Ironhack Final Project

AGRI-FOOD EMISSIONS AND TEMPERATURE CHANGES

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Content

Context

01

Adopted by 196 countries, **The Paris Agreement** from 2015 aims ‘to limit the temperature increase to 1.5°C above pre-industrial levels.’

02

So far **zero-carbon solutions** have been applied in economic sectors representing 25% of emissions, mostly in power and transport sectors.

03

in 2019, agri-food systems represent **31% of total** global anthropogenic emissions and more than 70% in Africa and South America. Since 1990, emissions from this sector **increased globally by 16%**.

Sources: UNCC, EC

Overview

Dataset was created based on the multiple datasets from FAO and IPCC and provides the information about emissions from agri-food industry.

Almost 7K rows of data presenting emissions from agri-food industry in 236 areas in the period of 30 years (1990 - 2020)

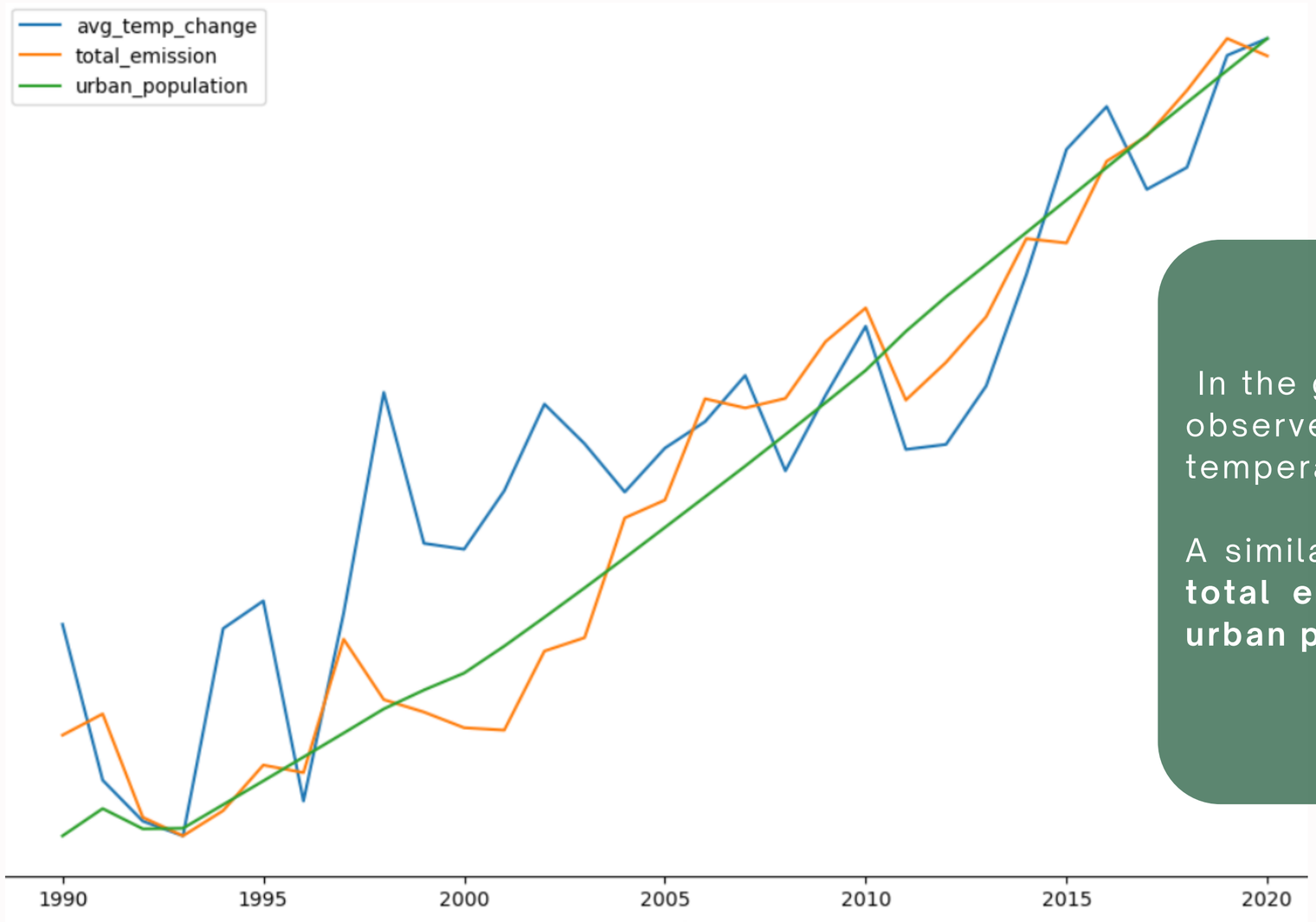
Target variable:
Average Temperature °C

+ 29 features

Year
Area
Population
Emissions from agri-food activities

Many features highly correlated - in order to address that, PCA and VIF were applied.

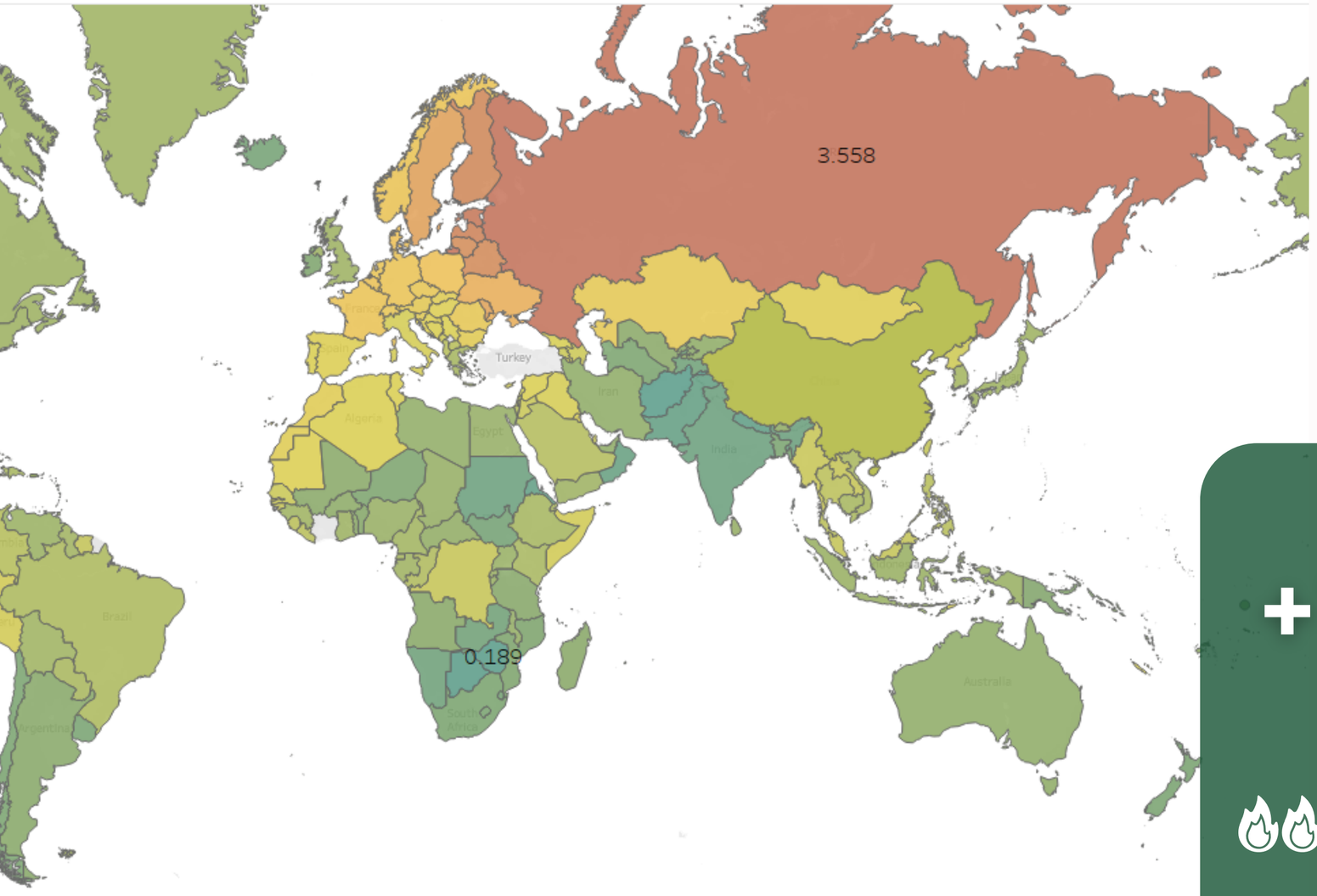
What is the data telling us?



In the given dataset we can observe that not only temperature is growing.

A similar trend is visible for **total emissions** as well as **urban population**.

What is the data telling us?



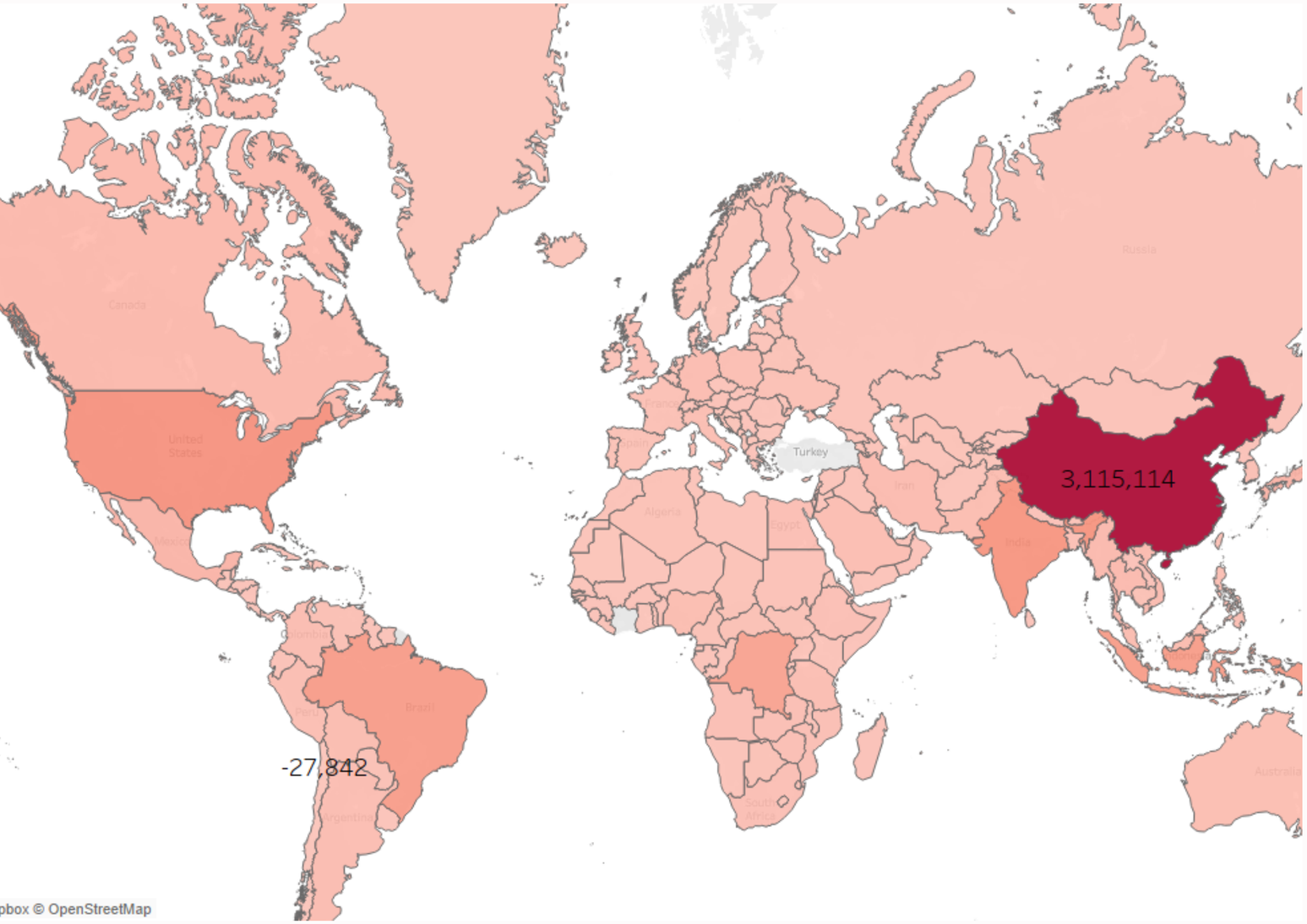
While the temperature is increasing globally, there are certain areas which are more impacted than others.

Yet, agri-food emissions are not the highest in countries where the temperature growth is most visible.

+1.50°C

in 2020

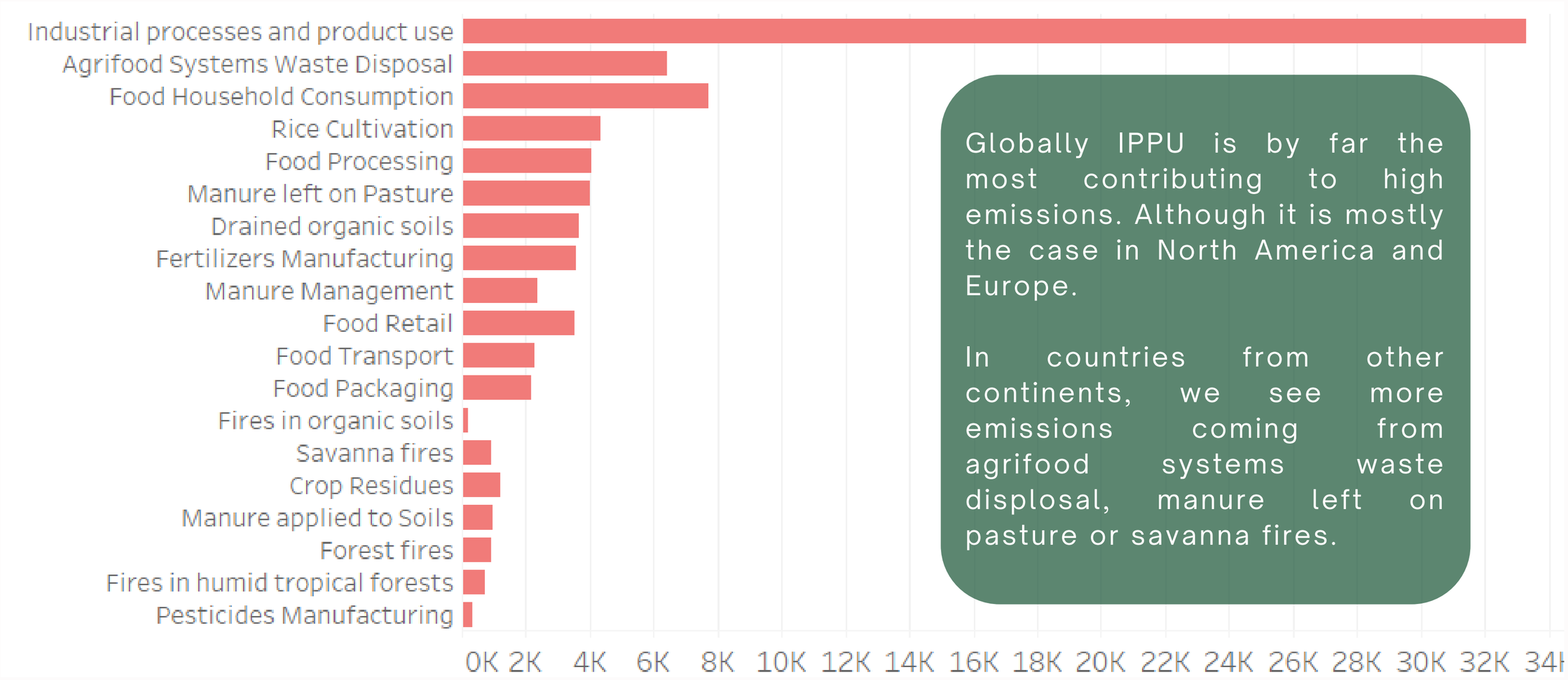
What is the data telling us?



In 2020 Chinese agri-food sector generated over 3 millions of kilotonnes of CO2. In this country, same year temperature raised on average by +1,57°C which is significantly lower from the highest change recorded that year in Russia (+3,56°C).

On the other end, in few countries we can observe a **negative emissions** which are explained by the positive impact of forestland acting as a carbon sink. One of those countries in 2020 was Chile.

What is the data telling us?



Globally IPPU is by far the most contributing to high emissions. Although it is mostly the case in North America and Europe.

In countries from other continents, we see more emissions coming from agrifood systems waste displosal, manure left on pasture or savanna fires.

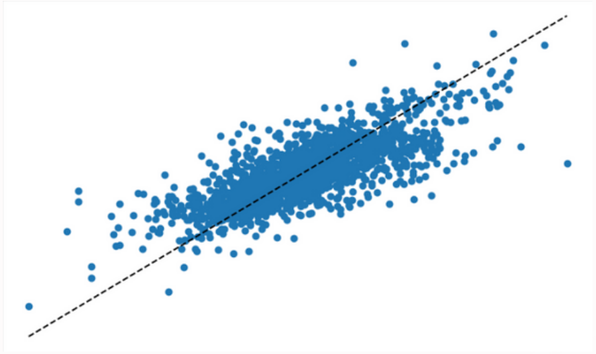
Predicting temperature change

-Regression models

Linear Regression, KNeighborsRegressor, RandomForestRegressor, GradienBoostingRegressor, BaggingRegressor

	Feature selection using VIF			Feature reduction using PCA			Selected countries		
	R2	RMSE	MAE	R2	RMSE	MAE	R2	RMSE	MAE
Linear Regression	0.50	0.16	0.30	0.50	0.16	0.30	0.34	0.10	0.26
KNeighbors Regressor	0.47	0.17	0.31	0.48	0.17	0.30	0.50	0.08	0.21
★ Random Forest Regressor	0.60	0.13	0.27	★ 0.57	0.14	0.28	0.55	0.07	0.20
Gradient Boosting Regressor	0.50	0.16	0.30	0.47	0.17	0.31	★ 0.58	0.07	0.20
Bagging Regressor	0.58	0.14	0.28	0.54	0.15	0.29	0.53	0.07	0.21

RANDOM FOREST REGRESSOR

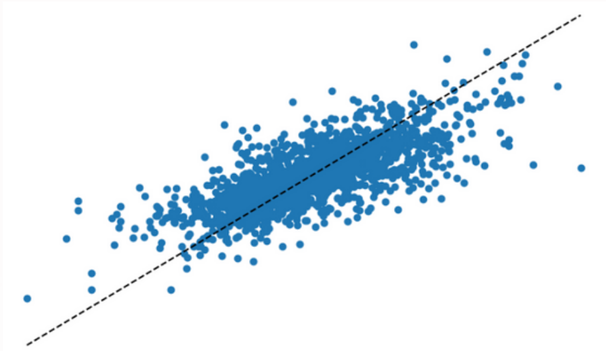


Feature selection using VIF

R2: 0.6

RMSE: 0.13

MAE: 0.27

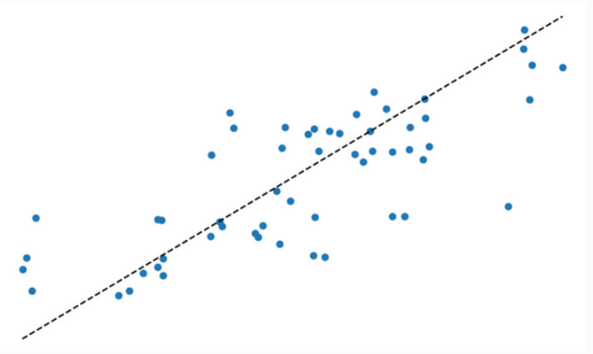


Feature reduction using PCA

R2: 0.57

RMSE: 0.14

MAE: 0.28



VIF + hyperparameter tuning

R2: 0.56

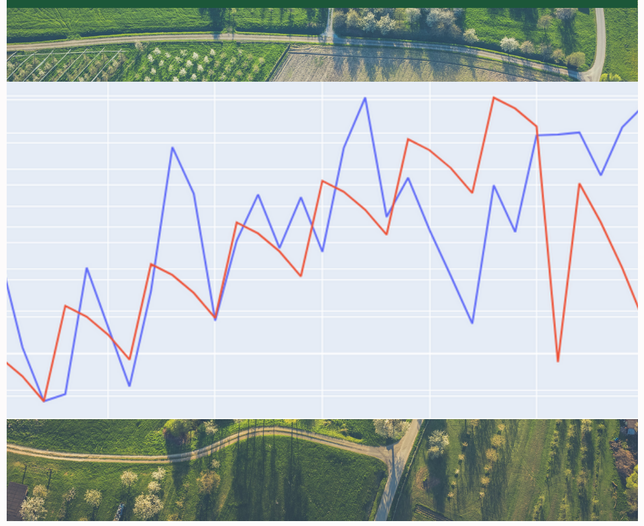
RMSE: 0.07

MAE: 0.2

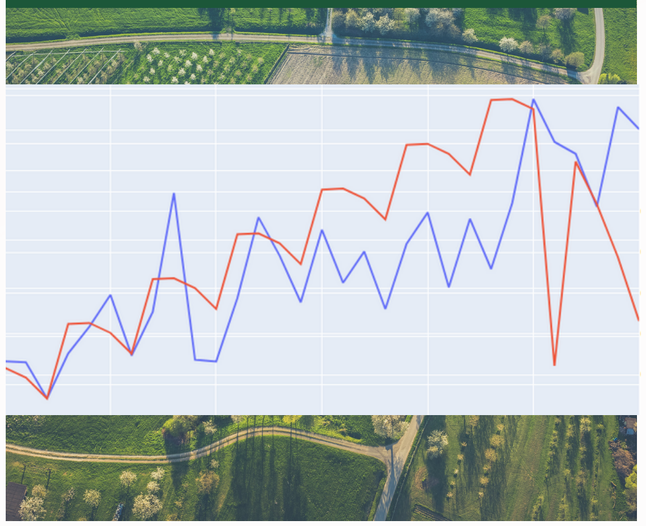
Predicting temperature change

Time series forecasting - Prophet

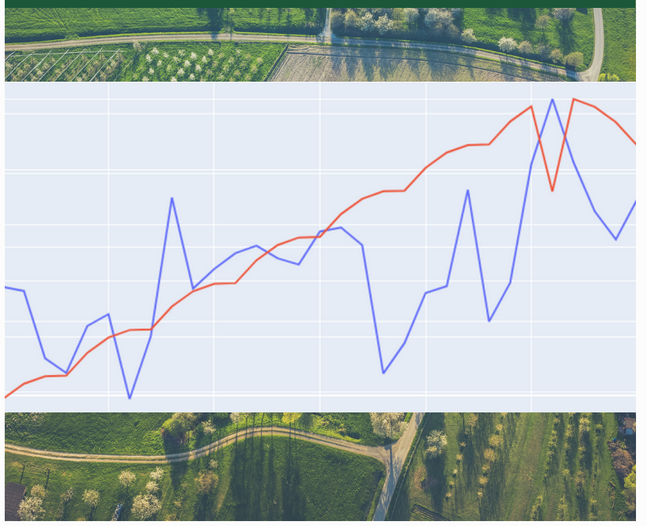
China



Brazil



USA



Time-series forecasting *is a technique that uses historical data to predict future values over a period of time. Factors that are taken into account are: trends, seasonality, unexpected events as well as amount and quality of data.*

Prophet *(by Facebook) is a procedure that allows time series forecasting fitting yearly, monthly, weekly, daily seasonality. It fits best with data that has strong seasonal effects and several seasons of historical data.*

ML models - next steps

Time series forecasting
ARIMA model might suit the data better

Time series forecasting
Lower periodicity might work better (e.g. daily)

Expanding dataset
Adding emissions from other sectors.

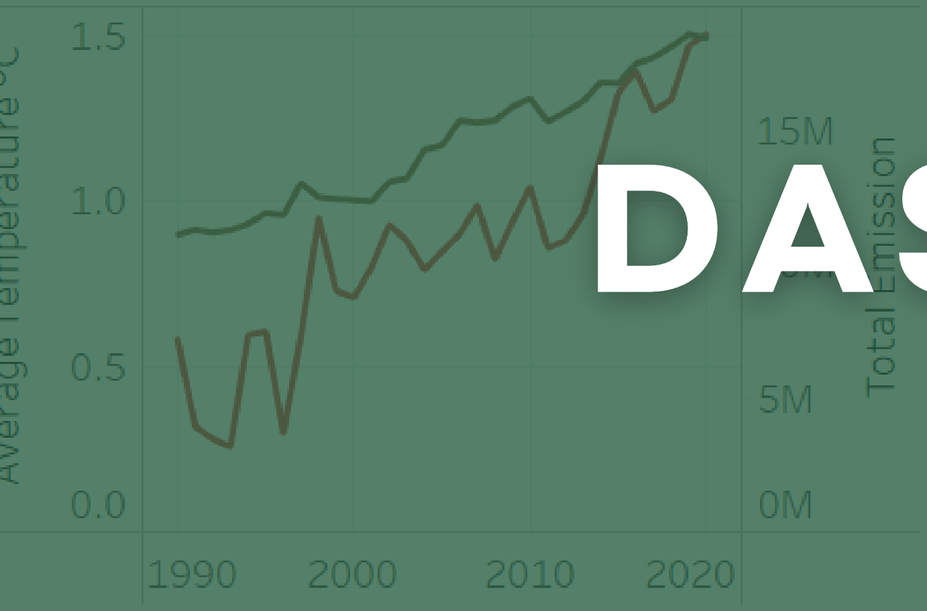
Regression models
Country selection with feature selection

DASHBOARD

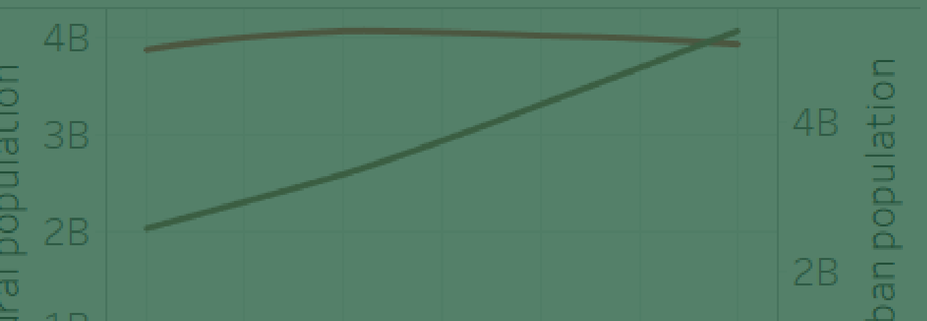
CO2 emission from agri-food and temperature change

ata presenting CO2 emissions generated by the agri-food
dustry per country and average temperature changes fr..

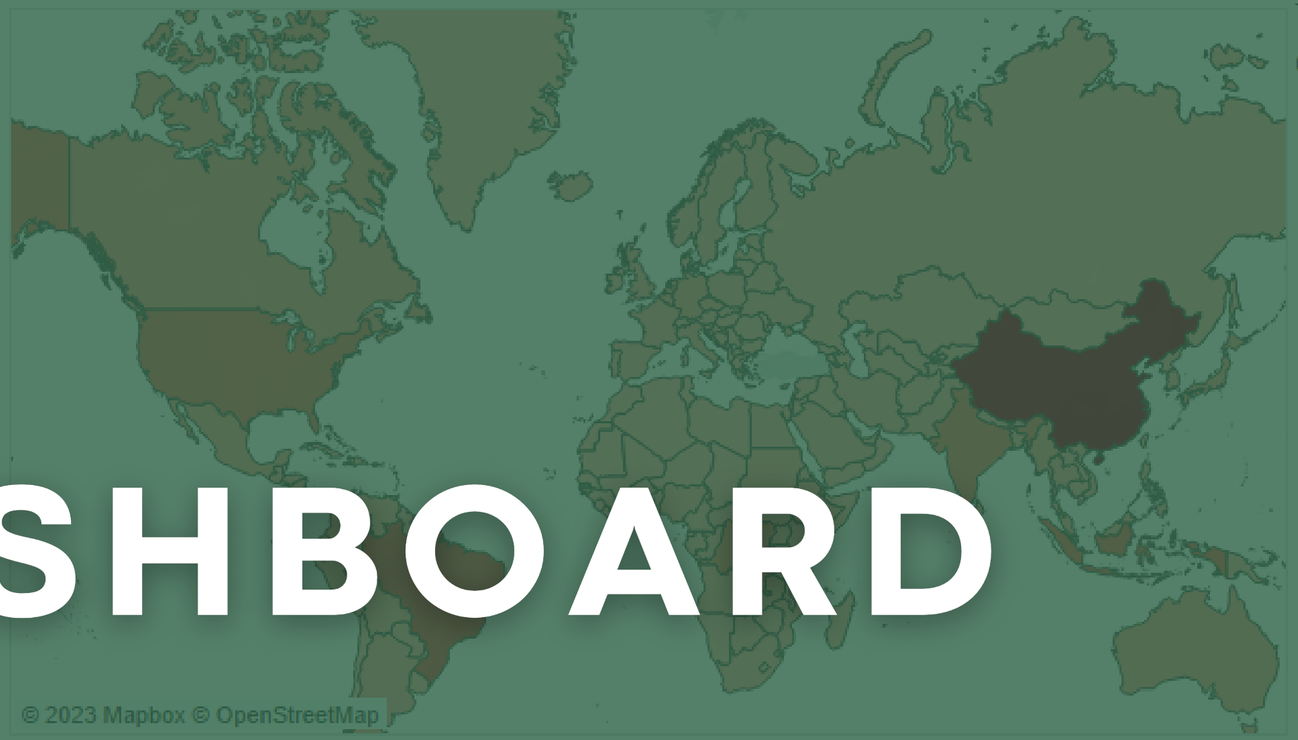
O2 emission and temperature change



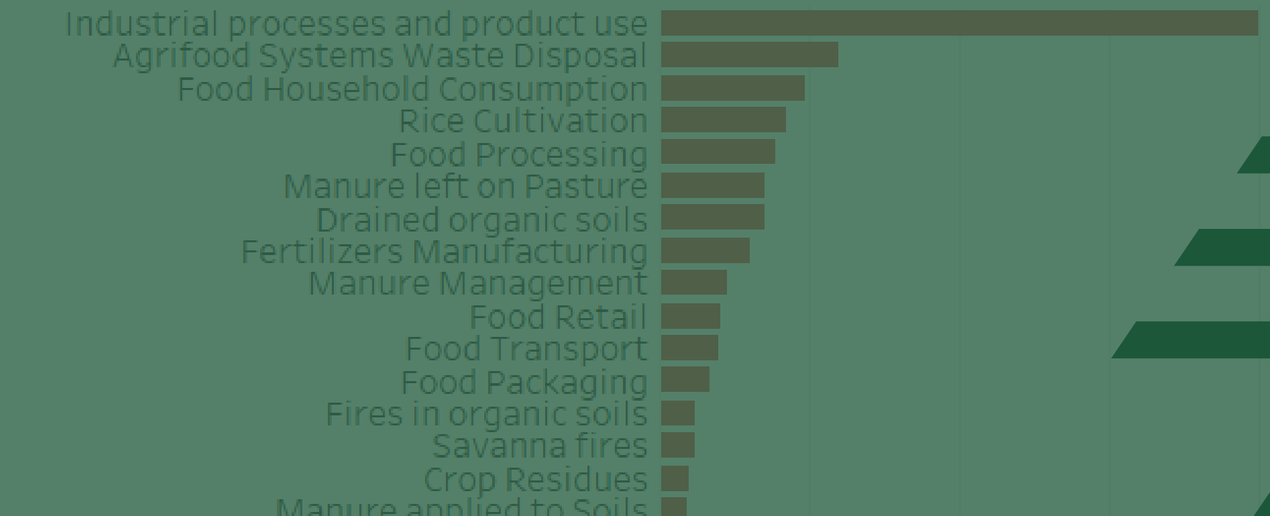
rban and rural population



CO2 emission per country



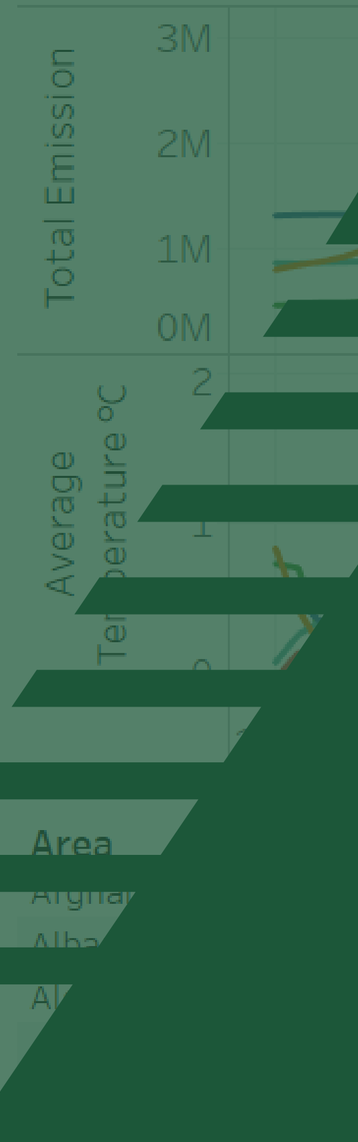
Average CO2 emission per activity



Country

To display information
country, use the map a

CO2 emission & ten



THANK YOU

IRON HACK