Do We Need More Babies to Save the Planet?

A Study on Greenhouse Gas Emissions & Population Growth

MGT 6203 Group 64

Agenda

01 Team Introduction

02 Background

03 Methodology

04 Hypothesis & Conclusion

05 Project Timeline

Team Introduction

Nitya Nandagopal

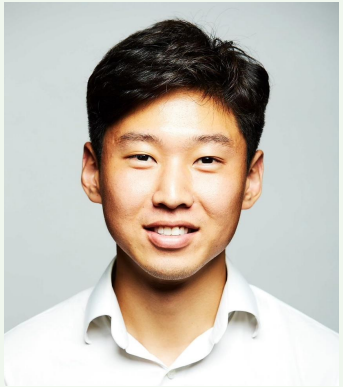
Data Scientist @ Verizon
Bachelor's in Electrical & Computer Engineering from the University of Texas at Austin.
Previous projects include forecasting equipment run rates in a cellular network and predicting budgetary needs of different business units.

Jessica Petersen

HSE Project Manager @ Cummins
Bachelor's in Chemical Engineering from Georgia Institute of Technology.
Previous projects include using a statistical approach to determine leading indicators that can predict increasing injury rates in the workplace.

Melissa Gibson

Senior Accountant @ Environmental Defense Fund
Bachelor's in Accounting from The College of New Jersey.
Previous projects include using a statistical approach to predict musician/entertainment booking prices for private events.

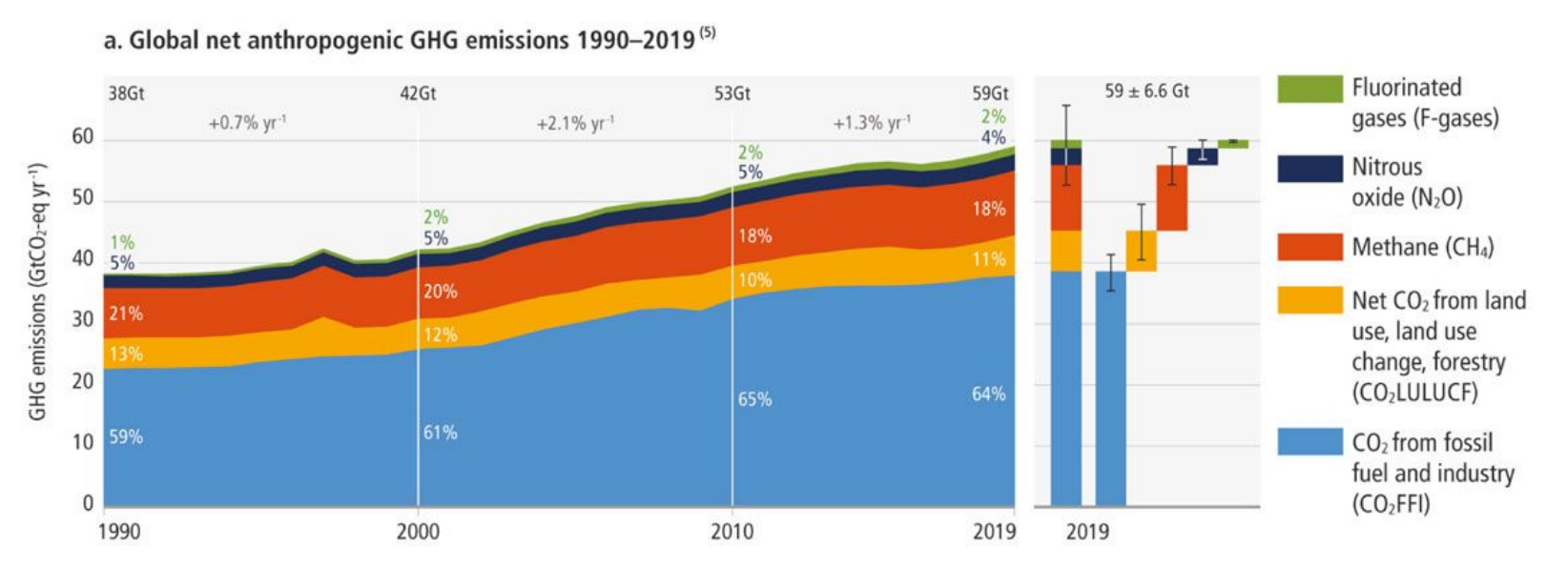


Stephen Kim

Data Scientist @ Credit Suisse
Bachelor's in Business Administration from the University of Notre Dame.
Previous projects include using a statistical approach to predict future times of payment completion by the bank's counterparty for intraday matching.

Background

- GHGs have been steadily increasing since 1990.
- The world's overall population has increased, but the growth rate is slowing.



Business Implications

80M+

Jobs at risk if temperature predictions materialize.

$520B

Potential loss in the US across 22 sectors.

$96.51T

Value of the net zero carbon industry.

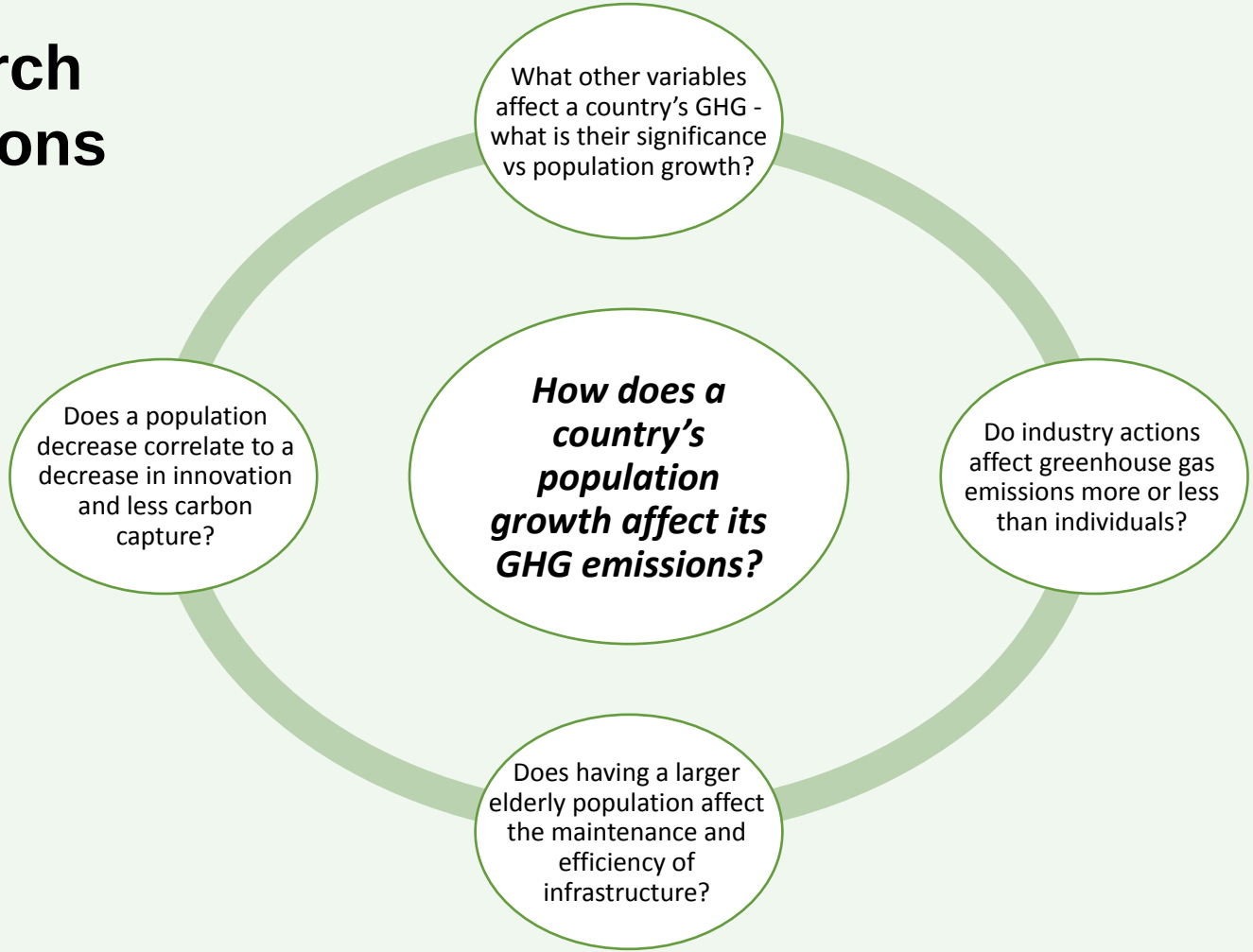
20-24%

Increase in global population at risk of flooding.

Business Implications

80M+	**Potential jobs at risk if temperature predictions materialize**
520B	**Potential loss in the US across 22 sectors**
$95.51T	**Value of the net zero carbon industry**
20-25%	**Increase in global population at risk of flooding**

Research Questions



Datasets

- Source: **Worldbank**
  - World Population Growth Data

Data Source	World Development Indicators					
Country Name	**Country Code**	**Indicator Name**	**Indicator Code**	**1960**	**1961**	**1962**	**1963**
Aruba	ABW	Population, total	SP.POP.TOTL	54,608.00	55,811.00	56,682.00	57,475.00
Africa Eastern and	AFE	Population, total	SP.POP.TOTL	130,692,579.00	134,169,237.00	137,835,590.00	141,630,546.00
Afghanistan	AFG	Population, total	SP.POP.TOTL	8,622,466.00	8,790,140.00	8,969,047.00	9,157,465.00
Africa Western and	AFW	Population, total	SP.POP.TOTL	97,256,290.00	99,314,028.00	101,445,032.00	103,667,517.00
Angola	AGO	Population, total	SP.POP.TOTL	5,357,195.00	5,441,333.00	5,521,400.00	5,599,827.00
Albania	ALB	Population, total	SP.POP.TOTL	1,608,800.00	1,659,800.00	1,711,319.00	1,762,621.00
Andorra	AND	Population, total	SP.POP.TOTL	9,443.00	10,216.00	11,014.00	11,839.00
Arab World	ARB	Population, total	SP.POP.TOTL	93,359,407.00	95,760,348.00	98,268,683.00	100,892,507.00
United Arab Emira	ARE	Population, total	SP.POP.TOTL	133,426.00	140,984.00	148,877.00	157,006.00
Argentina	ARG	Population, total	SP.POP.TOTL	20,349,744.00	20,680,653.00	21,020,359.00	21,364,017.00
Armenia	ARM	Population, total	SP.POP.TOTL	1,904,148.00	1,971,530.00	2,039,346.00	2,106,142.00
American Samoa	ASM	Population, total	SP.POP.TOTL	20,085.00	20,626.00	21,272.00	21,949.00
Antigua and Barbu	ATG	Population, total	SP.POP.TOTL	55,342.00	56,245.00	57,008.00	57,778.00
Australia	AUS	Population, total	SP.POP.TOTL	10,276,477.00	10,483,000.00	10,742,000.00	10,950,000.00
Austria	AUT	Population, total	SP.POP.TOTL	7,047,539.00	7,086,299.00	7,129,864.00	7,175,811.00
Azerbaijan	AZE	Population, total	SP.POP.TOTL	3,894,500.00	4,045,750.00	4,168,150.00	4,293,550.00
Burundi	BDI	Population, total	SP.POP.TOTL	2,746,628.00	2,815,972.00	2,887,398.00	2,948,133.00
Belgium	BEL	Population, total	SP.POP.TOTL	9,153,489.00	9,183,948.00	9,220,578.00	9,289,770.00
Benin	BEN	Population, total	SP.POP.TOTL	2,512,284.00	2,551,216.00	2,593,302.00	2,638,082.00
Burkina Faso	BFA	Population, total	SP.POP.TOTL	4,783,259.00	4,852,833.00	4,924,497.00	4,998,671.00
Bangladesh	BGD	Population, total	SP.POP.TOTL	50,396,429.00	51,882,769.00	53,461,661.00	55,094,115.00
Bulgaria	BGR	Population, total	SP.POP.TOTL	7,867,374.00	7,943,118.00	8,012,946.00	8,078,145.00
Bahrain	BHR	Population, total	SP.POP.TOTL	160,691.00	166,970.00	173,359.00	179,891.00
Bahamas, The	BHS	Population, total	SP.POP.TOTL	114,500.00	120,216.00	126,305.00	132,639.00
Bosnia and Herzeg	BIH	Population, total	SP.POP.TOTL	3,262,539.00	3,325,333.00	3,387,512.00	3,448,532.00
Belarus	BLR	Population, total	SP.POP.TOTL	8,198,000.00	8,271,216.00	8,351,928.00	8,437,232.00
Belize	BLZ	Population, total	SP.POP.TOTL	91,403.00	93,757.00	96,188.00	98,862.00
Bermuda	BMU	Population, total	SP.POP.TOTL	44,400.00	45,500.00	46,600.00	47,700.00
Bolivia	BOL	Population, total	SP.POP.TOTL	3,707,515.00	3,784,744.00	3,864,140.00	3,945,729.00
Brazil	BRA	Population, total	SP.POP.TOTL	73,092,515.00	75,330,008.00	77,599,218.00	79,915,555.00
Barbados	BRB	Population, total	SP.POP.TOTL	232,550.00	233,698.00	234,829.00	235,875.00

Datasets

- Source: **Our World in Data**
  - Greenhouse Gases Emissions Data

Entity	Code	Year	Total including LUCF
Afghanistan	AFG	1990	9579999.92
Afghanistan	AFG	1991	9810000.42
Afghanistan	AFG	1992	9029999.73
Afghanistan	AFG	1993	9109999.66
Afghanistan	AFG	1994	9149999.62
Afghanistan	AFG	1995	9579999.92
Afghanistan	AFG	1996	10609999.7
Afghanistan	AFG	1997	11579999.9
Afghanistan	AFG	1998	12399999.6
Afghanistan	AFG	1999	13279999.7
Afghanistan	AFG	2000	11500000
Afghanistan	AFG	2001	12369999.9
Afghanistan	AFG	2002	15010000.2
Afghanistan	AFG	2003	15649999.6
Afghanistan	AFG	2004	15439999.6
Afghanistan	AFG	2005	16350000.4
Afghanistan	AFG	2006	16870000.8
Afghanistan	AFG	2007	17260000.2
Afghanistan	AFG	2008	20659999.8
Afghanistan	AFG	2009	22750000
Afghanistan	AFG	2010	27239999.8
Afghanistan	AFG	2011	29170000.1
Afghanistan	AFG	2012	28549999.2
Afghanistan	AFG	2013	26770000.5
Afghanistan	AFG	2014	26520000.5
Afghanistan	AFG	2015	26840000.2
Afghanistan	AFG	2016	27049999.2
Afghanistan	AFG	2017	26680000.3
Afghanistan	AFG	2018	27840000.2
Afghanistan	AFG	2019	28790000.9
Africa		1990	2148500000
Africa		1991	2215109863
Africa		1992	2237260010
Africa		1993	2267389893
Africa		1994	2357189941
Africa		1995	2418229980
Africa		1996	2461639893
Africa		1997	2497939941
Africa		1998	2572780029
Africa		1999	2565679932

Variables

Key Variables

Dependent Variable	GHG Emissions
Independent Variable	Population

Additional Variables to Consider

- Young to Old Person Ratio
- Birth Rate
- Technology Level Rating
- Public Transportation to Car Ownership Ratio
- Public Transportation Rating
- Climate
- Productivity (ie. Labor, Employment, GDP, etc.)
- Registered Vehicles

Methodology

Data Wrangling

- Combine datasets with a primary key
- Remove NA values and blanks
- Add necessary columns and variables

Exploratory Data Analysis

- Means
- Trends
- Patterns

Variable Reduction

- PCA
- Lasso regression
- Ridge regression

Modeling

- 60-20-20 split to train-test-validate
- Regression models:
  - Linear regression
  - Logistic regression
- Fitting values:
  - R2
  - Adjusted R2

Prediction

- Predict GHG emissions from 2020-2022
- Compare to actuals
- Potentially forecast GHG further into the future

Hypothesis

Hypothesis

Conclusion

Population growth does not negatively affect GHG emissions.

?

Project Timeline

Appendix: Sources

Research

- https://www.biologicaldiversity.org/programs/population_and_sustainability/climate/
- https://www.scientificamerican.com/article/population-growth-climate-change/
- https://pubmed.ncbi.nlm.nih.gov/21553595/
- https://www.washingtonpost.com/climate-solutions/2021/05/25/slowing-population-growth-environment/
- https://www.biologicaldiversity.org/programs/population_and_sustainability/climate/

Data (Subject to Change as we add more)

- https://ourworldindata.org/greenhouse-gas-emissions
- https://data.worldbank.org/indicator/SP.POP.TOTL