

# Impact assessment of PDDs

## The economic, social, and environmental case for regulation

---

A report produced for Starship Technologies

24 May 2023



Oxford  
Analytica  
PART OF **FiscalNote**

**STARSHIP**

## About this report

**Oxford Analytica is providing an independent impact assessment for Starship Technologies. It should not be regarded as a substitute for the exercise by the recipients of their own judgment. Oxford Analytica Ltd and/or any person connected with it accepts no liability whatsoever for any direct or consequential loss of any kind arising out of the use of this study or any part of its contents.**

**Oxford Analytica**, part of FiscalNote, is an independent geopolitical analysis and advisory firm that draws on a worldwide network of experts to advise its clients on their strategies, operations, policies and investments. Oxford Analytica's trusted insights and seasoned judgements on global issues enable its clients to navigate complex markets where the nexus of politics and economics, business and society is critical to success. Founded in 1975, Oxford Analytica is the pioneer of geopolitical risk analysis, and today works with the world's most influential businesses, governments and international organisations.

### HEAD OFFICE

5 Alfred Street, Oxford OX1 4EH  
T +44 1865 261 600

*Any reproduction or distribution of this study in whole or in part without the written consent of Oxford Analytica Ltd is strictly forbidden.*

[www.oxan.com](http://www.oxan.com)

## Contents

<b>Executive summary .....</b>	<b>2</b>
<b>Economic benefits .....</b>	<b>3</b>
Benefits to jobs .....	3
Benefits to local businesses .....	3
<b>Social benefits .....</b>	<b>6</b>
STEM attitudes and interest .....	6
Social inclusion and well-being .....	7
Convenience .....	7
Human and cost savings .....	8
<b>Environmental benefits .....</b>	<b>11</b>
Congestion .....	11
Environment .....	11
Conclusion .....	13

## Executive summary

As part of its ongoing efforts to assess the impacts of personal delivery devices (PDDs), Starship Technologies commissioned Oxford Analytica to conduct an independent assessment of the current and potential economic, social and environment impacts of PDDs on the UK economy and the local communities. Analysis centres on related benefits to grocery and restaurant delivery. This document summarises the key findings of this analysis.

The rollout of Starship Technologies' PDDs across the UK has demonstrated the device's potential to function as a significant contributor towards local economies in a sustainable and socially impactful manner. Our analysis of use cases indicates that national expansion of PDDs would yield the following:

- We estimate that if PDDs achieve 2.6% online grocery delivery penetration, it would **result in £340 million of private sector investment between 2023 and 2030**, equating to average annual investment of nearly £50 million in PDD related infrastructure and support. If PDD share doubles to 5.0%, total required investment would stand at £655 million.
- Our findings indicate that if PDDs achieved a 5% share of current levels of online groceries, it would annually contribute **£75 million in direct wages, support approximately 1,200 new, well-paid STEM jobs.**
- Between 2021 and 2030, in current prices, our analysis indicates that PDDs offer the potential to increase restaurant revenue by 24.8%, with total average household spend **increasing by almost £10 million** in PDD-operational cities.
- Over the course of a year, time savings accumulated via PDD use prove to be hugely significant, **ranging from 7.1 working days in Wellingborough to 8.0 working days in Leeds.** The results to-date indicate that use of PDDs in this way would afford users the equivalent of an **additional week and half of free time every year.**
- It is estimated that by 2030 PDDs could cover around 200 million miles annually, equivalent to **reducing vehicle emissions by 46,000 tons of CO2** or avoiding the use of 20 million litres of petrol.

Altogether, the expansion of PDDs across the UK is anticipated to add considerable value across several industry verticals, including smaller brick-and-mortar retailers and restaurants. Enhanced accessibility and increased convenience to the end-user is expected to boost both financially productive time and total spending.

## Economic benefits

### Benefits to jobs

In the right growth environment, the direct wage and investment implications of building out Starship's business and broader PDD capacity in this burgeoning sector would be valuable to the UK economy. At current operating levels, PDDs account for about 0.2% of online grocery deliveries in the UK, but an average 2.6% in existing areas of operation. Starship's growth has resulted in £3 million in direct wages per year and £2 million in other investments, including facilities, couriers and marketing. Holding these levels of investment constant during the capacity build-out phase, we estimate that if PDDs achieved a 5% share of current levels of online groceries, it would annually contribute £75 million in direct wages, support approximately 1,200 new, well-paid STEM jobs.

The investment requirements of building out PDD capabilities across the UK would also be substantial. We estimate that if PDDs achieve 2.6% online grocery delivery penetration, as they already have in areas they operate, it could result in £340 million of private sector investment between 2023 and 2030, equating to average annual investment of nearly £50 million in PDD related infrastructure and support.

Figure 1. Direct wage and other investment benefits based on PDD share of online grocery delivery (£ million)

PDD market share	Direct wage impact, annual	Other investment, 2023-2030
0.5%	7.5	67
1.0%	15	131
2.0%	30	262
3.0%	45	393
4.0%	60	524
5.0%	75	655
10.0%	150	1,309

Source: Oxford Analytica, Starship Technologies

### Benefits to local businesses

The multi-channel approach to shopping and dining will continue to evolve from the use of social media, online marketplaces, cloud kitchens, and other channels. Ongoing improvements in technology, as well as the adoption of it, will all play a role in supporting the growth of e-commerce and local businesses, including brick and mortar operations. As noted by the Head of Online at Co-op, '[We] have employed more people to keep up with the demand from robots and the shop has been refitted recently because footfall has still increased.'

*Head of Online at Co-op, '[We] have employed more people to keep up with the demand from robots and the shop has been refitted recently because footfall has still increased.'*

For restaurants in the UK, third-party platforms supported by delivery capabilities such as PDDs have been shown to increase annual sales, orders, and profitability.<sup>1</sup> Between 2021 and 2030, in current prices, our analysis indicates that PDDs offer the potential to increase restaurant revenue by 24.8%, with total average household spend increasing by almost £10 million in current PDD-operational cities.

In addition to the knock-on benefits this increase in restaurant turnover offers in terms of local jobs and salaries, there are also likely to be taxation benefits because of greater consumer spending. Our analysis indicates that VAT receipts in PDD-operational cities could grow by an average of £2.0 million per year by 2030 (in current prices), with large cities such as Manchester and Leeds witnessing additional annual VAT receipts of £3.5 and 5.5 million, respectively.

Beyond restaurants and retailers, Starship's presence also has synergies with other stakeholders in the technology industry. MP for Leeds Alex Sobel, for example, in a conversation with Oxford Analytica said that Leeds-based telecommunications company 'aql now has expanded its operations [by] working with Starship, not just in Leeds but broadly across the UK'. This was reinforced by Professor Adam Beaumont at aql, 'We're delighted to work with Starship on such an innovative project. As Starship's data usage increases, this is driving aql to invest in installing high-capacity specialist 5G networks within the towns and cities where they operate. Ultimately this infrastructure will benefit all smart city stakeholders as well as Starship operations.'

Former MP Mark Lancaster is also on record as saying that he 'look[s] forward to seeing the [Starship] project enhance deliveries for local businesses.'<sup>2</sup> PDD technology has the potential to positively impact businesses on a nationwide scale. MP for Mid Norfolk George Freeman has said that 'the pace of new technology -- from AI in healthcare to drone delivery to nutraceuticals -- is creating a huge opportunity for the UK to be a global leader in testing new technologies and setting appropriate regulatory standards, which are key to investor and customer confidence.'<sup>3</sup>

---

1 [delivering-growth-full-report](#)

2 [MP checks in to see how robots are leading the way in Milton Keynes | Milton Keynes Citizen](#)

3 [Innovative regulators given £12 million to accelerate introduction of delivery drones and personalised medicines - GOV.UK \(www.gov.uk\)](#)

Figure 2. PDDs as a source of growth for local restaurants

City	Total additional household spend on restaurant takeaways per annum by 2030 (current prices, £ millions)	Additional VAT per annum by 2030 (current prices, £ millions)
Bedford	6.5	1.3
Cambridge	5.1	1.0
Leeds	27.3	5.5
Manchester	17.4	3.5
Milton Keynes	10.4	2.1
Northampton	8.5	1.7
Rushden	1.1	0.2
Wellingborough	1.9	0.4
<b>Average</b>	<b>9.8</b>	<b>2.0</b>

Source: Oxford Analytica, Office of National Statistics, Deloitte

## Social benefits

### STEM attitudes and interest

---

Rupert Oldfield, Transport Strategy Team Leader for Leeds City Council, noted that the presence of PDDs has both the potential to increase children's interest in pursuing STEM careers and encourage adoption of technology by disabled people, saying 'you could argue that seeing technology rolling around encourages children to get into STEM.'

Indeed, such benefits are borne out by existing research and have already informed government decision-making. Robotics has been used as a way of introducing children to computational thinking -- the cognitive processes underlying the application of computer science concepts and problem-solving strategies -- and STEM knowledge overall, particularly given the value of computational thinking skills in learning STEM subjects.<sup>4</sup>

Moreover, the ramifications of this are potentially also observable regarding children in less economically advantaged areas that have less contact with people in STEM. MP for Leeds Alex Sobel told Oxford Analytica that '[the PDDs are] probably opening up ideas for [such children] in terms of future opportunities'.



On a government policy level, the EU-funded ER4STEM (Educational Robotics for STEM) project, for example, in 2015 to 2018 introduced robots to European classrooms to foster children's interest in STEM.<sup>5</sup> The project, which ran under the EU's €80 billion Horizon 2020 research and innovation funding programme, leveraged children's fascination with 'autonomous machines' in the form of semi-autonomous smart devices and robotics as 'tangible artefacts' to inspire interest in STEM and associated careers.<sup>6</sup> Studies have evidenced links between educational robotics as a means of shaping STEM attitudes<sup>7</sup> and future inclination towards STEM professions.<sup>8</sup>

Positive reception of PDDs by residents, including children, has also been noted in other areas served by Starship. MP for Milton Keynes North, Ben Everitt, has stated that 'the introduction of Starship robots into Milton Keynes has been absolutely fantastic and you always have to smile when you see one going by -- I particularly enjoyed the stories about children trying to feed them!'<sup>9</sup>

---

4 [Frontiers | Educational Robotics Intervention to Foster Computational Thinking in Preschoolers: Effects of Children's Task Engagement \(frontiersin.org\)](#)

5 [Robots increase students' interest in science | ER4STEM Project | Results in brief | H2020 | CORDIS | European Commission \(europa.eu\)](#)

6 [Educational Robotics for STEM | ER4STEM Project | Fact Sheet | H2020 | CORDIS | European Commission \(europa.eu\)](#)

7 [Microsoft Word - 8446 Mosley.docx \(ed.gov\)](#)

8 [\(PDF\) ROBOTICS AS MEANS TO INCREASE STUDENTS' STEM ATTITUDES \(researchgate.net\)](#)

9 [Ben Everitt MP Meets with Starship Technologies to Discuss Delivery Robots Success in Milton Keynes | Ben Everitt](#)



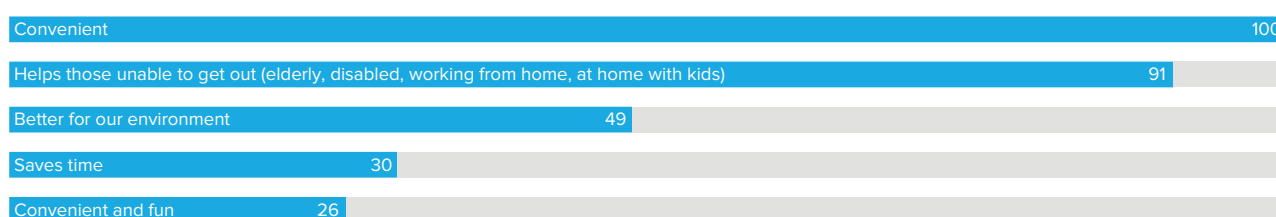
## Social inclusion and well-being

User survey data found that 86% of users would be negatively impacted if PDD deliveries ceased to exist. After convenience, the second most common benefit cited about PDD deliveries relates to helping people unable to leave their home, which included the elderly, disabled, professionals working from home, and parents at home with children. In many instances, the service is seen to provide access and convenience, while also being environmentally friendly (see Figure 3).

*User survey data found that 86% of users would be negatively impacted if PDD deliveries ceased to exist.*

In the words of one PDD user, 'It enables me to be more independent. [If I did not use it], I would ask others to get me things.' Furthermore, for people with social anxieties, in the words of one PDD user, 'It helps me to not deal with the anxiety

Figure 3. What are the main benefits of Starship deliveries in your area? (Top 5, responses weighted out of 100)



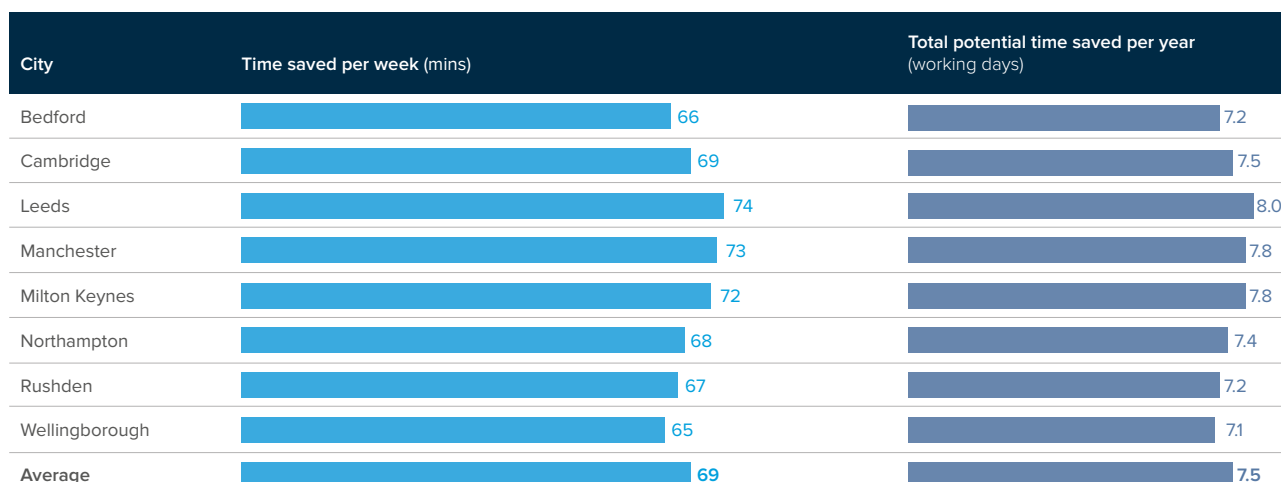
Source: Oxford Analytica, Starship Technologies

of interacting with people.' Indeed, MP for Leeds Alex Sobel told Oxford Analytica that 'there's also people with social anxiety, so even meeting a delivery driver is anxiety-inducing for them', with the PDDs proving a useful solution in such cases.

## Convenience

PDDs support both scheduled and unplanned delivery requests. With the average household in the UK visiting the supermarket or local store more than four times a week<sup>10</sup>, assuming PDDs could address household delivery needs on three out

Figure 4. PDDs as a source of convenience and time savings for local households



Source: Oxford Analytica, Starship Technologies

<sup>10</sup> [Bargain hunters visiting supermarkets four times a week - BBC News](#)

*In all cases, the results to-date indicate that use of PDDs in this way would afford users the equivalent of an additional week and half of free time every year.*

of four of these occasions, we find that a typical household in the cities served by Starship devices could save between 65 and 74 minutes per week through PDD deliveries. Over the course of a year, these time savings prove to be hugely significant, ranging from 7.1 working days in Wellingborough to 8.0 working days in Leeds. Stated differently, in all cases, the results to-date indicate that use of PDDs in this way would afford users the equivalent of an additional week and half of free time every year.

User survey findings also further reinforce these findings. In Leeds, 87% of families who have used Starship's PDD delivery found that the service either saved them time and/or valued the environmental benefits deriving from not having to jump in the car to collect groceries. In aggregate, this figure stands at 74% across all operating locations in the UK.

MP for Milton Keynes Ben Everitt told Oxford Analytica that 'the ability to access [Starship PDDs] as an option gives parents and carers just a bit of reassurance that if they can't leave the house, there is an option to get some shopping... [it] is a great option to have under your belt as a parent'.

### **Human and cost savings**

---

Based on reported road casualty data<sup>11</sup> and known causes of injury, we estimate that injuries attributable to current forms of commercial delivery total about 10,500 annually, requiring an average of 29 hospital visits per day. On average, each of these injuries costs £2,800 to treat at a total annual cost of £21.5 million to the National Health Service. The continued growth, as well as societal and economic importance of delivery, is likely to see these costs rise further.

In this sense, while PDDs will remain one of multiple delivery solutions, their exemplary safety record in the UK and elsewhere should be an important consideration given healthcare and other related considerations. Early findings in the UK also indicate that their presence appears to promote other positive outcomes, with 78% of respondents to a behavioural survey in Milton Keynes and Northampton stating that they are more careful when walking or driving near PDDs.

A report on autonomous delivery technology by the Harvard Ley School's Taubman Centre for State and Local Government notes that pavement robots can mitigate the risk of human error-related crashes and accidents.<sup>12</sup> In the US, for example, a study by the Virginia Tech Transportation Institute claims that full-scale market penetration of autonomous devices would cut national road fatalities and injuries by between 55 and 62%, saving around 34,000 lives and avoiding four million injuries per year, with most of the reduction due to the removal of vehicle occupants who were visiting a shop for goods that could have been delivered.<sup>13</sup>

Another study asserts that the roll-out of automated delivery services across the US will prevent an estimated 244,000 road collisions that cause injuries and/or fatalities, reducing road injuries by 348,000 and fatalities by 4,800 between 2025

<sup>11</sup> [Reported road casualties in Great Britain: motorcycle factsheet, 2021 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/90444/Reported-road-casualties-in-Great-Britain-motorcycle-factsheet-2021-2020.pdf)

<sup>12</sup> [Taubman-AVPI\\_ADV Publication\\_05-2022.pdf \(harvard.edu\)](https://www.taubmancenter.org/wp-content/uploads/2022/05/Taubman-AVPI_ADV_Publication_05-2022.pdf)

<sup>13</sup> [Final\\_Report\\_Nuro\\_Release.pdf \(vt.edu\)](https://www.vtti.org/wp-content/uploads/2022/05/Final_Report_Nuro_Release.pdf)

and 2035, with nearly \$397 billion in that timeframe in road safety savings -- by a significant amount accounting for the greatest proportion (55%) of an estimated \$719 billion in preserved economic value alongside time saved by drivers (44%) and emissions avoided (2%).<sup>14</sup>

Additionally, several studies find that a 10% penetration of delivery devices in an operational fleet result in a 6% reduction in crashes. One study reveals that crash savings, fuel efficiency and parking benefits, as well as travel time reduction would amount to \$2,000 per year per autonomous device, potentially nearing \$4,000 when broader crash costs are included.<sup>15</sup>

Based on 12.6% of groceries currently ordered online, equivalent to about 3.6 million grocery-related deliveries per week across the UK, if PDDs accounted for 2.6% of current online deliveries, which represents average market penetration to-date in the areas where Starship PDDs operate, the related crash savings, fuel efficiency and parking benefits would total up to £640 million annually. By 2030, if 26.9% of groceries are ordered online and PDDs continue to account for as little as 2.6% of deliveries, in current prices, total savings would reach up to £1.4 billion annually. If PDD market share doubles to 5.0% by 2030, total savings achieved would be up to £2.7 billion annually.

*By 2030, if 26.9% of groceries are ordered online and PDDs continue to account for a little as 2.6% of deliveries, in current prices, total savings would reach up to £1.4 billion annually.*

---

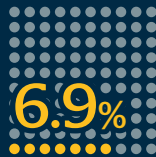
14 [200910\\_Nuro\\_Final\\_Report\\_Public.pdf \(steergroup.com\)](#)

15 [\(PDF\) Preparing a nation for autonomous vehicles: Opportunities, barriers and policy recommendations \(researchgate.net\)](#)

**Manchester**



**Average of all studies**



Number of minutes saved every week

Percentage of total emissions saved per year

**Leeds**



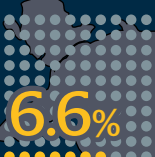
**Wellingborough**



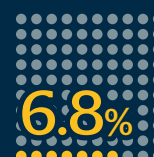
**Rushden**



**Northampton**



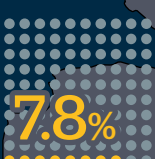
**Cambridge**



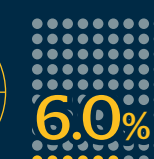
Leeds  
Manchester

Wellingborough  
Rushden  
Northampton  
Milton Keynes  
Cambridge  
Bedford

**Milton Keynes**



**Bedford**



## Environmental benefits

### Congestion

---

Heightened congestion caused by illegally parked vehicles leads to both increases in travel times and slower delivery of goods and services, which also increase noise and emissions, as well as reduce pedestrian, biking, and driving safety. On-road delivery vehicles are a meaningful and growing contributor to this issue, with a disproportionate amount of congestion caused in this way connected to commercial vehicles.<sup>16</sup> Indeed, PDDs may mitigate congestion via improved efficiency enabled by ensuring fleets are of an appropriate size, stacking trips, and longer operating schedules.<sup>17</sup>

Based on data from the UK Department of Transport, we estimate that the average driver loses almost 19 hours per year due to this kind of congestion, costing drivers in the UK a cumulative £1.1 billion annually.

The delivery capabilities of PDDs offer the potential to reduce some of these congestion costs. Since April 2018, Starship's PDDs, which operate on pavements and other pathways, have covered 1.4 million miles in Milton Keynes. Based on the results of these operations, as well as Starship's consumer survey finding that 70% of users would have used the car in the absence of the PDD service, on average, we estimate that PDDs are already saving Milton Keynes drivers nearly one and a half minutes per day due to their congestion neutral deliveries; while in Northampton, where operations began in November 2020 and are currently less extensive, PDDs are already saving a typical driver 44 seconds per day or just over half a working day per year. Alex Beckett, chair of Cambridgeshire County Council's Highways and Transport Committee, has stated that Starship 'has the potential to make life easier for thousands of residents while also reducing congestion.'<sup>18</sup>

In Cardiff and Leicester, which are among the 10 most congested cities in the UK<sup>19</sup> and both larger than Milton Keynes and Northampton, drivers lose between 20 seconds and 2 minutes 30 seconds per day to rush hour traffic. It indicates that benefits to-date through the build out of PDDs in both locations are already meaningful in the context of typical time saved by travelling in and outside of rush hour.

### Environment

---

Battery-powered PDDs reduce emissions not only by cutting down on motor vehicle traffic, but also by mitigating congestion, which further harms the environment. Our findings reveal that the average driver in the UK is contributing an additional 55.6 grams of oxides of nitrogen (NOx) per year due to congestion, with violators proportionately more likely to be commercial vehicles. In total, we find that

*On average, we estimate that PDDs are saving Milton Keynes drivers nearly one and a half minutes per day due to their congestion neutral deliveries.*



<sup>16</sup> [Double parking in New York city: a comparison between commercial vehicles and passenger vehicles \(repec.org\)](https://repec.org/)

<sup>17</sup> [Taubman-AVPI\\_ADV Publication\\_05-2022.pdf \(harvard.edu\)](https://www.harvard.edu/)

<sup>18</sup> [Robot deliveries rolled out to Cambourne after success in Northampton and Milton Keynes | ITV News Anglia](https://www.itv.com/news/anglia/)

<sup>19</sup> [Most congested cities in the UK](https://www.gov.uk/government/news/most-congested-cities-in-the-uk)

congestion responsible for causing an additional 2,200 tons of NOx per year in the UK.

At a local level, based on analysis of three key geographies for PDD operations, we found that congestion is causing an additional 9.5 tons NOx per year in Milton Keynes, while these figures come to 13.3 tons per year in Northampton and 33.4 tons in Cambridge.

Councillor Graham Lawman, North Northamptonshire Council's Executive Member for Highways, Travel and Assets has stated that Starship 'is another innovation that we are supporting to help to provide a clean and green alternative to the private car for day-to-day convenience shopping, helping to reduce emissions. They will be useful for those without a car or unable to get out for urgent items.'<sup>20</sup> Additionally, Councillor Helen Hayden, Leeds City Council's executive member for infrastructure and climate, has stated that Starship would help 'reduce the number of short journeys made by car, including those made by delivery vehicles' as the council aims for net-zero greenhouse gas emissions by the year 2030.<sup>21</sup>

*Based on a survey conducted by Cambridgeshire County Council, it was revealed that 80% of participants agreed that deliveries by PDDs had reduced short car journeys to collect groceries.*

By substituting vehicle journeys, PDDs have to-date cumulatively saved more than 400 tons of CO2 emissions from entering the atmosphere, which is equivalent to almost 1.7 million miles by car in the UK. Looking ahead, and at a larger scale, these estimates are corroborated by similar findings positing a CO2 reduction of 407 million short tons in the US between 2025 and 2035 with the adoption of autonomous delivery robots in general, equivalent to 88 million passenger vehicles off the road for one year.<sup>22</sup> NOx savings would come in at 236,000 tons.

MP Andrew Western told Oxford Analytica that 'the fact that [Starship PDDs] are zero carbon deliveries supports our efforts to tackle the climate emergency, not just in terms of replacing driver deliveries but stopping those car journeys of less than one mile.' In fact, based on a survey conducted by Cambridgeshire County Council, it was revealed that 80% of participants agreed that deliveries by PDDs had reduced short car journeys to collect groceries, with less than 5% believing that car journeys had not been reduced.

*At only one PDD delivery per week, average annual vehicle CO2 emissions could still be reduced by 2.3%.*

Starship also sources renewable energy providers, where possible, and is experimenting with varying charging methods and deployment processes to boost efficiency while cutting down on power consumption. From an environmental, social, and governance (ESG) perspective, PDDs also meet customers increasing prioritisation of sustainability, with a 2023 study by McKinsey demonstrating that products claiming environmental or social benefits experienced 8% more cumulative growth over the past five-year period than products which had not.<sup>23</sup>

In the cities where Starship PDDs are currently operating, based on a typical shopper using PDDs three times per week for local shopping needs, we found that someone could reduce his or her average annual vehicle CO2 emissions by 6.9%. This ranges from 5.8% in Wellingborough to 8.2% in Leeds. At only one PDD

20 [Robot delivery service expands into North Northamptonshire - Northants Live](#)

21 [Robot grocery delivery service launches in Leeds - BBC News](#)

22 [200910\\_Nuro\\_Final\\_Report\\_Public.pdf \(steergroup.com\)](#)

23 [Do consumers care about sustainability & ESG claims? | McKinsey](#)

delivery per week, average annual vehicle CO2 emissions could still be reduced by 2.3%. In other words, in addition to convenience and time saved, the environmental benefits for the individual and society at large are also considerable. Redditch MP Rachel Maclean has said that ‘now more than ever, it is important that we use the power of transport to build back greener, and transform how people and goods move around the UK.’<sup>24</sup>

Figure 5. PDDs as a source of emissions reductions for local shoppers

City	Average emissions saved per use of PDD (g CO2)	Average potential driver emissions saved per year (% of total)
Bedford	651.2	6.0
Cambridge	735.4	6.8
Leeds	881.9	8.2
Manchester	844.3	7.8
Milton Keynes	840.4	7.8
Northampton	714.3	6.6
Rushden	673.2	6.2
Wellingborough	626.5	5.8
<b>Average</b>	<b>745.9</b>	<b>6.9</b>

Source: Oxford Analytica, Office of National Statistics, Deloitte

Looking ahead, holding vehicle emissions constant, Oxford Analytica estimates that by 2030 PDDs could cover around 200 million miles annually, equivalent to reducing vehicle emissions by 46,000 tons of CO2 or avoiding the use of 20 million litres of petrol.

## Conclusion

Our findings, both quantitative and qualitative, demonstrate a strong user and community case for PDDs. Based on survey data and community leader comments, users and those who have engaged with the devices have overwhelmingly positive impressions of PDDs, in terms of safety, convenience, accessibility, and environmental benefits, among others.

The quantitative case for the use of Starship’s PDDs is similarly compelling. In local operating environments, PDDs currently deliver on a range of environmental, economic, social, and time-saving metrics; while given time and investment to grow, there is a clear opportunity to use PDDs to support the reduction in carbon emissions and congestion, and to deliver on a variety of economic benefits to local businesses across the UK.

<sup>24</sup> [Drone deliveries and seamless end-to-end journey routing could connect UK’s rural towns and communities - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/drone-deliveries-and-seamless-end-to-end-journey-routing-could-connect-uk-s-rural-towns-and-communities)







