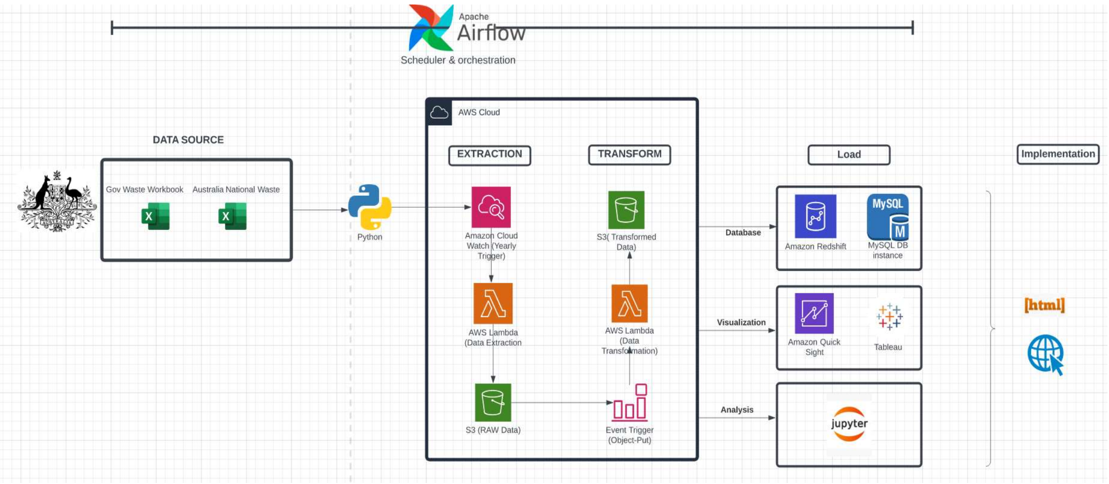
Waste Insight Planned ETL Workflow



- **Data Source:**
  - ➢ Australia Government, Department of Climate change
  - ➢ Victoria State Government
- **Scheduler:**
  - ➢ Airflow: it creates, schedules and monitor data workflow, very helpful when managing data pipeline.
- **Extraction:**
  1. Create a Lambda function to extract data from open sources.
  2. Set triggers via CouldWatch. Once a year, the lambda function will extract data from the open data source
  3. The extracted raw data will be sent to an AWS S3 bucket/Data lake
- **Transform:**
  1. Create a Lambda function to transform the data in the AWS S3 bucket containing the raw data. And send the transformed data to a new bucket
  2. Set up a trigger so Lambda will run whenever a file is added to the raw bucket.
- **Load:**
  - ➢ Load to database/management; eg. Redshift, Mysql
  - ➢ Load for visualization; eg. QuickSight, Tableau
  - ➢ Load for Analysis; eg. JupyterNote Book
- **Implementation:**
  - ➢ Dashboard or meaningful information discovered from the data will be write in html and implemented in our website
- **Note:**
  - ➢ Everything can be done automatically, just need a data engineer to monitor and maintain the whole process
  - ➢ To extract newest file, just change the year of file. For example 2020.xlsx to 2021.xlsx, which can be done by python string manipulation
- **Other Plan:** Build unit test for ETL pipeline

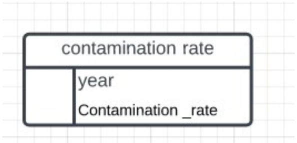
Open Data Sources

Data 1:

Name	Waste Services Workbook
Link	https://assets.sustainability.vic.gov.au/susvic/Workbook-Waste-Local-Government-Waste-Services-Workbook-2019-20.xlsx
Physical Access Used	EXCEL
Frequency of Iteration	Yearly
Granularity	Amount of money or tonnes of waste per year
Copyright details	https://www.sustainability.vic.gov.au/about-us/legal-and-policies/copyright

Schema

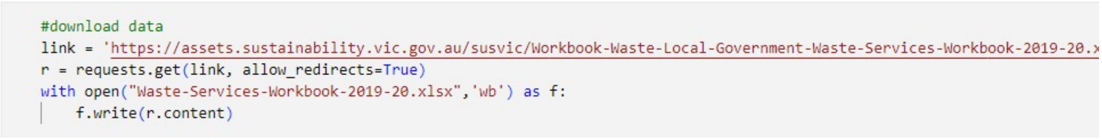
Column	**Description**
Year	Year of record
Contamination rate	Rate of wrong items in the recycling bin at Victoria



Example Code snippet

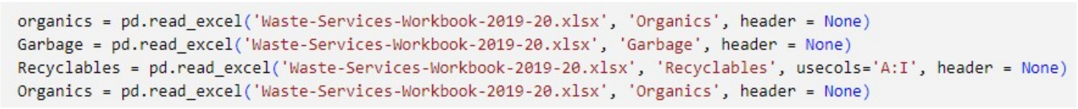
Environment: python 3.8

Extract Data:



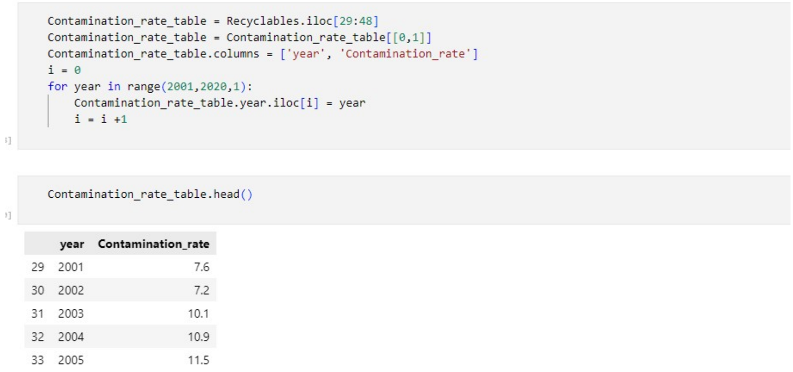
```
#download data
link = 'https://assets.sustainability.vic.gov.au/susvic/Workbook-Waste-Local-Government-Waste-Services-Workbook-2019-20.x
r = requests.get(link, allow_redirects=True)
with open("Waste-Services-Workbook-2019-20.xlsx",'wb') as f:
    f.write(r.content)
```

Load:



```
organics = pd.read_excel('Waste-Services-Workbook-2019-20.xlsx', 'Organics', header = None)
Garbage = pd.read_excel('Waste-Services-Workbook-2019-20.xlsx', 'Garbage', header = None)
Recyclables = pd.read_excel('Waste-Services-Workbook-2019-20.xlsx', 'Recyclables', usecols='A:I', header = None)
Organics = pd.read_excel('Waste-Services-Workbook-2019-20.xlsx', 'Organics', header = None)
```

Extract table:



```
Contamination_rate_table = Recyclables.iloc[29:48]
Contamination_rate_table = Contamination_rate_table[[0,1]]
Contamination_rate_table.columns = ['year', 'Contamination_rate']
i = 0
for year in range(2001,2020,1):
    Contamination_rate_table.year.iloc[i] = year
    i = i +1
```

```
Contamination_rate_table.head()
```

	year	Contamination_rate
29	2001	7.6
30	2002	7.2
31	2003	10.1
32	2004	10.9
33	2005	11.5

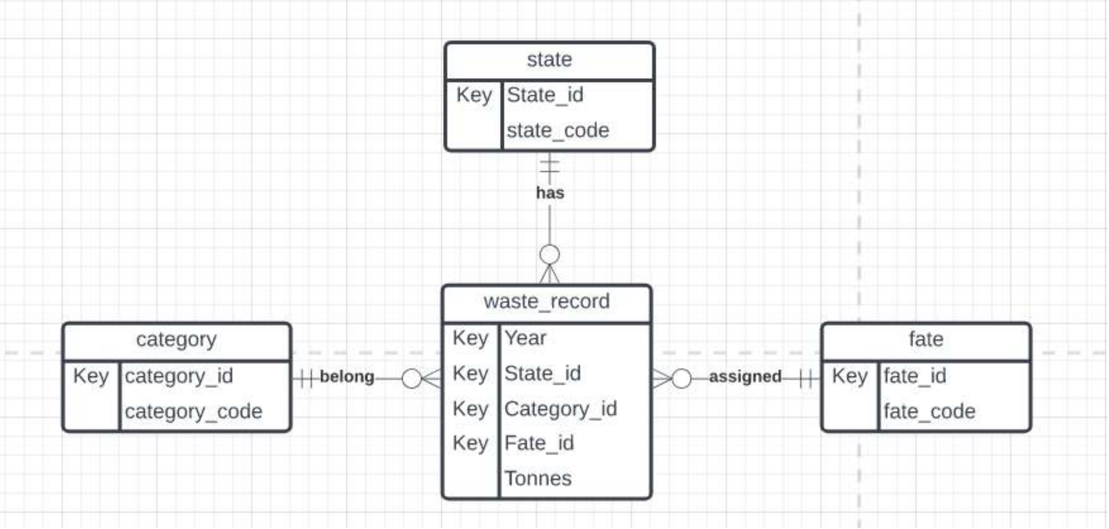
Data 2:

Name	National Wastes Database
Link	https://www.dcceew.gov.au/sites/default/files/documents/national-waste-database-2022.xlsx
Physical Access Used	EXCEL
Frequency of Iteration	Yearly
Granularity	Amount of money, rates or tonnes of waste per year
Copyright details	https://www.dcceew.gov.au/about/copyright

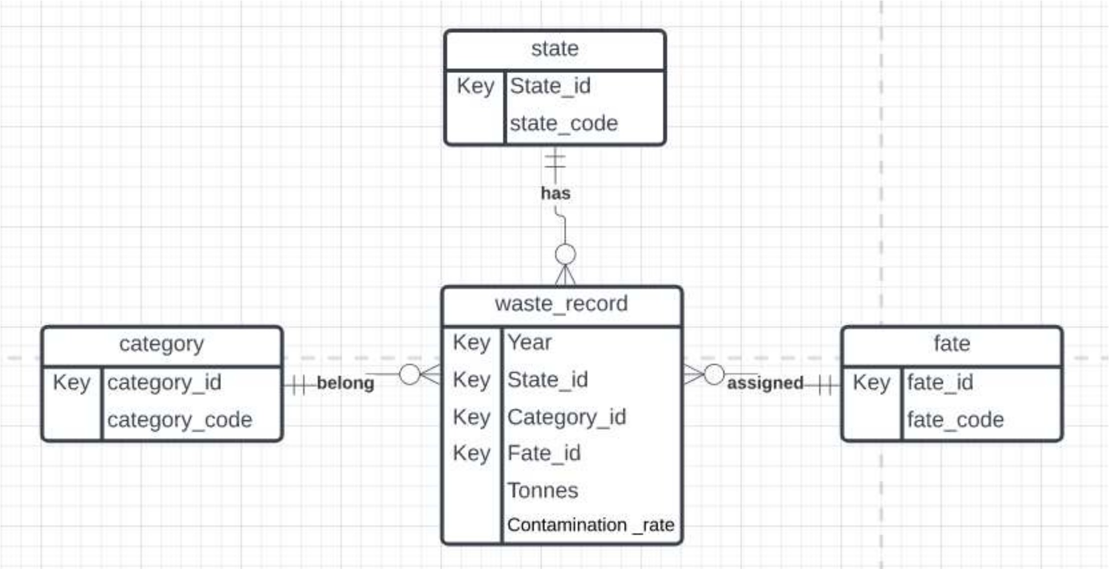
Schema:

Column	**Description**
Year	Year of record
Jurisdiction	State, for example: VIC,TAS
Category	Waste category, for example, hazard waste, glass, plastic
Management	How to manage the waste, for example: recycling, waste reuse
Fate	How to dispose the waste, for example: recycling, energy recovery
Tonnes	Total tonnes of waste

Conceptual Model



Data 2 and Data 1 merge:

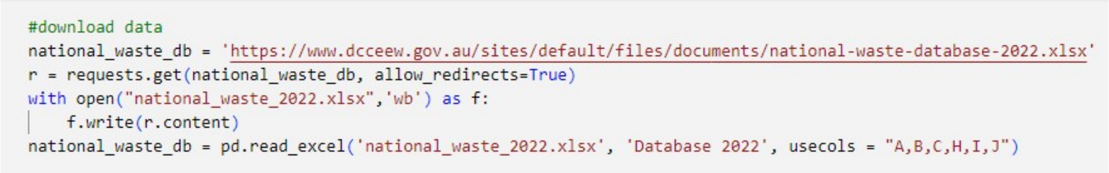


Notes: will find description for each category and fate and add into database in the future

Code Snippet

Environment: python 3.8

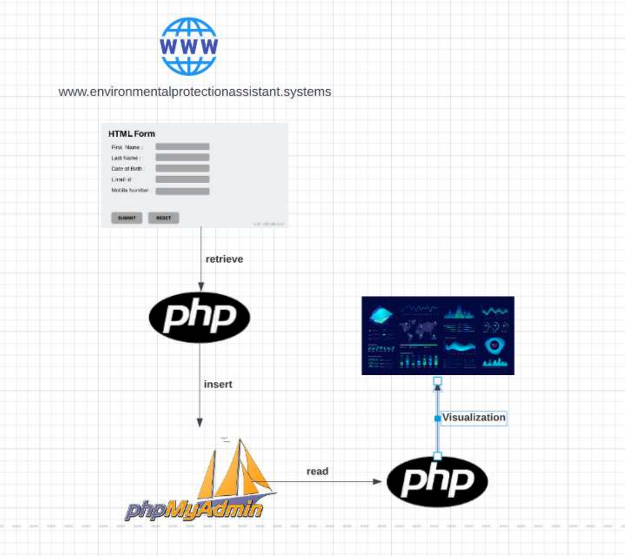
Extract Data:



```
#download data
national_waste_db = 'https://www.dcceew.gov.au/sites/default/files/documents/national-waste-database-2022.xlsx'
r = requests.get(national_waste_db, allow_redirects=True)
with open("national_waste_2022.xlsx",'wb') as f:
    f.write(r.content)
national_waste_db = pd.read_excel('national_waste_2022.xlsx', 'Database 2022', usecols = "A,B,C,H,I,J")
```

- The data is load into Tableau for visualization directly

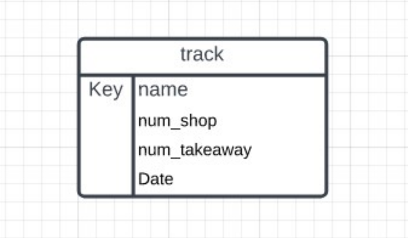
Website Data Flow



- **Data Flow:**
  - A Html form is deployed at Track on Waste page, user can enter and record their progress in developing sustainable habits
  - Data will be retrieved by a php function and insert into a table from WordPress database
  - Another php function can read the data from database and plot graphs

Schema:

Column	**Description**
Name	User's name
Num_shop	How many times did the user shop
Num_takeaway	How many times did the user order takeaway
Date	Date of record



Notes: The current user group is Rosa herself and some of her friends, so the names will not be repeated. When the user group expands in the future, the E-mail will be used as the Primary Key

Reference

Dashboard, web form and data extraction code link:

https://github.com/JRenMike/FIT5120-Data-Governance