



# ENVIRONMENTAL BENEFITS OF GIVING BIKES A SECOND LIFE

Report for Halfords by Small World Consulting

The Halfords  
**BIKE X CHANGE**  
Trade In › Trade Up › Save

# SECOND -HAND BIKES

## THE OPPORTUNITY

**AS A LOW-CARBON METHOD OF TRANSPORT, BICYCLES ARE AN IMPORTANT PART OF DECARBONISING TRANSPORT SYSTEMS.**

The UK bike market increased hugely during the pandemic. The market was valued at **£2.31 billion** in 2020 according to the Bicycle Association, an increase of **45% vs 2019**. In June 2021 Halfords reported cycling revenues up **54.1%** compared with the previous year.

The characteristics of the second-hand bike market in the UK are difficult to analyse in detail as it mainly operates via online marketplaces and social media.

The size of the second-hand bike market seems to have grown substantially, with almost a quarter of people (23%) who bought bikes in 2021 buying second hand, up from 17% in 2020 (Mintel, 2021).

And yet, Halfords research conducted in 2020 suggests that there is a vast untapped resource of potentially serviceable bikes out there, with as many as seven million unused bikes sitting neglected in sheds and garages across the UK.

At a time when the UK faces supply constraints it makes sense to stimulate the second-hand bike market and get as many bikes as possible into service.



Choosing a suitable second-hand bike in good condition can be difficult, especially for those new to cycling.

This is due to:

- Lack of confidence in buying a safe and reliable bike
- Safety concerns when picking up the bike
- Not being able to tell a good deal from a bad deal



## INTRODUCING...

The Halfords  
**BIKE X CHANGE**  
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Given the enormous opportunities presented by the second-hand bike market Halfords has launched the Halfords Xchange.

We are calling on owners of used Halfords bikes – whether it's a bike they don't currently use or it's simply time for an upgrade – to trade in their old bike and get up to £250 to spend on anything at Halfords.

Our expert technicians will assess, repair and refurbish all second-hand bikes so they are ready for a new owner.

We're aiming to sell at least 100,000 adult and kids' second-hand bikes a year, all at a great price, ready to ride, safety checked with a 12-month warranty.

## CALCULATING THE BENEFITS

When demand for bikes is so high it's a great shame that so many perfectly good bicycles are being left to gather dust in sheds and garages.

Even if people don't want to trade their old bike for a new one, they can do their wallet and the planet a power of good by taking advantage of the Halfords Xchange.

We asked world-renowned sustainability expert Mike Berners-Lee and his team at Small World Consulting to calculate the carbon benefit of bringing 100,000 second-hand bikes back into service, on the assumption that they would be purchased in preference to 100,000 new bikes.

Mike and his team considered only the benefits arising from the manufacture of a new bike versus extending the life of a 'used' bike, plus carbon emissions related to maintenance. They did not consider the potential additional benefits that may arise from the person buying a second-hand bike switching away from more carbon intensive forms of transport.

Of course, even with a flourishing second-hand bike market there will continue to be a demand for new bikes. Bike components can only be repaired or reconditioned so many times but extending the life of more bikes – and ensuring that second-hand bikes on the road are in good order and safe to ride – will deliver environmental and social benefits.

## HALFORDS AND THE CIRCULAR ECONOMY

Halfords is committed to developing a more sustainable business model, which includes reducing the volume of virgin materials used in packaging and key products; placing a greater focus on circular economy business practices, which aim to keep products and materials in use for as long as possible.

The Halfords Xchange scheme is a prime example of this - consumers can obtain a bike from a pool of existing refurbished bikes, therefore extending the lifetime of a bike already in circulation. We believe this will help to address the very high demand for new bikes, in turn reducing carbon emissions and waste.



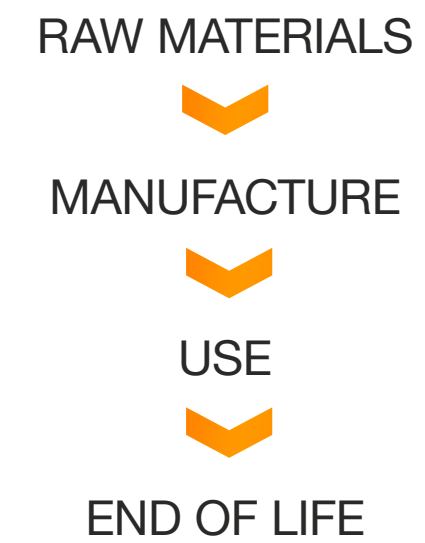
# LINEAR ECONOMY VERSUS CIRCULAR ECONOMY

The linear economy has a start and end point, with raw materials being extracted, used, and then thrown away. Today, most of the things we buy fall into this "take-make-dispose" model.

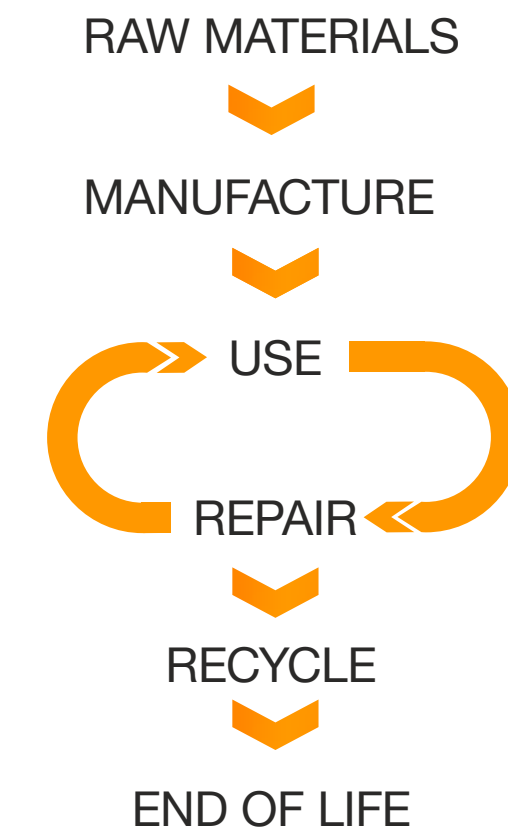
The circular economy, on the other hand, aims to keep products and materials in use for as long as possible, to reduce waste and pollution. A switch to a more circular economy is seen by many as a key action in tackling the climate and ecological crises.

A bike exchange scheme is a prime example of a circular economy business model. This is because a consumer can obtain a bike from an existing circle of used bikes. Extending the lifetime of existing bikes should help address the very high demand for new bikes, in turn reducing the associated carbon emissions and waste of manufacturing new bikes, or sending them to landfill.

## LINEAR ECONOMY



## CIRCULAR ECONOMY



# HOW WE CALCULATED THE CARBON SAVING OF SECOND LIFE BIKES

In this report we estimate the potential carbon saving from the Halfords Xchange scheme.

To estimate the carbon saving, we compared two scenarios:

- 1) A used bike reaches the end of its life and is thrown away, and a new bike is manufactured and sold.
- 2) The same used bike is repaired and maintained by Halfords and sold second hand, with its sale replacing the sale of a new bike.

The following assumptions have been made:

- SWC calculated the footprint of an aluminium bike (including all features e.g., tyres, handlebars etc.). Steel frame bikes, carbon frame bikes, titanium frame bikes, and electric bikes have not been included in this analysis.
- If a bike is bought second-hand, all the embodied emissions have already been 'written off' by the person who first bought the product, so the embodied emissions don't have to be considered.
- We also assume that in-use emissions (past the point of sale) for a new bike and a second-hand bike will be the same, and therefore do not need to be calculated.
- The end-of-life emissions are very small compared to the emissions from manufacture, so are not included in our calculations.
- The maintenance Halfords will carry out to get the bike ready for resale entails the replacement of 10% of the bicycle, and therefore is 10% of the carbon footprint.
- The second-hand bike will be functionally equivalent to a new bike.

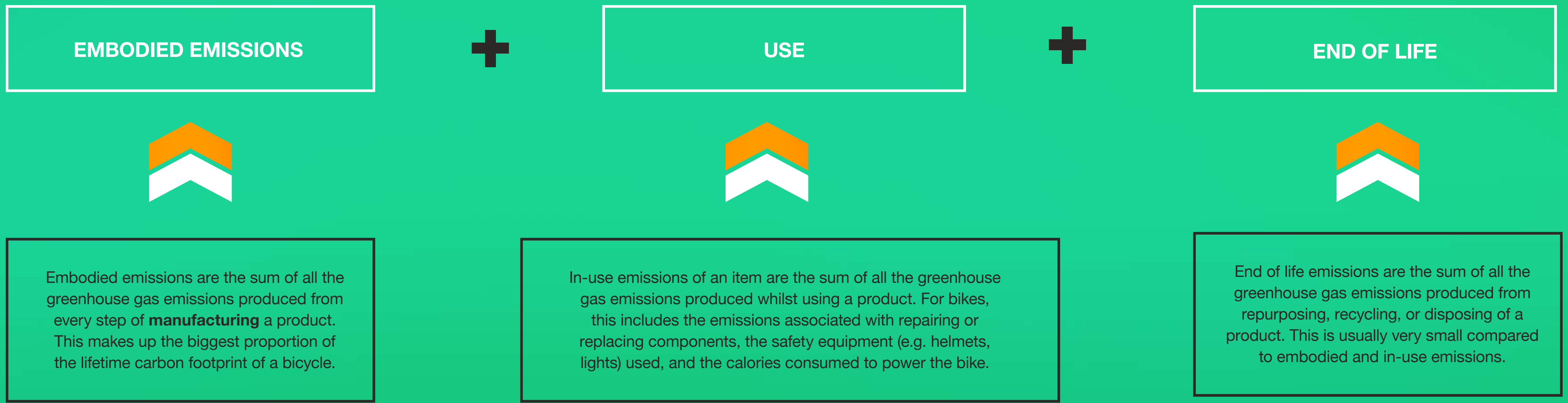
## UNCERTAINTIES

It is important to remember that carbon footprints are a 'best estimate'. However well you estimate them, uncertainties will always remain. There are many components that make up a bicycle, and the materials and their quantities can vary hugely depending on the bike. Different materials can take different amounts of energy to produce, meaning that there can be a huge range in the embodied emissions of bikes. For example, Trek found that their carbon fibre bike frames produced nearly three times the emissions as their aluminium bike frames (Trek, Sustainability Report, 2021). We are taking 95 kg CO<sub>2</sub>e to represent an average priced aluminium framed bike, but it is important to acknowledge that a different bicycle could have an embodied emission of many times that.



# THE CARBON FOOTPRINT OF BICYCLES

The life cycle of a bicycle can be broken down into three broad stages, each of which contributes the emission of greenhouse gases (carbon dioxide equivalent, or CO<sub>2</sub>e)



## METHODOLOGY: EMBODIED EMISSIONS

Our calculations are based off a value of 95 kg CO<sub>2</sub>e for the manufacture of an average aluminum frame commuter bike (European Cyclists' Federation, 2011). This figure was calculated using a life cycle analysis approach, the most common approach to carbon foot printing.

Life cycle analysis works by identifying the key processes that must happen for a product to be created. The footprint of the product is the sum of the emissions of all those processes added together.

Although useful in some areas, life cycle analyses often underestimates carbon footprints. This is because it is never possible to include every process. The resulting underestimation, or 'truncation error' can often amount to 50% or more.\*

Looking at the system boundaries of the life cycle assessment by the European Cyclists' Federation, we estimate a truncation error of 43% (in other words, 95 kg CO<sub>2</sub>e is an underestimation by 43%). We applied that error to 95 kg CO<sub>2</sub>e.

**We estimate the embodied emissions of an average bicycle to be 167 kg CO<sub>2</sub>e.**

*European Cyclists Federation 2011*

\* Mike Berners-Lee, How Bad Are Bananas, 2020, page 252



## METHODOLOGY: USE PHASE

The emissions from the use phase of a bicycle, whilst much smaller than that, say, of a car, still need to be considered. Emissions from the use phase of a bicycle come from:

- **Maintenance and repair**
- **Equipment required for use** (e.g. helmet, bike lock, lights etc.)
- **Calories eaten to power bike**



The emissions from maintenance and repair are relevant to these calculations, as the second-hand bikes will be repaired by Halfords before being sold.

The emissions from cycling equipment, calories eaten, and maintenance and repair after purchase, are not included in these calculations, as we are just looking at the emissions up until the point of sale.

We have assumed that a full safety check plus a few new parts will be equivalent to around 10% of the total emissions of manufacture of a bike. This comes to around 9.3 kg CO<sub>2</sub>e. Hence the CO<sub>2</sub>e saving of a second-hand bike is 157.3 kg CO<sub>2</sub>e.

There is a degree of uncertainty to this figure, as each second-hand bike sold to Halfords will be in a different condition and will require different repairs or new parts, meaning each bike will have different emissions from repair.





## POTENTIAL CARBON SAVINGS



The calculation here is essentially the carbon saving of repairing a second-hand bike, instead of buying one new.

End-of-life emissions are negligible compared to emissions of manufacture, so are not considered here

**CARBON SAVING**



EMISSION OF MANUFACTURE



EMISSION OF LANDFILL & RECYCLING



EMISSION OF REPAIR & MAINTENANCE

Every  
**100,000 CYCLES**  
sold through the Halfords Bike  
Xchange will result in an estimated  
**16,000 TONNES**  
of CO2 saved.  
(vs 100k new bikes being purchased).



**That's equivalent to the  
carbon emitted by 7,600  
return passenger flights  
between London and New York\***

## POTENTIAL WASTE SAVINGS AND OTHER ENVIRONMENTAL BENEFITS

Although some old bikes are sent to recycling, it is estimated that 15 million bikes end up in landfill annually worldwide (ThePedalClub, 2021).

It is hard to know exactly what proportion, but some of the bikes sent to landfill will still be in a useable condition or have parts that could be re-used in different bikes.

Bike exchange schemes will encourage bikes to be diverted away from being sent to landfill and keep the bikes and their components in use for much longer.

Bicycles are made of many different components made of many different materials. Alongside their carbon impact, each of these materials have different environmental costs associated with their extraction and production.

Using recycled aluminium in a frame has less of an environmental impact than making a frame from raw materials, but it is better still to keep that frame in use as long as possible through repairs, with recycling as a last resort only when safety is at risk of being compromised.

Resources are finite and each has an environmental cost, so the longer materials can stay in use, the better for the planet.

## POTENTIAL COST SAVINGS

Second-hand bikes are cheaper than their new equivalents. This has several benefits:

- Cheaper bikes makes cycling accessible for more people.
- It makes it easier for people with a price limit to get a good quality bike that is right for them.
- Cheaper bikes can directly address transport poverty by improving access to bikes. Cycling hugely benefits the most disadvantaged in society.
- Buying second hand is great for beginners, as it means you don't have to spend much on a good bike to try it out.
- Great for young families, where growing children need to size up in frame often.
- The lifespan of children's bikes is far shorter than that of adult bikes due to children constantly outgrowing them. This is costly for the parents or guardians and creates the problem of what to do with the unusable bikes sat in the shed.
- More value for money.
- It is possible to buy a bike that would have been way over your price limit if bought new.



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