

Business Intelligence - Tableau Assignment

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Step 1: Download any ONE of the following datasets related to Pakistan:

Gas and Electricity consumption of Sindh and Punjab: <https://opendata.com.pk/dataset/gas-and-electricity-consumption-of-sindh-and-punjab>

Step 2: Acquire domain knowledge (if you don't have) and then write a problem statement which you will solve using BI (just one liner).

The data is from open data Pakistan, it contains data related to gas and electricity consumption in Pakistan overall and separately contains record for two of the provinces, Punjab, and Sindh. It also shows in which sector, or by which group the resources (gas, electricity) are being used. The data spans over a period of 1998 till 2016.

Problem statement:

To identify the trends in the consumption of natural resources – gas and electricity in the span of several years. We analyze if we have a connection between the patterns shown by the data of both the natural resources. This analysis helps us to even forecast the future consumption in Punjab, and Sindh in the sectors mentioned.

Step 3: Load and Transform data (mention all steps of transformation very briefly)

Here the data is stored in the form of separate excel sheet in the same excel file.

Total Number of tables or sheets is 8.

Table Information and Renaming Attributes:

By names and attributes tables are defined below:

PAKISTAN GAS DATA – Overall Pakistan data for gas consumption

- Three attributes – Year, sector, Consumption (mm cf)
- Renaming the attributes,

- Year to Year_PAK_G
- Sector to Sector_PAK_G
- Consumption (mm cf) to PAK_Consumption(mm cf)_G

PAKISTAN GAS DATA			
4 fields 152 rows			
Table Details >	#	Abc	#
	PAKISTAN GAS DATA	PAKISTAN GAS DATA	PAKISTAN GAS DATA
	Year_PAK_G	Sector_PA...	PAK_Consumption(mm cf)_G
	2000	Household	140,899
	2000	Comercial	20,618
	2000	Cement	6,977
	2000	Fertilizer	175,393

SINDH GAS DATA – Record of gas consumption in the province of Sindh

- Three attributes – Year, Group, Consumption (mm cf)
- Renaming the attributes,
 - Year (Sindh Gas Data) to Year_Sindh_G
 - Group (Sindh Gas Data) to Sector_Sindh_G
 - CONSUMPTION (mm cf) (SINDH GAS DATA) to Sindh_Consumption(mm cf)_G

SINDH GAS DATA ▾ 3 fields 76 rows

#	Abc	#
SINDH GAS DATA	SINDH GAS DATA	SINDH GAS DATA
Year_Sindh_G	Sector_Sindh_G	Sindh_Consumption(mm cf)_G
1998	TOTAL	164,227
	HOUSEHOLD	41,412
	COMMERCIAL	5,602
	INDUSTRIAL	117,213
	TOTAL	181,990
	HOUSEHOLD	42,193

PUNJAB GAS DATA – Record of gas consumption in the province of Punjab

- Three attributes – Year, Group, Consumption (mm cf)
- Renaming the attributes,
 - Year (Punjab Gas Data) to Year_Punjab_G
 - Group to Sector_Punjab_G
 - CONSUMPTION (mm cf) (PUNJAB GAS DATA) to Punjab_Consumption(mm cf)_G

PUNJAB GAS DATA ▾ 3 fields 95 rows

#	Abc	#
PUNJAB GAS DATA	PUNJAB GAS DATA	PUNJAB GAS DATA
Year_Punjab_G	Sector_Punjab_G	Punjab_Consumption(mm cf)_G
1998	TOTAL	657,951
	HOUSEHOLD	203,390
	COMMERCIAL	37,423
	INDUSTRIAL	413,201
	OTHERS	3,937

ANALYSIS – The table shows an analysis of the data already provided of gas consumption in Pakistan. We will not use this, but we can also here take this to take the years or just the summary of data. But this table won't be used to make any analysis result.

PAKSITAN ELECTRICITY DATA– Overall Pakistan data for electricity consumption

- Three attributes – Year, sector, Consumption (Kwh Million)
- Renaming the attributes,
 - Year to Year_PAK_E
 - Group to Sector_PAK_E
 - Consumption (Kwh Million) to PAK_Consumption(Kwh Million)_E

PAKISTAN ELECTRICITY		3 fields 133 rows	
Table Details >	#	Abc	#
	PAKISTAN ELECTRICITY	PAKISTAN ELECTRICITY	PAKISTAN ELECTRICITY
	Year_PAK_E	Sector_PAK_E	PAK_Consumption(Kwh Million)_E
	2000	HOUSEHOLD	22,765
	2000	COMMERCIAL	2,774
	2000	INDUSTRIAL	14,349
	2000	AGRICULTURAL	4,924
			212

SINDH ELECTRICITY DATA – Record of electricity consumption in the province of Sindh

- Three attributes – Year, Group, Consumption (Kwh Million)
- Renaming the attributes,
 - Year (Sindh Electricity) to Year_Sindh_E
 - Group (Sindh Electricity) to Sector_Sindh_G
 - CONSUMPTION (Kwh Million) (SINDH ELECTRICITY) to Sindh_Consumption(Kwh Million)_E

SINDH ELECTRICITY		3 fields 90 rows	
Table Details >	#	Abc	#
	SINDH ELECTRICITY	SINDH ELECTRICITY	SINDH ELECTRICITY
	Year_Sindh_E	Sector_Sindh_E	Sindh_Consumption(Kwh Million)_E
	2002	Domestic	4,312
			929
			3,777

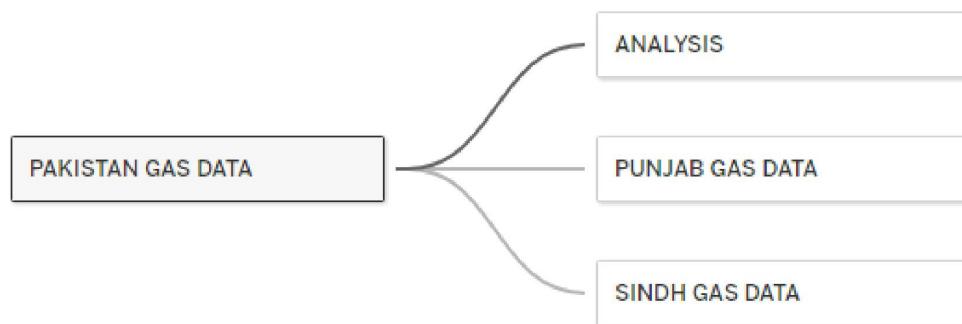
PUNJAB ELECTRICITY DATA – Record of electricity consumption in the province of Punjab

- Three attributes – Year, Group, Consumption (mm cf)
- Renaming the attributes,
 - Year (Punjab Gas Data) to Year_Punjab_E
 - Group (Punjab Electricity) to Sector_Punjab_E
 - CONSUMPTION (Kwh Million) (PUNJAB ELECTRICITY) to Punjab_Consumption(Kwh Million)_E

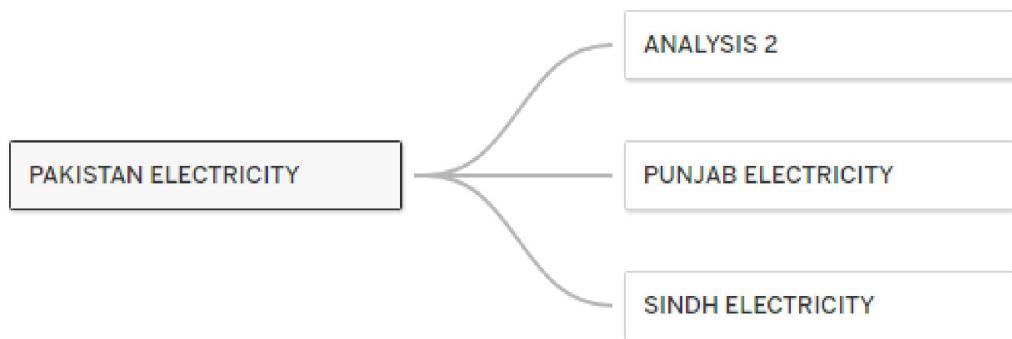
ANALYSIS 2 – The table shows an analysis of the data already provided of electricity consumption in Pakistan. We will not use this, but we can also here take this to take the years or just the summary of data. But this table won't be used to make any analysis result.

Joining relevant tables:

The tables related to gas are connected and same goes with electricity. Three tables namely SINDH GAS DATA, PUNJAB GAS DATA, ANALYSIS are joined with PAKISTAN GAS DATA joined on the year.



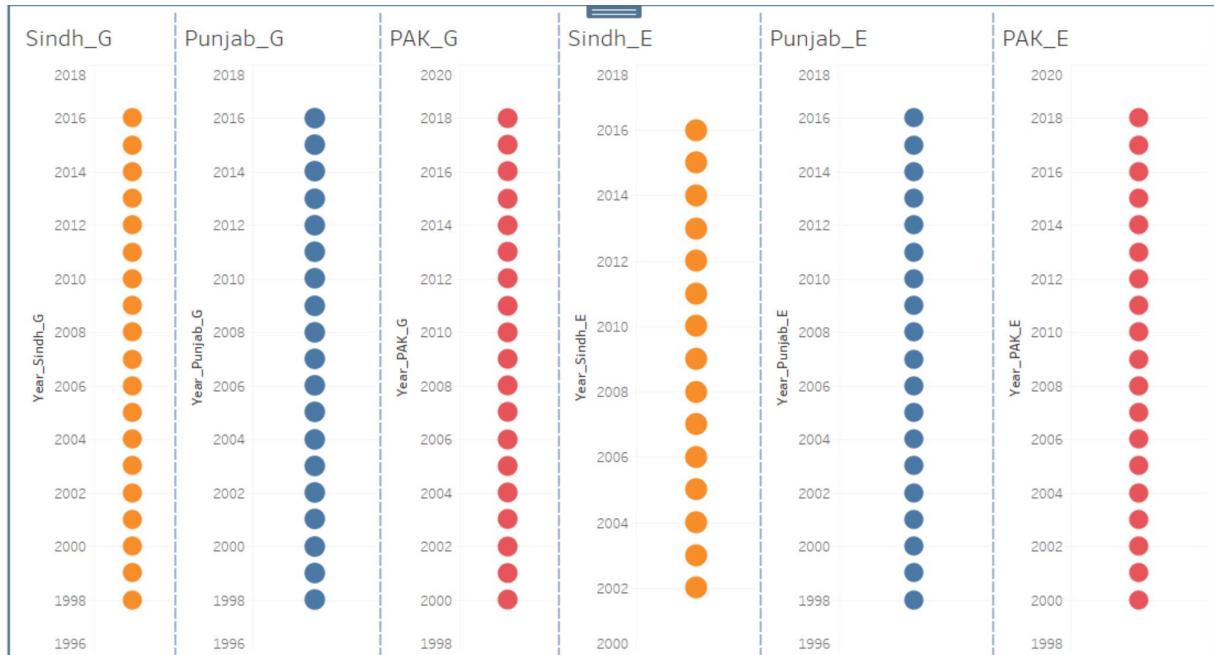
Three tables namely SINDH ELECTRICITY DATA, PUNJAB ELECTRICITY DATA, ANALYSIS are joined with PAKISTAN ELECTRICITY DATA joined on the year.



Now we have two set of tables, we will also compare gas and electricity with each other, we compare both using dashboards and stories to determine useful insights. Here we have form two parts of the data each having four tables.

Data	Analytics
<ul style="list-style-type: none"> <input type="checkbox"/> PAKISTAN ELECTRICITY+ (gas-electricity-consumption) <input checked="" type="checkbox"/> PAKISTAN GAS DATA+ (gas-electricity-consumption) 	<ul style="list-style-type: none"> <input type="checkbox"/> PAKISTAN ELECTRICITY+ (...) <input checked="" type="checkbox"/> PAKISTAN GAS DATA+ (gas...)
Search <input type="text"/> <input type="button"/> <input type="button"/> <input type="button"/>	Search <input type="text"/> <input type="button"/> <input type="button"/> <input type="button"/>
Tables <ul style="list-style-type: none"> > <input type="checkbox"/> ANALYSIS > <input type="checkbox"/> PAKISTAN GAS DATA > <input type="checkbox"/> PUNJAB GAS DATA > <input type="checkbox"/> SINDH GAS DATA <p>Abc Measure Names</p> <hr/> <p># Measure Values</p>	Tables <ul style="list-style-type: none"> > <input type="checkbox"/> ANALYSIS 2 > <input type="checkbox"/> PAKISTAN ELECTRICITY > <input type="checkbox"/> PUNJAB ELECTRICITY > <input type="checkbox"/> SINDH ELECTRICITY <p>Abc Measure Names</p> <hr/> <p># Measure Values</p>

Getting Familiar With Data:



Here we see the span of data for both gas and electricity. For both, overall Pakistan data starts from 2000. And mostly the data limits end till 2016.

PAK_G

Sector_PAK_G	
Cement	Abc
Comercial	Abc
Fertilizer	Abc
Household	Abc
Industry	Abc
Power	Abc
Total	Abc
Transport(CNG)	Abc

Sindh_G

Sector_Sindh_G	
COMMERCIAL	Abc
HOUSEHOLD	Abc
INDUSTRIAL	Abc
TOTAL	Abc

Punjab_G

Sector_Punjab..	
COMMERCIAL	Abc
HOUSEHOLD	Abc
INDUSTRIAL	Abc
OTHERS	Abc
TOTAL	Abc

This shows the usage of gas. We can see that usage of gas in Pakistan is a little different from the sectors in which electricity is used. For example, gas is used in cement industry over all Pakistan and Agriculture requires electricity.

PAK_E

Sector_PAK_E	
AGRICULTURAL	Abc
COMMERCIAL	Abc
HOUSEHOLD	Abc
INDUSTRIAL	Abc
OTHER GOVT	Abc
STREET LIGHTS	Abc
TOTAL	Abc

Sindh_E

Sector_Sin..	
Agricultural	Abc
Commercial	Abc
Domestic	Abc
Industrial	Abc
Others	Abc
Total	Abc

Punjab_E

Sector_Punjab..	
Agricultural	Abc
Commercial	Abc
Domestic	Abc
Industrial	Abc
Others	Abc
Public Lighting	Abc
Total	Abc

Electricity in both provinces have a few extra domains of usage.

Edit Aliases [Sector_PAK_G]

Member	Has Alias	Value (Alias)	
Cement	*	CEMENT	<input type="button" value="OK"/>
Comercial	*	COMERCIAL	<input type="button" value="Cancel"/>
Fertilizer	*	FERTILIZERS	
Household	*	HOUSEHOLD	
Industry	*	INDUSTRIAL	
Power	*	POWER	
Total	*	TOTAL	
Transport(CNG)	*	TRANSPORT(CNG)	

For Gas:

Here since we have INDUSTRIAL in the Punjab and Sindh table, we can change industry in Pakistan table too. We also make the other sector name uppercase.

Edit Aliases [Sector_Punjab_E]		
Member	Has Alias	Value (Alias)
Agricultural	*	AGRICULTURE
Commercial	*	COMMERCIAL
Domestic	*	HOUSEHOLD
Industrial	*	INDUSTRIAL
Others	*	OTHERS
Public Lighting	*	PUBLIC LIGHTING
Total		<input type="text" value="TOTAL"/>
<input type="button" value="OK"/> <input type="button" value="Cancel"/>		
<input type="button" value="Clear Aliases"/> <input type="button" value=""/>		

Edit Aliases [Sector_Sindh_G]		
Member	Has Alias	Value (Alias)
Agricultural	*	AGRICULTURE
Commercial	*	COMMERCIAL
Domestic	*	HOUSEHOLD
Industrial	*	INDUSTRIAL
Others	*	OTHERS
Total		<input type="text" value="TOTAL"/>
<input type="button" value="OK"/> <input type="button" value="Cancel"/>		
<input type="button" value="Clear Aliases"/> <input type="button" value=""/>		

For Electricity:

Here we change the sector values in Sindh and Punjab tables to match the overall Pakistan data.

Step 4: List down dimensions (with different types as done in class) along with KPIs (to be extracted from transformed data)

PAKISTAN GAS

- Year_PAK_G
- Sector_PAK_G
- PAK_Consumption(mm cf)_G

SINDH GAS DATA

- Year_Sindh_G
- Sector_Sindh_G
- Sindh_Consumption(mm cf)_G

PUNJAB GAS DATA

- Year_Punjab_G
- Sector_Punjab_G
- Punjab_Consumption(mm cf)_G

PAKSITAN ELECTRICITY DATA

- Year_PAK_E
- Sector_PAK_E
- PAK_Consumption(Kwh Million)_E

SINDH ELECTRICITY DATA

- Year_Sindh_E
- Sector_Sindh_G
- Sindh_Consumption(Kwh Million)_E

PUNJAB ELECTRICITY DATA

- Year_Punjab_E
- Sector_Punjab_E
- Punjab_Consumption(Kwh Million)_E

Dimensions (time):

- Year

Since we only have year, it's taken as time dimension.

Dimensions (normal):

- Sector

Sector can be a dimension in some cases.

Measure:

Consumption of both gas and electricity.

Step 5: List down some potential analyses (can be identified from Step 4)

Questions:

Over the years, how the consumption trends are affected.

Time Dimension: Analyze KPI's across time dimension

1. What are temporal trends of KPI's across year..

Normal Dimension:

2. Analyze KPI's across sectors

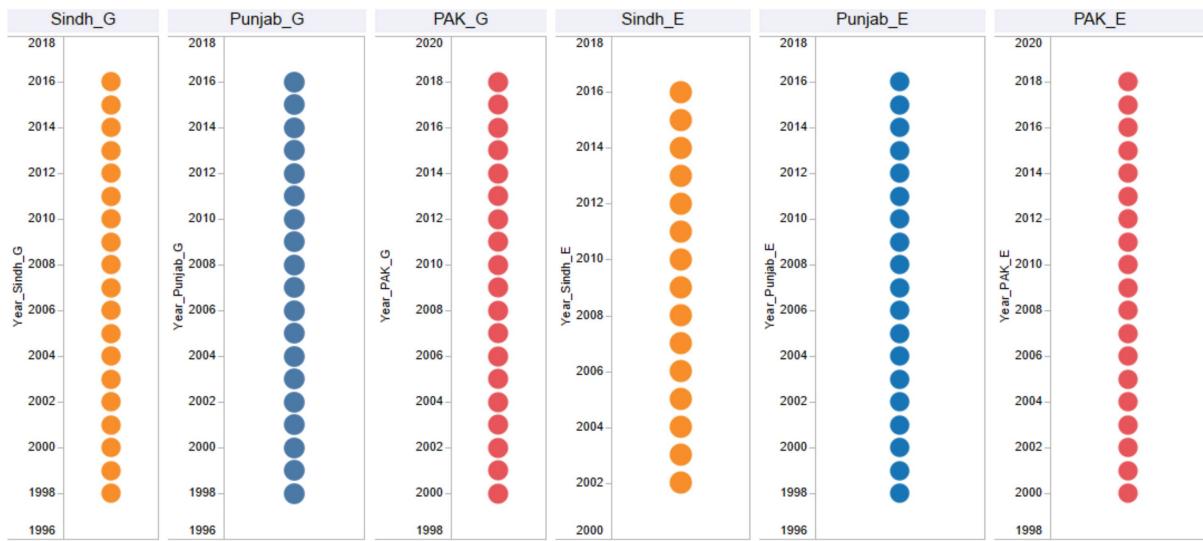
Slicers:

- Sector.

Spaning year

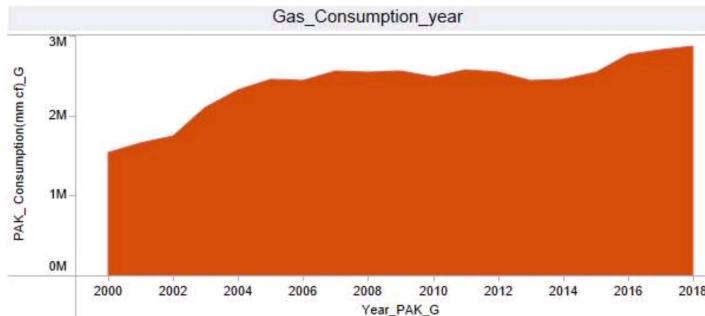
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The dashboard shows the span of the data in each table. Like in gas data of sindh and punjab we start 1998 till 2016 but this pattern differ from electricity data of both provinces which start from 1998 and 2002 respectively.



Gas Consumption Over The Years

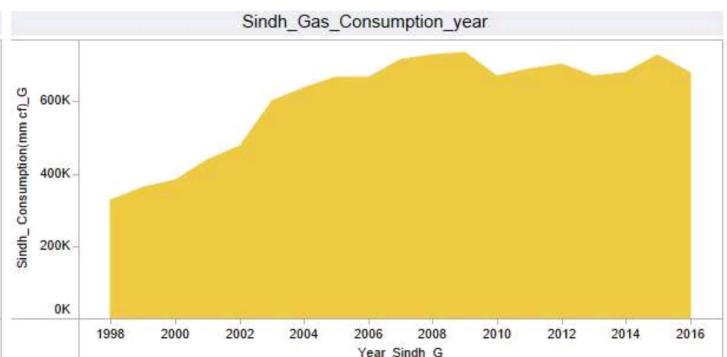
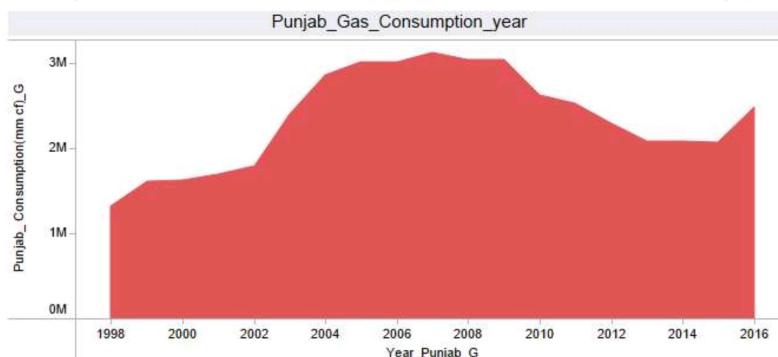
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This shows the Gas consumption pattern against the year. For overall Gas consumption in Pakistan we see an increase after 2002 then except for few downward depths we see a decrease curve at 2015 after that there is only increase in the consumption. This simply shows that consumption of gas increase almost every year all over Pakistan.

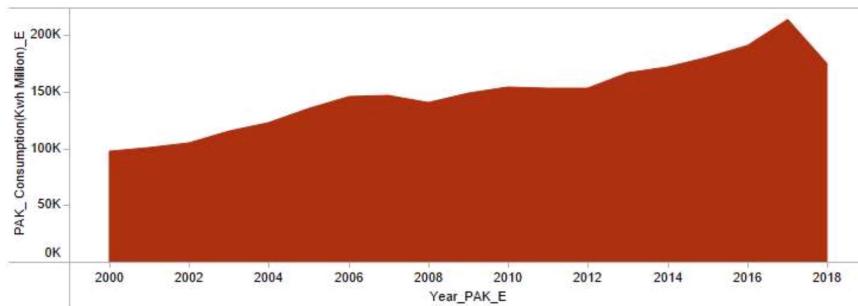
But this trend differ in the provincial record we see an increase in Punjab and Sindh both after 2002, just like the above trend. In punjab the increase is till 2009 then we see a decrease till 2015. Although in 2016 the consumption increase again but it no where matches the previous highs of 2008.

For sindh we see frequent increase and decrease after 2002, it also has a major high in 2008 and after 2016 its having a decrease in consumption.

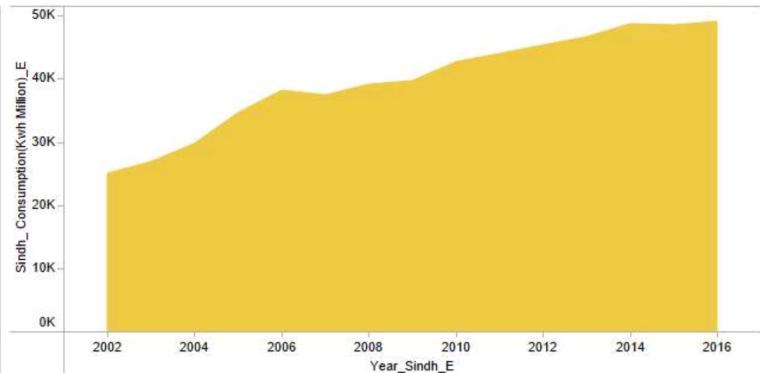
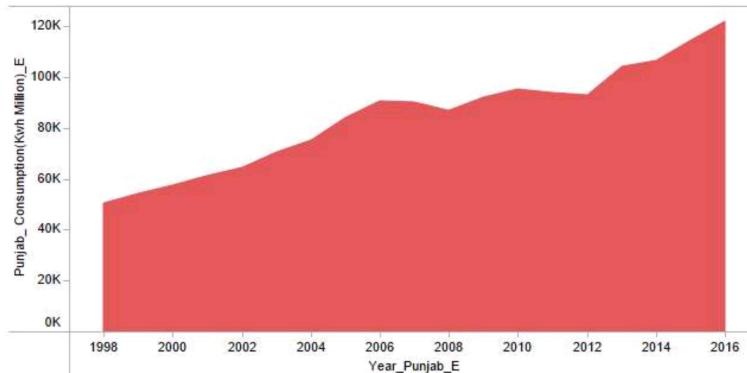


Electricity Consumption Over The Years

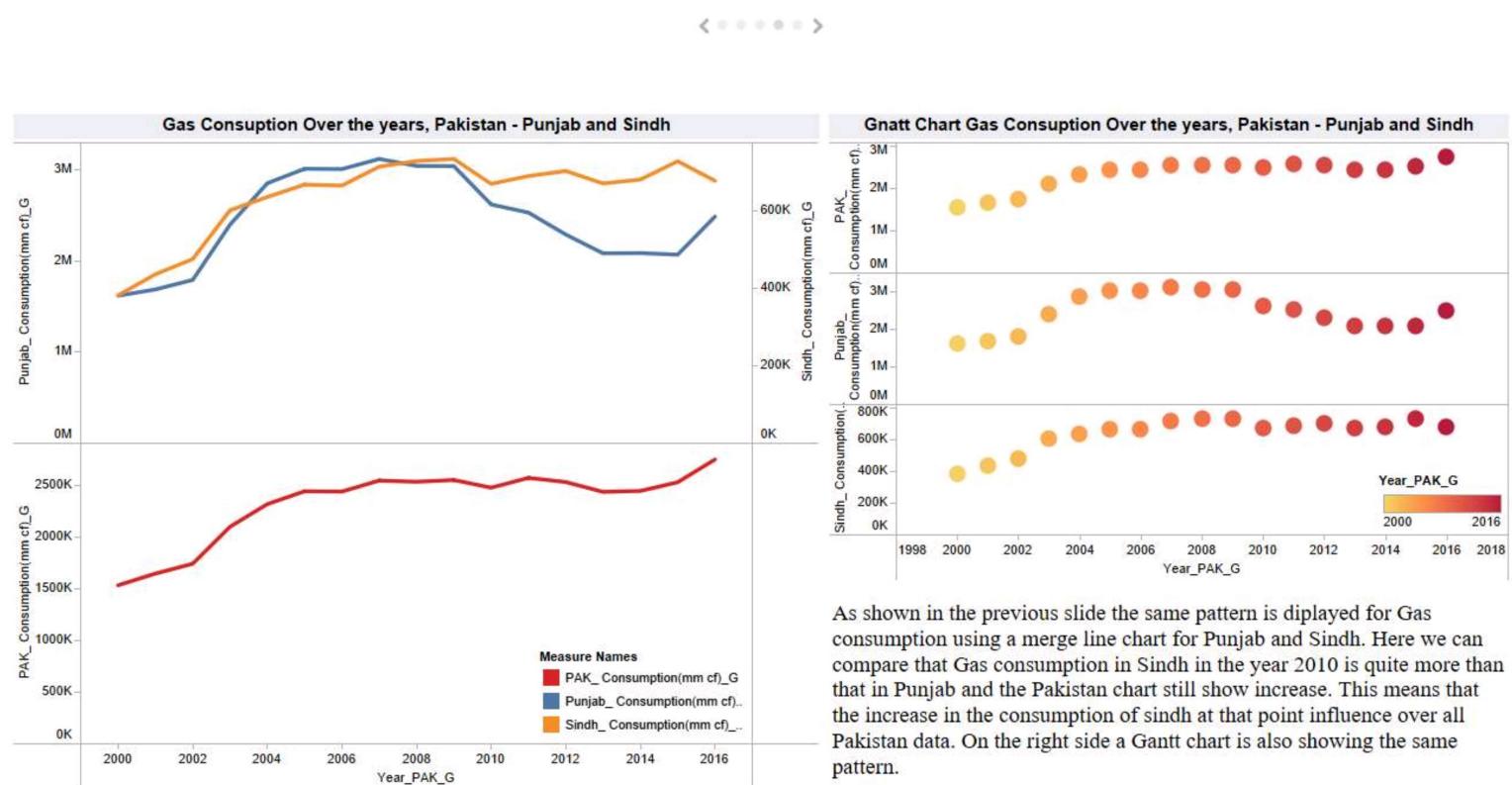
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The electricity consumption shows a subtle increase from 2002 to 2007 and again from 2009 till 2017 then here after we see a decrease in consumption, which is astonishing but this could be showing the decrease in the number of factories again maybe indicating inflation. For the consumption in Punjab we see an increase from 1998 till 2016. Then again the provincial data shows subtle increase till 2016. Since we don't have provincial data after that we can't predict if it matches the national data and show a decrease in consumption after 2018. The consumption in Sindh also shows a rapid increase pattern.

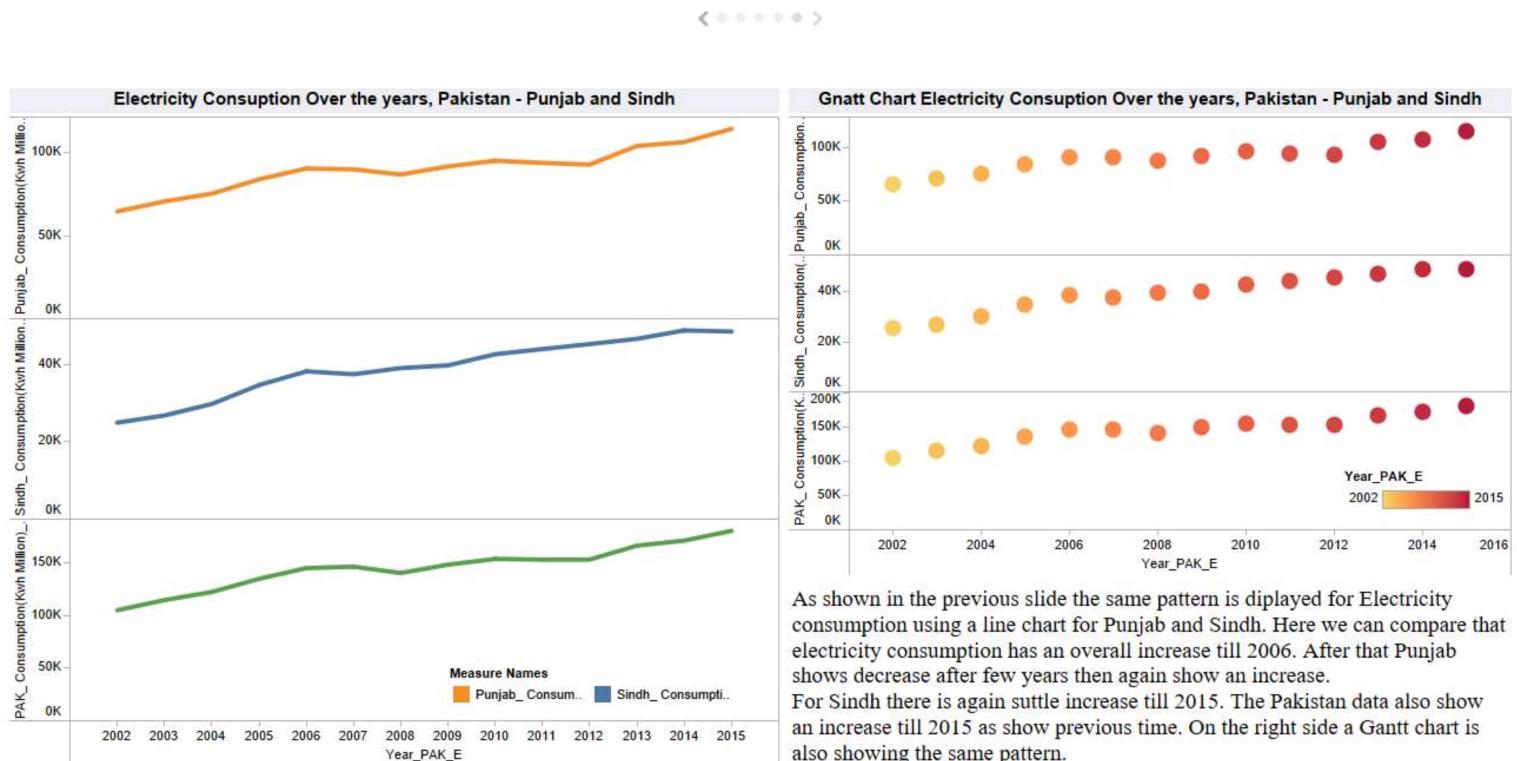


Gas Consumption Over the years - Line and Gantt Chart



As shown in the previous slide the same pattern is displayed for Gas consumption using a merge line chart for Punjab and Sindh. Here we can compare that Gas consumption in Sindh in the year 2010 is quite more than that in Punjab and the Pakistan chart still show increase. This means that the increase in the consumption of sindh at that point influence over all Pakistan data. On the right side a Gantt chart is also showing the same pattern.

Electricity Consumption Over The Years - Line and Gnatt Chart



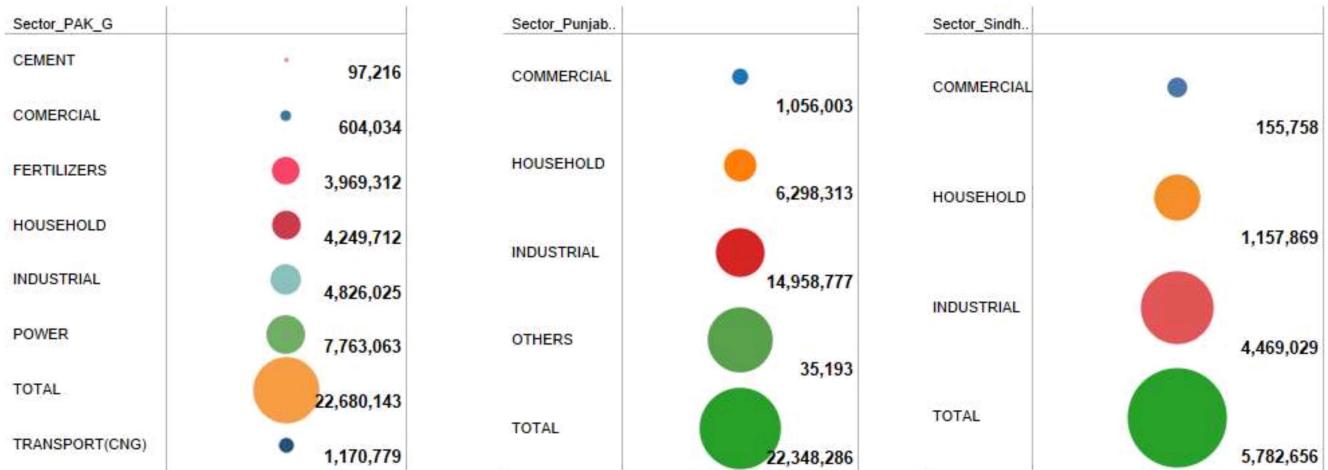
Sector Wise Consumption of Gas

This shows the sector wise consumption of Gas. Here we are not concerned with the time. We simply see over the entire data which group have utilized the most of this natural resource,

Here we can see that most gas is utilized all over Pakistan in power. This means that it is used in form of fuel to make power out of it. Second is the household meaning the majority population use gas stoves for cooking.

In both provinces we see almost same pattern. The major Gas consumption lies in the sector of industrial. Now this can lead to two assumptions. Like before factories use them as fuel - raw material. Second is that its being itself as a commodity.

Other sectors also have impact on Gas usage.



Sector Wise Consumption of Electricity

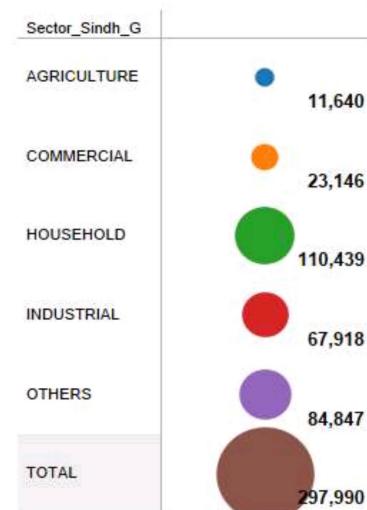
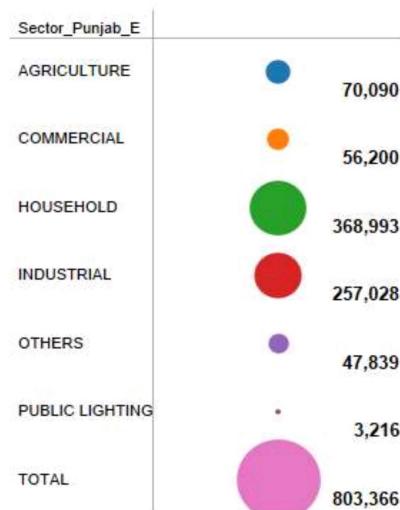
This shows the sector wise consumption of electricity. Here we are not concerned with the time. We simply see over the entire data which group have utilized the most of this natural resource,

Here we can see that most electricity is used all over Pakistan in household. This means that it is used in form of light and is a basic necessity of life.

In both provinces we see almost same pattern. The major electricity consumption is at public's houses. So this is a general commodity in Pakistan, used by almost everyone.

Other sectors also have impact on Electricity usage.

Sector_PAK_E		
AGRICULTURAL	148,771	
COMMERCIAL	103,776	
HOUSEHOLD	666,980	
INDUSTRIAL	397,334	
OTHER GOVT	85,160	
STREET LIGHTS	7,267	
TOTAL	1,409,384	



Sector Wise Consumption of Gas and Electricity



Sector Wise Consumption of Electricity and Gas

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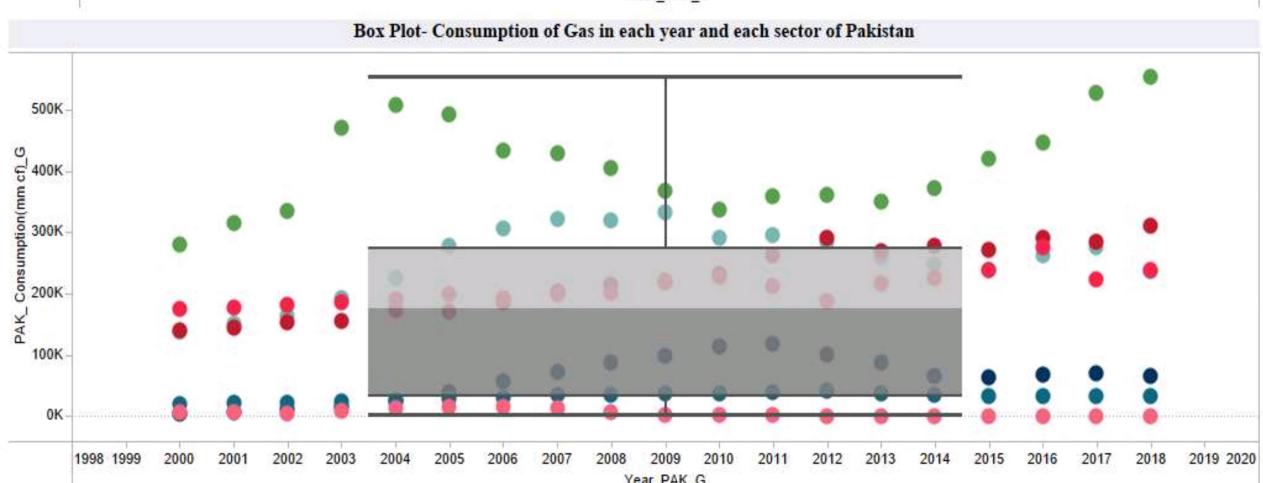
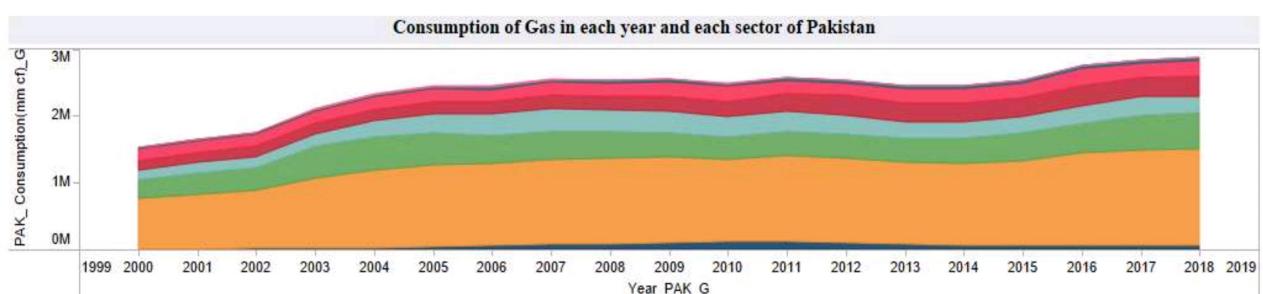
Pakistan - Punjab, Sindh -- Gas Consumption in three main sectors

Measure Names	PAK_Consumption(mm cf)_G	Punjab_Consumption(mm cf)_G	Sindh_Consumption(mm cf)_G
Value	0M	42M	11M
Commercial	PAK_Consumption(mm cf)_G	Punjab_Consumption(mm cf)_G	Sindh_Consumption(mm cf)_G
Household	PAK_Consumption(mm cf)_G	Punjab_Consumption(mm cf)_G	Sindh_Consumption(mm cf)_G
Industrial	PAK_Consumption(mm cf)_G	Punjab_Consumption(mm cf)_G	Sindh_Consumption(mm cf)_G

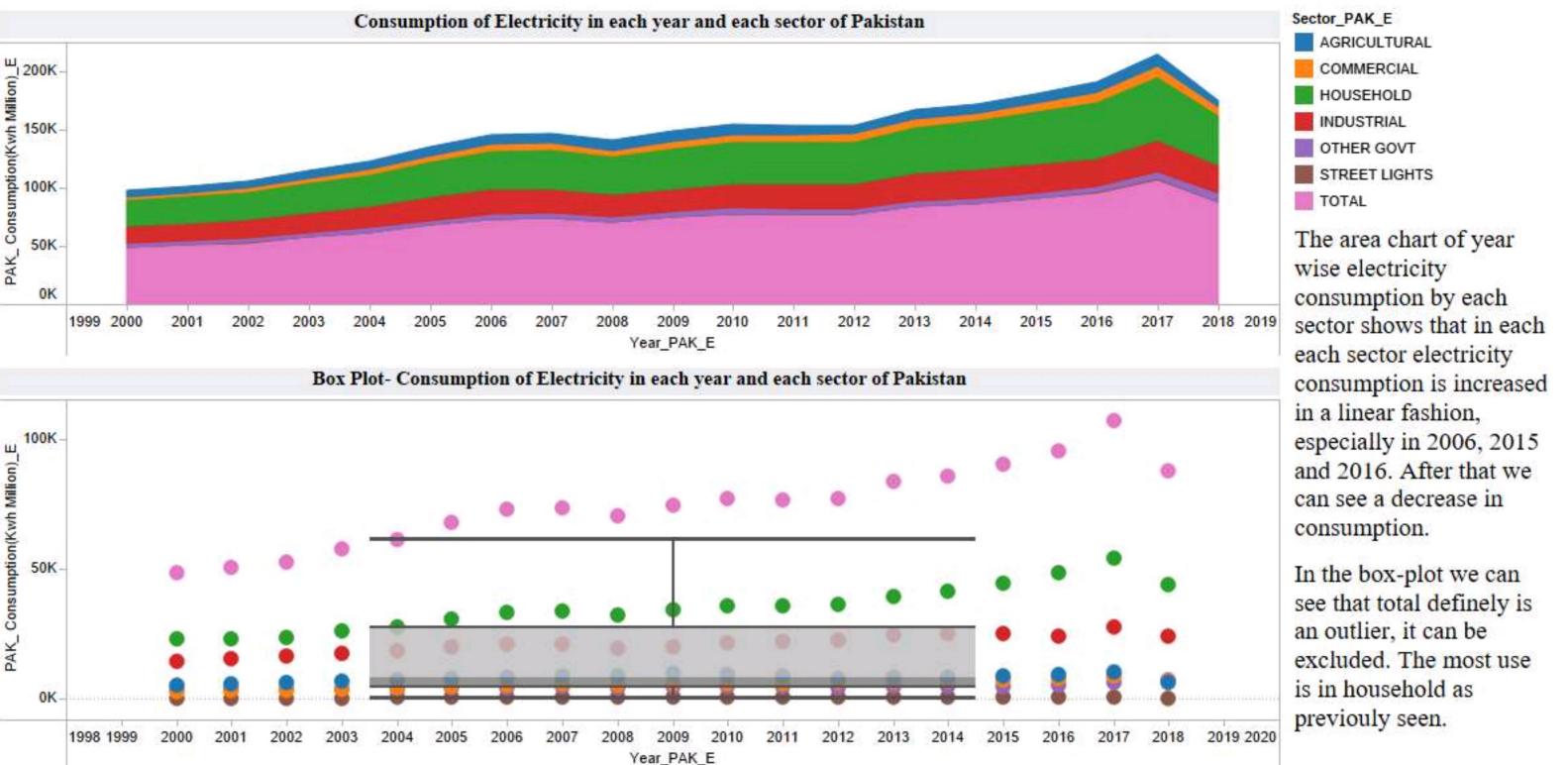
Pakistan - Punjab, Sindh -- Electricity Consumption in three main sectors

Measure Names	PAK_Consumption(mm cf)_E	Punjab_Consumption(mm cf)_E	Sindh_Consumption(mm cf)_E
Value	0K	1450K	1450K
Agricultural	PAK_Consumption(mm cf)_E	Punjab_Consumption(mm cf)_E	Sindh_Consumption(mm cf)_E
Commercial	PAK_Consumption(mm cf)_E	Punjab_Consumption(mm cf)_E	Sindh_Consumption(mm cf)_E
Household	PAK_Consumption(mm cf)_E	Punjab_Consumption(mm cf)_E	Sindh_Consumption(mm cf)_E
Industrial	PAK_Consumption(mm cf)_E	Punjab_Consumption(mm cf)_E	Sindh_Consumption(mm cf)_E

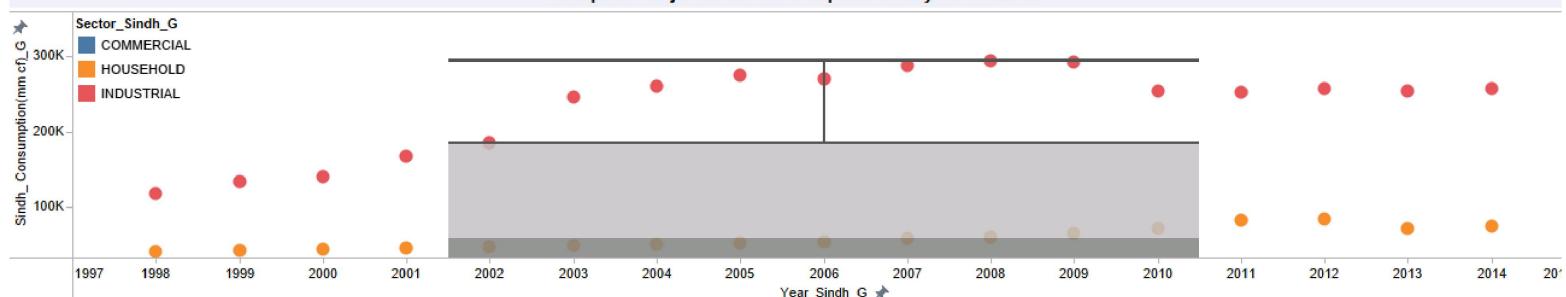
Gas and Electricity Consumption by year and sector



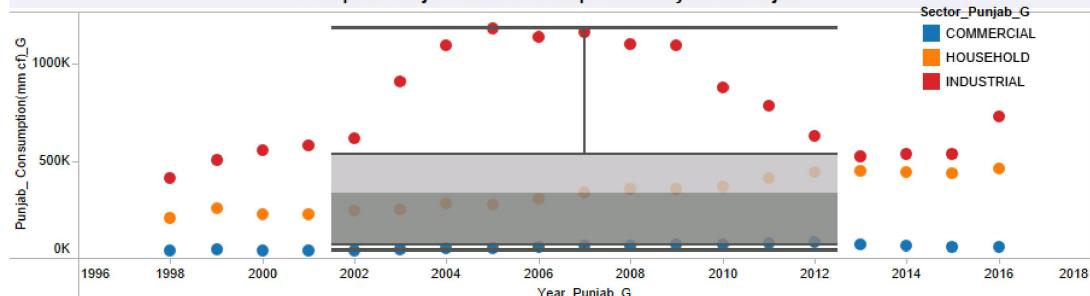
The area chart of year wise Gas consumption by each sector shows that in each each sector gas consumption is increased. The most usage is shown in cement, commercial and household, as depit previously. The box plot also shows the same pattern. The power is considered an outlier as it has the most usage. Household comes under normal usage which is show inside the box.



Box-plot -- Major sector consumption in an year in sindh



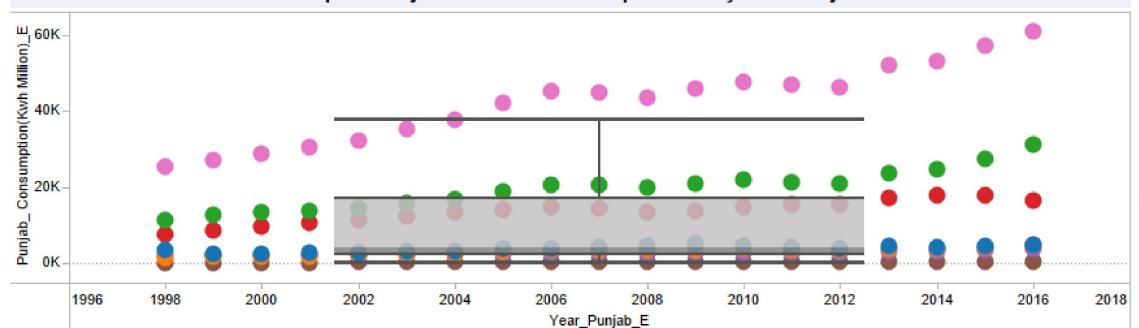
Box-plot -- Major sector consumption in an year in Punjab



The gas consumption in sindh has a normal range in the household sector. The outliers come from the industrial side. The major fact here is that commercial field have very less weight here, meaning not many commercial business can consume Gas.

The box-plot of punjab shows industrial to be an outlier, the house-hold just as sindh lies in the normal ranhe. The commercial side is even lower than the normal range in both plots which can be alarming.

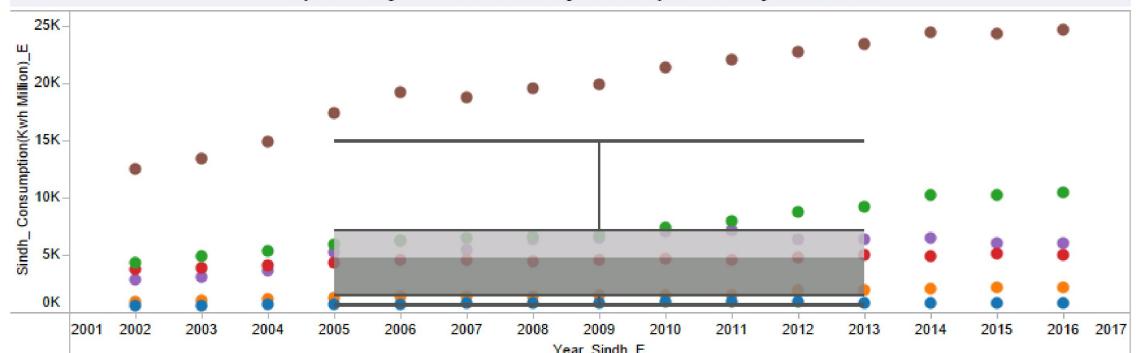
Box-plot -- Major sector Gas consumption in an year in Punjab



Sector_Punjab_E
 ■ AGRICULTURE
 ■ COMMERCIAL
 ■ HOUSEHOLD
 ■ INDUSTRIAL
 ■ OTHERS
 ■ PUBLIC LIGHTING
 ■ TOTAL

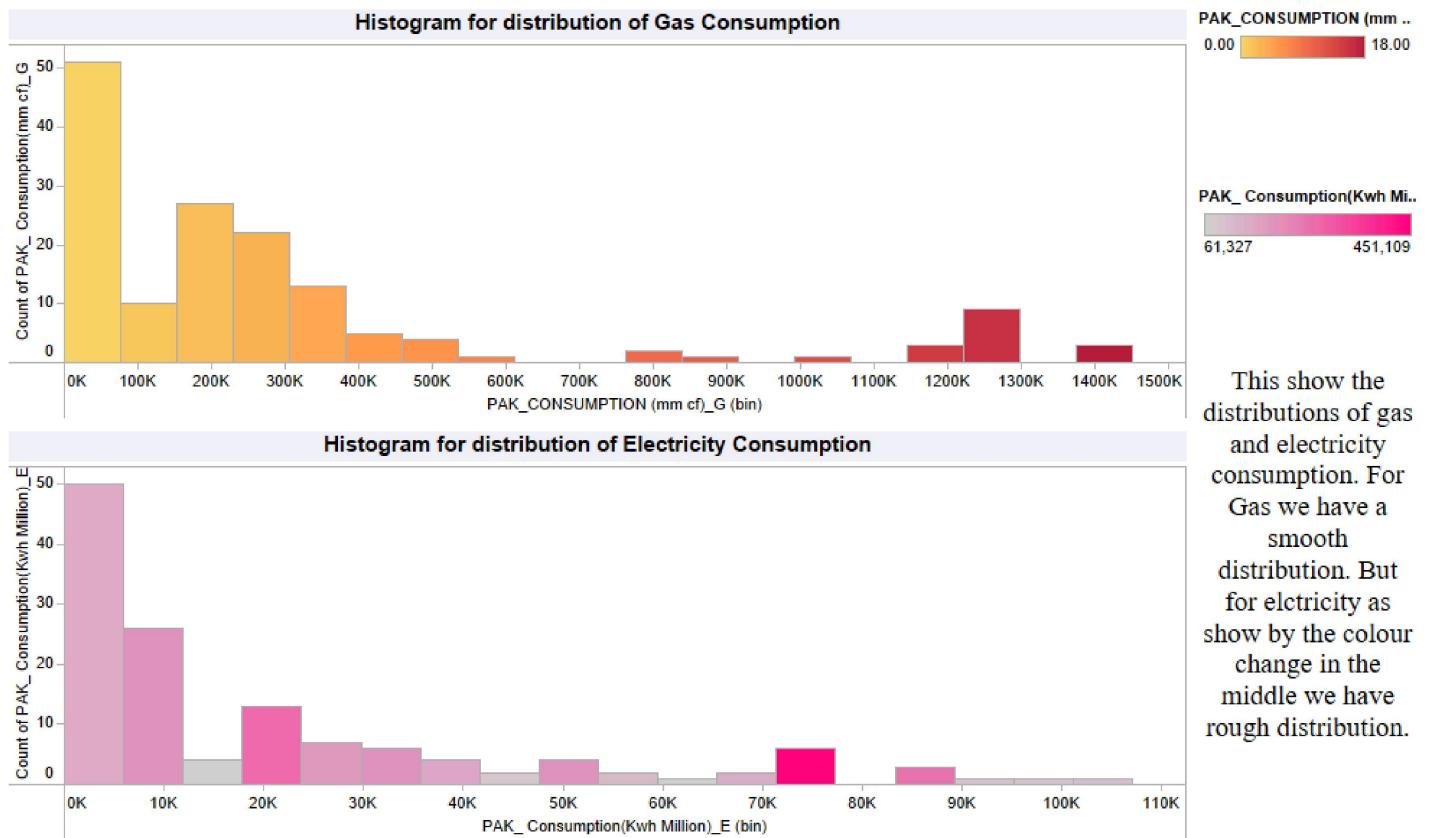
Sector_Sindh_E
 ■ AGRICULTURE
 ■ COMMERCIAL
 ■ HOUSEHOLD
 ■ INDUSTRIAL
 ■ OTHERS
 ■ TOTAL

Box-plot -- Major sector Electricity consumption in an year in sindh

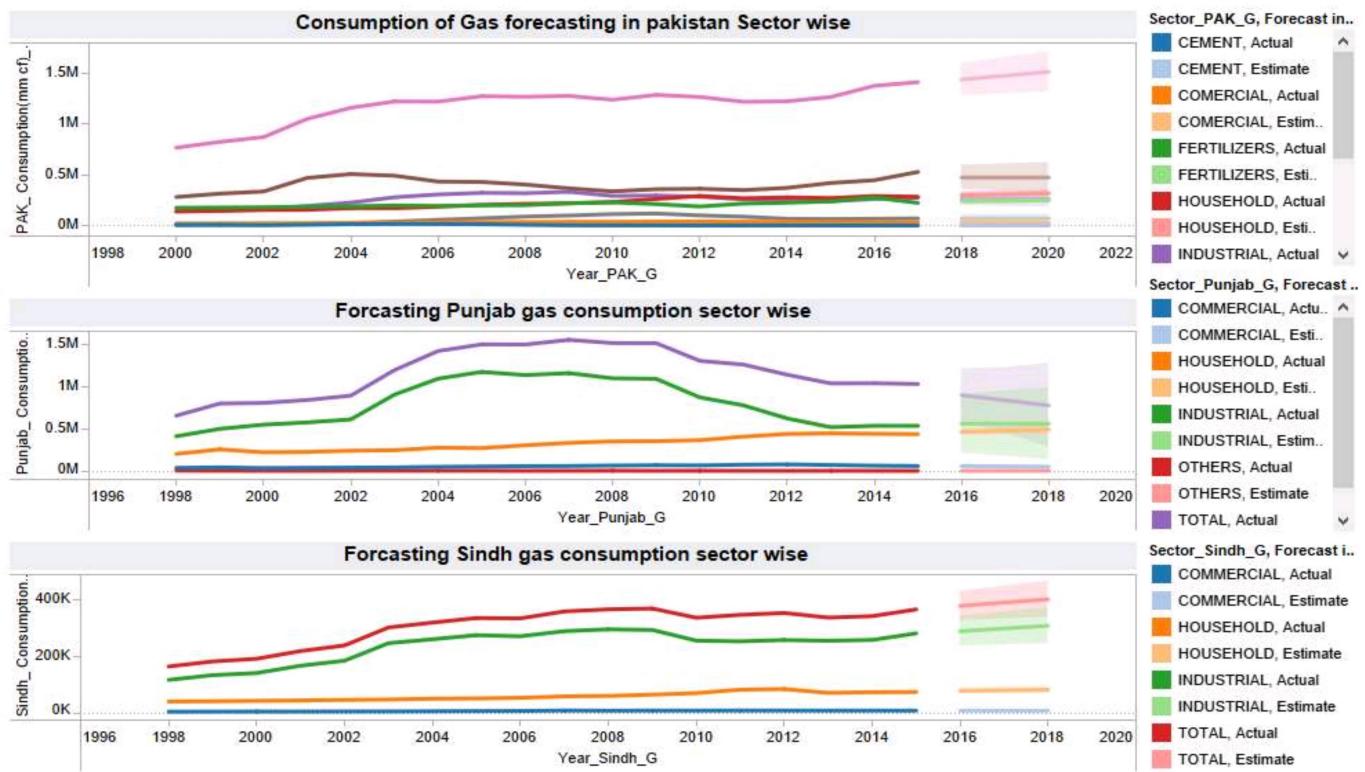


The electricity consumption consumption in Sindh has a normal range in the household sector, which later grows to be an outlier. All other sectors lie in the normal range.

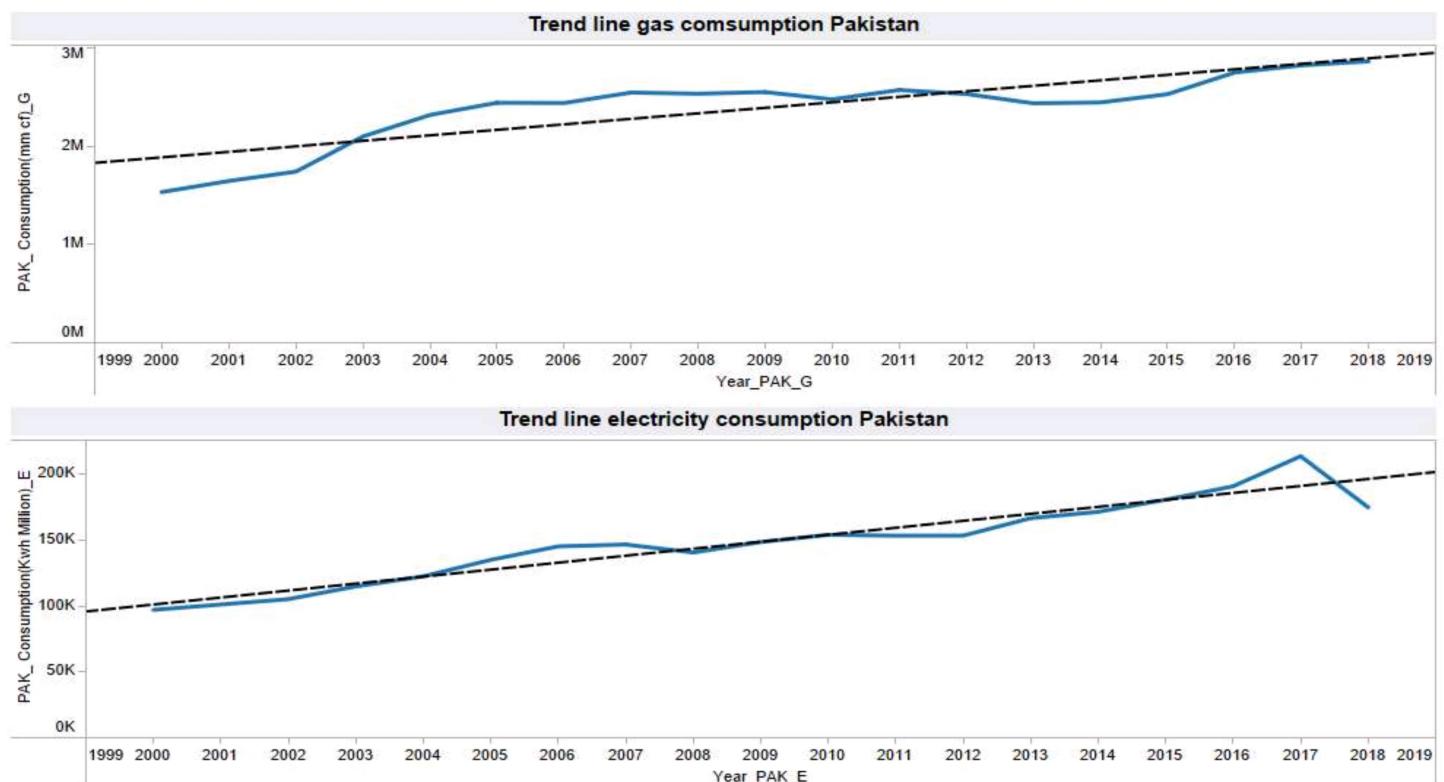
The box-plot of Punjab shows industrial to be a borderline normal. The household here also grows over the years to be the outlier. The commercial side is even lower than the normal range in both plots which can be alarming.



Trend line and forecasting



Trend line and forecasting



Trend line and forecasting

