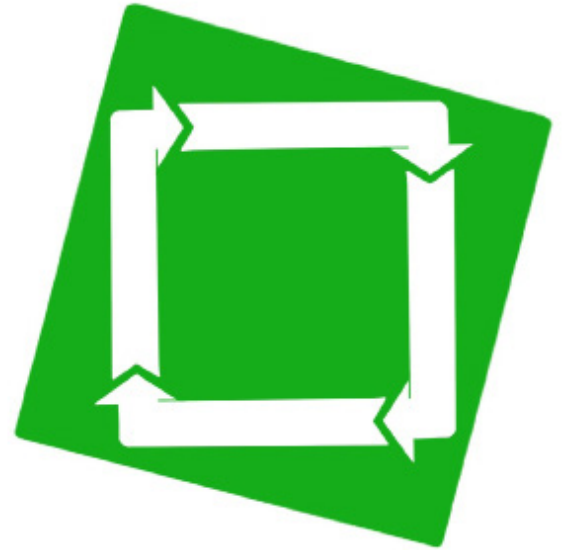


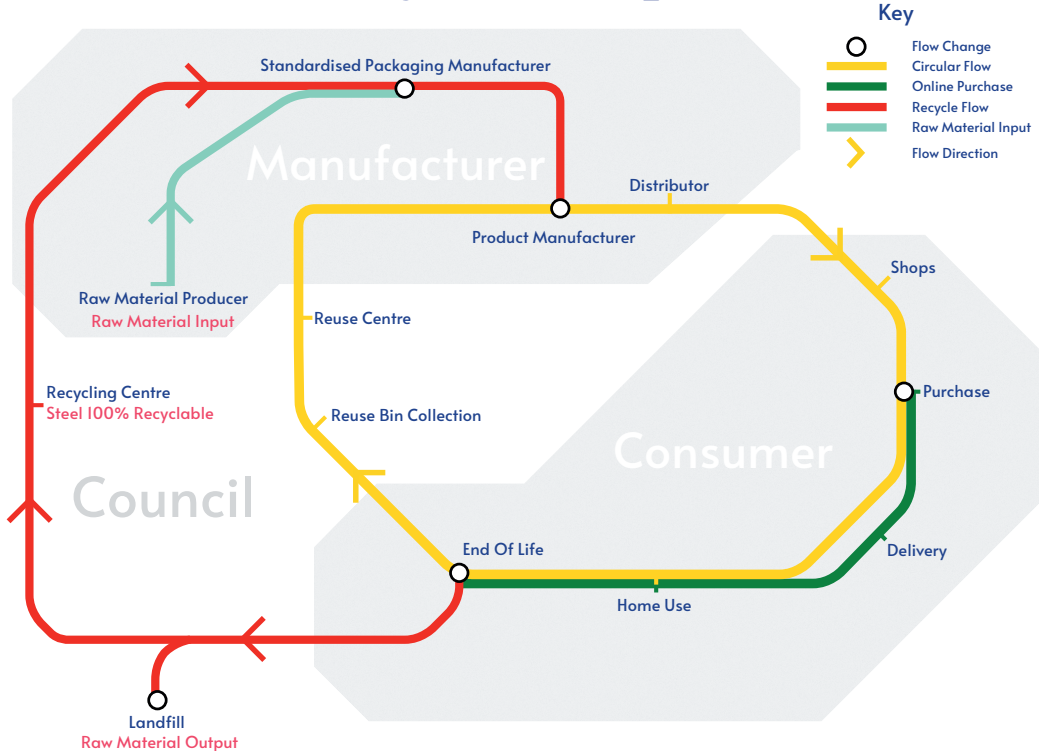
**Making the earth greener  
square by square...**



**GREEN SQAURE**

**Jonathan Tang  
Oliver Veal  
Kerim Taskin**

# System Map



## Reuse Centres

The core of our system is the reuse centre. These are facilities that clean, inspect and repair reusable packaging to be sold back to manufacturers.

The facilitating technology is a QR code scanner that identifies each container that passes through the facility to obtain information such as which company filled it, how many reuse cycles has it undergone and other metadata.

Barcodes and RFID cannot be used for this as barcodes contain

less information than a QR code, and an RFID chip would be blocked by the metal container. RFID chips would also decrease recyclability of the steel containers.

Once the container is identified in the reuse centre, it can be collated at the end of the process into crates of similar containers. This means that when manufacturers buy containers back from the reuse centre, they know that the containers they buy are suitable for their products, and discounts can be given for more heavily used containers, helping to incentivise reuse.

# How It Works

## 1. Manufacture of Standardised Packaging

Durable, reusable and standardised packaging is manufactured from a mixture of virgin (~75%) and recycled (~25%) steel and crated up.

The crates of packaging are bought by product manufacturers and filled with product in bottling plants.

Filled containers are distributed to shops and bought by consumers.

## 2. End of Life

When the product reaches its end of life, the packaging is disposed of in Reuse Bins.

The local council will run a collection of these bins just like general waste and recycling, and used packaging will be brought to a local reuse facility.

Here the containers are cleaned, inspected and repaired before being recrated to be sold back to product manufacturers at a lower cost than new packaging.

## 3. Recycling

If a container is too damaged to be reused, or is thrown directly into the recycling bin by consumers, it will be recycled.

Steel is 100% recyclable, meaning almost all of the material used to make the reusable containers can remain in the flow. The only material output in the flow is if the consumer decides to throw the container into general waste. This could be avoided with advertising campaigns and information on labels that would inform people not to do this.

The manufacturers of the standardised packaging can then use a percentage of recycled steel when making the containers, further improving material efficiency.

# System explanation

400x

## Reuse

Containers are built to last. Each container could be used up to 400 times. The more reuse cycles the packaging undergoes, the higher the efficiency of the system. Around 22 cycles are needed to break even for energy saving.

## Steel

Steel is tough, durable and recyclable making it ideal for manufacturing containers with the goal of maximising the number of times they can be reused. It is 100% recyclable, meaning very few resources ever leave the flow.

100%

## Government

70M

The proposed system uses a council-run collection system for reuse bins, with the goal of complete coverage of the system nationwide. The bins are integrated into everyday life so there is a seamless transition for users to the system. All 70 million people in the UK should have access to a reuse bin

## Standardised

The idea behind making containers standard shapes is to reduce the complexity of the operation at reuse centres. This is not a solution for general waste; only the supported containers could make their way to reuse facilities.

400x

## Incentives

The consumer can buy home care products as usual from shops or online, and can dispose of them directly into a bin in their home. No additional effort is required other than obtaining a reuse bin.

Product manufacturers can obtain cheaper packaging, but are limited in the short term to more homogeneous container shapes.

Much less material is recycled or landfilled, reducing total material consumption. Less energy is used throughout the process.

## The Future

### Distribution / Collection

Factory-to-consumer distribution is inherently quite efficient: goods are moving from one location to many. Moving goods from many locations to one is more challenging, and is why we have chosen a council-run reuse bin collection to return packaging to the manufacturer.

The downside of this is a limited choice of size/shape of container is required to keep complexity of machinery in the reuse centres down.

One possible solution to allow for efficient return of packaging to its manufacturer would be to use a shared usage model of delivery drones.

### Drones

Each home would have a "landing pad" that a standard sized container would be placed on with used packaging inside. A drone would be automatically dispatched from the nearest distribution center to collect the packaging.

From the distribution centres, packaging can be returned directly to manufacturers, meaning a variety of shapes and sizes of container can be used, increasing marketability of products and strengthening branding, while remaining in the circular model.

# REUSE BINS

**Time Frame: 10–15 years.**

## The Issues

Consumer knowledge and behaviour can be helped and influenced, but not controlled.

Failure of consumers to sort packaging in their recycling causes problems for recycling centres.

Manufacturing and materials takes up 98.6% of the energy used in the life cycle of packaging.

Recycling materials requires energy to break them down, and then remanufacture into packaging.

## Our Solution

Reuse bins kept by recycling bins allow for consumers to not change how they behave. The journey of the packaging is the same in the consumers' hands.

Standardised packaging will remove the need to sort waste for consumers and recycling centres.

The amount of unsorted recycling going into recycling centres is decreased greatly, allowing for more efficiency and infrastructure development.

Local councils collect reusable waste and send them to reuse centres, much like recycling.

Reuse centres clean and repair packaging, then sell the packaging back to the distributors. Thus reducing the need to manufacture more packaging.

Any irreparable packaging is removed and sent to recycling centres to be recycled.

## The Design

### The Bin

The bin was designed to have a shape desirable for stacking containers inside. The raised backboard houses a QR code scanner to allow for quick and convenient scanning and dropping.

## What's Inside

### NFC Reader

The bin has an NFC Reader that links up with the user's phone and the installed Green Square app.

### QR Code Scanner



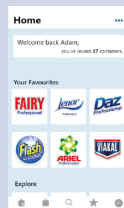
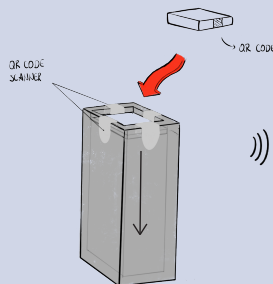
The bin has a QR code scanner that will scan the bottom of the reusable packaging before it is placed in the bin.

Scanning the packaging lets the app know that you've finished using your product.

### Descending Platform

The bin has a descending platform on the inside that allows for easy scanning and stacking when dropping off the reusable packaging.

## The App



The Green Square app keeps you registered and keeps track of how many containers you reuse.

Your product is automatically added to your shopping list or automatically re-ordered for you through the app.

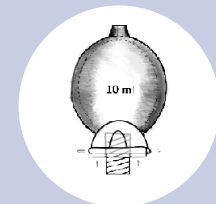
The app uses an algorithm to help the council improve waste collection efficiency.

Learn more about the brands you buy from through the app!

# PACKAGING DESIGN

## 1. SQUEEZE

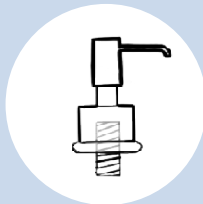
Squeeze is ideal for jobs that need a very specific amount of a liquid product. Squeeze makes it impossible to spill large amounts of strong chemicals as it only releases 10mL of the liquid upon squeezing the silicon tip.



Simple design. The bottle is designed with durability being the main consideration as it is desired that a single bottle is able to go through at least 20 cycles (10 years) of reuse.

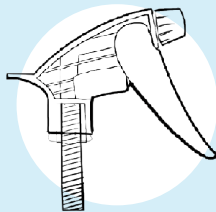
## 2. PRESS

Press is for things like hand soap. Press is not much different than the ordinary hand soap dispenser except that it is designed to withstand hundreds of more cycles and to be easily torn apart for recycling.



## 3. SPRAY

Spray is designed for long use and isn't much different than an ordinary spray mechanism. One small difference is the added dome (part b on the image to the right). This dome allows better ergonomics when the spray is in use.



# ASSEMBLY

Attachment heads are bought assembled and only need screwing on the bottle however each head is held together with only one bolt which once taken out allows everything to come apart easily.

## 3.2 DOME

Dome is designed to allow a hand to rest on it during usage as bottle is rectangular and won't allow hand to easily be placed. Made from stainless steel..



## 3.1 SPRAY HEAD

Spray head is equipped with a "v" notch nozzle.

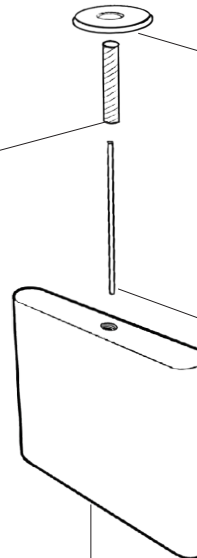
All made from PET with steel spring and metal linkages.

## 3.3 SILICON DISC

Silicon disc is a compressable piece that is placed between the dome and bottle to prevent any leakage that may occur.

## 3.4 STEEL THREAD

Stainless steel thread all parts of the attachment head to remain together and also joins the attachment head to the aluminium bottle.



## 3.5 STRAW

Straw simply fits and remains in place with a push into the head. Made from PET.

## 3.6 BRUSHED STAINLESS STEEL BOTTLE

Single piece brushed stainless steel bottle with a simple design. These bottles are coated on the inside with a super hydrophobic layer to make cleaning the inside of such a bottle very easy or even unnecessary. Bottles are edged with QR codes to allow easy identification and tracking.

# WHY RECYCLED STEEL?

? Why not use the effects of climate change to build systems that will fight against climate change ?

## VAST AVAILABILITY



### REDUNDANT CARS

New light weight electric cars designed to increase sustainability make previous gas and petrol, high steel rate cars redundant

An average car is made of 55% steel. [1]



### CONSTRUCTION WASTE

Climate change is leading to more natural disasters which are destroying the current buildings

The debris from these buildings will contain more steel. [2][9][10][11]



### ILLEGALLY DISPOSED SHIPS

Many ships are disposed of illegally [3]

The hulls of these ships are made of steel.[4]



### EXCESS STEEL PRODUCTION

There is already an excess of steel production. In China, only 70% of the steel manufactured is being used [5]

30% of the steel manufactured in China is an excess.[5]



## RECYCLABILITY



### ECONOMICAL

It is economically favourable to actually recycle steel instead of producing it from virgin materials [6]



### RECYCLABILITY

Steel isn't downgraded upon recycling and therefore can be recycled indefinitely [6]



### EFFICIENT

Steel has been recycled for more than 150 years leading to developed, efficient methods of recycling [6][8]



## USAGE & REUSE



### CORROSION RESISTANT

Especially stainless steels composition allows steel to be used for a long time without being corroded [7]



### NO CHEMICAL LEACH

Unlike plastic that can change the content of what it contains by leaching over 2000 different chemicals into it.[7]



### UV RESISTANCE

The added chromium, carbon, silicon, manganese, nickel and molybdenum in steel allows good UV resistance [7]



### EASY TO CLEAN

Steel has a non porous structure which makes it easy to clean where as plastic has a naturally porous structure [7]



### HIGHLY DURABLE

Green square steel bottles are expected to last for at least 400 reuse cycles which is 8 times more than ecover bottles [7]



# GREEN SQUARE VS. ECOVER

## INSIGHT

Green Square is compared to eCover on both the packaging level and the system level with regards to it's sustainability and desirability. Desirability is very important both for the customer and the business as no matter how sustainable a packaging may be, if it's not desirable, we believe that there will always be consumers and businesses that will not want to comply. eCover was chosen as the business to compare green square with because of eCovers focus on reusability and this being one of Green Squares priorities.

### PACKAGING

#### DESIRABILITY

##### BUSINESSES

**STANDARDIZATION**  
Compared to eCover all greensquare packaging shapes are standard and simple. With added QR codes, packaging compared to eCover can be more easily managed and refilled in factories.

##### CUSTOMER PERCEPTION

Packaging is made from stainless steel which is a material that is perceived as much more premium compared to the plastics used in eCover bottles.

##### ATTRACTIVE DESIGN

The square shapes of the packaging is unique but also very attractive compared to eCover bottles.

##### HOME STORAGE EFFICIENCY

The square shape also allows product users to easily store the item in their house (ie. on shelves). Compared to eCover this is a more future proof geometry as space will become very valuable in houses.

##### CUSTOMERS

#### SUSTAINABILITY

##### SHAPE

##### TRANSPORT STORAGE EFFICIENCY

Shape allows much more efficient storage during travel compared to eCover bottles.

##### MINIMAL WASTE

Super hydrophobic coating on the inside allows less content wastage and lower levels of energy used to bring the bottle back to a reusable state.

##### NO TOXIC CHEMICALS

Stainless steel doesn't release the toxic chemicals into the soil as most plastics do in case the bottle was to end up in landfill.

##### ABUNDANCE OF MATERIAL

Steel is a material that is found in abundance and will increase in it's availability compared to the oils that plastics are made from.

##### SLOWING LOOPS

Stainless steel is a much more durable material compared to plastics and is expected to last for 8 times more reuse cycles than eCover bottles that can be reused around 50 times. This slows down the loops.

##### MATERIAL

### SYSTEM

#### DESIRABILITY

##### BUSINESSES

**HIGHER CONVENIENCE**  
The existence of reuse bins through the collaboration with the council allows higher levels of convenience for the customer compared to eCover.

**FEASIBILITY FOR WIDER USAGE**  
Green Square system allows multiple businesses to carry on selling as they are without having to make a difference to their business model whereas the system used for eCover isn't very feasible for multiple businesses to apply as shops only have limited space.

##### DEMATERIALISATION OF PACKAGING

Compared to eCover the owner never fully owns the packaging. This leads to the dematerialisation of the product.

##### EFFICIENCY IN THE SYSTEM

Recollection, refurbishment and redistribution at an industrial level allows much greater efficiency compared to this being done by individuals as is done with eCover.

##### INVOLVEMENT OF COUNCIL AND GOVERNMENT

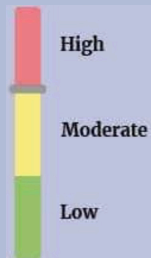
Having the council and the government involved in the system allows the system to be much more widely implemented around the country compared to eCover where lots of people may not have access to it.

##### CUSTOMERS

#### SUSTAINABILITY

# Impact on Stakeholders

## Home Care Companies



Home Care Companies will need to use standardised packaging shapes and sizes, losing some of their brand uniqueness.

Home Care Companies will have a largely reduced amount of newly manufactured packaging, saving them energy, and reducing carbon emissions.

## Retailers



Retailers such as supermarkets or pharmacies and their online counterparts will not be impacted greatly. However, because of the design of the packaging, space efficiency on shelves or in warehouses where their products are kept will be greatly increased.

## Consumers



Consumers should be relatively unaffected. They will continue to purchase from their respective shops, and when they are finished with the product, they will put it in a bin.

Consumers will have less things to recycle, allowing for easier sorting for what they do recycle.

## Local Councils



Local Councils will only need to implement the reuse bin system into the existing waste collection system.

## Recycling Centres



New reuse centres will need to be built that will handle the cleaning and maintenance and redistribution of packaging to the home care companies.

Recycling centres will have a greatly reduced input of waste, meaning that the quality of waste management should increase and the infrastructure will have a chance to develop.



# RESOURCES

[1] <https://www.etf.com/sections/features-and-news/1289-cars-and-metal-metal-and-cars?nopaging=1>

[2] <https://blog.capterra.com/5-tips-for-recycling-your-construction-waste/>

[3] [https://en.wikipedia.org/wiki/Ship\\_disposal](https://en.wikipedia.org/wiki/Ship_disposal)

[4] <https://www.marineinsight.com/guidelines/what-materials-are-used-for-building-ships/>

[5] <https://www.businesswire.com/news/home/2016111005670/en/Top-3-Trends-Impacting-Global-Stainless-Steel>

[6] <https://www.tatasteeleurope.com/en/sustainability/steel-for-a-sustainable-future/the-life-cycle-of-steel/recyclable-or->

[7] <https://www.elementalbottles.com/blogs/news/steel-water-bottle-vs-plastic-water-bottle-whats-the-benefit-of-steel-water-bottles>

[8] <http://large.stanford.edu/courses/2016/ph240/martelarol/>

[9] <http://www.level.org.nz/material-use/minimising-waste/reuse-and-recycling/>

[10] [http://www.earthquakes.bgs.ac.uk/news/EQ\\_increase.html](http://www.earthquakes.bgs.ac.uk/news/EQ_increase.html)

[11] <https://www.bbc.co.uk/news/resources/idt-d7bc8641-9c98-46e7-9154-9dd6c5fe925e>













