Data Prototype

RGU Team 2

Research

Glasgow has one of the lowest recycled amount of waste per person among all Scottish cities. It is 0.1 tonnes, with similar amounts being seen only in Shetland and Orkney islands. It also has one of the lowest recycling rates, with Glasgow City reaching only 24.6.% recycling in 2018.

0.10 t

recycled per person in 2018

Table 2. Scottish Household waste generated and managed per person in 2018 - summary data[3]

Local Authority	Generated (tonnes per person)	Recycled (tonnes per person)	Other diversion from landfill (tonnes per person)	Landfilled (tonnes per person)	Carbon Impact (TCO_2e per person)
Aberdeen City	0.38	0.18	0.12	0.08	0.87
Aberdeenshire	0.46	0.20	0.01	0.25	1.18
Angus	0.47	0.26	0.19	0.02	0.97
Argyll and Bute	0.56	0.21	0.09	0.26	1.38
City of Edinburgh	0.37	0.14	0.03	0.19	0.95
Clackmannanshire	0.51	0.29	0.01	0.21	1.04
Dumfries and Galloway	0.53	0.15	0.15	0.24	1.53
Dundee City	0.41	0.15	0.23	0.03	1.00
East Ayrshire	0.44	0.23	0.04	0.17	0.97
East Dunbartonshire	0.48	0.26	0.09	0.12	1.03
East Lothian	0.47	0.25	0.02	0.20	1.05
East Renfrewshire	0.46	0.31	0.01	0.14	0.94
Falkirk	0.43	0.22	0.02	0.19	0.97
Fife	0.45	0.23	0.03	0.19	0.91
Glasgow City	0.39	0.10	0.03	0.27	1.17
Highland	0.54	0.23	0.03	0.28	1.35
Inverclyde	0.36	0.20	0.02	0.14	0.74
Midlothian	0.46	0.27	0.06	0.13	1.01
Moray	0.50	0.29	0.00	0.21	0.96
Na h-Eileanan Siar	0.53	0.12	0.07	0.35	1.41
North Ayrshire	0.45	0.25	0.05	0.16	1.04
North Lanarkshire	0.43	0.19	0.06	0.18	1.04
Orkney Islands	0.46	0.10	0.22	0.12	1.22
Perth and Kinross	0.47	0.25	0.03	0.20	0.93
Renfrewshire	0.46	0.22	0.14	0.10	1.07
Scottish Borders	0.46	0.18	0.01	0.27	1.16
Shetland Islands	0.42	0.04	0.28	0.09	1.35
South Ayrshire	0.50	0.26	0.06	0.18	1.11
South Lanarkshire	0.47	0.21	0.04	0.23	1.13
Stirling	0.44	0.24	0.00	0.20	0.93
West Dunbartonshire	0.47	0.20	0.05	0.22	1.15
West Lothian	0.41	0.27	0.04	0.10	0.83
Total Scotland	**0.44**	**0.20**	**0.05**	**0.19**	**1.06**

https://www.sepa.org.uk/media/469650/2018-household-waste-commentary.pdf

Research

Table 1. Scottish Household waste generated and managed in 2018 - summary data[2]

Local Authority	Generated (tonnes)	Recycled (tonnes)	*Percentage Recycled (%)*	Other diversion from landfill (tonnes)	*Percentage Other diversion from Landfill (%)*	Landfilled (tonnes)	*Percentage Landfilled (%)*	Carbon Impact (TCO_2e)	*2017 Recycled (Percentage)*
Aberdeen City	85,540	40,483	*47.3*	27,438	*32.1*	17,619	*20.6*	*198,518*	*43.9*
Aberdeenshire	120,519	52,298	*43.4*	2,784	*2.3*	65,437	*54.3*	*308,193*	*43.7*
Angus	54,619	29,890	*54.7*	22,346	*40.9*	2,383	*4.4*	*112,134*	*55.2*
Argyll and Bute	47,972	18,150	*37.8*	7,725	*16.1*	22,098	*46.1*	*119,149*	*38.7*
City of Edinburgh	193,341	74,962	*38.8*	17,678	*9.1*	100,701	*52.1*	*492,832*	*41.0*
Clackmannanshire	26,122	14,706	*56.3*	492	*1.9*	10,924	*41.8*	*53,571*	*59.5*
Dumfries and Galloway	79,325	21,757	*27.4*	22,504	*28.4*	35,064	*44.2*	*227,001*	*27.8*
Dundee City	60,773	21,761	*35.8*	34,673	*57.1*	4,340	*7.1*	*148,299*	*35.5*
East Ayrshire	53,148	27,553	*51.8*	4,957	*9.3*	20,647	*38.8*	*118,087*	*52.9*
East Dunbartonshire	51,643	28,218	*54.6*	9,994	*19.4*	13,431	*26.0*	*111,395*	*47.9*
East Lothian	50,134	26,623	*53.1*	1,987	*4.0*	21,524	*42.9*	*110,686*	*53.1*
East Renfrewshire	43,927	29,090	*66.2*	1,085	*2.5*	13,753	*31.3*	*89,068*	*67.1*
Falkirk	68,571	34,800	*50.8*	3,175	*4.6*	30,595	*44.6*	*154,954*	*55.9*
Fife	167,353	85,471	*51.1*	10,560	*6.3*	71,322	*42.6*	*339,867*	*54.7*
Glasgow City	245,318	60,438	*24.6*	17,377	*7.1*	167,502	*68.3*	*733,950*	*26.7*
Highland	127,880	54,571	*42.7*	7,280	*5.7*	66,029	*51.6*	*317,214*	*43.6*
Inverclyde	28,027	15,690	*56.0*	1,724	*6.2*	10,614	*37.9*	*57,554*	*57.2*
Midlothian	41,890	24,369.0	*58.2*	5,194	*12.4*	12,327	*29.4*	*91,870*	*51.6*
Moray	47,522	27,256	*57.4*	0	*0.0*	20,266	*42.6*	*91,661*	*57.8*
Na h-Eileanan Siar	14,325	3,305	*23.1*	1,756	*12.3*	9,265	*64.7*	*37,897*	*23.9*
North Ayrshire	61,421	33,510	*54.6*	6,815	*11.1*	21,096	*34.3*	*141,057*	*55.8*
North Lanarkshire	146,175	63,879	*43.7*	19,970	*13.7*	62,326	*42.6*	*353,977*	*39.6*
Orkney Islands	10,221	2,153	*21.1*	4,826	*47.2*	2,650	*25.9*	*27,128*	*18.3*
Perth and Kinross	71,815	37,120	*51.7*	4,045	*5.6*	30,650	*42.7*	*140,239*	*55.6*
Renfrewshire	81,255	39,998	*49.2*	24,087	*29.6*	17,010	*20.9*	*189,505*	*47.8*
Scottish Borders	52,491	20,365	*38.8*	1,455	*2.8*	30,671	*58.4*	*134,140*	*39.9*
Shetland Islands	9,649	1,017	*10.5*	6,477	*67.1*	2,156	*22.3*	*31,049*	*8.0*
South Ayrshire	55,814	29,340	*52.6*	6,490	*11.6*	19,984	*35.8*	*124,772*	*52.5*
South Lanarkshire	150,470	66,676	*44.3*	11,261	*7.5*	72,533	*48.2*	*361,238*	*47.3*
Stirling	41,925	22,688	*54.1*	434	*1.0*	18,804	*44.9*	*88,173*	*55.1*
West Dunbartonshire	41,867	18,206	*43.5*	4,036	*9.6*	19,624	*46.9*	*102,739*	*47.6*
West Lothian	74,194	48,340	*65.2*	7,730	*10.4*	18,124	*24.4*	*152,069*	*61.3*
Total Scotland	**2,405,246**	**1,074,682**	***44.7***	**298,356**	***12.4***	**1,031,467**	***42.9***	***5,759,986***	***45.5***

24.6%

recycled in 2018

68.3%

landfilled

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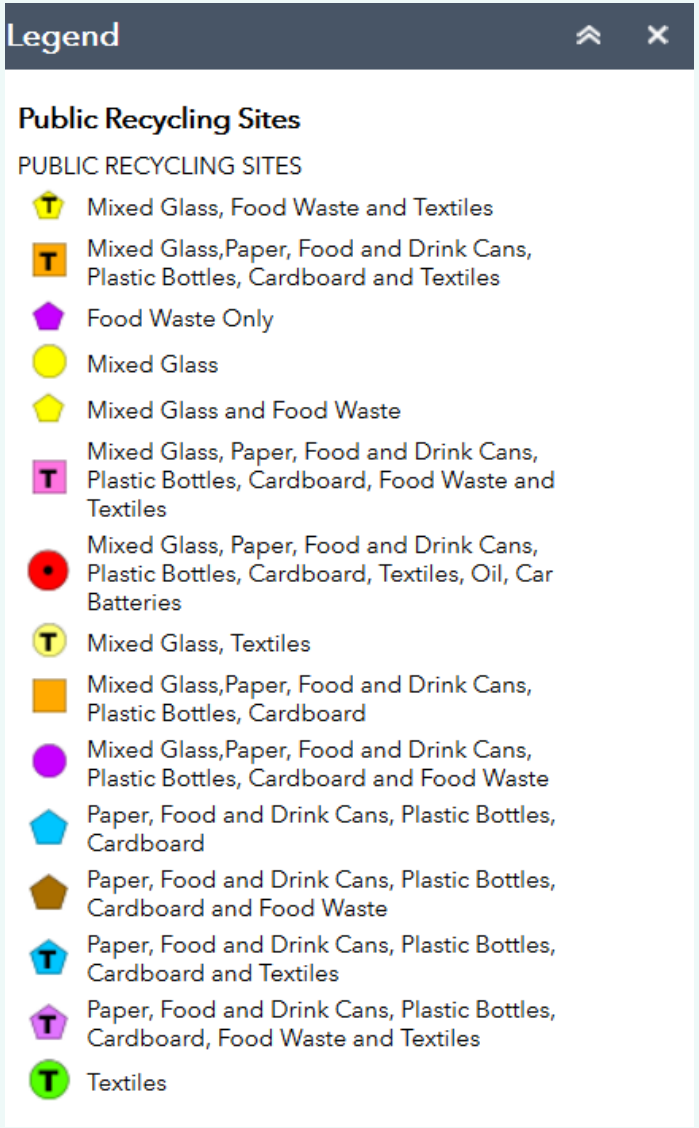
https://www.sepa.org.uk/media/469650/2018-household-waste-commentary.pdf

Data needed for building the app



Recyclable materials list

The starting point will be this list which contains the recycling materials for Glasgow Recycling centres. We will also use the data on recycling materials from WiseUpToWaste about materials that can or not be recycled.

Further on we will add more materials based on which can or not be recycled at Glasgow facilities, but also to serve as an information point for the users when not sure what can be recycled.

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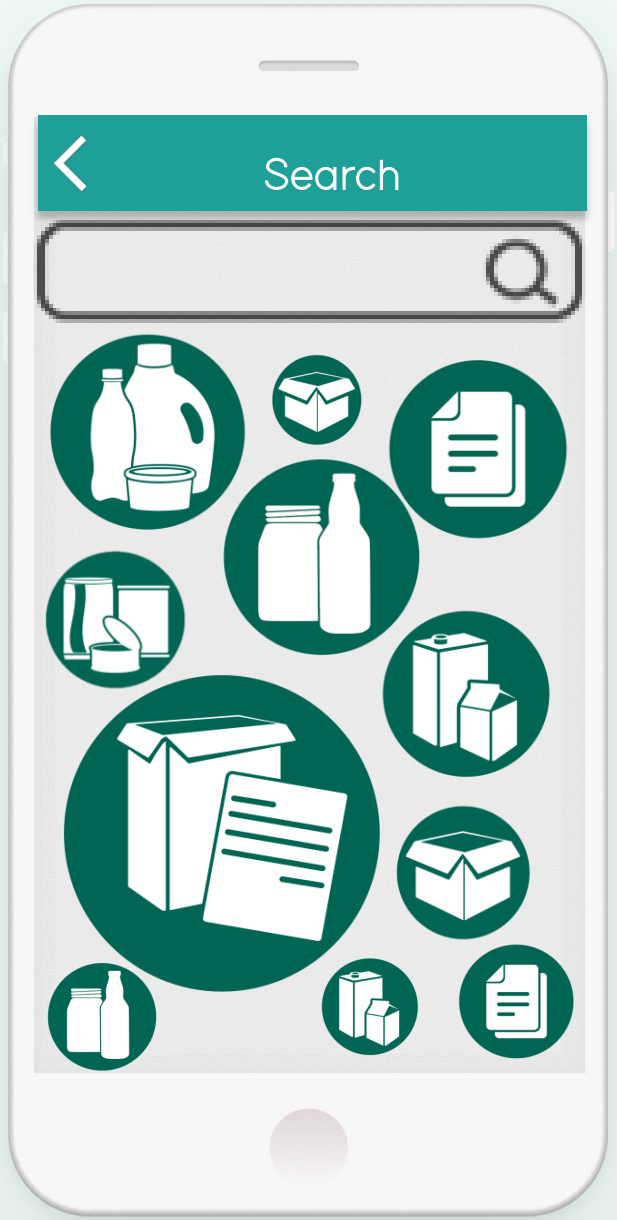
http://www.wiseuptowaste.org.uk/recycle/a-z-of-materials/

https://glasgowgis.maps.arcgis.com/apps/webappviewer/index.html?id=345f389a91ff4f1fa193b24df832fb05

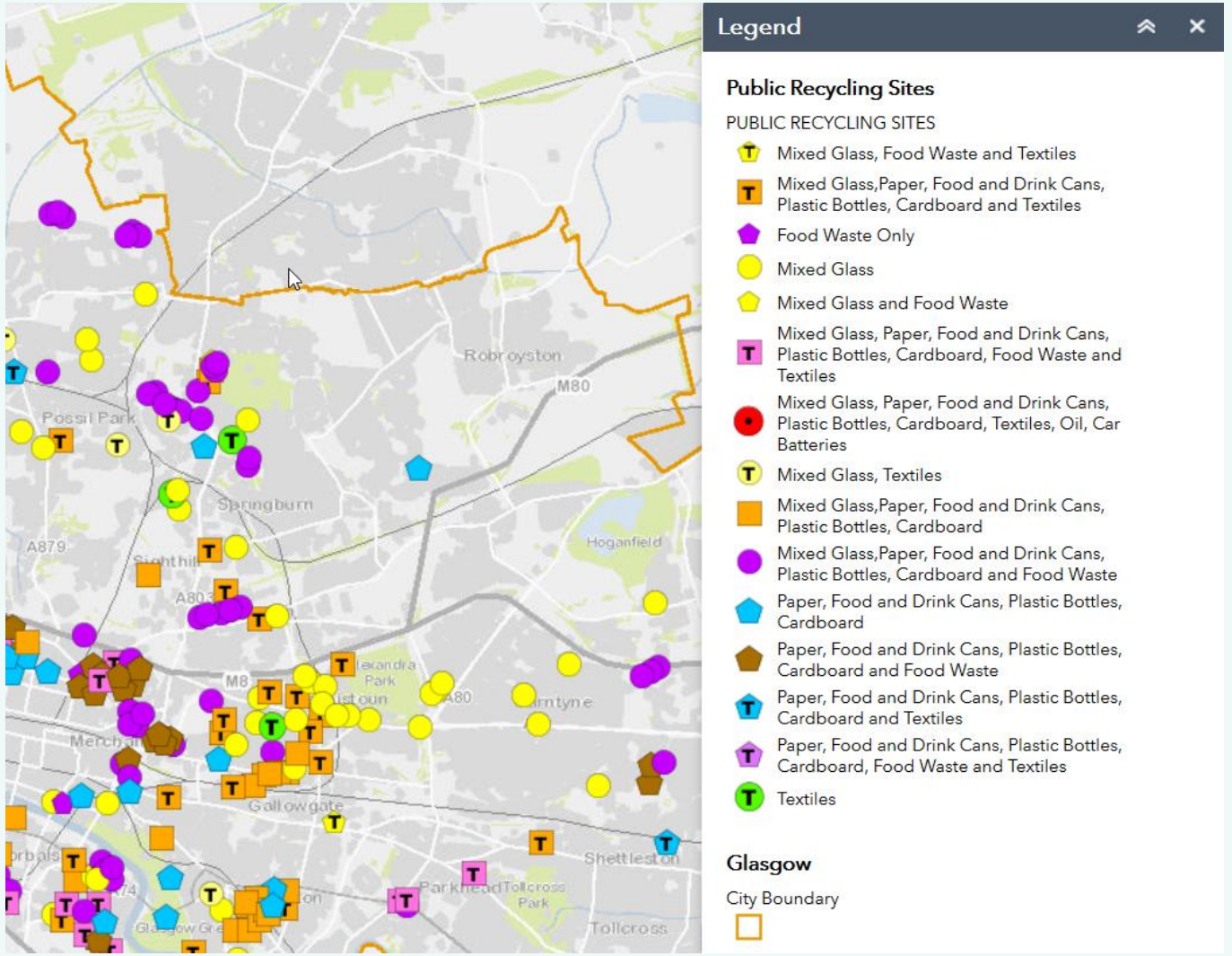


Data needed for building the app

Existing recycling sites in Glasgow

The recycling points will be used from the "Where can I recycle?" map by the Glasgow City Council website that contains this information. They will serve as an indication on where would the collection points be.

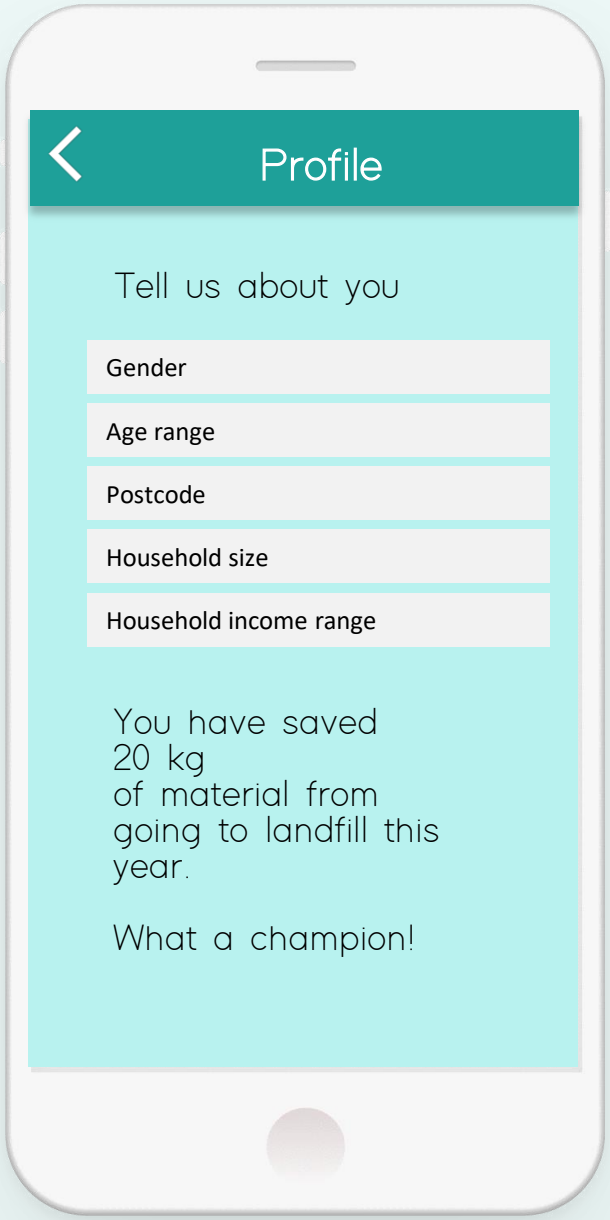
https://glasgowgis.maps.arcgis.com/apps/webappviewer/index.html?id=345f389a91ff4f1fa193b24df832fb05



Data needed for building the user base

Contact Glasgow Universities and start advertising there first.

Students might be asked to opt in if they would like in an initial campaign launched using the marketing materials in the Concept prototype as early as September 2020. There is a potential to expand the concept all over Scotland following Glasgow.

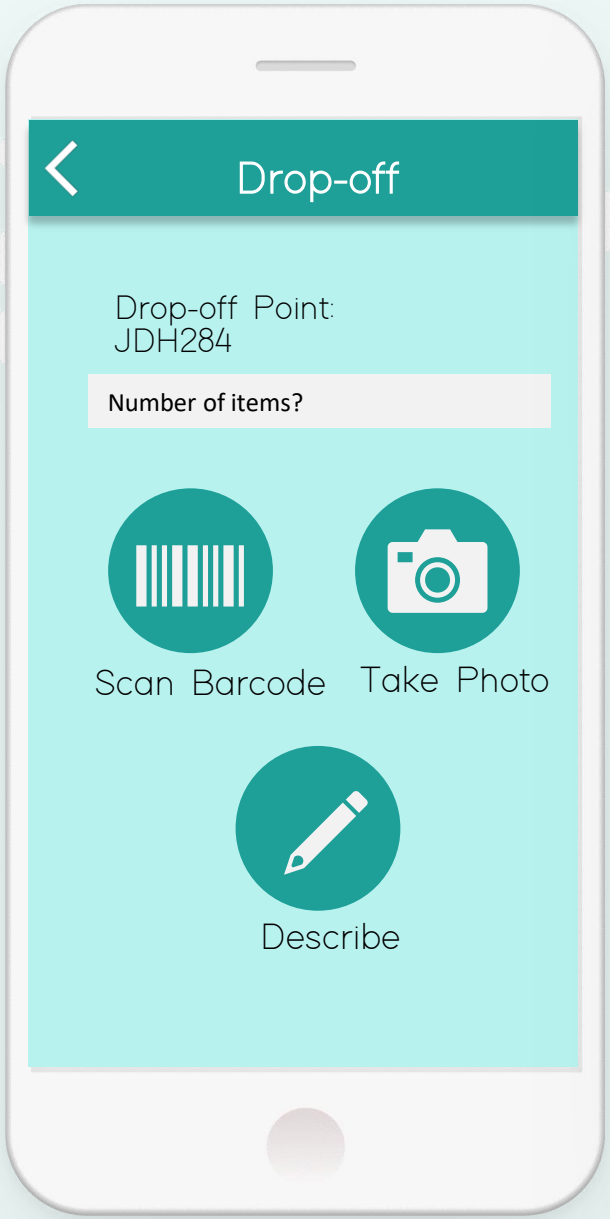


User data collection

The user will fill in general data about themselves to help us create some user categories and understand recycling patterns in different communities.

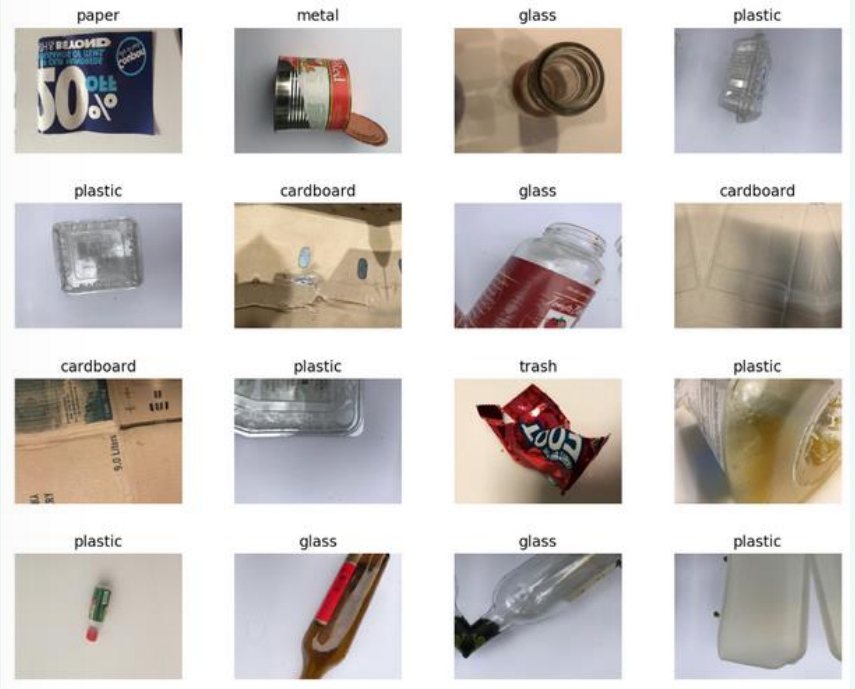
The data will be securely stored and only used for improving recycling services, especially in deprived areas. These data points will not be mandatory, and to motivate people share their profile there will be a reward.

One alternative option would be to have a limited info profile which contains only household information



Data Collection

With the help of the mobile app Glasgow will collect enough data to train their own smart recycling system. The images could be stored in a cloud service, or on a Glasgow owned server.



Building a waste image classifier

With the collected data Glasgow City council can create a waste sorting algorithm to use at its recycling centres. With the help of Machine Learning and Computer Vision Upcycle Glasgow will build an algorithm that will automatically sort the waste, reducing the need for people to sort their recycling at the collection point.

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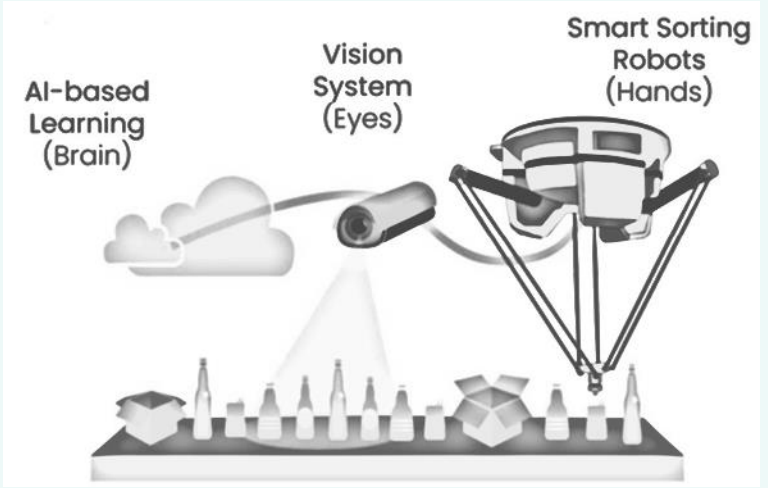
https://towardsdatascience.com/how-to-build-an-image-classifier-for-waste-sorting-6d11d3c9c478

Video waste sorting

The next step will be video Computer Vision models able to sort out the waste dynamically on the tray. Deep Neural Networks can be used, as there already exist research done in the area of waste sorting using Deep Learning models.



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https://www.semanticscholar.org/paper/RecycleNet%3A-Intelligent-Waste-Sorting-Using-Deep-Bircanoglu-Atay/44e9a393795ce7ccd61b7b1c91e7c83d8e42b94d