Accelerating the decarbonisation of car fleets through secondhand trade

Executive **Summary**

At OLX, we are building a more sustainable world through trade. We operate global marketplaces that facilitate the trade of goods and services to hundreds of millions of people every month across five continents. The trading of second hand cars through platforms like OLX brings liquidity to the car market: owners can more easily trade in their cars and find replacements as there is more transparency in the market. This transparency of value leads to the prolonging of the economic life of cars, and thereby reduces the need for new materials.

However, next to the material use of cars, vehicles have a broader footprint to consider. OLX set out to understand the full lifecycle of secondhand cars, to better understand the impact on vehicle greenhouse gas emissions. Two bodies of research were fielded to understand this impact within the Indian market. This paper outlines the main insight that second hand car trade can potentially be a positive catalyst to a low carbon future.

Transport & Decarbonisation

Globally, transportation is the second largest source of greenhouse gas (GHG) emissions[1]and 45% of these emissions come from passenger transport. Vehicles are a significant source of greenhouse gas emissions, due to the burning of fossil fuels in their combustion engines. Our first body of research shows that on average, 86% of the emissions over the lifetime of an average Indian car, are emitted during the combustion of the car and production of the fuel, in contrast to just 14% during the manufacturing and disposal of the car.

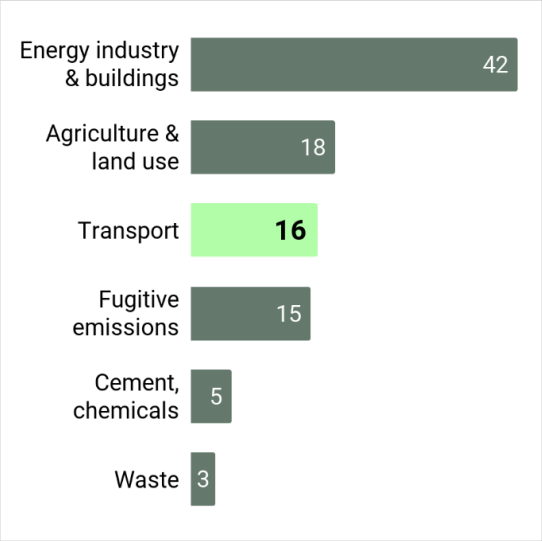


Figure 1: *Global GHG emissions, split by sector.*

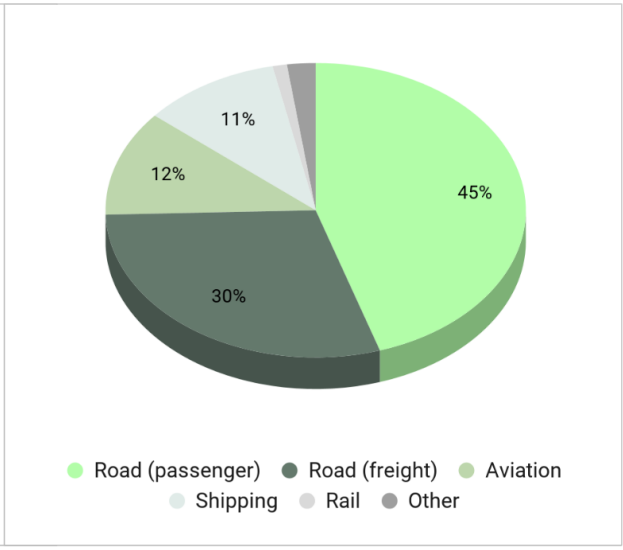
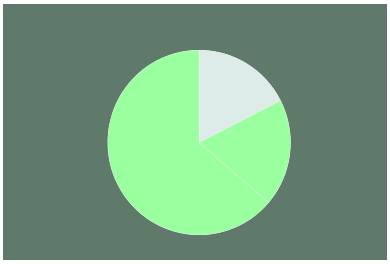


Figure 2: *Global transport GHG emissions, split by type of transport*

Over the last years, technological developments, guided by emissions regulations, have significantly reduced the emissions per driven car-kilometre. For some car brands, this reduction amounts to 38 % in two decades. This gives a clear environmental incentive to replace an older car with a more fuel-efficient one, even if it is a used car.

[1] Climatewatch, 2021.

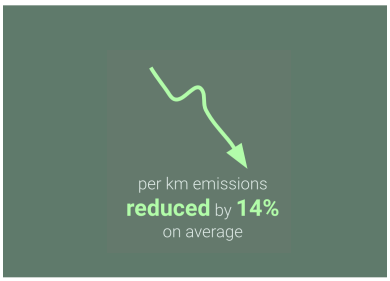
Our primary consumer research in India has shown that 71% of interviewed people that bought a secondhand car, switched to a car with lower emissions per driven kilometre. Platforms like OLX Autos offer consumers the necessary convenience, transparency and trust to trade in an older car[2]. Consequently, the trade in secondhand cars can significantly help reduce carbon emissions from car use, as consumers upgrade to newer car models.



LCA research identified that emissions from fuel production and combustion in the use-phase (86%) emits significantly more carbon than the car's production and disposal (14%).

Average fleet emissions can be reduced if there are more cars within the fleet with lower emissions per kilometer driven.

Primary consumer research yielded an insight that 71 out of every 100 times an Indian consumer buys and sells their car, they upgrade to a less carbon intensive vehicle.



The research also showed that this trade to less carbon intensive cars resulted in a 14% reduction of combustion emissions per kilometre, on average.

The more secondhand cars circulate, the faster the carbon intensity of the fleet drops.

Opportunities

The research shows that second hand car trade helps speed up the adoption of more fuel-efficient vehicles. The more secondhand cars circulate, the faster the carbon intensity of the fleet drops. This offers a **starting point** that shows the potential of second hand car trade for building a sustainable economy.

Further opportunities lie in exploring how to more actively stimulate the users of second hand car trading platforms to switch to more fuel efficient vehicles. Finding ways to bring incentives to upcycle their cars can further accelerate the process. For example, tax incentives, public health campaigns, or rewards for trading up from low to high efficiency vehicles could inspire more Indians to trade up sooner than they might without such nudges.

We welcome and invite all organisations to contribute to our efforts. We believe that collaboration with public agencies, NGOs, and private entities can further accelerate the decarbonisation, and we look forward to hearing from you. Drop us a line at decarbonise-india@olx.com.

[2] Second hand car trade in India is growing by 5% year on year, and as of 2021 the 'new car to used car ratio' stands at 1:2.2. As of 2010, online classified marketplaces have entered the market, making it easier for users to trade cars.

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Glossary **of terms**

Bharat Stage Emissions Standards (BSES)	Emission standards instituted by the Government of India to regulate the output of air pollutants from compression ignition engines and Spark-ignition engines equipment, including motor vehicles.
Carbon intensity	The amount of GHG emissions, expressed as carbon equivalent, per a given unit, for instance an economy or kilometer.
CO2-equivalent (CO2-eq)	Greenhouse gases have very different warming effects: one tonne of methane does not have the same impact on warming as one tonne of CO2. Carbon dioxide equivalents (CO2-eq) attempt to convert the warming impact of the range of greenhouse gases into a single metric. C02-eq is calculated by multiplying each gas by its 100-year 'global warming potential' value: the amount of warming one tonne of the gas would create relative to one tonne of CO2 over a 100-year timescale. Total greenhouse gases are then measured as the sum for all of these gases.
Greenhouse gas emissions (GHG)	Greenhouse gases are gases that trap heat in the atmosphere. The most common gas is carbon dioxide from burning fossil fuels: coal, oil, and natural gas.
Lifecycle Analysis (LCA)	A methodology for assessing environmental impacts associated with all the stages of the life cycle of a product, process or service. For a manufactured product this includes the impact from all elements of its life: extraction of raw materials, manufacturing, transport of competed product to its, use and its end of life treatment.
Fixed emissions	We refer to GHG emissions as being fixed if they are not dependent on any variables. In this paper, fixed emissions are the emissions from the production of the car (manufacturing) and disposal of a vehicle (scrapping, stripping, recycling).
Variable emissions	We refer to emissions as being variable when they are dependent on a variables, such as kilometers driven. In this paper, variable emissions consist of two components: the emissions associated with the fuel combustion and the production of the fuel itself for every kilometer driven.

Acronyms

CAFE	Corporate Average Fuel Economy
EV	Electric vehicles
FAME	Faster Adoption and Manufacturing of (Hybrid and) Electric vehicles
GDP	Gross Domestic Product
g/km	Measure of grams of CO2 equivalent emissions per kilometer driven
ICE	Internal combustion engine
LCA	Life Cycle Analysis
NNEMP	National Electric Mobility Mission Plan

I. Transport & trade

OLX and sustainable trade

At OLX, we are building a more sustainable world through trade. We operate global marketplaces that facilitate the trade of goods and services to hundreds of millions of people every month across five continents. OLX helps people buy and sell cars, find housing, get jobs, buy and sell household goods, and much more. Its well-loved consumer brands (including OLX, OLX Autos, Otomoto, Property24, and more) offer safe, smart, and convenient trading platforms and services for its customers.

Through our brands and platforms, OLX aims to make secondhand the first choice. Giving products another life means we don't need to pull as many new resources from our already pressured planet. And it helps bring value to products otherwise discarded or left lying around[3]. The trading of second hand cars through platforms like OLX brings liquidity to the car market: owners can more easily trade in their cars and find replacements as there is more transparency in the market. This transparency of value leads to the prolonging of the economic life of cars, and thereby reduces the need for new materials.

However, next to the material use of cars, vehicles have a broader footprint to consider. OLX set out to understand the full lifecycle of secondhand cars, to better understand the impact on vehicle greenhouse gas emissions. Two bodies of research were fielded to understand this impact within the Indian market. This paper outlines the main insight that second hand car trade can potentially be a positive catalyst to a low carbon future.

Transport and climate change

Globally, the transport sector accounts for 16% of global greenhouse gas emissions, which is third to only energy for industry and building (42%) and agriculture and land use (18%) (figure 1). Within the transport sector, passenger transport is the biggest contributor: causing 45% of global transport emissions (figure 2). In 2020, the transport sector added 12 billion metric tons of greenhouse gases into the atmosphere, including CO2, N2O and methane. The International Council of Clean Transportation (ICCT) estimates that without significant policy changes, annual GHG emissions from transportation will nearly double by 2050 to 21 billion metric tons.

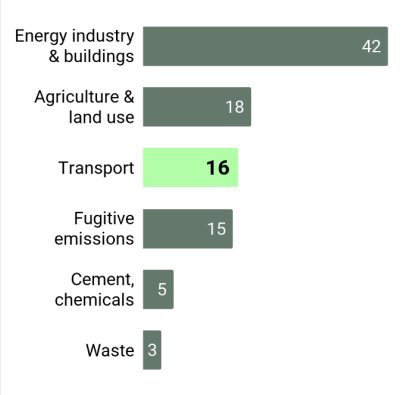


Figure 1: *Global GHG emissions, split by sector.*

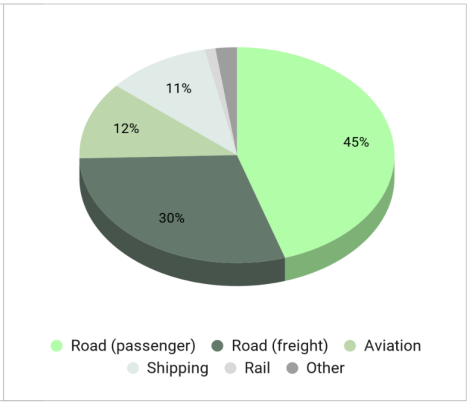


Figure 2: *Global transport GHG emissions, split by type of transport*

[3] This has been quantified in OLX's impact report.

India is the world's third largest emitter of greenhouse gas emissions, and transport is fast becoming one of its biggest sources of emissions. While India currently has a small vehicle fleet relative to its large population its fleet is expected to grow rapidly as people are switching from scooters and motorcycles to four-wheelers[4]. With sales of new vehicles of 21 million in 2016, and the number of vehicles on the road is expected to double to 200 million by 2030. Mobility is vital to economic growth, as it gives access to employment, goods and services, and it affects business productivity.

To curb the growth in GHG emissions from transport in India, several studies show that a mix of policies and solutions will be required. There is not one single solution, but rather a multitude of changes are needed: vehicle electrification, increased use of alternative fuels, restraining travel demand, modal shifts to public transport and fuel efficiency improvement in ICE vehicles. The ICCT suggests India should prioritise vehicle electrification, electricity grid decarbonization and stringent fuel efficiency standards.

India has set out to reduce car emissions through a multi-pronged plan (see box 1). In 2016, India adopted Euro 6/VI-equivalent standards that went into effect in 2020, and the country has a number of plans to accelerate the adoption of hybrid and electric vehicles.

Box 1: India's multi-pronged plan to reduce vehicle emissions

In the context of its commitment to reduce the GHG intensity of its GDP 45% by 2030[5] (and to reduce local air pollutants that harm human health), the Indian government has a multi-pronged plan to reduce car emissions:

- Bharat Stage VI Emission Standards to regulate the output of emissions from vehicles, in force from April 2020, with stage 2 (in-car sensing) from April 2023
- Corporate Average Fuel Economy (CAFE) regulations designed to increase fuel efficiency with CAFE II norms, in force since April 2022, limiting average CO2 emissions to 113 g/km
- National Electric Mobility Mission Plan (NEMMP), vision and roadmap for a faster adoption of EVs and their domestic manufacture
- Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME), the flagship scheme for subsidising EVs to boost demand
- National Policy on Biofuels, 2018, designed to promote the use of domestic feedstock in biofuel production to substitute fossil fuels
- Requirement for cars more than 20 years old and commercial vehicles more than 15 years old to undergo (local air pollutants, not CO2) emission tests[6]

[4] Overall car ownership is still very low in India and currently stands at 30 cars per 1,000 people, Pre-owned Car Market Report, 2021.

[5] *India's Updated First Nationally Determined Contribution Under Paris Agreement*, *Government of India, 2022.*

[6] *India's 'Cash-for-Clunkers' Needs Strong Incentives to Succeed*, *Bloomberg, 2021*.

II. LCA & Consumer insights

To better understand how secondhand car trade impacts GHG emissions, OLX fielded two independent bodies of research: (a) a comprehensive "life cycle analysis" (LCA) of car GHG emissions, and (b) primary customer research under Indians who recently sold and replaced a secondhand car.

a. Life Cycle analysis of vehicles in India

In collaboration with DSS+ and funded by Prosus, OLX undertook a comprehensive LCA of car emissions - studying car emissions of the most common makes and models across India – assessing the carbon emissions across each car's full lifetime including its (1) production, (2) use, and (3) disposal.

The analysis is performed on a database of 2,250 models and makes of cars registered in India between the years 2010 - 2020. The database covers more than 85% of the cars driven in India, and this database is updated every year by adding around 350 new cars. A main source for this data is the Society of Indian Automobile manufacturers (SIAM). The main automobile manufacturers declare the fuel efficiency and CO2 emissions of their car models to SIAM, including data on kerb weight, engine capacity, fuel type, emission standard, and declared fuel economy.

The analysis allows the comparison per kilometre for different car models, as the functional unit is set to one kilometre driven. The allocation factor is the total distance a car can drive during its lifespan. In the modelling the technical lifetime of a car is assumed not to exceed 15 years; with annual mileage assumed to be 20,000 km, the maximum distance driven over its lifetime is 300,000 km. Emissions are measured in carbon dioxide equivalents (CO2 eq.), with non-CO2 gases (such as CH4 and N2O) weighted according to their global warming potential over 100 years.

The model is made up of four emission components:

- Production of the car: Impacts are calculated with reference to the Bill of Materials (source: Ecoinvent) and the energy needed for assembly and manufacturing. The manufacturing emissions are allocated across the expected life of the car (see below).
- Production and transportation of the fuel: The impact relating to the production of the fossil fuels to power the cars relating to the well-to-tank ("upstream") part, involving the extraction and production of fuel.
- Combustion of the fuel the engine consumes: The tank-to-wheel ("downstream") part of usage emissions, related to the combustion of fuel. This depends on the distance driven, fuel economy and fuel type. The declared fuel economy from SIAM is used to calculate exhaust emissions.
- Disposal of the car at end-of-life: Emissions relating to the recycling and disposal of components. The end-of-life stage can generate emission benefits when recycling materials that would otherwise have to be made new.

The analysis considers the following parameters to specify the type of cars included in the evaluation in the Indian market: manufacturer, model, year, engine volume, size, fuel type, Bharat Stage (BS) emission standards, and the number of km driven. The focus of the study was on combustion engine vehicles (petrol, diesel, LPG and CNG), as electric vehicles currently make up less than 1% of the total vehicle market in India.

The modelling takes into account important aspects of how emissions change over time:

- Changes in fuel efficiency over time: Driver behaviour, maintenance, road conditions and fuel quality are major factors that influence the fuel economy of a vehicle. We assume that in the first 10,000-30,000 km fuel economy increases by 10% due to the 'break-in' of the vehicle (i.e. the engine gets optimised). After this period, we assume a gradual linear decrease in fuel economy, due to wear and tear (these assumptions have been vetted by experts in car manufacturing).
- Allocation of the emissions related to car manufacturing and car disposal: These 'fixed cost' emissions are allocated over the lifetime of the car. In our model they are front-loaded (a greater percentage is assigned to the early kms driven) to reflect the emission benefits of driving a car for longer before manufacturing a new one. We consider the fixed cost emissions to be fully 'depreciated' once a car has been driven for 300,000km, its technical lifespan assumed in our model.

b. Primary customer research

OLX commissioned Infoleap to conduct a survey on consumer behaviour in India to understand better what type of cars users are trading to. The research was conducted in four major metropolitan areas in India (Delhi, Mumbai, Chennai and Bangalore). Data was collected from 312 consumers who recently (within the last 6 months) sold their car and bought a replacement. A sample size of around 75 was taken per metropolitan area, made up of people between 28 and 50 years of age who had sold and bought a vehicle in the previous year. The sample of users was random and the car could be bought or sold through any channel, not just through OLX Autos.

There were two objectives to the research:

- Provide details about the make and type of car, model, year of manufacture, and mileage of both the cars users traded in and the replacement cars they bought
- Give insight into the reasons for the car trade: what triggered the purchase of the replacement car and what were drivers for selling the previous car?

III. Insights

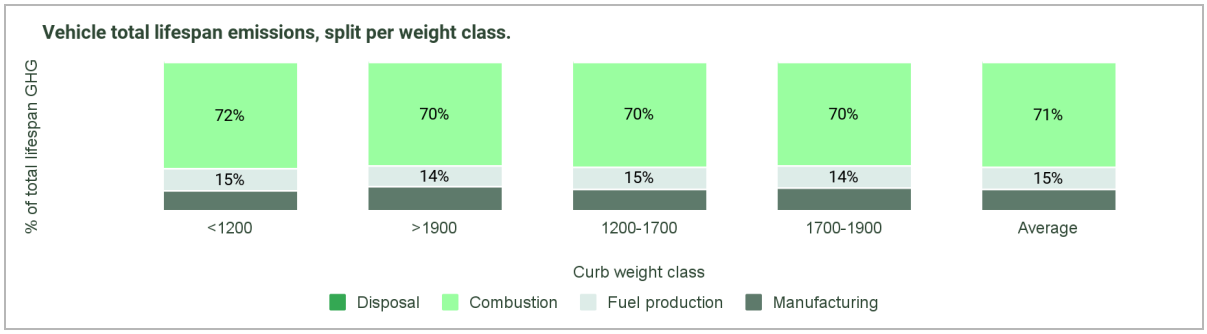
Based on the research insights, there is a clear contribution of secondhand car trade to decarbonise India's vehicle fleet, in helping with a faster adoption of high fuel economy vehicles. There are two main takeaways to consider:

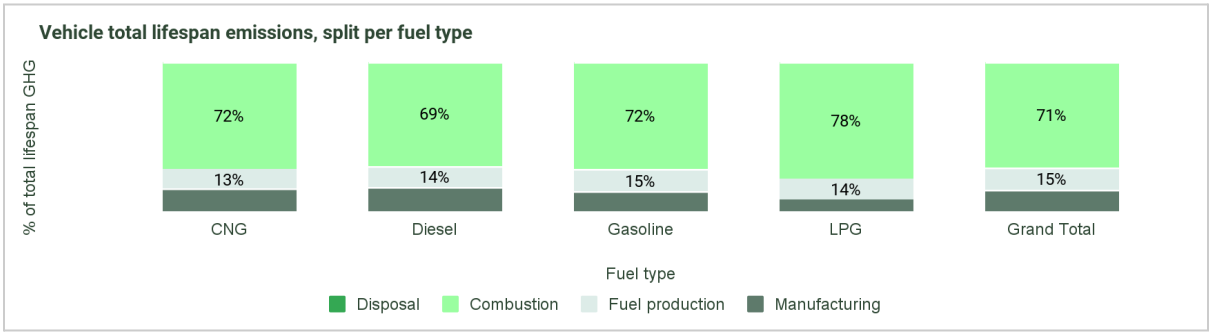
i. Technical improvements in fuel economy hold the greatest potential in reducing emissions.
ii. Second hand car trade can help improve a car fleet's average fuel efficiency through the faster adoption of newer cars with high fuel economy.

i. Technical improvements in fuel economy hold the greatest potential in reducing emissions.

OLX undertook a comprehensive life cycle analysis of car emissions - covering the production of the car, its use phase (fuel production and engine combustion), and its disposal. The manufacturing and disposal are "fixed" emissions: impacts not dependent on the age of the vehicle or kilometres driven during its lifetime. Variable emissions of a car are those dependent on the number of kilometres driven. The emissions from fuel production as well as the fuel combustion are considered variable emissions.

The variable emissions makes up 85% of total emissions based on an average Indian car with a technical lifespan of 300,000km. Combustion of the fuel is the biggest contributor, amounting to on average 71% of the total emissions. The exact composition of emissions varies slightly depending on the curb weight class and the fuel type. This insight shows that targeting combustion emissions is. Improving the fuel efficiency of vehicles can significantly reduce emissions from combustion.

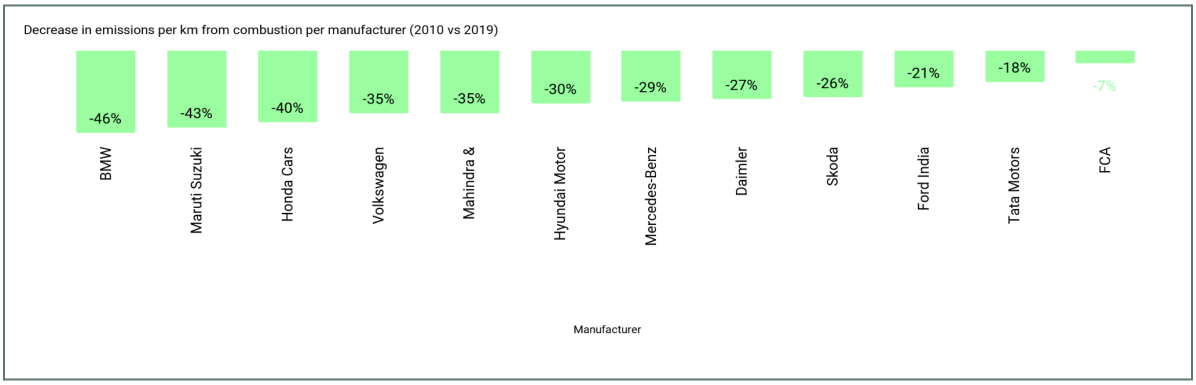




The ICCT regards improvements in vehicle efficiency as holding the greatest potential for meeting transport decarbonization goals by 2050 and could account for more than half the needed emission

reductions[7]. A lot of governments have therefore imposed emission standards, such as the European EURO standards from2003, and the Bharat Stage Emissions Standards in India as of 2010. These emission standards dictate the allowed maximum of particulate emissions discharged into the atmosphere. They are intended to give the automotive supply chain a clear direction for reducing pollutant emissions. In the European Union, new car CO2 emissions, on average, have to reduce 15% by 2025 and 37.5% by 2030, relative to a 2021 baseline[8].

And so far improvements in technology can be seen: car manufacturers have brought down the carbon intensity of combustion on average by 38% in the last twenty years. Our research among Indian car manufacturers also shows that some manufacturers have managed to bring their carbon intensity down by 46% in the last 9 years[9].



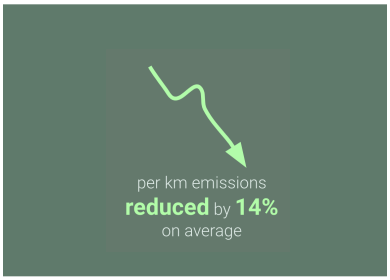
ii. Second hand car trade can help improve a car fleet's average fuel efficiency.

Results of a primary consumer survey, undertaken in four metro areas of India and covering 312 consumers, show that second hand car trade can help improve a car fleet's average fuel efficiency as people switch to newer and more fuel efficient vehicles. Out of the people that traded, 68% of respondents switched their vehicle to a secondhand vehicle with improved fuel efficiency. This switch (and in some cases switches from diesel to petrol) caused 71% of users to trade up to less carbon intensive vehicles, thereby reducing the average emissions per kilometre by 14%.

The 29% of respondents that did not trade up in terms of fuel efficiency were mostly due to users switching to bigger and heavier cars. This insight is further supported by the qualitative questions in the survey, where respondents stated that "a higher status car" was their main reason for buying a new(er) car, followed by "wanting a bigger car due to changes in family structure". The fuel economy of a vehicle is strongly correlated with weight, where heavier cars will need more combustion per kilometre compared to lighter cars.

[7] *International Council on Clean Transportation, 2023.*
[8] *This means, using the current 2021 CO2 target of 95 g/km as the baseline, these reductions would translate into a target value of 81 g/km (2025) and 59 g/km (2030).*
[9] *Considering vehicles of all weight classes.*

Primary consumer research yielded an insight that 71 out of every 100 times an Indian consumer buys and sells their car, they upgrade to a more fuel efficient car.



The research also showed that this trade to less carbon intensive cars resulted in a 14% reduction of combustion emissions per kilometre, on average.

The more secondhand cars circulate, the faster the carbon intensity of the fleet drops.

This 14% reduction for every kilometre driven occurs even when there is no information on the used car platform to guide or motivate consumers to choose a car with better emission performance. Naturally, the majority of users are choosing cars that are more fuel efficient. This insight shows the potential of using secondhand car trade to get users to trade towards fuel efficient cars. Instead of waiting for new cars to trickle down into the economy, the more secondhand cars circulate, the faster the carbon intensity of the fleet drops.

IV. Opportunities and potential

At OLX, we are building a more sustainable world through trade. Based on the research insights, there is a clear role for OLX and secondhand car trade in helping decarbonise India's vehicle fleet, by helping a faster adoption of more efficient vehicles. This research offers a **starting point** that shows the potential of second hand car trade in helping on the broader journey of decarbonising the transport sector in India. Decarbonisation of the transport sector requires a multitude of solutions, where improving vehicle efficiency is just one among others like electrification, shifts to public transport or using biobased fuels.

To further explore the role secondhand car trade can have, more research and testing can be done. It might mean finding ways of actively stimulating users of car trading platforms to choose more fuel efficient vehicles, but it could also mean relying on policies to remove the worst polluters off the road or finding partnerships to explore the potential further.

Stimulating the choice for more fuel efficient vehicles

One way to bring up the average fleet fuel efficiency is by trying to nudge consumers to choose more fuel efficient vehicles. By increasing consumer awareness of emission impact at the point of purchase, by spotlighting emissions data, by showcasing lower emission options to buyers, and by partnering with public and private entities to explore consumer incentives, it might be possible to increase the 71% ratio of secondhand car transactions that lead to an improvement in emissions.

Finding ways to bring incentives to upcycle their cars can further accelerate the process. For example, tax incentives, public health campaigns, or rewards for trading up from low to high efficiency vehicles could inspire more Indians to trade up sooner than they might without such nudges. And the uptake of more fuel efficient vehicles might also indicate that secondhand trade can help facilitate the accelerated uptake of electric vehicles in the future. More research is needed if this is the case

Removing the worst polluters

Improve the car scrapping and recycling ecosystem to remove vehicles with very low fuel efficiency as options for car traders. India's recently implemented "fitness test" for all 15 year-old vehicles is a great example of an effective intervention. What will also help would be further investment into pan-Indian car recycling centres that adhere to the highest ecological standards, economic subsidies to car sellers who might otherwise keep driving a high emissions car, and regulatory restrictions to avoid high emission cars from being exported to other markets. Marketplaces can potentially have an additional role in identifying which second hand vehicles have fuel efficiency below par and working with governments to remove these at a certain point in their lifespan.

Partnerships

Finally, we welcome and invite collaborators to amplify our efforts. We believe that collaboration with public agencies, NGOs, and private entities can accelerate the impact of these interventions, and look forward to collectively improving the carbon emission performance of India's fleet of passenger vehicles.

Would you want to discuss or collaborate? Drop us a line at decarbonise-india@olx.com.

About the authors

This paper was a co-creation between Prosus and OLX, with the help of a number of partners who helped with research and data collection.

OLX

OLX is a global leader in facilitating trade. It builds leading marketplace ecosystems enabled by tech, powered by trust, and loved by its customers.

Serving hundreds of millions of people every month across five continents, OLX helps people buy and sell cars, find housing, get jobs, buy and sell household goods, and much more. Its well-loved consumer brands (including OLX, OLX Autos, Otomoto, Property24, and more) offer safe, smart, and convenient trading platforms and services for its customers. OLX is powered by teams around the world, who are unified in their ambition to help people get more from the world's limited resources.

For more information, visit www.olxgroup.com.

OLX is a division of Prosus, a global consumer internet group and one of the largest technology investors in the world. Prosus has a primary listing on Euronext Amsterdam (AEX:PRX) and a secondary listing on the JSE Limited (XJSE:PRX), and is majority-owned by Naspers.

Prosus

Prosus is a global consumer internet group and one of the largest technology investors in the world. Operating and investing globally in markets with long-term growth potential, Prosus builds leading consumer internet companies that empower people and enrich communities.

The group is focused on building meaningful businesses in the online classifieds, food delivery, payments and fintech, and education technology sectors in markets including India and Brazil. Through its ventures team, Prosus invests in areas including health, logistics, blockchain, and social commerce. Prosus actively seeks new opportunities to partner with exceptional entrepreneurs who are using technology to improve people's everyday lives.

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