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Advanced SQL and Cloud Databases

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UK ROAD SAFETY ANALYSER using Azure PaaS database, Microsoft power bi report builder and power bi dashboard

1.Introduction

The given assignment is based on UK road safety data of last 5 years. So, we had to imagine that we are employed as a Business Intelligence developer for UK road safety related research company (the client). The client is currently in the process of developing a reporting tool called UK Road Safety Analyzer using Azure PaaS Databases, Microsoft Report Builder and Power BI to analyze historical serious roadside accidents. The client requires our knowledge and expertise to design, implement and test a reporting system for this project using Azure PaaS Database, Microsoft Report Builder and Power BI. Use Microsoft Report Builder and Power BI as a presentation layer. We should provide a report detailing our approach and proposed frond-end design in Microsoft Report Builder and Power BI. We should also provide our SQL statements with appropriate comments and a full backup of our database. In addition to the front-end design, the client also requires working T-SQL statements with meaningful comments to achieve the following outcomes.

For that as the first step we should insert the 3 datasets (Road accidents last 5 years, Road Vehicles last 5 years, Casualties last 5 years) to Azure Paas Database. Then created all the tables using T SQL. Then we created 5 meaningful reports using power bi report builder. We included filtering, sorting, and grouping functionality in the reports. We included various search facilities in the reports. Also, created a Power BI Dashboard using data in the Azure database that allows users to evaluate the factors that correlate with the serious road traffic accident.

2.Exploration the dataset

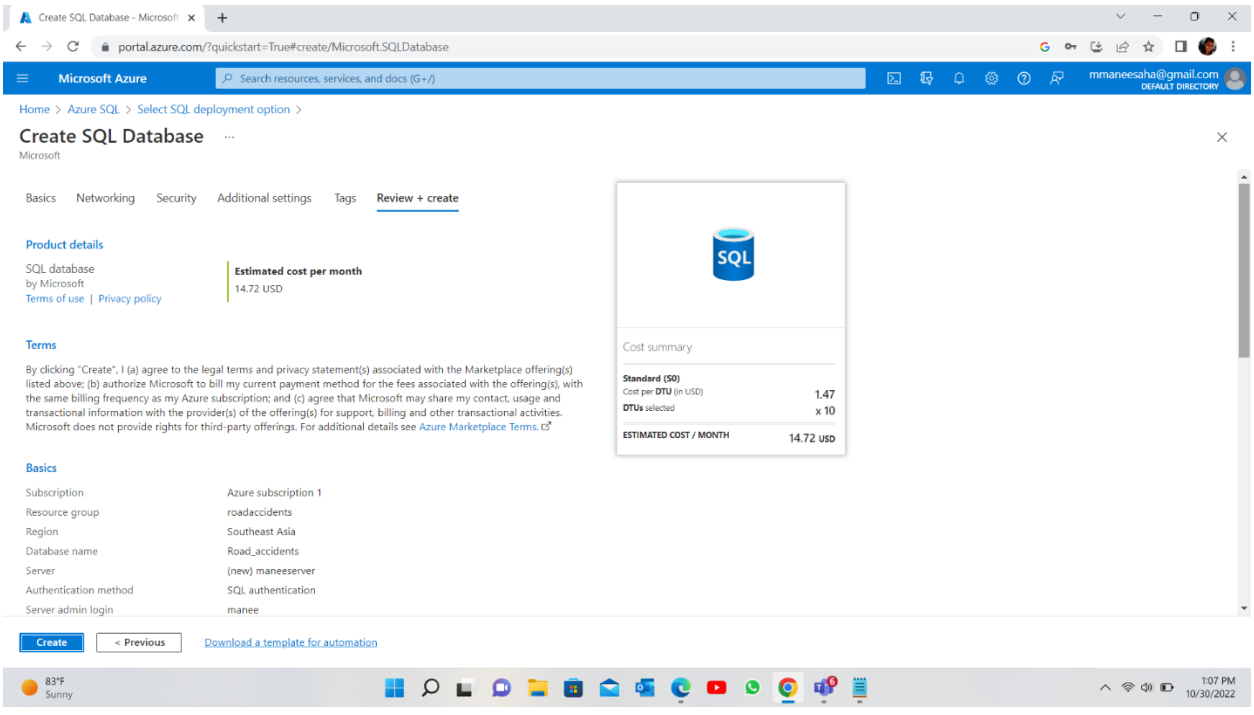
Every day, millions of citizens use road infastructre for walking, riding or driving. Any kind of serious accident on our roads is a disaster. As a responsible member of the community, it is our duty and responsibility to take the road safety measures more seriously to protect the community. In some cases, victims of a road side accident can fully recover from their injuries within a short period of time, while other victims become permanently disable. Road traffic injuries are majorly ignored public health problem, requiring rigorous efforts to provide effective and sustainable protection. One way to reduce the number of traffic accidents is to analyse traffic accidents recorded in depth and to understand the causes of the accidents. Understanding where traffic accidents most happened and identify any peak time

widows are crucial for improving road safety and road traffic enforcement officers. One of the most common methods of analysing road traffic accidents is descriptive statistics and time series analysis. This Research organization seeks to evaluate existing data and interpret road side accidents from multiple angles, at various levels and more broadly to discover potentially useful rules to improve road safety. Currently, improving road safety is the main goal of smart transport system and it leads to the importance of safety of the road infrastructure. Accident severity prediction information can provide rescuers with valuable information in response to the severity of accidents and other associated risks. In this study provides the details about road traffic accidents in Great Britain that were reported by the police during last five years using the STATS19 reporting system. The data used in this project was collected by police forces, either through officials who take part in the scene or from members of the public reporting the incident in police stations after the incident. Accidents that happened on private land or car parks are not included in the study. Damage only accidents that do not result in personal injury are also excluded from this study. Fatal accident defined as a road side accident that at least one person is killed. Serious accident defined as that at least one person is seriously injured but no one involved in the accident is killed. Slight accident defined as that at least one person is injured but not requiring medical treatment.

The 3 datasets have given enough data including all the aspects of road accidents. After downloading those 3 datasets we just explored it using Microsoft excel. But there were not much null data and no inconsistence data. We compared all the columns with the statistics data guide they provided for further details about the columns. So that the only thing we had to do with the dataset is renaming those value into text types for better understanding.

3.Creating the Azure Paas Database

When we were creating the Azure Paas Database, we needed an eligible subscription for creating the Azure Paas database.

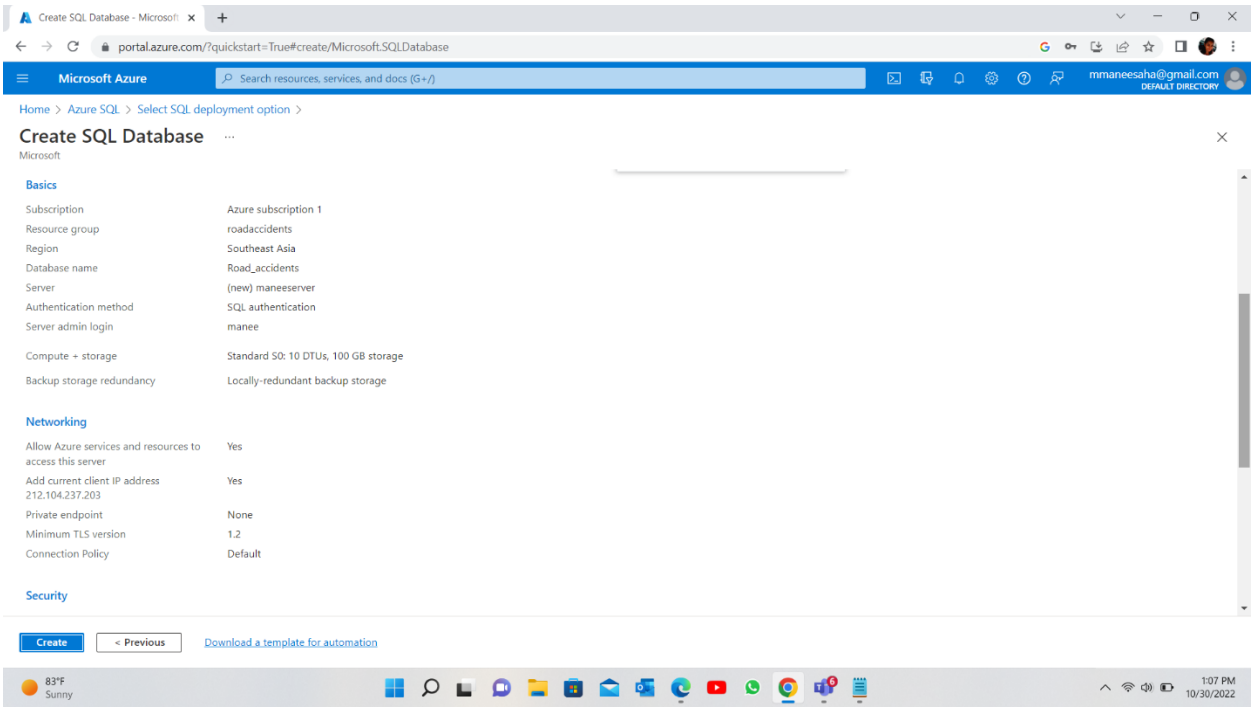


Azure SQL Database is a fully managed platform as a service (PaaS) database engine that handles most database management functions like upgrading, patching, backups, and monitoring without requiring user intervention. Azure SQL Database always runs on the most recent stable version of the SQL Server database engine and a patched operating system, with 99.99% uptime. The PaaS capabilities built into Azure SQL Database allow you to concentrate on domain-specific database administration and optimization tasks that are critical to your business (Microsoft Documentation).

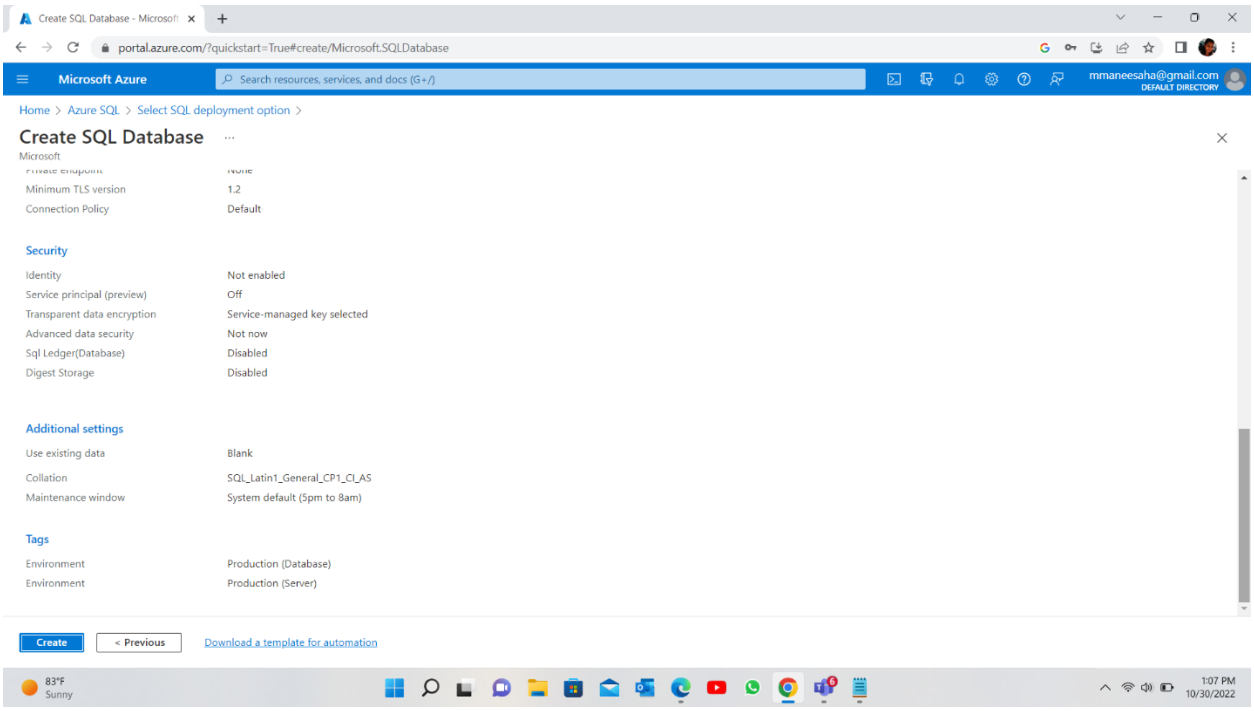
So we logged on to Azure portal using valid user id and subscription. When we were logging to the azure, we should make sure that we have created the valid resource group. Then to create the database we should select "Azure SQL" from the left-hand menu and add to select the deployment options.

In our case we should select the single database option to proceed next steps. After that we should provide valid details about the subscription and resource group in Basics page. So here as the project details, we filled out following datils.

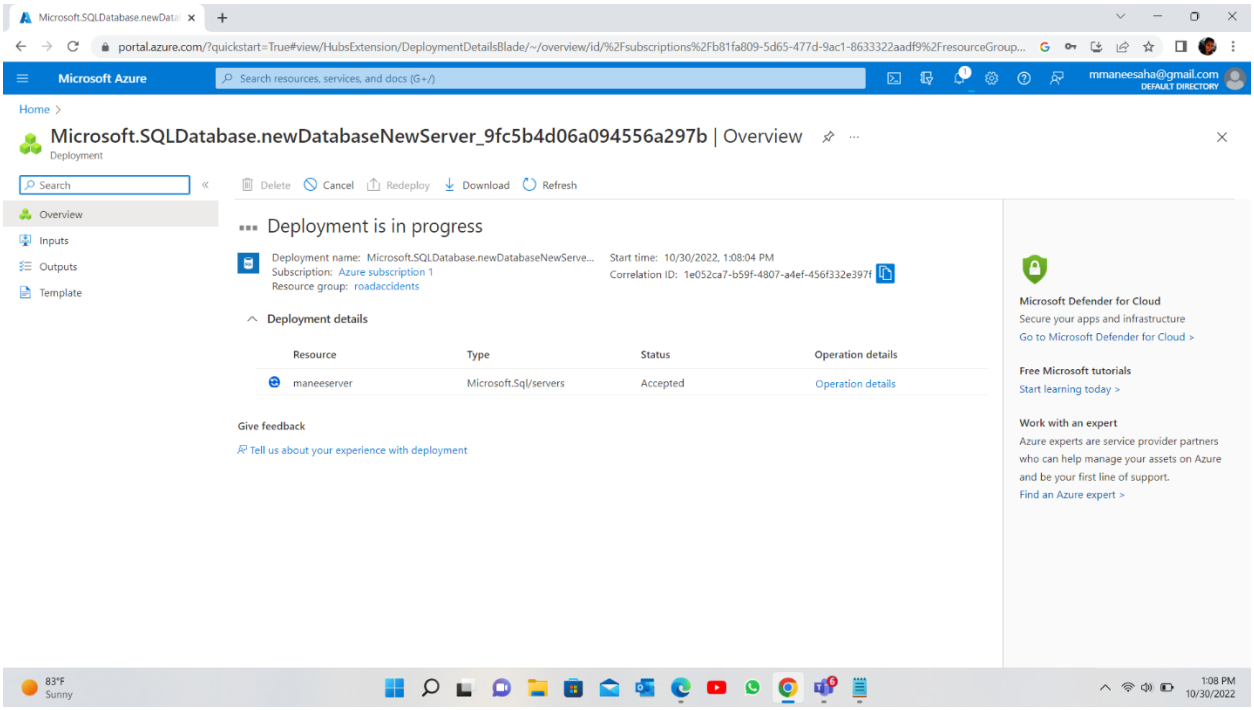
Server Name, Server admin login, password, Location

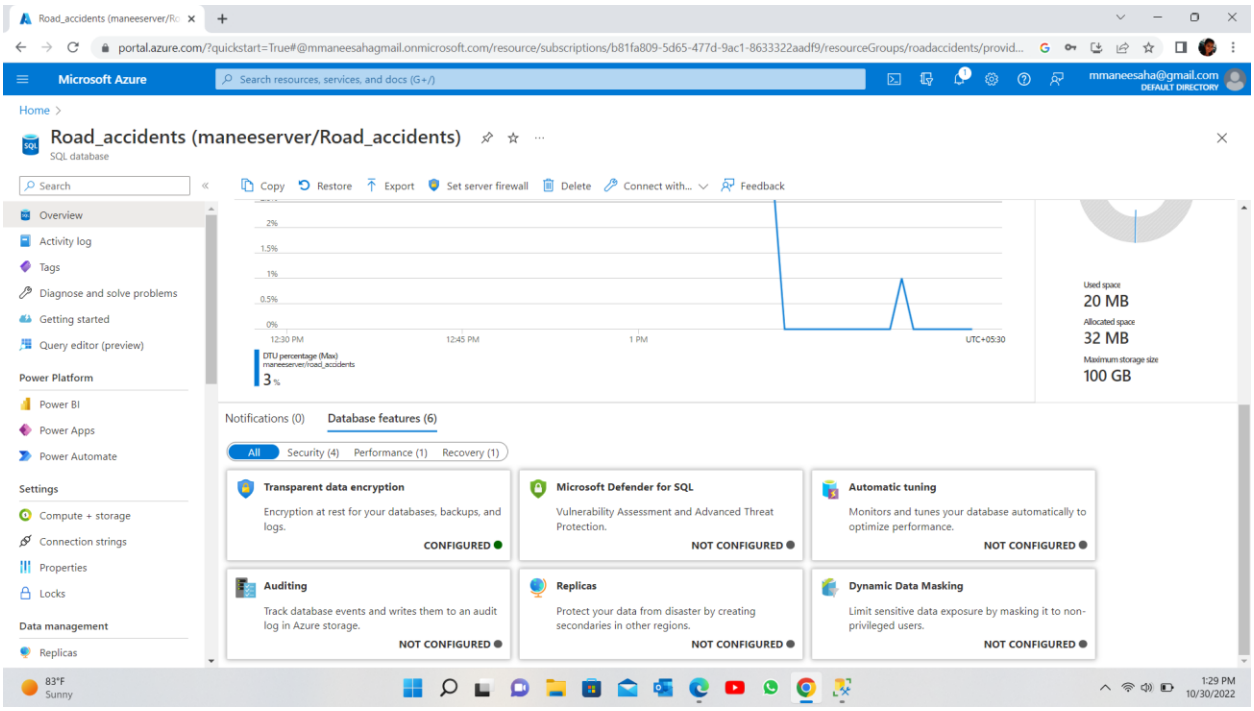


As the location we chose South India. After providing database and server details , we should select to use SQL elastic pool section, and then chose no option. Then as the nect step we should configure database and it navigated to a new page and asking to select tier and generation. We just adjusted the Vcores to 5.



Then we were in the additional settings page and reviewed that page and clicked to create. That was initiated the deployment to create the database. Once the database is created, we got an alert on the page saying the deployment is completed.





4.Importing data, creating tables in SQL

Once it completed, we imported the 3 datasets separately as 3 tables into our created database in Azure. Then we generated our 5 ideas for paginated reports before combining the 3 tables. Because , we can easily decide needed columns and then easily created the new view to combine 3 tables only with that selected columns . To combine 3 tables we created the following view ,

CREATE VIEW acc As
SELECT
A.[accident_index],A.[accident_year],A.[longitude],A.[latitude],A.[police_force],
A.[number_of_vehicles],
A.[number_of_casualties],A.[local_authority_district],A.[time],A.[road_type],A.[speed_limit],
A.[light_conditions],A.[weather_conditions],A.[road_surface_conditions],A.[carriageway_hazards],
A.[urban_or_rural_area],A.[special_conditions_at_site],A.[junction_detail],
A.[junction_control],

C.[vehicle_reference],C.[casualty_reference],C.[casualty_class],C.[sex_of_casualty],
C.[age_of_casualty],C.[age_band_of_casualty],C.[casualty_severity],
C.[pedestrian_location],C.[pedestrian_movement],
C.[car_passenger],C.[bus_or_coach_passenger],C.[pedestrian_road_maintenance_worker],C.[casualty_home_area_type],
C.[casualty_imd_decile],C.[lsoa_of_casualty],C.[accident_reference],

V.[vehicle_type],V.[vehicle_manoeuvre],V.[vehicle_direction_from],V.[vehicle_direction_to],
V.[junction_location],V.[hit_object_in_carriageway],V.[hit_object_off_carriageway],
V.[first_point_of_impact],V.[vehicle_left_hand_drive],V.[journey_purpose_of_driver],
V.[engine_capacity_cc],V.[propulsion_code],V.[age_of_vehicle],V.[generic_make_model],
V.[driver_imd_decile],V.[driver_home_area_type],V.[lsoa_of_driver]

FROM [dbo].[dft-road-casualty-statistics-accident-last-5-years (1)] AS A FULL OUTER JOIN
[dbo].[dft-road-casualty-statistics-casualty-last-5-years (1)] AS C
ON A.[accident_index] = C.[accident_index] FULL OUTER JOIN
[dbo].[dft-road-casualty-statistics-vehicle-last-5-years (1)] AS V
ON A.[accident_index] = V.[accident_index]
GO

```
CREATE VIEW Road_Accident_UK As
SELECT
A.[accident_index],A.[accident_year],A.[longitude],A.[latitude],A.[police_force],
A.[number_of_vehicles],A.[accident_severity],
A.[number_of_casualties],A.[local_authority_district],A.[time],A.[road_type],A.[speed_limit],
A.[light_conditions],A.[weather_conditions],A.[road_surface_conditions],A.[carriageway_hazards],
A.[urban_or_rural_area],A.[special_conditions_at_site],A.[junction_detail],
A.[junction_control],

C.[vehicle_reference],C.[casualty_reference],C.[casualty_class],C.[sex_of_casualty],
C.[age_of_casualty],C.[age_band_of_casualty],C.[casualty_severity],
C.[pedestrian_location],C.[pedestrian_movement],
C.[car_passenger],C.[bus_or_coach_passenger],C.[pedestrian_road_maintenance_worker],C.[casualty_home_area_type],
C.[casualty_imd_decile],C.[lsoa_of_casualty],C.[accident_reference],C.[casualty_type],

V.[vehicle_type],V.[vehicle_manoeuvre],V.[vehicle_direction_from],V.[vehicle_direction_to],
V.[junction_location],V.[hit_object_in_carriageway],V.[hit_object_off_carriageway],
V.[first_point_of_impact],V.[vehicle_left_hand_drive],V.[journey_purpose_of_driver],
V.[engine_capacity_cc],V.[propulsion_code],V.[age_of_vehicle],V.[generic_make_model],
V.[driver_imd_decile],V.[driver_home_area_type],V.[lsoa_of_driver],V.[sex_of_driver],
V.[age_of_driver]

FROM [dbo].[dft-road-casualty-statistics-accident-last-5-years ] AS A FULL OUTER JOIN
[dbo].[dft-road-casualty-statistics-casualty-last-5-years ] AS C
ON A.[accident_index] = C.[accident_index] FULL OUTER JOIN
[dbo].[dft-road-casualty-statistics-vehicle-last-5-years] AS V
ON A.[accident_index] = V.[accident_index]
GO
```

So, we combined 3 tables. After that we created 5 views for each scenario connected with above main view. Let's talk about each view separately in the implementation the database section.

Then we connected this Azure Paas database with the SQL Server Management Studio. To do that we should connect the database engine with SQL authentication instead of using windows authentication. For this process we should provide Azure database server details that we created in the azure portal, so that we provided the server's name, user login name and the password under the windows authentication. Therefore, we connected the database engine with the azure database for the SQL database.

5.Implementing the Azure SQL database.

First, we created each view and filtered them to get the table without any null or missing data values.

So, our first scenario is Interpreting crash risk accident severity and casualty severity based on Driver's age band.

Here these are the main reasons can be affected for accidents based on driver's age and age band.

- While very old drivers have higher accident rates, the impact of their accident rate on society is small because they drive very short distances and thus have a low total number of accidents in which they are involved.
- The primary focus of efforts to reduce traffic accidents must be on young drivers. They are one of the leading causes of high accident rates due to their prior alcohol consumption, refusal to wear seat belts, and high mileage.
- Driver education programs aimed at improving driving ability have little effect on accident rates. However, driver education and law enforcement programs aimed at reducing alcohol consumption before driving and encouraging the use of seat belts could help to reduce accident rates.
- Experience of driving.

So here we created the view mainly including , driver's age , driver's age band, casualty severity and accident severity.

```
CREATE VIEW Driver_Typef AS
SELECT [accident_index], [accident_year], [sex_of_casualty], [age_of_casualty], [age_band_of_casualty],
[casualty_severity], [pedestrian_location],[car_passenger], [casualty_type], [casualty_home_area_type]
FROM [dbo].[acc1]
WHERE [accident_index] IS NOT NULL AND [accident_year] IS NOT NULL AND [sex_of_casualty] IS NOT NULL AND
[age_of_casualty] IS NOT NULL AND [age_band_of_casualty] IS NOT NULL AND [casualty_severity] IS NOT NULL AND
[pedestrian_location] IS NOT NULL AND
[car_passenger] IS NOT NULL AND [casualty_type] IS NOT NULL AND [casualty_home_area_type] IS NOT NULL
```

So here We just explore with the age band and accident severity , most of fatal accidents and fatal casualty severities have been happened by drivers who are in 25 to 46 age range.

Our Second scenario is to see the accident severity based on weather and light conditions on that situation.

Therefore we created the view mainly including accident severity , speed limit , weather conditions , lighting conditions data columns. Also we needed to check the locations with weather conditions to check the accident locations, so that we included longitude, latitude and local authority district columns to the view.

In the dataset, given weather conditions are fog, raining with no high winds , snowing with no high winds, icy, snowing with high winds, raining with high winds. Given light conditions are daylight ,dark – no lighting, dark – lighting unknown . Likewise we explored accidents severity based on those weather conditions .

```
CREATE VIEW Weather_Conditionsf AS
SELECT [accident_index], [accident_year], [longitude], [latitude],[police_force], [accident_severity],
[time], [local_authority_district], [road_type], [speed_limit], [light_conditions], [weather_conditions]
FROM [dbo].[acc1]
WHERE [accident_index]IS NOT NULL AND [accident_year]IS NOT NULL AND [longitude] IS NOT NULL AND
[latitude] IS NOT NULL AND
[police_force] IS NOT NULL AND [accident_severity] IS NOT NULL AND [time] IS NOT NULL AND
[local_authority_district] IS NOT NULL AND [road_type] IS NOT NULL AND
[speed_limit] IS NOT NULL AND [light_conditions] IS NOT NULL AND [weather_conditions] IS NOT NULL
```

So, reasons can be like these,

The truth is that bad weather increases the likelihood of an accident significantly. Conditions such as fog, rain, sleet, snow, and ice not only reduce visibility but can also impair vehicle performance. Snow may obscure road markings, and icy patches may catch you off guard and cause your vehicle to spin out of control. High winds may blow drivers off course, or they may collide with debris strewn across the road. Because of the slippery piles of leaves strewn across the pavement, even Connecticut's beautiful autumns can end up causing accidents.

Even if the driver drives exceptionally well, vehicle accidents caused by weather conditions can occur if another driver is less prepared or cautious than that driver. Therefore, during bad weather, it is critical to drive in a well-equipped vehicle (such as one with all-wheel drive) and at a slower speed. The only thing worse than being involved in a bad weather accident is being found to be at fault because the driver did not take the necessary precautions.

Third scenario is to interpret about the road accidents affected by road surface conditions.

According to the findings, pavement surface conditions have a significant positive effect on accident risks. Pavement surface distresses have a direct impact on ride comfort and can cause driver distraction, resulting in loss of control of the vehicle, which can lead to injuries or deaths. The acceptable ranges of pavement surface conditions were also presented(EDP Sciences,2022)

To explore this, we created the view mainly including speed limit, road surface conditions, light conditions, and road type.

The dataset had given relevant information about road surface conditions as, dry, flood, snow and wet. Given road types were slip road, dual carriage way, single carriage way, one way street.

We created the view including those columns .

```
SELECT [accident_index], [accident_year], [police_force], [accident_severity], [number_of_vehicles],
[road_type], [speed_limit], [junction_detail], [junction_control], [light_conditions], [weather_conditions],
[road_surface_conditions], [special_conditions_at_site]
FROM [dbo].[acc1]
WHERE [accident_index] IS NOT NULL AND [accident_year] IS NOT NULL AND [police_force] IS NOT NULL AND
[accident_severity] IS NOT NULL AND [number_of_vehicles] IS NOT NULL AND [road_type] IS NOT NULL AND
[speed_limit] IS NOT NULL AND [junction_detail] IS NOT NULL AND [junction_control] IS NOT NULL AND
[light_conditions] IS NOT NULL AND [weather_conditions] IS NOT NULL AND
[road_surface_conditions] IS NOT NULL AND [special_conditions_at_site] IS NOT NULL
```

So here we explored accidents indexes with each, and every road surface conditions and accident severity also. Let's talk about the analysis further in the implementation of the report builder section.

The fourth idea is to interpret about hit objects, vehicle type, age of vehicle on accident severity and also the casualty severity.

Over the last few years, the automobile industry has made numerous safety improvements. While this is certainly good news for those purchasing new vehicles today, it does little to improve the safety of those who drive older vehicles, whether by choice or due to financial constraints. Side air bags and electronic stability control were either not factory-installed features in older cars or had not yet been invented at the time some vehicles were built. As a result, drivers of these vehicles are more likely to be involved in accidents that result in serious injuries or death (Chadwick McGrady, P.C., Sep 17, 2020, Car Accidents).

So we created the view including following columns.

```
CREATE VIEW Accidents_Typef AS
SELECT [accident_index], [accident_year], [vehicle_type], [hit_object_in_carriageway], [hit_object_off_carriageway],
[journey_purpose_of_driver], [sex_of_driver], [age_of_driver], [age_of_vehicle], [propulsion_code]
FROM [dbo].[acc1]
WHERE [accident_index] IS NOT NULL AND [accident_year] IS NOT NULL AND [vehicle_type] IS NOT NULL AND
[hit_object_in_carriageway] IS NOT NULL AND [hit_object_off_carriageway] IS NOT NULL AND
[journey_purpose_of_driver] IS NOT NULL AND [sex_of_driver] IS NOT NULL AND [age_of_driver] IS NOT NULL AND
[age_of_vehicle] IS NOT NULL AND [propulsion_code] IS NOT NULL
```

Fifth idea is to interpret the area of casualty home whether it is a urban area, small town or rural area and how it is affected on accidents.

Rural areas have consistently had higher rates of fatal motor vehicle injuries than urban areas. This has been true for both the elderly2 and children. According to National Highway Traffic Safety Administration (NHTSA) traffic safety statistics from 2001, rural areas accounted for 61% of traffic fatalities, despite accounting for only 40% of vehicle miles traveled and 21% of the population. 19 Several state and local studies, as well as international studies, have found that rural motor vehicle injury fatality rates are higher than urban rates. 18,20–23 Despite a 20-year decline in motor vehicle injury fatality rates, rural rates continue to outnumber urban rates. Researchers have proposed a variety of potential explanations for the disparities in motor vehicle injury fatality rates between rural and urban areas, including Rural drivers may drive more miles than urban drivers3,5; they may be less likely to take safety precautions, such as wearing seat belts or properly restraining children; and there may be differences in alcohol consumption patterns. Rural roads may be less safe than city streets, and rural vehicles may be less safe than city vehicles. Rural collisions may be more severe than urban collisions (because of differing speed limits or road conditions) Rural crash victims may not receive medical

attention as quickly as urban crash victims, and the medical response may be of lower quality(C Zwerling et al , 2022)

So we created the view for this idea including following columns.

```
CREATE VIEW Accidents_Area1 AS
SELECT [accident_index], [accident_year], [casualty_class], [age_of_casualty], [sex_of_casualty],[casualty_severity],
[pedestrian_location],[pedestrian_movement], [casualty_type], [casualty_home_area_type],[accident_severity]
FROM [dbo].[acc1]
WHERE [accident_index]IS NOT NULL AND [accident_year]IS NOT NULL AND [casualty_class]IS NOT NULL AND
[age_of_casualty]IS NOT NULL AND [sex_of_casualty]IS NOT NULL AND [casualty_severity]IS NOT NULL AND
[pedestrian_location]IS NOT NULL AND [casualty_type]IS NOT NULL AND [casualty_home_area_type]IS NOT
NULL AND [accident_severity] IS NOT NULL
```

6.Implementation of Microsoft power bi report builder.

First, we created a template for the use of all the report builder, so that it was made easier to design processes. So that we easily imported the data and proceeded next steps.

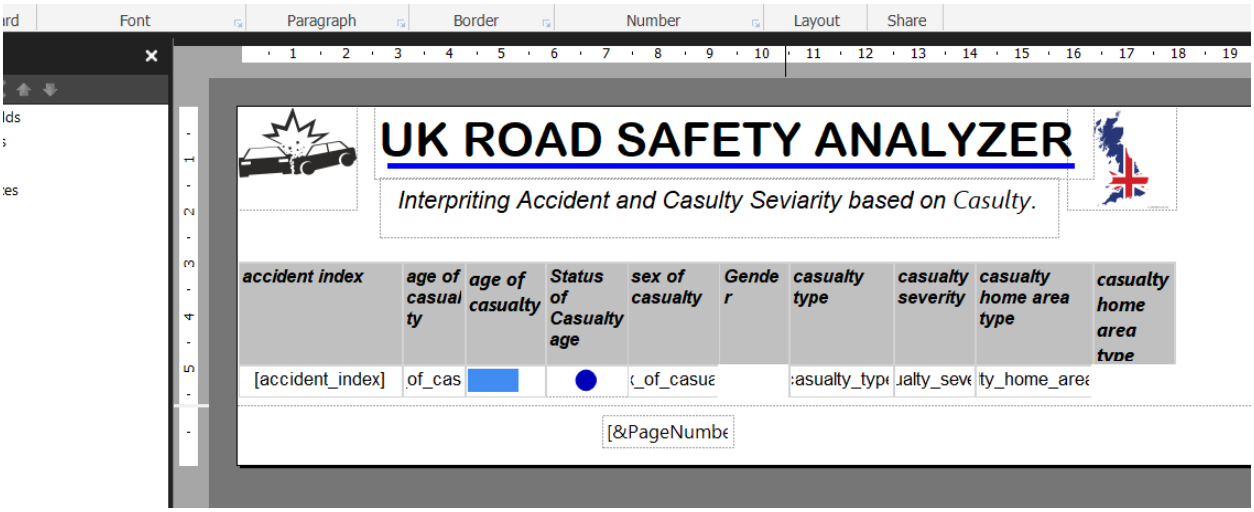
First we set the report page into A4 size page using report properties option. Then we set margins into1.5 cm . Page set to 18cm width. Then we inserted image logos for Identifying about that this data is related to united kingdom road accidents. Then we inserted page number expression using built in expressions options in report pane. So that we created a template for 5 Microsoft power bi reports.

Here we imported the dataset as a power bi dataset. We prepared the views in SQL and then imported it to the power bi to design the dashboard. And from there we renamed all the numeric values in to text type words for better understanding. So that renamed dataset we imported to the power bi report builder.

To do that we published our power bi dataset to my workspace in power bi services page. Then in report builder we imported the dataset as a power bi dataset, choosing the correct dataset from its workspace. Then we selected each view and then selected columns for each report builder for designing processes.

First scenario - Interpreting crash risk accident severity and casualty severity based on Driver’s age band.

Here we created a table for our template and we selected the columns for the table.



We needed to interpret how the age and the sex of driver affects of road accidents. In report designing we created visualizations for two gender types in two colors in a separate column. And we inserted a data bars for age of the driver.

Here when we are talking about the age of the driver , we just explored about the common age of someone can have a driving license in UK . That age is 17. So we created indicator for age of the driver highlighting driver's below 17 years old and above 17 year's old. We added different colors for those indicators according to the age band of drivers. That was

17 – 35 years – green color

36- 55 – purple color

Data missing – yellow color

Above 55 – blue color

Below 17 – cross mark indicator (who cannot have a driving license)

After that we adjusted column width , height and other all adjustments using properties pane options. Next we add alternative row colors for designing purposes. We created a parameter for choosing colors as alternative row colors. And we created a parameter for accident year. So that when viewing the report we have to select the year and the color.

UK ROAD SAFETY ANALYZER

Interpriting Accident and Casulty Seviarity based on Casulty.

accident index	age of casualty	age of casualty	Status of Casualty age	sex of casualty	Gender	casualty type	casualty severity	casualty home area type	casualty home area type
2019136AB1115	1			Male		Pedestrian	Serious	Urban area	
2019136AM1251	19			Male		Pedestrian	Serious	Urban area	
2019471901611	8			Male		Pedestrian	Serious	Urban area	
2019471901647	61			Male		Pedestrian	Serious	Urban area	
2019471901747	60			Male		Pedestrian	Serious	Urban area	
2019471901839	19			Male		Pedestrian	Serious	Urban area	
2019136B81514	21			Male		Pedestrian	Serious	Urban area	
2019136BI0924	85			Male		Pedestrian	Serious	Urban area	
2019136BJ0638	38			Male		Pedestrian	Serious	Urban area	
2019136BO1225	73			Male		Pedestrian	Serious	Urban area	
2019136BT2243	78			Male		Pedestrian	Serious	Urban area	
2019010157561	70			Male		Pedestrian	Serious	Urban area	
2019010156849	41			Male		Pedestrian	Serious	Urban area	
2019010157140	45			Male		Pedestrian	Serious	Urban area	
2019010157179	26			Male		Pedestrian	Serious	Urban area	
2019010157340	39			Male		Pedestrian	Serious	Urban area	
2019010191057	24			Male		Pedestrian	Serious	Urban area	
2019010191631	11			Male		Pedestrian	Serious	Urban area	
2019010192004	3			Male		Pedestrian	Serious	Urban area	
2019010192044	20			Male		Pedestrian	Serious	Urban area	

Second scenario- to see the accident severity based on weather and light conditions on that situation.

We imported the data for the report builder and added columns to the table. Here we have renamed weather conditions values and light conditions values into texts for better understanding of the client.

We created parameters for choosing year and choosing color for alternative row colors. Also we inserted a data bar for visualizing the speed limit of the vehicle in a separated column. So that we can easily see the speed limit and accident severity based on it's weather and light conditions. We included colored rectangle for interpreting the accident severity(fatal , serious) using two different colors for better understanding.

Most of fatal accidents have been under high-speed limits and raining with high rains whether conditions.

UK ROAD SAFETY ANALYZER

Effect of weather conditions on road accidets severity

Accident index	Accident severity	Accident year	Light conditions	Road type	Speed limit	Speed Limit	Weather conditions
2020010273749	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010274283	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010276241	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010251867	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010252649	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010279221	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010278617	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010255925	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010256653	Serious	2020	Day Light	Single Carriageway	30		Fine no high winds
2020010230055	Serious	2020	Day Light	Single Carriagew	30		Fine no high winds

Third scenario - to interpret about the road accidents affected by road surface conditions.

We wanted to emphasize that with bad road conditions road accidents can be happened with several special conditions at side. So, for the report we mainly focused on those 2 columns that road surface conditions column and special conditions at site column. So, we renamed values of those columns using power bi.

We included parameters for choosing accident year and choosing alternative row colors. Then we added rectangle in tow different colors for interpreting fatal and serious severity conditions in a separate column.

Fourth scenario- to interpret the area of casualty home whether it is a urban area, small town or rural area and how it is affected on accidents.

UK ROAD SAFETY ANALYZER

Effect of road surface conditions and special conditions at site on accident severity

Accident index	Accident year	Accident severity	Fatal or Serious	Light conditions	Number of vehicles	Number of vehicles	Road surface conditions	Special conditions at site	Road type
2017010066273	2017	Serious		Day Light	2		Dry	Road Works	Single Carriage way
201706L031126	2017	Serious		Day Light	2		Dry	Road Works	Single Carriage way
2017440216559	2017	Serious		Day Light	2		Dry	Road Works	Single Carriage way
2018440100788	2018	Serious		Day Light	2		Dry	Road Works	Single Carriage way
2019010198528	2019	Serious		Day Light	2		Dry	Road Works	Single Carriage way
2017430278860	2017	Serious		Day Light	2		Dry	Road Works	Single Carriage way
2019301900575	2019	Serious		Day Light	2		Dry	Road Works	Single Carriage way
2019440257747	2019	Serious		Day Light	2		Dry	Road Works	Single Carriage way
2020010281081	2020	Serious		Day Light	2		Dry	Road Works	Single Carriage way

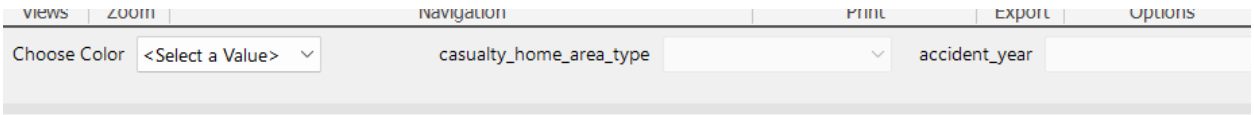
Rural areas have consistently had higher rates of fatal motor vehicle injuries than urban areas. Researchers also have proposed a variety of potential explanations for the disparities in motor vehicle injury fatality rates between rural and urban areas, including Rural drivers may drive more miles than urban drivers , they may be less likely to take safety precautions, such as wearing seat belts or properly restraining children; and there may be differences in alcohol consumption patterns. Rural roads may be less safe than city streets, and rural vehicles may be less safe than city vehicles. Rural collisions may be more severe than urban collisions (because of differing speed limits or road conditions) Rural crash victims may not receive medical attention as quickly as urban crash victims, and the medical response may be of lower quality.

UK ROAD SAFETY ANALYZER

Interpriting Accident and Casulty Seviarity based on Casulty Home area type.

accident index	accident year	sex of casualty	Gender	accident severity	casualty severity	casualty home area type	casualty home area type
2019136B10436	2019	Female		Serious	Serious	Urban Area	
2019471901143	2019	Female		Serious	Serious	Urban Area	
2019136B80338	2019	Female		Serious	Serious	Urban Area	
2019010157945	2019	Female		Serious	Serious	Urban Area	
2019070191693	2019	Female		Serious	Serious	Urban Area	
201931D217819	2019	Female		Serious	Serious	Urban Area	
2019051913092	2019	Female		Serious	Serious	Urban Area	
2019051910141	2019	Female		Serious	Serious	Urban Area	
2019010223533	2019	Female		Serious	Serious	Urban Area	
2019010223852	2019	Female		Serious	Serious	Urban Area	
2019010224137	2019	Female		Serious	Serious	Urban Area	
201906K265676	2019	Female		Serious	Serious	Urban Area	
2019200814861	2019	Female		Serious	Serious	Urban Area	
2019200816863	2019	Female		Serious	Serious	Urban Area	
2019200820602	2019	Female		Serious	Serious	Urban Area	
2019200821981	2019	Female		Serious	Serious	Urban Area	
2019200822184	2019	Female		Serious	Serious	Urban Area	
2019010168432	2019	Female		Serious	Serious	Urban Area	
2019010191879	2019	Female		Serious	Serious	Urban Area	
2019100888171	2019	Female		Serious	Serious	Urban Area	

So we created two parameters for this also choosing colors and accident year.



Fifth scenario- to interpret about hit objects, vehicle type, age of vehicle on accident severity and also the casualty severity.

Over the last few years, the automobile industry has made numerous safety improvements. While this is certainly good news for those purchasing new vehicles today, it does little to improve the safety of those who drive older vehicles, whether by choice or due to financial constraints. Side air bags and electronic stability control were either not factory-installed features in older cars or had not yet been invented at the time some vehicles were built. As a result, drivers of these vehicles are more likely to be involved in accidents that result in serious injuries or death.

For this we included indicators for vehicle age,

Below 5 years – lime

6 to 10 years – yellow

11 to 20 – red

21 to 30 – turquoise

Above 30 years – hot pink

Parameters for accident year, and choosing color we created.

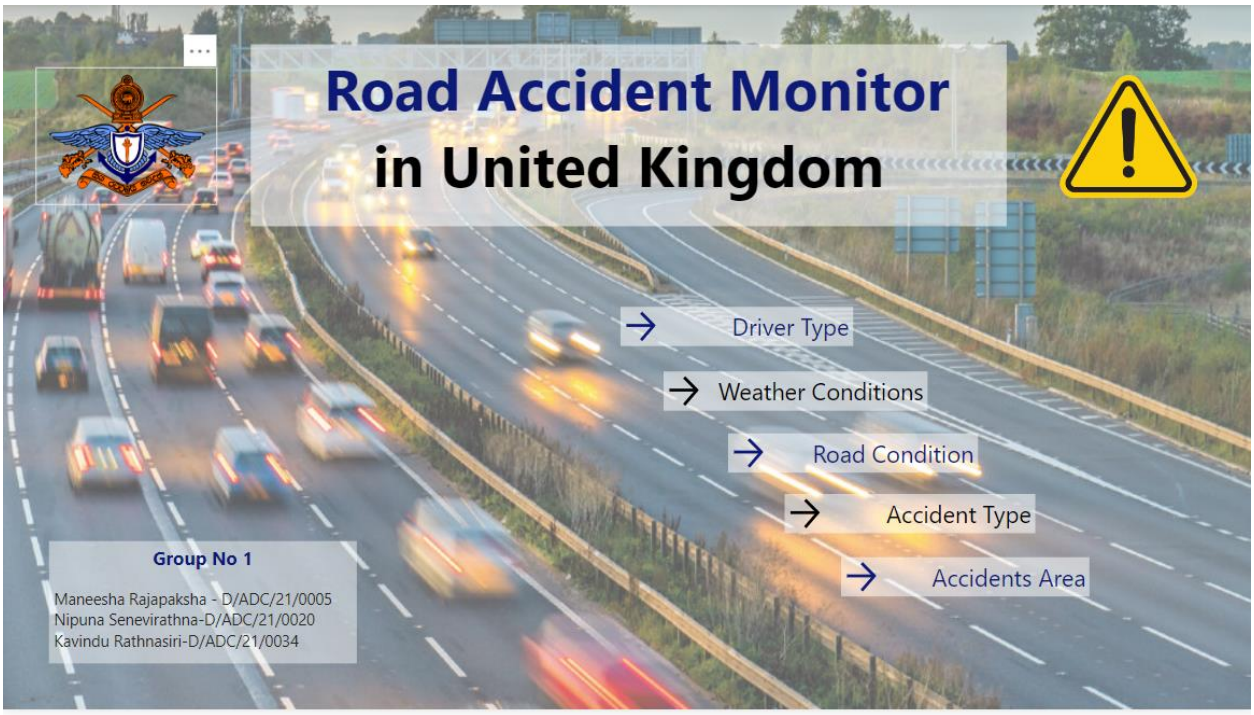
UK ROAD SAFETY ANALYZER

Interpriting Accident and Accident type based on Driver and Vehicle age.

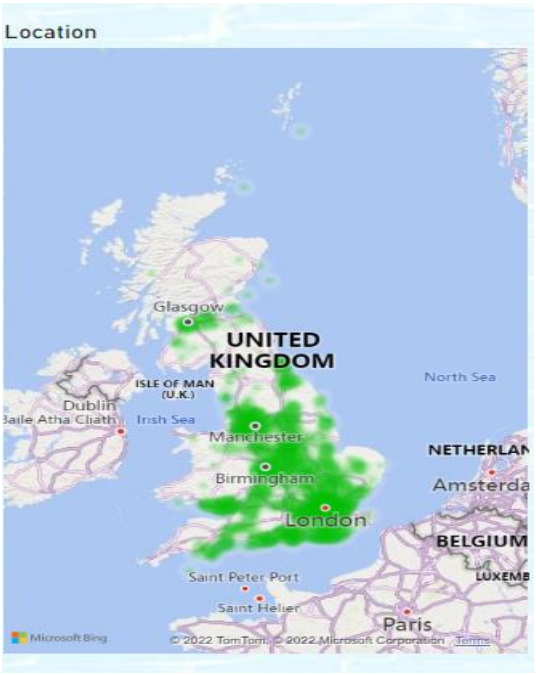
accident index	sex of driver	Gender	age of driver	age status of driver	vehicle type	age of vehicle	age status of vehicle	propulsion code	journey purpose of driver	hit object in carriageway	hit object off carriageway
2019460883912	Male		61		Car	1		Petrol	Other	None	None
2019230817505	Male		24		Car	1		Petrol	Other	None	None
2019450859651	Male		32		Car	1		Petrol	Other	None	None
2019450863484	Male		60		Car	1		Petrol	Other	None	None
2019450872492	Male		18		Car	1		Petrol	Other	None	None
2019350854501	Male		70		Car	1		Petrol	Other	None	None
201997GA00401	Male		56		Car	1		Petrol	Other	None	None
2019420849937	Male		20		Car	1		Petrol	Other	None	None
2019230905425	Male		29		Car	1		Petrol	Other	None	None
2019460910794	Male		83		Car	1		Petrol	Other	None	None
2019450892085	Male		66		Car	1		Petrol	Other	None	None
2019450821808	Male		70		Car	1		Petrol	Other	None	None
201997UA70704	Male		53		Car	1		Petrol	Other	None	None
2019470879920	Male		40		Car	1		Petrol	Other	None	None
2019450837261	Male		74		Car	1		Petrol	Other	None	None
201997GU00304	Male		56		Car	1		Petrol	Other	None	None
2019450814785	Male		19		Car	1		Petrol	Other	None	None
2019360828694	Male		33		Car	1		Petrol	Other	None	None
2019420888490	Male		28		Car	1		Petrol	Other	None	None

7.Implementation of dashboard

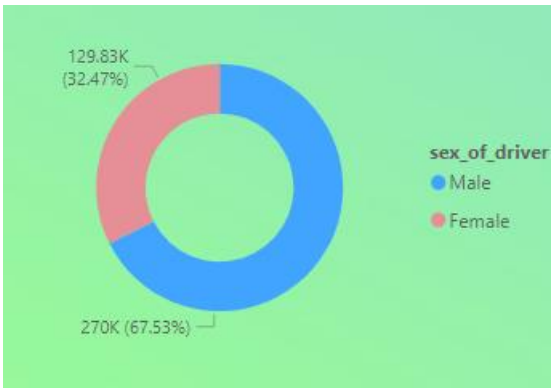
We imported data from Azure SQL database. Then for each view , we created 5 dashboard pages and created a home page for navigate each scenario using a navigator pane. Navigator pane includes all 5 scenarios and once you click on one , it will be opened the relevant dashboard page.



1 st page – Effect of driver's age and sex for road accidents.

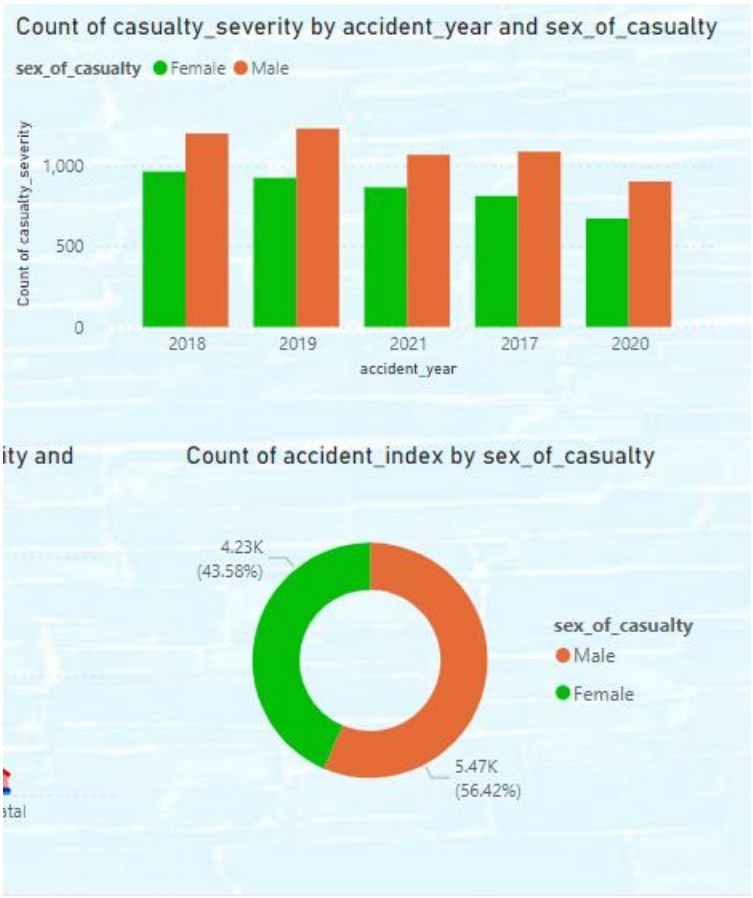


Here the map shows the locations of accidents were happened mostly.



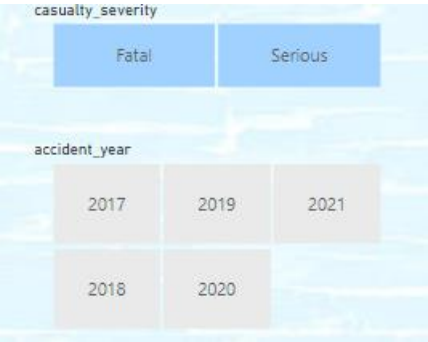
This figure shows that male and female count of drivers. Clearly, we can see that most of road accidents were happened by male drivers than female drivers.

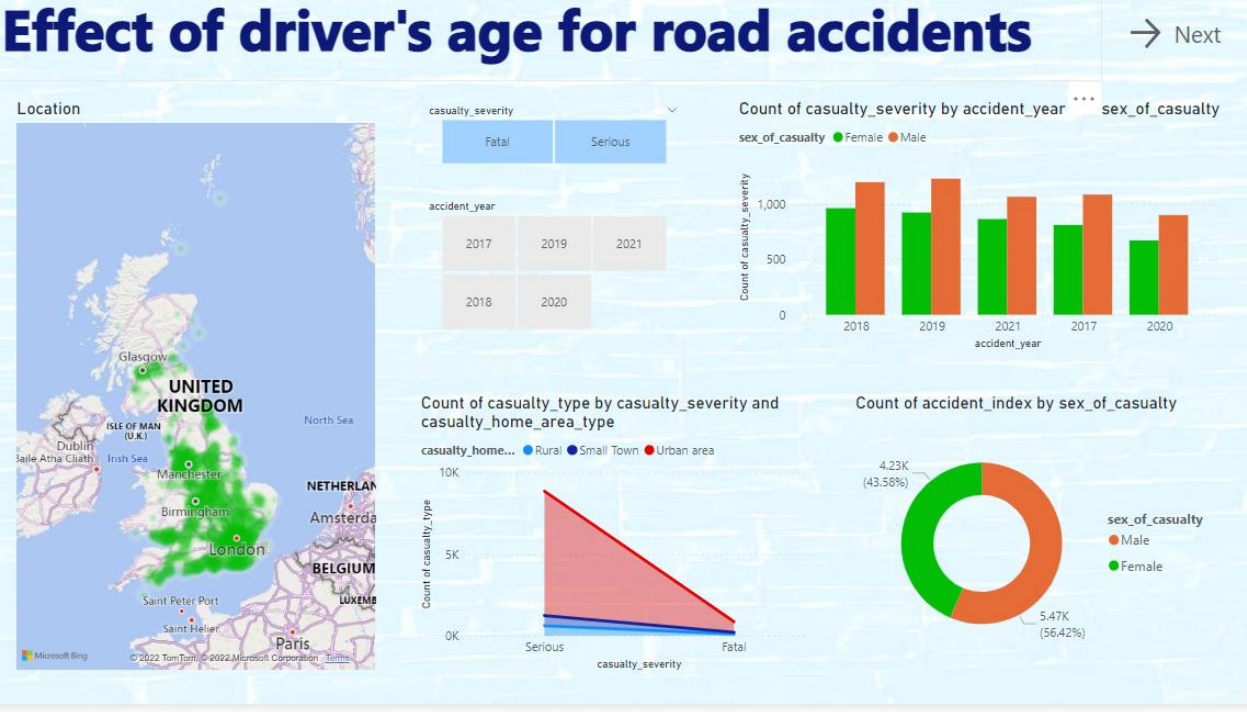
We visualized casualty severities and according to the year and also casualty sex. In Most of accidents there were male casualties than female casualties in every year. We can see that using following power bi visualization.



Green color represents female casualties while orange color represents male casualties. Casualty counts have mentioned in the each diagram.

For this scenario we created two slicers for casualty severity which is fatal and serious. The other slicer was created for accident year.





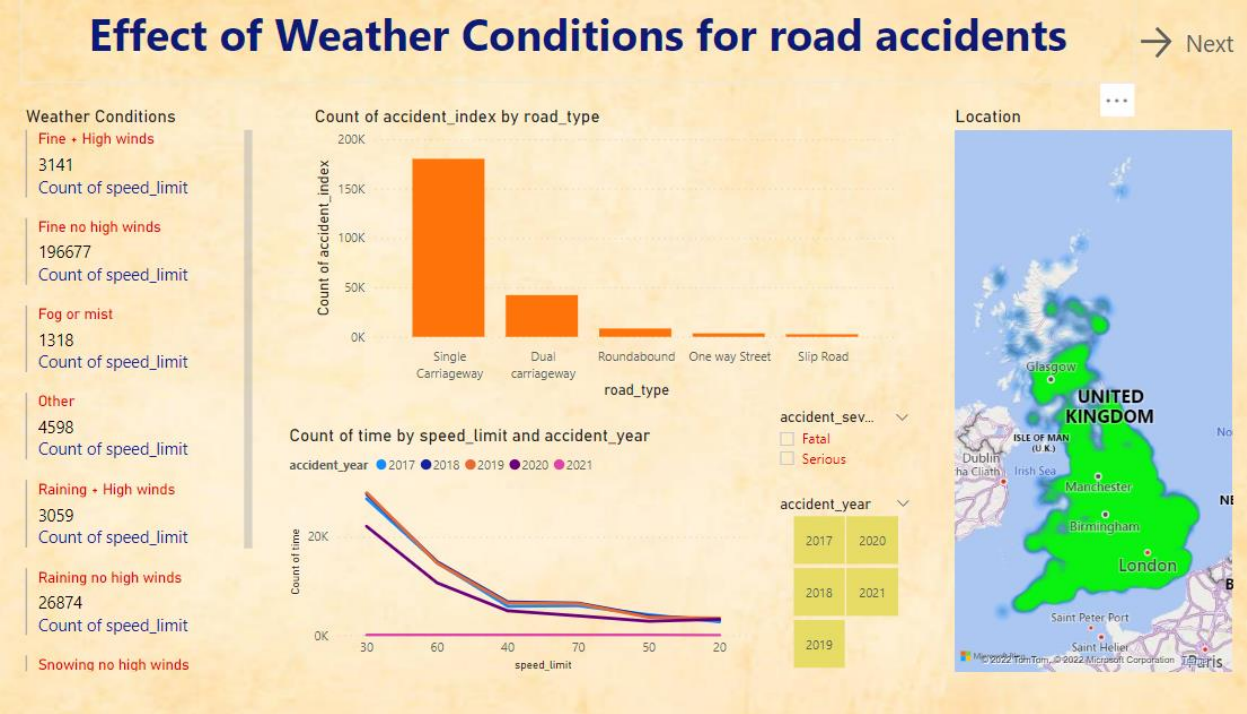
Second page – Effect of weather and light conditions for road accidents.

We built visual for each weather condition with speed limit of vehicle..

Next visualization is created for interpreting road types and accidents. As the following visualization , clearly we can see that most of accidents have been happened **in single carriage way** road type.

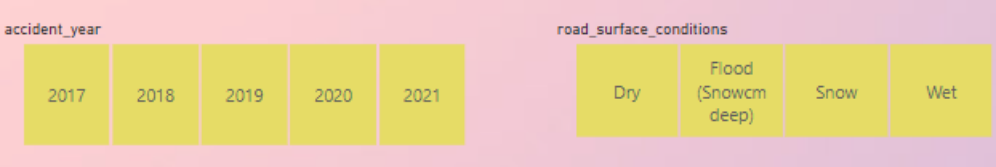
After that we created the speed limit line chart under various weather conditions for each accident year. It was like following chart.

In this chart 2017 and 2019 speed limit lines are closer than 2020 speed limit line. So we can see that in 2020 year, driver's speed limits have went on a lower limit than the other past years.



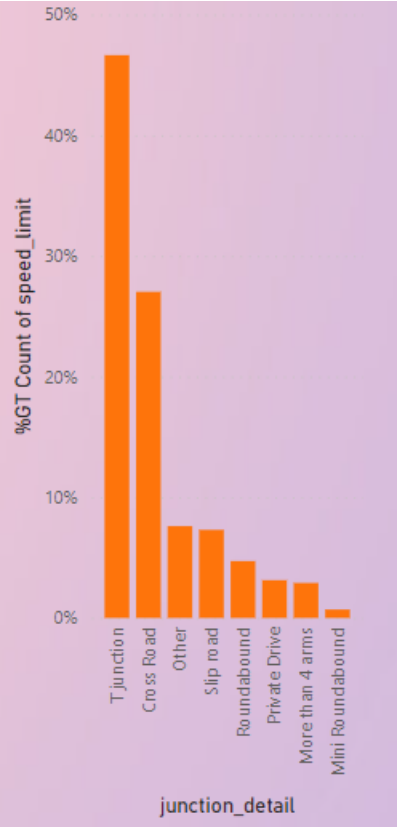
Third page - How the road surface conditions effects on road accidents.

For this we created the slicer for road surface conditions, which are dry , flood, snow, wet.

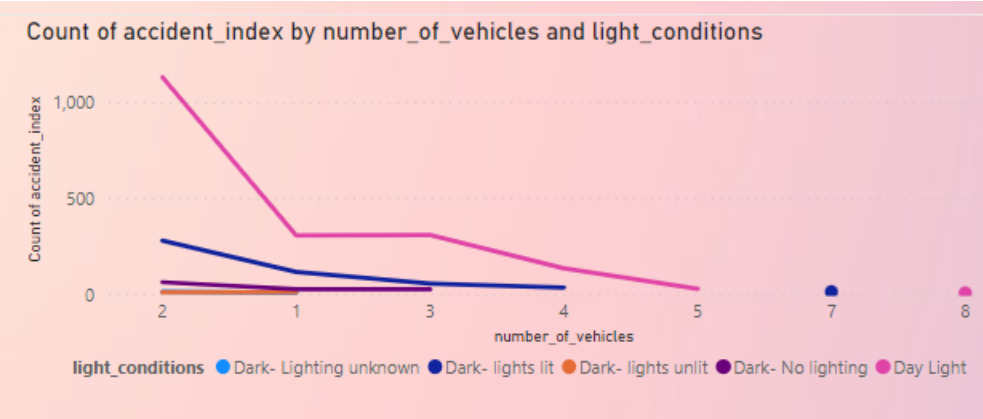


Under various road surface conditions we created visualizations for each junction detail, light conditions.

We created bar chart for each junction types that accidents have happened .We can change the slicer to various road surface conditions and see the changes in every visualization



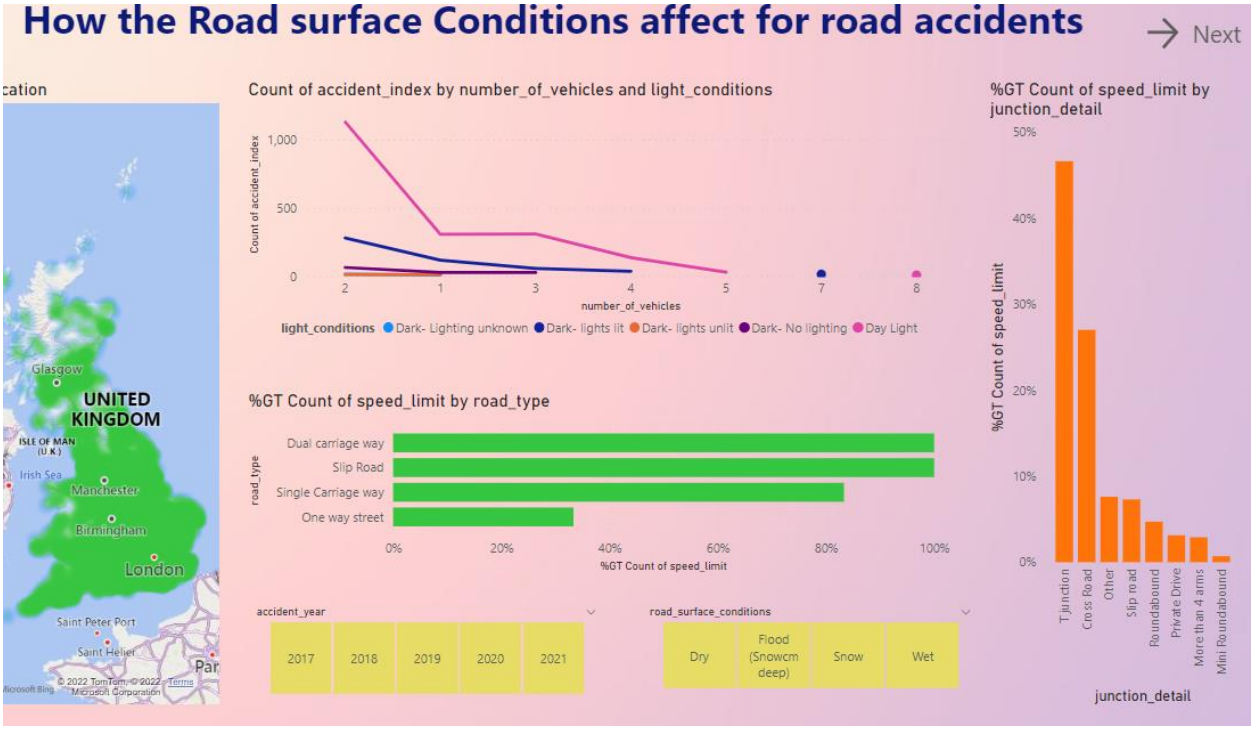
Above chart shows speed limits in every junction types. So in most of accidents maximum speed limits were in T junctions. Least number of accidents were in mini roundabouts.



Above visualization shows the accidents and number of vehicles in the accident under various light conditions. We can clearly see that maximum number of accidents have been happened in day light light condition. In dark light conditions , vehicle accidents are lower in a considerable manner. The reason for that , we thought , in dark and night times vehicle count is low than day light times. In day time , most of vehicles are on the road than night times.

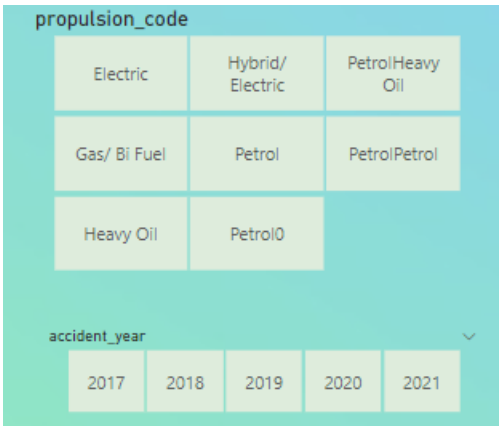
Following map shows the locations of accidents.

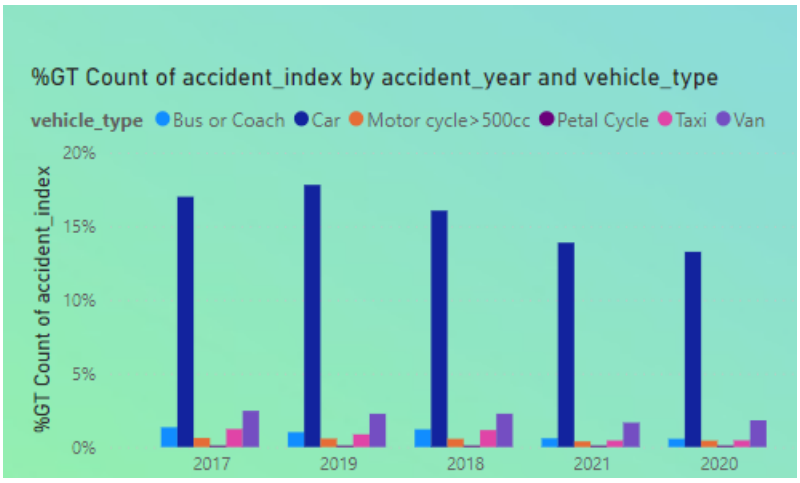
Here from the bubble size we can see the accidents count in various locations. The largest bubble is in London. So most of accidents have been happened in London city in United Kingdom.



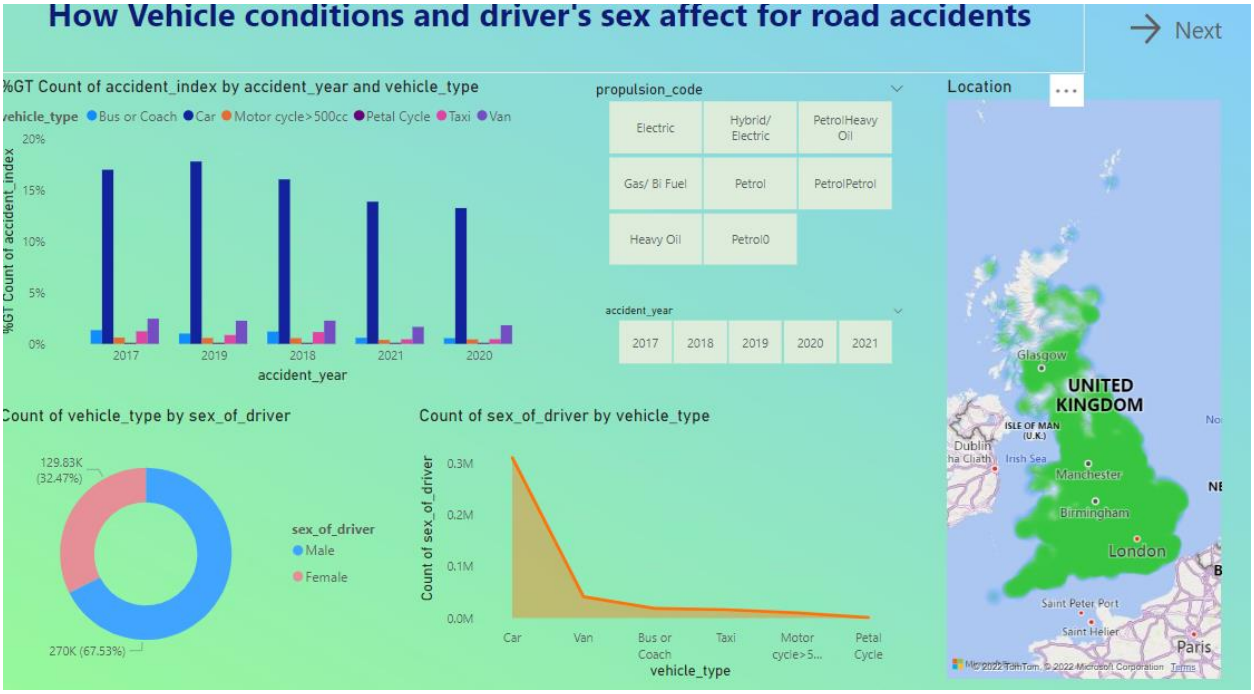
Fourth page – <u>How vehicle type , vehicle age effects on road accidents.</u>

We created slicers for accident year and propulsion codes. So can change the propulsion type and see the changes in the dashboard. Available propulsions are petrol,Electric,Gas/bi fuel,Petrol/heavy oil,Hybrid/electric.



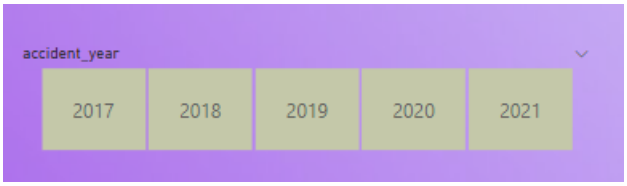


Above visualization shows the vehicle types of accidents. Clearly, we can see that many of accidents are car accidents in every year constantly. Van accidents are little bit more than other vehicle types but lower than car accidents in a considerable amount in every year. Petal cycle accidents are the least number from all accidents. By the way most of car accidents have been happened in 2019 year.

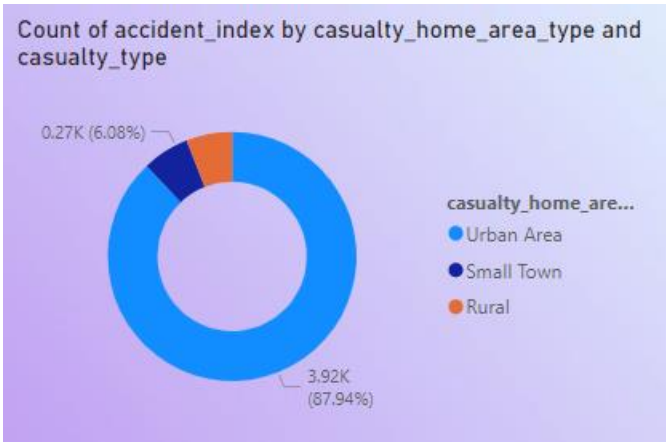


Fifth page – Road accidents according to casualty home area type (Urban area, small town , Rural area)

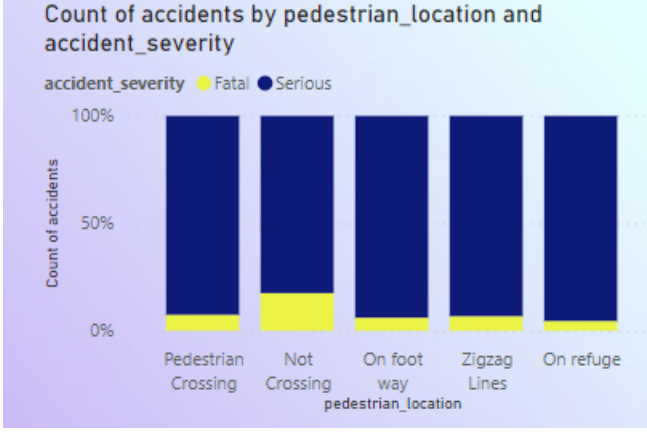
We inserted the slicer for changing accident year.

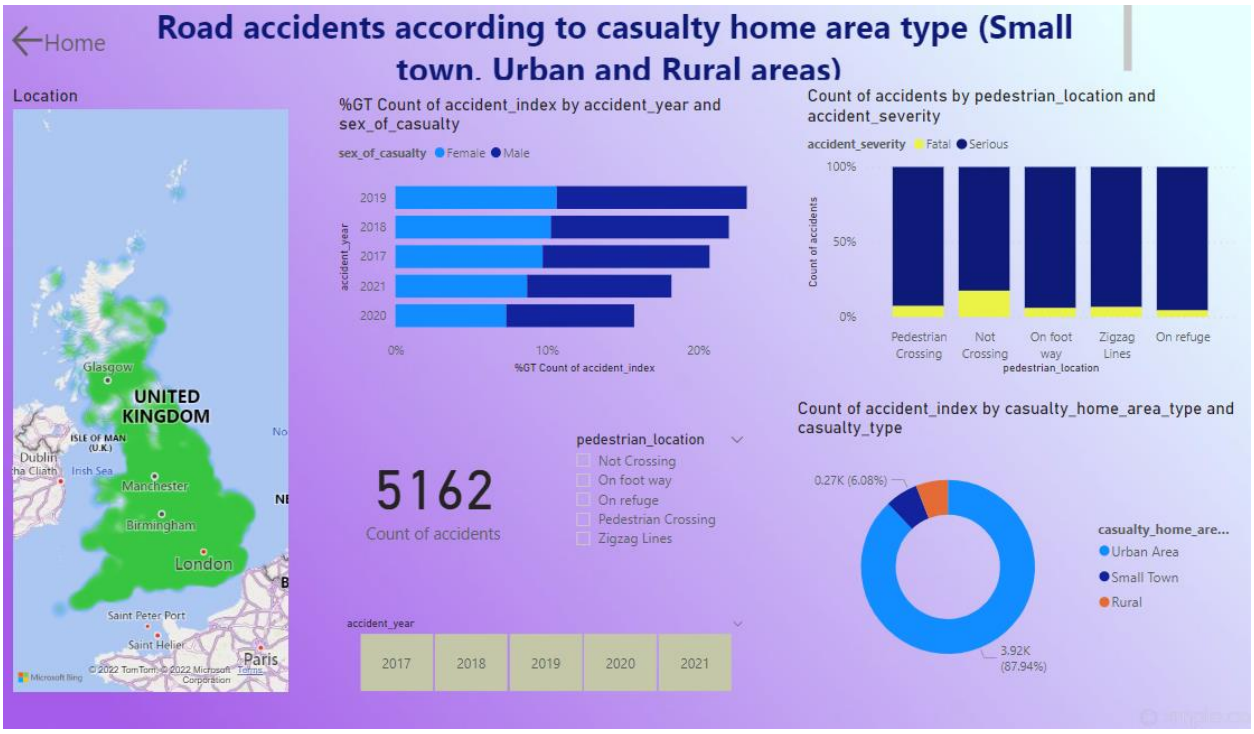


Following visualization interprets the accident areas in a gauge .



So very clearly we can see that most of accidents have been happened in urban areas than other areas. Accidents in small towns and rural areas seems like have equal number of accidents.





From above chart we just explored count of accidents according to pedestrian location and how the accident situation whether it was fatal or serious. So effortlessly we can see that in all pedestrian location accidents are not fatal but serious. Fatal accidents represent by yellow color while serious accidents represent by dark blue color. But one thing we can see that fatal accidents were little bit more in not crossing pedestrian location than the other locations.

So this was the implementation of the power bi dashboard.

8.Conclusion

As The client requires our knowledge and expertise to design, implement and test a reporting system for this project using Azure PaaS Database, Microsoft Report Builder and Power BI , we provided all the requirements through the process of the assignment. We completed the task by Use of Microsoft Report Builder and Power BI as a presentation layer. We provided the above report detailing our approach and proposed frond-end design in Microsoft Report Builder and Power BI. We also provided our SQL statements views with appropriate comments and a full backup of our database. Since Inserting the last 5 years dataset from the https://www.data.gov.uk to Azure PaaS Database , Creating all the tables using T-SQL , five meaningful summarised reports using Microsoft report builder that including filtering, sorting and grouping functionality in the reports to creating the Power BI Dashboard using data in the Azure database that allows users to evaluate the factors that correlate with the serious road traffic accident , we have done a huge work . So this task helped us to practice the use of azure SQL PaaS database , improve creating report builder skills and designing power bi dashboards.

9.References

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6. Risk factors of road traffic accidents in Rural and Urban areas of indonesia based on the national survey of year 2018, Intan Zainafree[1], Nadia Syukria[2], Silfia Addina[3], Muhamad Zakki Saefurrohim[4]