KYOTO PROTOCOL, WORLD PERFORMANCE ANALYSIS

TECHNICAL PRESENTATION

MAY, 2020

WHAT MOTIVATES THIS PROJECT

Our concern: air pollution and public health

• Since the beginning of human kind, economic development has driven us to grow up at higher and higher speeds. This has meant industrialization, great levels of mobility, densely population areas and a higher demand of natural resources. All this also caused a damage to our environment and therefore public health issues too, one of them is **air quality.**

KYOTO PROTOCOL, AN ATTEMPT FOR A CLEANER FUTURE

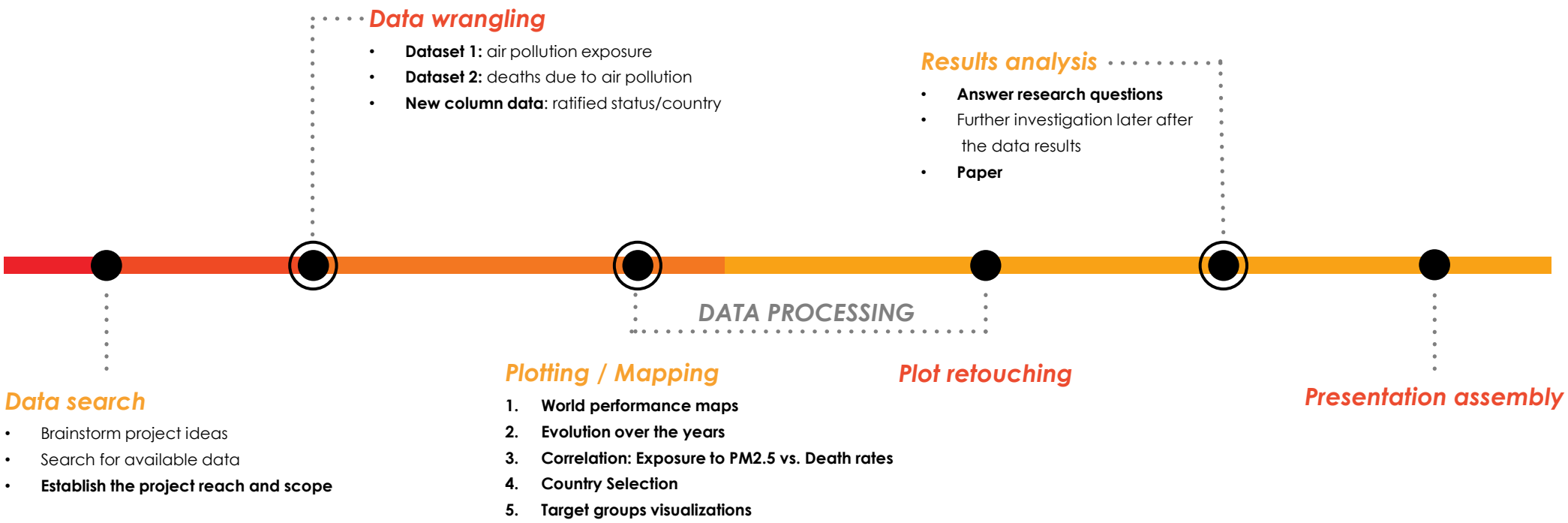
The Kyoto Protocol was an historic international effort to reduce the greenhouse gas emissions and curb its damaging effects. **Have we achieved something since its last state of ratification on 2009?**
Back then, 187 countries took the commitment to do something for the environment and our health and now its time to take a look at the results.

RESEARCH QUESTIONS

1. Overall, has the world air pollution decreased in the last years?
2. How the air pollution levels have impacted in the number of deaths due to respiratory diseases?
3. Is there a significant difference in the air pollution levels between the countries that ratified the Kyoto Protocol and those who didn't?
4. Overall, the Kyoto Protocol aimed to reduce the world air pollution to the levels reported in 1990 by at least 5%. Did we achieved it?

From data search to results presentation

PROJECT DEVELOPMENT



WHERE OUR DATA COME FROM

DATASET

Exposure to PM2.5 in countries

Contains **(1)** mean population exposure to PM2.5 and **(2)** percentage of population exposed to specific levels of air pollution measured in micrograms/m3.

The dataset is indexed by country and contains annual measurements. We filtered data for 1990 and from 2010 to 2016.

Source:
https://stats.oecd.org/

Our World in Data

DATASET

Death rates total air pollution

Contains **(1)** the deaths caused by respiratory diseases related to air pollution. This is measured as number of deaths per 100,000 people.

The dataset is indexed by country and contains annual measurements. We got data from 1990 to 2017.

Source:
https://ourworldindata.org/causes-of-death#risk-factors-for-death

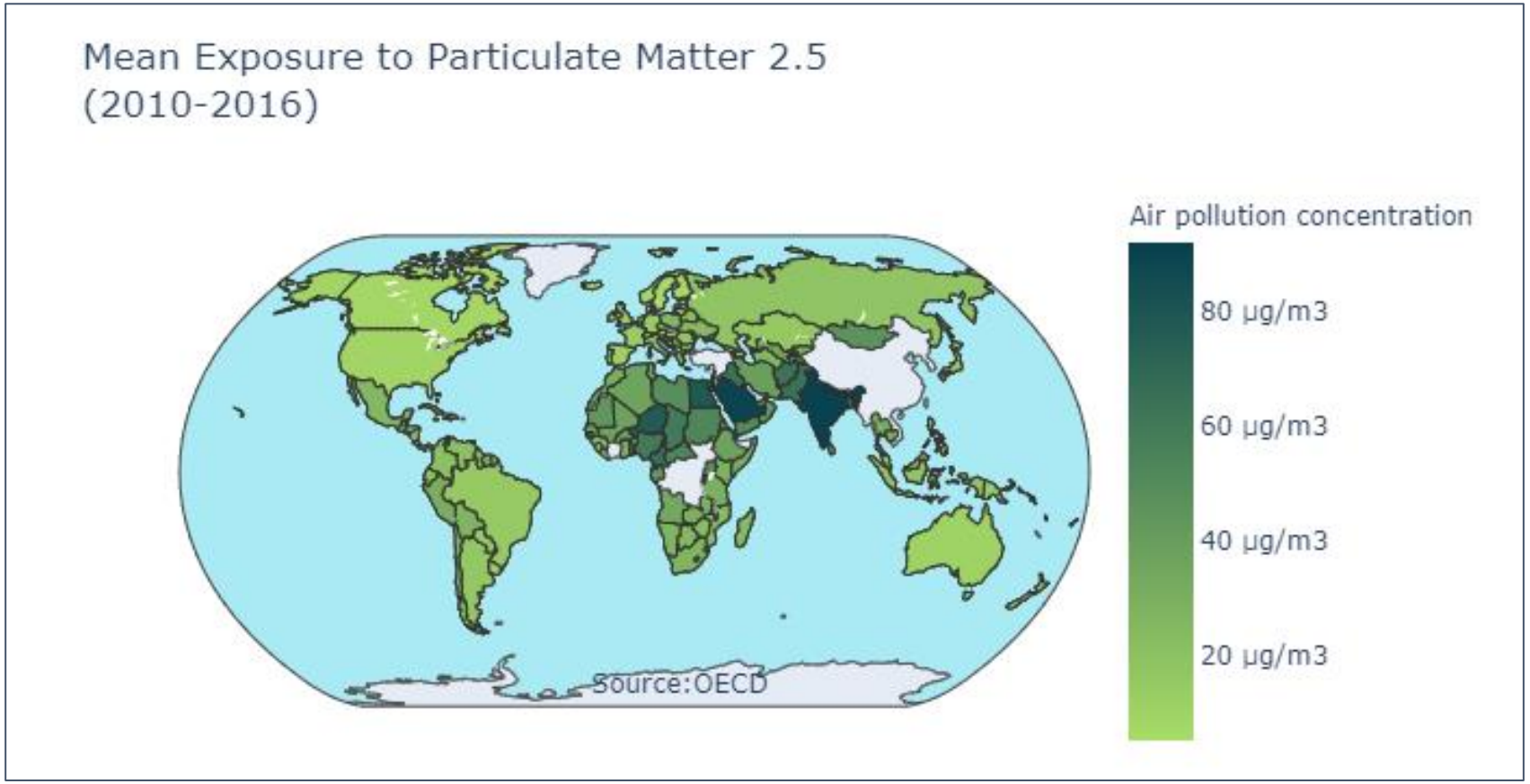
PDF DOCUMENT

Kyoto Protocol, status of ratification 2009

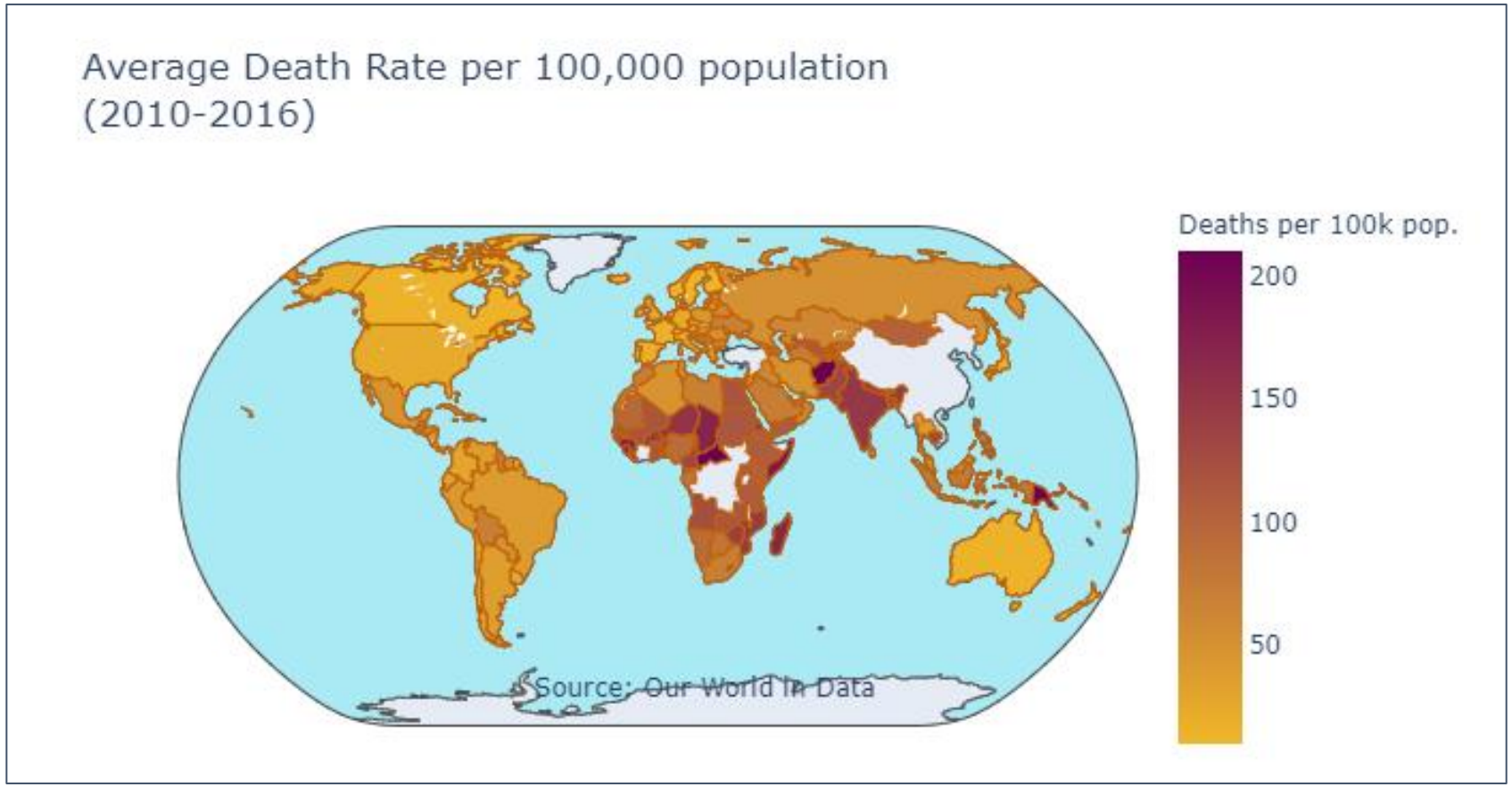
Contains **(1)** the list of countries that ratified the Kyoto protocol and accepted to decrease their gas emissions.

Source:
http://unfccc.int/files/kyoto_protocol/status_of_ratification/application/pdf/kp_ratification.pdf

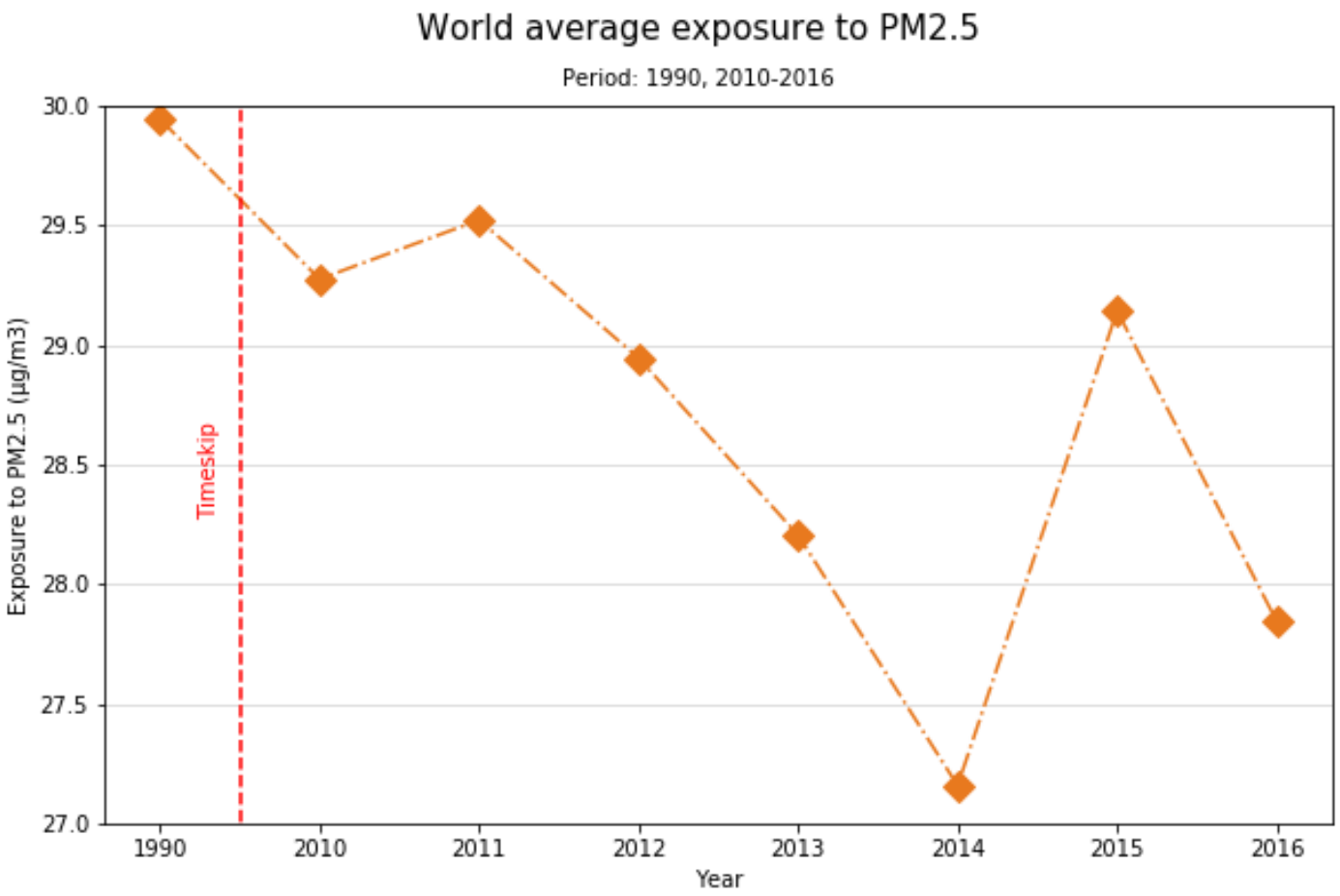
DATA ANALYSIS



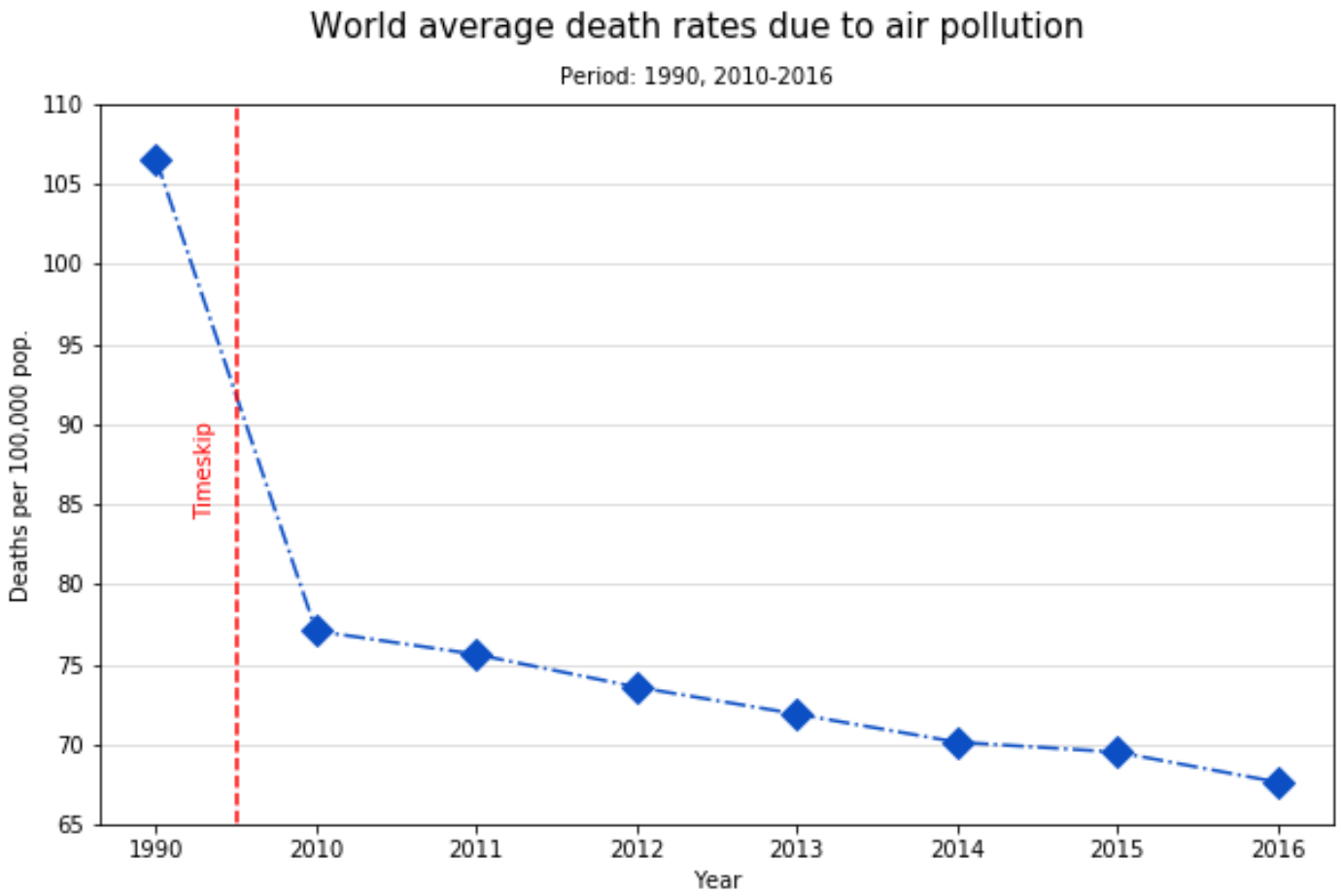
This map shows the average exposure to particulate matter 2.5 from 2010-2016. The map indicates that the countries that are the most exposed to this particle are India (South Asia), Saudi Arabia (Western Asia), and some African nations like Niger, Egypt, and Chad. Latin American, Caribean and South American countries are exposed significantly to PM2.5, however, it can be said that their numbers are presumably lower compared to the aforementioned nations.



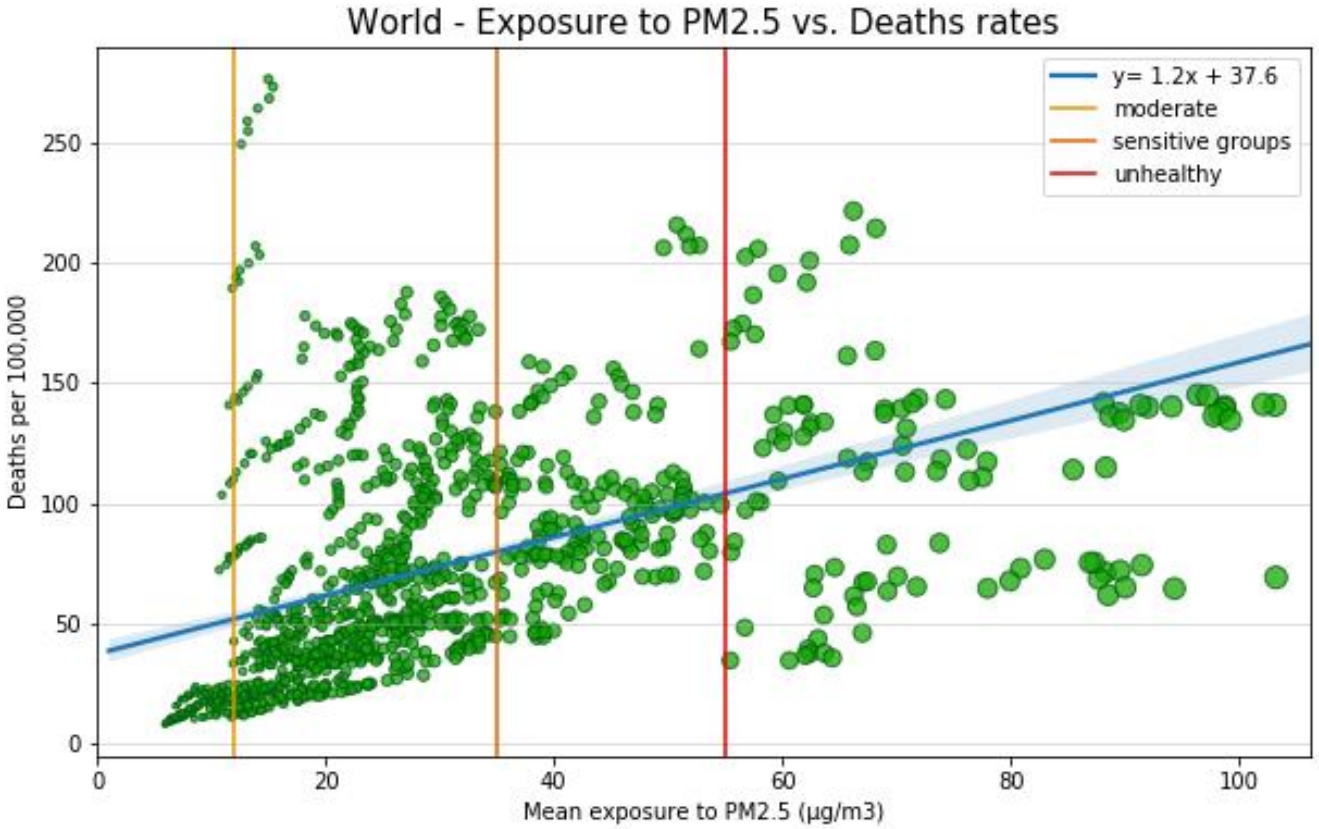
The world map shows an overview of the average number of deaths per 100,000 population per country from 2010-2016 due to air pollution. As can be noted, the countries that have the highest number of deaths attributed to air pollution are found in Middle and eastern Africa, and southern Asia. Countries like Papua New Guinea, situated in the southwestern pacific ocean, Afghanistan, Central Africa, and Somalia stand out on the map. In the case of America, the central and south regions have the countries with a higher number of deaths, being these Guatemala and Bolivia. Finally, as can be seen, within Europe, the western region concentrates the countries with the highest number of deaths, being Serbia and Ukraine the ones that stand out.



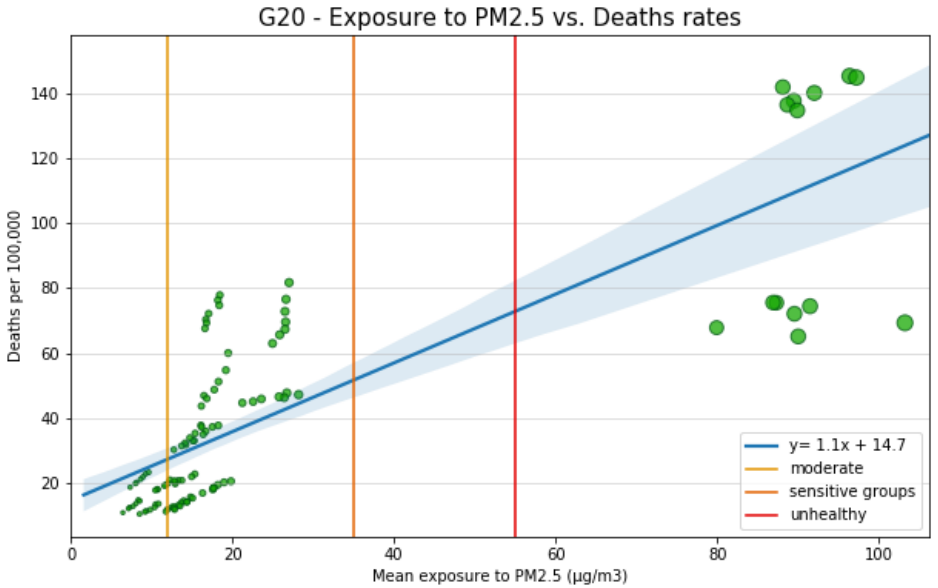
The graph illustrates the change of the mean exposure to PM2.5 of 1990, and from the 2010-2016 period. It can be said that exposure decreased from 1990 to 2016. However, something that worth mentioning is the rebound from 2014 to 2015 and again a decrease in 2016. An explanation of the situation that occurred in 2015 is going to be discussed later in the writing.



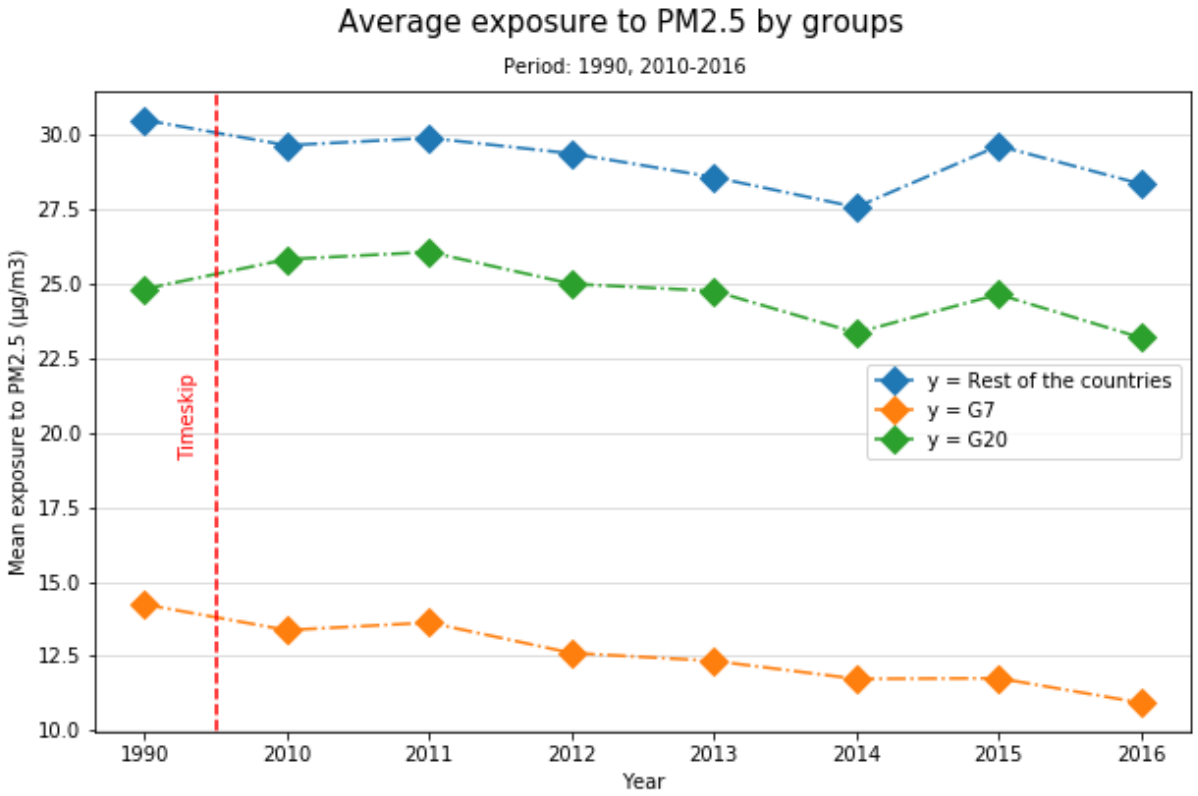
The graph shows the change in deaths per 100,000 population of 1990, and from 2010-2016. This one certainly indicates a decrease in deaths due to air pollution in the aforementioned year and period.



The graph shows the relationship between Mean exposure to PM2.5 and deaths per 100,000 population due to air pollution. The results indicate a weak positive correlation between both factors. Also, the r-squared value suggests that the linear regression model may not accurately predict the number of deaths with different exposure levels.

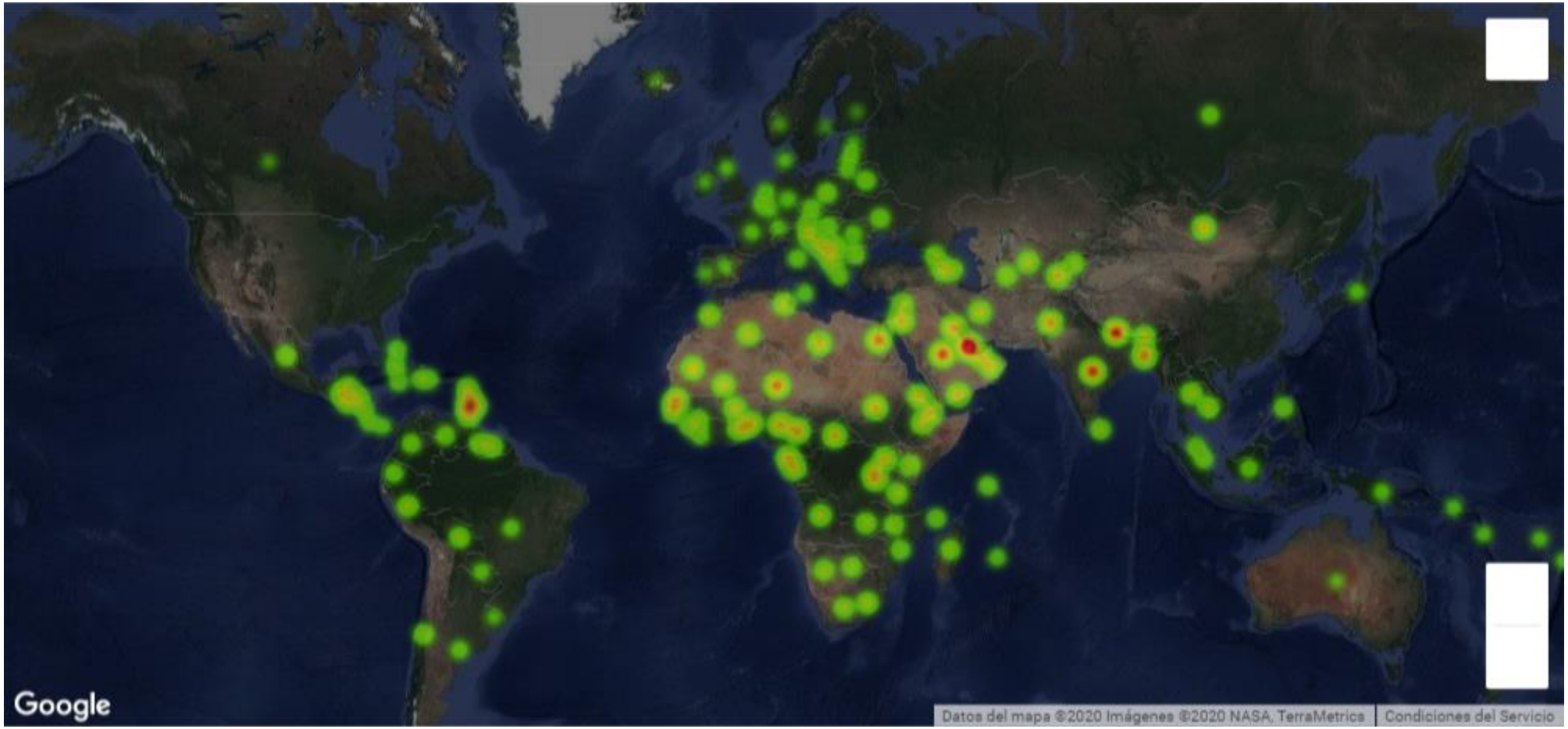


The present comparison was made between the countries that belong to the G7 group and the ones that are members of the G20 group. At first, it can be seen that the correlation between both factors is much higher in the G20 group, being this a strong positive correlation. Also, the r-squared value indicates that the regression equation of this group model the data much better than in the G7 countries. That is, the number of deaths might be predicted more accurately with different exposure to PM2.5. In addition, the mean values of both factors are clearly lower in the G7 group than in the G20 group. The latter is also seen on the scale of both groups. In the case of the first group, there may be other factors that influence death due to pollution.



This graph displays the comparison between G7, G20, and countries that do not belong to either G7 and G20, showing the average exposure to PM2.5. The period covered was 1990 and from 2010-2016. In general, this figure demonstrates that developed countries are exposed to lower levels of PM2.5 than in developing countries. As can be seen, the yellow line indicates the better performance of G7 countries finding their exposure levels under 15 µg/m3 and with a decreasing trend. On the other hand, G20 and the rest of the countries' groups present exposure levels much higher than G7, having values higher than 22.5 µg/m3. It should be noted that the rebound from 2014 to 2015, which was mentioned before, is observed but only for G20 and the rest of the countries groups, indicating that G7 was not affected significantly by the issue that occurred in that year.

Countries that signed and ratified Kyoto Protocol – Mean exposure to PM2.5



FINAL CONCLUSIONS

So far, have we decreased the air pollution levels?

1 **Overall, has the world air pollution decreased in the last years?**

Yes, we see a decreasing tendency for most countries, this in spite of being part of a global accord or not.

2 **How the air pollution levels have impacted in the number of deaths due to respiratory diseases?**

It varies from case by case. For first world economies there seem to be a bias between pollution levels and pollution related health issues, we believe this is due to higher expenditure in health-related programs and infrastructure. For most third world economies the relationship is quite direct.

3 **Is there a significant difference in the air pollution levels between the countries that ratified the Kyoto Protocol and those who didn't?**

No there is not. Most countries show improvement in pollution levels over time in spite of being coerced into it or not. Which actually we think is really good, everyone seems to be aware of the importance of this and putting their effort into it.

4 **Overall, the Kyoto Protocol aimed to reduce the world air pollution to the levels reported in 1990 by at least 5%. Did we achieved it?**

Yes, most countries show even more than 5% improvement against 1990 pollution levels.

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THANKS!