutants in the air, reducing city breathability, and therefore walkability. This is also confirmed by the measurements of $NO_2$ concentration, conducted in the framework of the Green Lungs project in Tirana city centre and presented in Figure 1.

**Figure 1.** Nitrogen Dioxide concentration heat map in Tirana city centre.




**Source:** Green Lungs (2019) – experts' calculation on the pollution load from the public transport fleet

On the eve of 2020, Tirana is ranked first among European capitals with the most polluted air (NUMBEO, 2019). This demonstrates again that improving mobility in the city is a complex task, which should be addressed at various levels of planning and management and for all users.

## Pollution Load from Public Transport Sector

The public transport service in Tirana is delivered through contracts between the municipality and private operators. The fleet is comprised of a variety of vehicles (fuel combustion engines). There are no alternatives such as trains, metro, or electric or hydrogen vehicles for public transport. This sector actually contributes significantly to air and noise pollution in urban areas. The combustion process leads to high emissions as a result of the combination of poorly refined local fuel and the age of the fleet. The fuel marketed in Albania is of poor quality (Supreme State Audit, 2015) and is expensive compared to most other countries in the region (Autotraveler, 2019). The Albanian government has imposed one of the most aggressive tax regimes on fuel in the region, where 60% of the final price for one litre of fuel is taxes[15]. Yet, there have not been any improvements regarding fuel quality or monitoring and marking practices (Kondi, 2019). Furthermore, the fleet of public transport vehicles is between 13 and 14 years old.

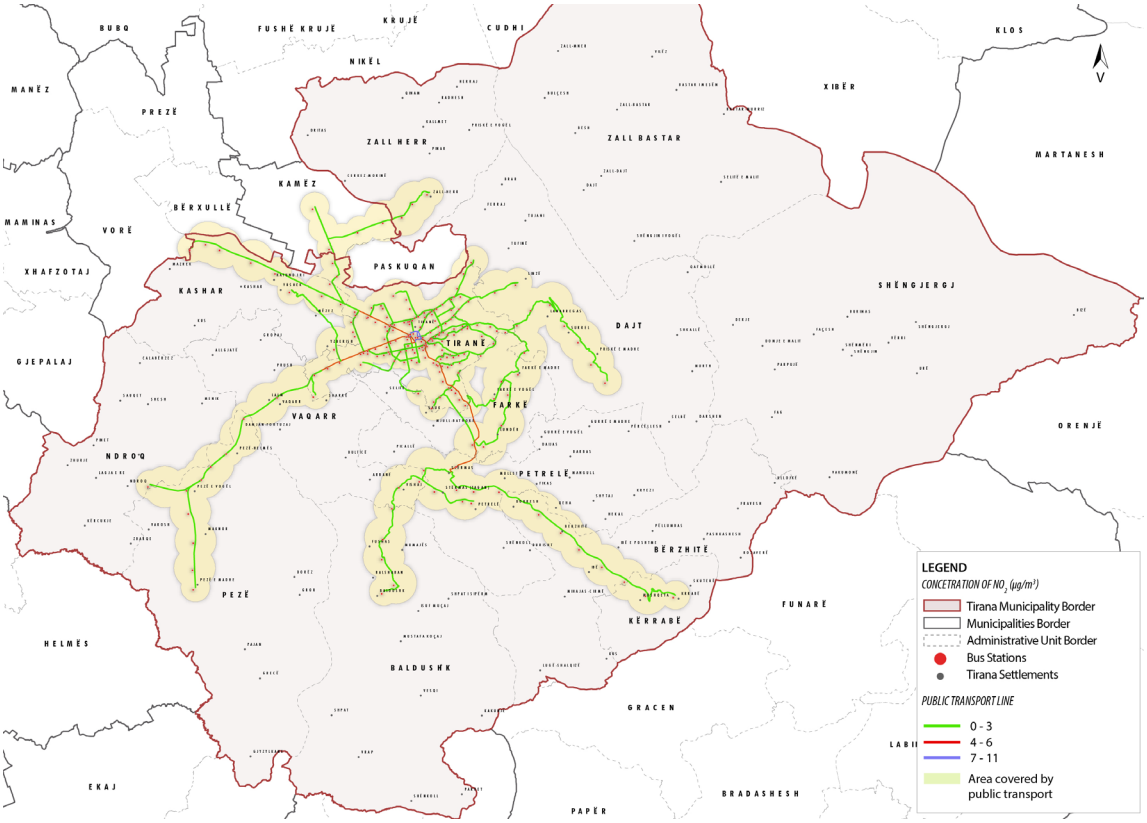
Given that the national annual fuel consumption from the transport sector during 2017 was around 828 ktoe[16] (NANR, 2018), one could calculate that fuel traders have contributed to the state budget with around 20 million Euro coming from the carbon tax applied on the final product price. This is approximately the same amount that the central government allocated to the Ministry of Tourism and Environment for implementing various programs and projects to mitigate environmental issues arising from all sectors during 2019.[17] Nevertheless, this amount is neither sufficient for covering investments to enhance air quality in urban areas, nor to fund the monitoring of air emissions from the industry and transport sectors. It is the fourth consecutive year that the Albania's Environmental Status Report (ESR) (prepared by the ministry responsible for the environment) does not indicate any concrete figure related to air quality, due to the lack of monitoring practices being implemented on site. A lack of monitoring and public information on ambient air quality and, most importantly, on annual emissions from industry and transportation are a direct result of poor budget planning and a lack of human resources to maintain and operate a national laboratory. As a result, not only should there have been policy improvements in terms of controlling and decreasing emissions from the transport sector, but specific targets should have been outlined to phase out large emitting vehicles from the public transport fleet at the local and regional level. Currently, the only monitoring practices officially acknowledged by the municipality were conducted through the private sponsorship of Vodafone Albania in four crucial monitoring stations in Tirana.

According to the GCAP and SDS, more than 18.5 million passengers use public transport within the territory of the Municipality of Tirana each year. There are eight registered private operators that apply a tariff of 40 Lek/person, regardless of the travelled distance, as long as there is no line changing. There are more or less 280 bus stations situated along the served axes.

In order to calculate the pollution load from public transportation, the following data and sources were used. Statistic in Tirana's SDS indicate that 36% of residents are active users of public transport; 27% use their own private cars; and the rest are classified as using alternatives, such as bicycle, motorcycle, and walking (Municipality of Tirana, 2018a). Rural areas, accounting for approximately 17,000 inhabitants, do not have access to such services (ibid.). The actual public transport fleet consists of 305 buses, out of which only 65 buses comply with Euro-V/VI standards on combustion emissions. According to data provided by the Municipality of Tirana, the combined public transport capacity (seats and standing volume) is 30,365 passengers, with only 31% of this capacity consisting

of actual seats. The estimated daily volume is considered to be around 55,000-62,000 passengers (ibid.). For this analysis, 16 lines and 305 buses currently operating in Tirana were taken into consideration.

**Figure 3.** Public transport coverage area in Tirana Municipality



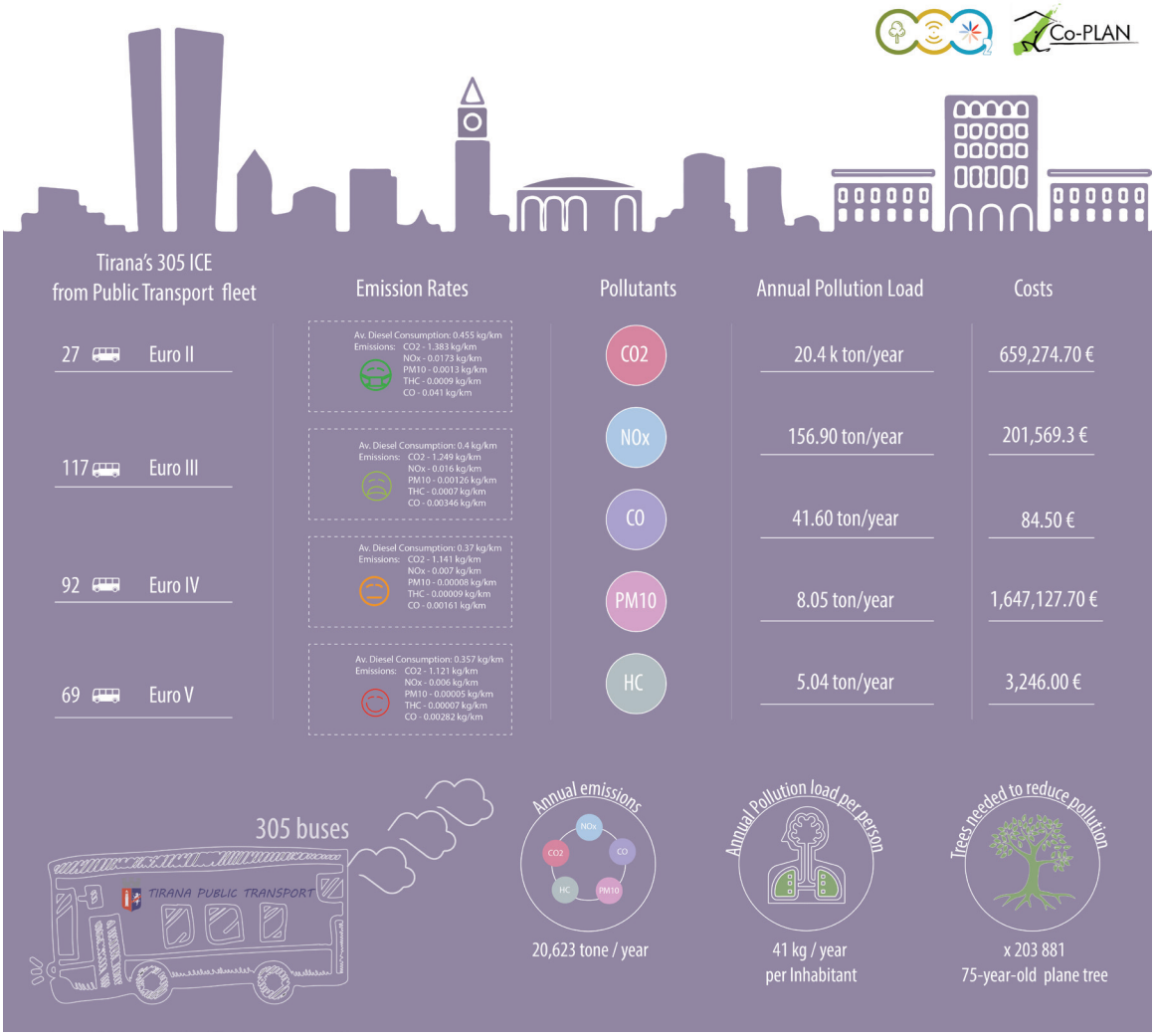

**Source:** Co-PLAN (2018) - geographical analysis of public transport accessibility in Tirana

The whole fleet of Tirana's public transport works on Ignition Combustion Engines (ICE) and diesel fuel is used on the 305 buses. According to calculations, the $CO_2$ per litre of diesel burned in open air is 2,640 grams.[18] Standards for Euro II-III-IV-V-VI indicate the level of filtering and processing of particulates that is created as a result of this chemical process. The higher the Euro standard classification the lower the carbon dioxide emissions from the ICE exhaust unit. Complementary data regarding the vehicle type, mark, first year registration, engine power fuel type, and daily cycles were provided officially by the Municipality of Tirana.

Through GIS analysis, route distances were identified and the fuel consumption for each of the buses was calculated. Referring to the Directive 70/220/EC and Regulation 715/2007, the fuel consumption rates (in l/km) and the emission rates for PM10, CO, CO2, NOx, and HC (gram/km) are calculated for an average speed of 20-45km/hrs. The amortization factor of the ICE is not considered since this current analysis intends to provide indicative results rather than a thorough breakdown for each vehicle.

Initially, a classification of each bus is made according to the emission category it falls under, given technical specifications as provided by the municipality. Then, specific routes of each bus were calculated to find the exact number of kilometres travelled per bus. Finally, the overall fuel consumption for each bus was calculated, referring to their ICE Euro category and specific emissions in terms of $PM_{10}$, CO, $CO_2$, NOx, and HC per annum.

**Figure 4.** Pollution results from public transport fleet




**Source:** Co-Plan (2019) – experts' calculation on the pollution load from the public transport fleet

Once the calculations were adapted to reflect a yearly summary of each pollutant component, the Australian and New Zealand's Emission Trading Register was referenced with regard to the actual costs at which these pollutants are being traded on global markets. If Albania were to adhere to the EU, this sector alone from the Tirana Municipality would cost 2.5 million Euro, taken from the national state budget as a tax on the overall contribution to emissions in the atmosphere.

To conclude, this analysis on emissions sourcing from the public transport fleet of Tirana Municipality indicates that **this sector generates around 21 kt of pollutants per year.** If the problem was to be solved through a natural solution, such as through trees that could absorb most of the pollutants, Tirana would need around 203,881 *platanus trees* of at least 75 years old within the city centre to mitigate the pollution load from $CO_2$ and $PM_{10}$.

If the age of the public transport vehicles and amortization factor were taken into consideration, the amount of pollutants could potentially increase to up to 141 kt. For example, a direct monitoring practice was conducted to identify the pollution load emitted from two typical busses falling under the Euro-IV category. This monitoring showed that the age factor contributes to an increase of about 67% of total emissions of $PM_{10}$, $CO_2$, and NOx compared to the

Euro-IV baseline. The monitoring was done by placing an AeroQual Series500 monitor at a bus-station near the area '21-Dhjetori'.[20] However, as mentioned above, the age and amortization factor is excluded from the overall calculation of emissions for the purpose of this article.

## Conclusions and Recommendations

This article aimed to provide an overview of the current status of pollution from public transport in the Municipality of Tirana, focused on the pressing need for decarbonisation, and on policies that could potentially deal with the issue. Public transportation has become a priority issue for the Municipality of Tirana in the last four years, focusing primarily on managing congestion and introducing bike lanes. On a policy level, the municipality has addressed public transportation through its GCAP and SDS. Yet, decarbonisation is not addressed in these documents, nor is it presented as a concept.

The state of public transportation currently indicates a lack of environmental sustainability and a low quality of service delivery. There has also been a lack of institutional response towards the implementation of legal commitments in terms of emission standards. The absence of state emission inspections and a clear roadmap for the sector's decarbonisation actions has created conditions in which private operators do not feel obliged to decrease emissions, nor to increase standards and the quality of their service. This is also due to the fact that emissions are not currently being monitored and reported.

Following a technical evaluation of the pollution load emitted by the public transport sector in Tirana, findings indicate that each of the inhabitants in the urban area of the city carries a personal load composed of $PM_{10}$, HC, NOx, and $CO_2$ up to 42.3 kg/year per person. This quantity accounts for the emissions of only 305 busses in the public transport fleet, assuming that all of the busses meet the respective ICE-Euro emission standards. However, there is also the issue of the age of the fleet, which could potentially increase this value to 70.64 kg/year per person, or by approximately 67%. According to year-round air quality monitoring conducted in Tirana, the average concentration of NO2 is two times higher than the allowed EU and national standard of 40µg/m3 (GreenLungs, 2019). The situation would be further aggravated if all public service vehicles and private vehicles were considered.

In this context, improvements are needed and a number of policy recommendations could be proposed. To begin with, since $CO_2$ emissions depend on fuel properties (regulated by the central government), national policies and interventions are needed to monitor fuel quality and regulate the import of vehicles to meet Euro V standards or above. However, in order to lead towards full decarbonisation, significant efforts should be made to improve the public transport sector in particular. This means that in addition to improving the fuel and technological features of the ICE bus fleet, the Municipality of Tirana should also introduce a strategy and actions for electric mobility as an alternative. There is a very good opportunity to do so with the Sustainable Urban Mobility Plan, which is currently being prepared. This effort should be supported on a national scale through a policy framework and dedicated financial resources. As Albanian transport technologies are in an embryonic stage and public transport infrastructures are far from developed, there is a good opportunity to leapfrog towards the most recent technologies and mobility systems, particularly electric vehicles and systems for public transportation. This, combined with public-private partnerships, could lead towards decarbonisation and an improved quality of service.

However, the decarbonisation of public transportation can also be achieved through indirect means, such as urban

planning and environmental management. This would improve and increase public spaces and walkability, safety and environmental conditions for pedestrians, and efficient parking spaces. Together with an improvement in the quality of public transportation, this would also reduce the use of private vehicles for mobility. More green spaces, larger pathways for pedestrians, and a fully functioning clean-technology public transportation are imperative, as citizens will not voluntarily expose themselves to polluted air and high noise levels.

Nevertheless, financial implications are relatively high for a municipality to implement the full decarbonisation of its public transportation fleet. Securing funds remains a challenge and the municipality should be more proactive in accessing various sources. As a first step, the municipality should set a clear objective for the full decarbonisation of the transport fleet within the SUMP while integrating financial implications into its budget planning. The municipality should also assess its current contracts and draw up an action plan to amend them or call for new service providers to make sure that decarbonisation goals are achieved. To meet the EU Directive 2018/2001, Tirana's public vehicles fleet should replace at least 14% of its final fuel consumption with EVs powered by renewable sources or engines that operate with biofuels by 2030, as per the commitment made by the GCAP and SDS documents.

## Notes

1. Talanoa is a concept from Pacific countries based on the idea that story-telling leads to consensus building and decision making. It was introduced by the Republic of Fiji during the COP23 proceedings.
2. European emission standard classification: define the acceptable limits for exhaust emissions for any vehicle sold within the European Union and European Economic Area. Emission classifications 'Euro' are defined in a series of EU directives introducing an increasingly stringent emission standard.
3. Particular Matter of 10 microns in diameter
4. Carbon Monoxide
5. Carbon Dioxide
6. Oxides of Nitrogen
7. Hydro Carbon residuals
8. The Australian and NZ emission trading system is pioneering the polluter pay principle for light duty vehicles; thus, it introduces cost calculations per each pollution element based on the prices set for the global emission trading system.
9. The Ministry of Tourism and Environment, Ministry of Infrastructure and Energy, National Environmental Agency, Institute of Public Health, Environmental Inspectorate, Water Agency, etc.
10. The Clean Air for Europe programme was established to support the European Commission in implementing the strategy on air pollution based on the Directive on Ambient Air Quality.
11. Screening Albanian National Environmental Legislation for preparation of EU negotiations on Chapter 27
12. The GIZ funding is provided under the SUMSEEC II project supporting cities in Southeast Europe (SEE) to develop energy efficient, sustainable mobility solutions.
13. Private Company focused on providing solutions for resource management, energy, environment, security, safety, etc. Link: https://gdi.net/
14. Tirana Parking is a public agency created by Tirana Municipality to administer and maintain public parking, above-ground and underground, as well as related infrastructure and investments. http://tiranaparking.al/
15. A brief breakdown of taxes included in the final fuel price consists on: 37 Lekë/litre excise tax, 35 Lekë/litre VAT, 27

Lekë/litre infrastructure tax, 3 Lekë/litre carbon tax, 3 Lekë/litre licensing tax, and 1 Lekë/litre marking and scanning tax.

16. ktoe – Kilo ton of oil equivalent 1ktoe = 1000 ton of fuel.
17. The budget for the Ministry of Tourism and Environment approved in 2019 is 2.6 billion Lekë. http://www.scan-tv.com/buxheti-per-turizmin-e-mjedisin-2-6-mld-leke-per-2019-me-shume-fonde-per-pyjet/
18. Basic chemistry behind emission calculations dictates that 1 litre of diesel weighs 835 grams. Diesel consists of 86.2% of carbon, or 720 grams of carbon per litre of diesel. In order to combust this carbon to CO2, 1,920 grams of oxygen is needed. The sum is then 720 + 1,920 = 2,640 grams of CO2/litre of burned diesel. This is if the burning reaction was to happen in normal testing conditions (open air and temperature of 25 degrees Celsius).
19. Technical data-sheet of AeroQual Series 500 monitoring equipment https://www.aeroqual.com/product/series-500-portable-air-pollution-monitor.
20. Air monitoring conducted under the supervision and guidance of 'Green Lungs for Our Cities', implemented by Co-PLAN Institute for Habitat Development and Milieukontakt Albania. The purpose of the project is, among others, to enable alternative monitoring processes and data sources in regard to air pollution, noise and greenery in urban areas.

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