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Introduction

Thailand's manufacturing and industry played a significant role in economic growth, most manufactured products are export products that bring a tremendous amount of income to the country each year. According to the Commerce Ministry, Thailand's exports of industrial products surged by 14.6% year-on-year in October 2021 with the growth rate of 5 categories of the product include vehicles, electronic, food, rubber and plastic industries. However, regardless of the growth rate that manufacturing and industry contributes to national income, It also contributes an immense amount of greenhouse gasses which are the source of disaster in Thailand, resulting in an environmental loss that affects the living of people

Thailand has always been one of the countries that emit a tremendous amount of greenhouse gases. According to the Climate Change Performance Index (CCPI), Thailand was placed 23rd in greenhouse gases emissions and 31st in climate change performance index out of 64 countries with scores of 26.15 and 55.25, shown in figures 1 and 2 in the Appendix. Even though the country remains its medium rating, The effect of climate change is becoming increasingly severe throughout the times. For example, Thailand was severely affected by pm 2.5 dust from 2018 until now which by 2021 Chiang Mai has become the most polluted in the world; Riverside districts in Bangkok are now swamped by rising waters because of rising sea level; Citizens in 20 provinces are affected by the flood in 2021; People suffered by drought for several consecutive years. Accordingly, Disasters that occurred are partly the result of industrialization which contributes an enormous amount of sulfur dioxide (SO₂), nitrogen dioxide (NO₂), and carbon dioxide (CO₂), etc. As a result, Gases that are emitted from industrial activities cause climate change by trapping heat and contributing to air pollution, odor pollution, and water pollution. Hence, Thailand has managed to control levels of pollution emitted from industrial activities. However, according to the 26th United Nations Climate Change Conference (COP26), Thailand's climate strategies focus on adaptation rather than mitigation. As scientists set deadlines for net-zero target by 2050 to prevent global temperatures from rising beyond 1.5 degrees Celsius, The country is procrastinated to 2065 which is 15 years later than the deadline.

However, Thailand plans to increase the industrial area in the "Triangle of Security, Sustainability and Wealth" project by changing 2,672 hectares in subdistricts of Jana, namely Sakom, Taling Chan, and Na Thap, which is supposed to be an agricultural area for people, making most people in the area not satisfied for 3 reasons. Firstly, the plan is against the town planning act. Originally the project includes only 3 provinces: Yala, Pattani, Narathiwat. Hence, by the process of the law, it must be qualified by people in the area in which the plan had not followed the process. Secondly, even though the Southern Border Provinces Administrative Centre (SBPAC) assured that the plan will create new jobs for at least 100,000 people to work in the industry, but an academician from TDRI argues that most of the industries are capital intensive industries which do not need plenty of workers. Another reason is that most people in the area are specialized in agriculture or fishing. Consequently, this may result in people losing jobs in the future. Lastly, air pollution and sea pollution. Since local resources in the Jana subdistrict contains fishes that are important to the economy and ecosystem more than 60 types and are resources for people's nourishment, people in the area are highly concerned about pollution that might affect their jobs and well-being. Nonetheless, people are also concerned about pm 2.5 that usually occurred nearby industrial areas.

The purpose of this paper is to observe the industrial effect on the environment and to study the solution to address the conflict of the industrialization plan and people in Jana subdistrict. Hence, this paper is concerned with 3 questions as follow:

- 1) Will increase in industrial activities also increase greenhouse gases?
- 2) Weather the effect of economic trends on environment in Songkhla should be concerned?
- 3) How do people react to the plan to increase the industrial area in the Jana subdistrict?

Literature review

This research focused on the relationship between industrial activities and environmental effects. Hence, the researcher separated research findings into 3 categories

1. Literature about economic-related and climate change

- William D. Nordhaus (1991) suggested that efficient strategies coping with greenhouse gases must weigh the costs and benefits of different policies. The researcher examined 3 different policy measures: reducing CO₂ emissions, CFC reduction, and afforestation. Then, calculated an overall marginal cost of greenhouse gas reduction. The result showed that about 10% of greenhouse gases can be reduced at a low cost where above the marginal cost of abatement rises sharply
- Nemat Shafik (1994) concludes that in order to address an environmental problem, the cost is highly concerned. For example, local air pollution tends to be addressed when the country reaches a middle-income level because it is costly to abate and the problem is more severe, compared to lower-income countries. Hence, the problem that is addressed is usually considered cost and social benefits first. The researcher also address that the level of technology has a positive impact on environmental quality
- Stephen and Adam (2009) assess the influence of climate response uncertainty on economic benefits estimates of greenhouse gases emissions reductions. The risk-adjusted estimates of willingness to pay are highly sensitive to subtle differences in assumptions about the damage function at high damage levels.
- Richard S. J. Tol (2009) researched the economic effects of climate change which the result is incommensurate. From the paper, an increase in temperature 1-2 Celsius might have a positive impact on the economy but only in short term. On the other hand, it tends to have a negative impact in the long term
- Richard S.J. Tol (2011) studied the social cost of carbon. The paper provides the result of estimation of willingness to pay (WTP) for climate change policy

suggest that people who are not experts are concerned more about the total impact of the economy rather than greenhouse gas emission. However, estimates of the WTP to avoid greenhouse gas emissions at the margin are in line with estimates of the social cost of carbon.

2. Literature about current environmental issues in Thailand related to climate change and industrialization

- John, Kamilya, and Robert (2009) are concerned about rice production that is affected by climate change in Thailand. The result found that farmers are unable to prevent neutralize loss effects from extreme climate change. However, from a small increase in rainfall, they will be able to adjust more to middle climate change
- Uma, Nuntavarn , and Sasitorn (2010) identified the problem of petroleum pollution in the Gulf of Thailand that the dominant source of PAHs, which is the chemical contaminated too the air which can cause long term health problems to people around the area, in the marine environment of Thailand is pyrogenic in origin, and only near the discharged points is a strong petrogenic PAH profile observed. Hence, management measured to minimize pollution is needed to prevent long term risk
- Saroj, Kuaanan, and Chumpol (2012) are concerned about the water quality around the industrial areas in the U-tapao river. Due to unregulated and uncontrolled effluents and wastewater from industries, the water of the area becomes incredibly toxin that is unable to consume
- Parade and Wanida (2013) studied about effects of air pollution-related respiratory symptoms in schoolchildren industrial areas Rayong. The result finding showed that Children living near industrial areas particularly with high level of PM10 and VOCs are at risk of chronic bronchitis, bronchial asthma, dyspnea, and wheezing, persistent cough
- Nawhath, Sangam, and Indrajit (2018) investigate the cause of the flood in Bangkok. Firstly, geographically Bangkok is located in the low-lying Chao

Praya river which lies above the mean sea level of only 1.5 meters. Hence, during the period of high tides, the city is vulnerable to floods. Secondly, The result from the survey reveal that the 3 factors that contribute to the city flood vulnerability are clogged drainage, the narrow sewers, and the inadequacy of staff which residents in the flood-prone localities are perceived

3. Literature about climate change mitigation policy

- David L. Barkley and Mark S. Henry (1997) suggested that promotion in industrial cluster is not the solution for a community of people in the area. The cluster approach will be effective in nonmetro areas. The area with diverse industrial bases should continue to concentrate their industry development resources in the more traditional program area
- Ernst, Lenny, Joyashree, Lynn, and Jochen (2009) address that full use of mitigation cannot be made in industrialized or developing nations due to several barriers such as limited access to capital, lack of management attention, or insufficient availability of knowledge. The least cost of solving the warming problem is to reduce non-CO2 and energy efficiency
- Vasiliki and Anastasios (2013) focused on an alternative approach to limit the emission of greenhouse gases. The finding suggests using geoengineering policy if international cooperation to reduce greenhouse gases emission cannot be reached. Second
- Ann Alberini (2016) found that the policy-induced heterogeneity in WTP values and that associated with individual characteristics and opinions on climate change are of roughly the same magnitude.
- Tiago, Zeina, and Cezar (2021) showed that applying the aggregate and distributional effects of climate change mitigation policies within and across countries yields drops in output ranging from 0.5% (Brazil) to 2.1% (China).

Research gap

This research tries to find the roots of the problem, the effects, and solutions only in economic point of view, not consider people's opinion towards the current situation. Nonetheless, most of the reference research are lacked of updated data and new methodologies since the research was conducted from 1991 – 2016. Since effect of the environment, greenhouse gases, and climate change have several factors, some result from the research might not enough to address the problem

Data and methodologies

1. Data

As this paper is concerned about industrialization and environment, we obtained data from public institutions such as Manufacturing Production Index (MPI) from the office of industrial economics; and climate change performance index; National Statistical Office; Thailand greenhouse gas management organization. Moreover, this research mainly focused on using the most updated data. Hence, we use google engine to collect data from satellite and Twitter

2. Methodologies

- i) By obtaining data from public institutions, we compute the data into Microsoft excel to generate the relationship between indexes such as correlation or r-square
- ii) Use rapid miner to observe people's attitude towards social problems
- iii) Interpret the information that is received from rapid miner and Microsoft excel

Result

I: Impact of industrial production toward carbon dioxide emission

According to figure 3 in the appendix, The relationship of year-on-year percentage change between MPI and CO₂ is positively correlated ($r = 0.557$). However, during 2018 between 2019, the MPI index sharply drop then increase in 2019 until the equilibrium point between 2019 and 2020 that two lines are negatively correlated. This result implied that the graph is inconclusive because of the lack of statistical information since the time period is too short. Additionally, the MPI index solely might not be enough to indicate as a cause carbon dioxide emissions because there are other factors such as rainfall or pandemic situation that affect the trend of carbon dioxide emission

II : Economic growth impact on the environment

Figures 4 showed the relationship between log nighttime light index and greenhouse gases index, the correlation between the log nighttime light index and CO₂, HCHO, SO₂ is positively correlated but negatively correlated only with SO₂. As a result, an increase in 1% of the nighttime light index will increase in CO₂ 0.0003%, in HCHO 0.104%, in SO₂ 0.0033%, and NO₂ -33.25%. Furthermore, consider from figure 5 in the appendix, R² of all 4 greenhouse gases index are low, especially in HCHO and NO₂. This might caused by not having enough small number of observation or not enough variable to explain nighttime light

III : People responses toward the increasing industrial area in Jana

Figure 7 in appendix showed sentiment index of people towards the plan of increasing industrial area in Jana. As a result, the index reflects negative attitude towards the plan, consider from average of -0.372

Limitations

this research lacks information in deep details and time period which makes the result inconclusive. Moreover, there are several factors that affect the environment. Hence, considering only in economic point of view might not be enough for further research. Lastly, as Rapid Miner cannot generate sentiment into Thai language, the resulting number of people on Twitter is too small.

Policy recommendation

Even though government intend to improve the economic growth in Songkhla, they have to assure the improvement in better well-being of people in the areas and respect their attitudes towards the area people too

We suggest government to have restrictions to prevent unhealthily pollution on the communities, people' original occupations, level of greenhouse gas that was emitted, and well-being of people in the communities. Nonetheless, Government should collect carbon tax equal to the equilibrium of willingness to pay from industries and economic loss to assure that the economic still can grow while lower rate of emitting pollution; and subsidize local people to enhance other industries such as the agricultural sector.

Research and development (R&D) is also needed to observe the further impacts that might lead to tremendous negative impacts and develop possible technologies in the area to improve resources for people in the area and economic

Conclusion

As government has plan to improve the economic growth of people in Songkhla, they plan to increase industrial areas which originally are the agricultural areas for people in Jana subdistrict. Arise from the issue, people in the areas is not satisfied with the plan for 3 reasons; 1. The government does follow the town planning law 2. People in the area do not expert in industrial areas which later might result in losing jobs 3. environmental impact on the marine ecosystem is highly concerned. Hence, our research has 3 purposes to study this issue; 1. The relationship of economic trends and greenhouse gas emission 2. To observe economic trend and greenhouse gas in Songkhla to find that weather the heavy industrial is needed 3. Observe people attitude towards the issue

From the literature review, most of past research still lacks updated data and new methodologies. Also, most research focused on the economic point of view only. So, this paper tries to collect data from the most updated which are from satellite data and twitter.

As a result of generating data, we found that economic trends and greenhouse gas index is positively correlated except the NO₂ index which show negative correlation. However, the effect of each index is small. Moreover, as we consider only the economic trends, they might not be enough information on variables or other factors to consider. Another result is that people in Twitter tends to have a negative attitude towards the current issue which.

Suggestion for further research

We suggest using data with a long time period and considering not only economic factors since the environmental effect because it might weaker the result. Another suggestion is to study on the effect from other specifically to identify the problem in details

Bibliography

The Economics of The Greenhouse Effect exported By Oxford University Press
(1991) William D. Nordhaus . Retrieved 1 November 2016, from,
<https://www.jstor.org/stable/2233864>

Economic Development and Environmental Quality: An Econometric Analysis By Oxford
University Press (1994) , from ,<https://www.jstor.org/stable/2663498>

Rural Industrial Development: To Cluster or Not to Cluster? (1997) Published By: Oxford
University Press, David L. Barkley and Mark S. Henry , from ,
<https://www.jstor.org/stable/1349744>

Industrial energy efficiency and climate change mitigation (2008) Published online: 30
November 2008 ,Ernst Worrell & Lenny Bernstein & Joyashree Roy & Lynn Price & Jochen
Harnisch. from , <https://link.springer.com/content/pdf/10.1007/s12053-008-9032-8.pdf>

Climate Response Uncertainty and the Benefits of Greenhouse Gas Emissions Reductions
(2009) , Published online: 15 May 2009 ,Stephen C. Newbold · Adam Daigneault . from ,
<https://link.springer.com/content/pdf/10.1007/s10640-009-9290-8.pdf>

The Economic Effects of Climate Change (2009) exported By American Economic
Association, Richard S. J. Tol , from, <https://www.jstor.org/stable/27740523>

Impact of Climate Change on Rice Production in Thailand (2009) Published By: American
Economic Association , John Felkner, Kamilya Tazhibayeva and Robert Townsend , from
<https://www.jstor.org/stable/25592400>

Health impact of climate change on occupational health and productivity in Thailand
Published online (2010) from,<https://doi.org/10.3402/gha.v3i0.5607>

The Social Cost of Carbon (2011) Published By: Annual Reviews , Richard S.J. Tol , from
<https://www.jstor.org/stable/43202706>

Effects of Industrial Waste Disposal on the Surface Water Quality of U-tapao River, Thailand (2012) Published Press, Singapore .from , <http://www.ipcbee.com/vol32/019-ICESE2012-D10030.pdf>

Products exported by Thailand (2014). (2016). The Observatory of Economic Complexity. Retrieved 1 November 2016, from http://atlas.media.mit.edu/en/visualize/tree_map/hs92/export/tha/all/show/2014/

Effects of Air Pollution Related Respiratory Symptoms in Schoolchildren in Industrial Areas Rayong , Thailand (2016) published by the Thai Society of Higher Education Institutes on Environment from , <http://www.tshe.org/ea/pdf/vol9no1-14.pdf>

Policy- v. Individual Heterogeneity in the Benefits of Climate Change Mitigation: Evidence from a Stated-Preference Survey (2016) By Anna Alberini, Milan Ščasný and Andrea Bigano from , https://www.jstor.org/stable/pdf/resrep15079.pdf?ab_segments=0%252FSYC-6168%252Ftest&refreqid=excelsior%3A67d1a66696dbf5620d79cc3807d4406e

Urban Flooding and Climate Change: A Case Study of Bangkok, Thailand (2018) Published March 14, 2018, from, <https://journals.sagepub.com/doi/abs/10.1177/0975425317748532>

Climate Change Mitigation Policies: Aggregate and Distributional Effects (2021) Published by: [Energy Policy Research Group, University of Cambridge](#) , Tiago Cavalcanti, Zeina Hasna and Cezar Santos . from , <https://www.jstor.org/stable/resrep30319>

Monitoring Climate Mitigation Efforts of 60 Countries plus the EU – covering 92% of the Global Greenhouse Gas Emissions (2021) from , https://ccpi.org/wp-content/uploads/CCPI-2022-Results_2021-11-07_A4-1.pdf

Appendix

Part 1: figure

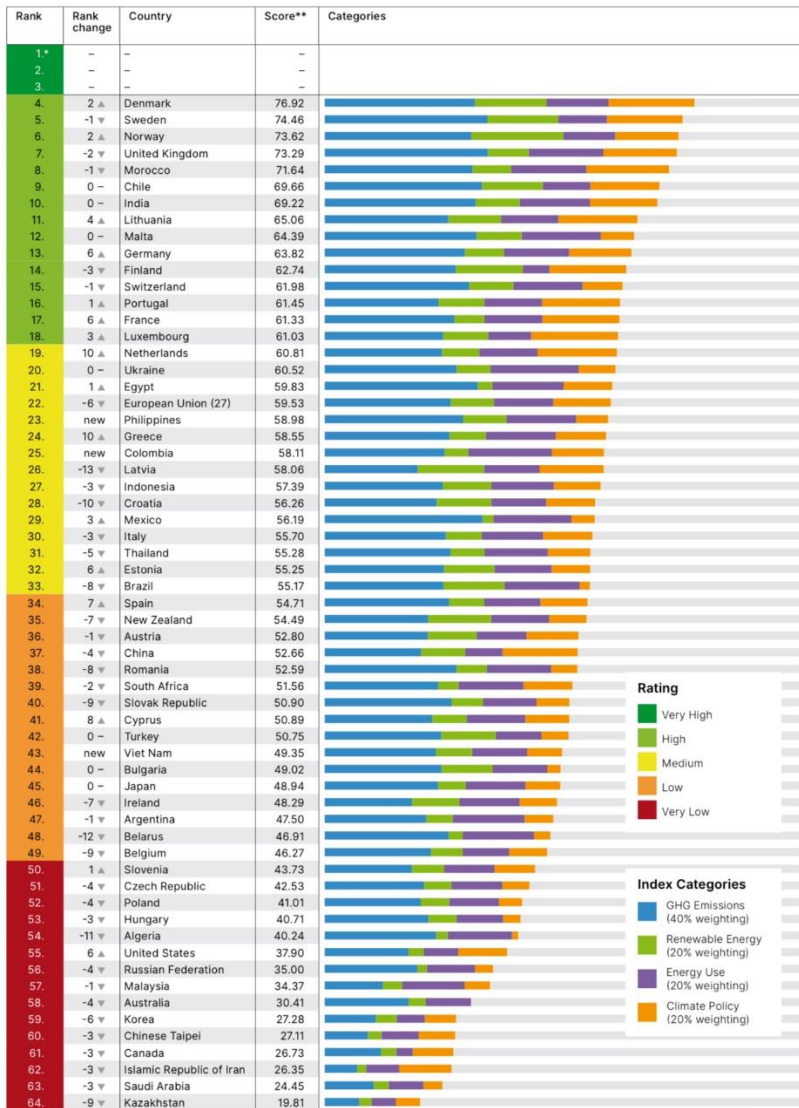
Figure 1: Greenhouse gas emissions – rating table

| Rank | Country | Score* | Overall Rating | GHG per Capita – current level (including LULUCF)** | GHG per Capita – current trend (excluding LULUCF)** | GHG per Capita – compared to a well-below-2°C benchmark | GHG 2030 Target – compared to a well-below-2°C benchmark |
|------|--------------------------|--------|----------------|---|---|---|--|
| 4. | United Kingdom | 33.93 | High | Medium | High | High | Very high |
| 5. | Sweden | 33.84 | High | Very high | High | High | Medium |
| 6. | Mexico | 32.85 | High | High | Medium | High | High |
| 7. | Chile | 32.69 | High | High | Very Low | Very high | Very high |
| 8. | Egypt | 31.79 | High | High | Low | High | Very high |
| 9. | Malta | 31.56 | High | High | Very high | Medium | Low |
| 10. | India | 31.42 | High | Very high | Very Low | Very high | Very high |
| 11. | Denmark | 31.22 | High | Low | High | Medium | Very high |
| 12. | Morocco | 30.71 | High | High | Very Low | Very high | Very high |
| 13. | Norway | 30.50 | High | Medium | High | Medium | High |
| 14. | Switzerland | 30.03 | High | High | High | Medium | Medium |
| 15. | Germany | 29.12 | High | Low | High | Medium | High |
| 16. | Philippines | 28.80 | High | Very high | Very Low | Very high | Very high |
| 17. | Ukraine | 27.38 | Medium | Medium | Medium | High | Medium |
| 18. | Romania | 27.37 | Medium | High | Low | High | Medium |
| 19. | Finland | 27.21 | Medium | Medium | High | Medium | Low |
| 20. | France | 26.97 | Medium | Medium | Medium | Medium | Medium |
| 21. | Slovak Republic | 26.40 | Medium | Medium | Low | High | Medium |
| 22. | European Union (27) | 26.21 | Medium | Medium | Medium | Medium | Medium |
| 23. | Thailand | 26.15 | Medium | Medium | Medium | Medium | Low |
| 24. | Greece | 25.96 | Medium | Medium | High | Low | Low |
| 25. | Spain | 25.88 | Medium | Medium | Medium | Low | Low |
| 26. | Belarus | 25.75 | Medium | Medium | Low | Medium | Medium |
| 27. | Lithuania | 25.70 | Medium | High | Very Low | High | Medium |
| 28. | Italy | 25.20 | Medium | Medium | Medium | Medium | Low |
| 29. | Colombia | 24.92 | Medium | High | Low | Medium | Low |
| 30. | Estonia | 24.79 | Medium | Very Low | High | Medium | Low |
| 31. | Brazil | 24.69 | Medium | Medium | High | Low | Very Low |
| 32. | Luxembourg | 24.66 | Low | Very Low | High | High | Medium |
| 33. | Indonesia | 24.56 | Low | Medium | Very Low | Medium | Medium |
| 34. | Netherlands | 24.37 | Low | Low | Medium | Low | Medium |
| 35. | Bulgaria | 24.27 | Low | Medium | Medium | Medium | Low |
| 36. | Turkey | 24.23 | Low | High | Low | High | Very Low |
| 37. | Portugal | 23.66 | Low | High | Low | Low | Low |
| 38. | South Africa | 23.62 | Low | Low | High | Very Low | Low |
| 39. | Japan | 23.58 | Low | Low | High | Very Low | Low |
| 40. | Croatia | 23.28 | Low | High | Low | Medium | Low |
| 41. | Algeria | 23.18 | Low | Medium | Low | Low | Low |
| 42. | Viet Nam | 23.15 | Low | High | Very Low | High | Low |
| 43. | Cyprus | 22.31 | Low | Medium | Low | Low | Low |
| 44. | Belgium | 22.08 | Low | Low | Medium | Low | Low |
| 45. | Hungary | 21.55 | Low | Medium | Very Low | Medium | Low |
| 46. | New Zealand | 21.51 | Low | Very Low | High | Very Low | Low |
| 47. | Austria | 21.44 | Low | Low | Medium | Low | Low |
| 48. | Argentina | 21.10 | Low | Low | Medium | Very Low | Low |
| 49. | Czech Republic | 20.66 | Very Low | Very Low | Medium | Low | Low |
| 50. | China | 20.03 | Very Low | Low | Low | Low | Very Low |
| 51. | Poland | 19.94 | Very Low | Low | Low | Low | Low |
| 52. | Latvia | 19.33 | Very Low | High | Very Low | Low | Very Low |
| 53. | Russian Federation | 19.26 | Very Low | Very Low | Low | Medium | Very Low |
| 54. | Slovenia | 18.16 | Very Low | Low | Low | Very Low | Very Low |
| 55. | Ireland | 18.15 | Very Low | Very Low | Medium | Very Low | Very Low |
| 56. | Australia | 17.45 | Very Low | Very Low | Medium | Medium | Low |
| 57. | United States | 17.41 | Very Low | Very Low | Medium | Very Low | Low |
| 58. | Malaysia | 12.08 | Very Low | Very Low | Low | Very Low | Very Low |
| 59. | Canada | 11.71 | Very Low | Very Low | Medium | Very Low | Very Low |
| 60. | Korea | 10.63 | Very Low | Very Low | Low | Very Low | Very Low |
| 61. | Saudi Arabia | 10.19 | Very Low | Very Low | High | Very Low | Very Low |
| 62. | Chinese Taipei | 9.01 | Very Low | Very Low | Low | Very Low | Very Low |
| 63. | Kazakhstan | 7.18 | Very Low | Very Low | Low | Very Low | Very Low |
| 64. | Islamic Republic of Iran | 6.70 | Very Low | Very Low | Very Low | Very Low | Very Low |

* weighted and rounded ** Land Use, Land-Use Change and Forestry

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Figure 2: Climate Change Performance Index – rating table



* None of the countries achieved positions one to three. No country is doing enough to prevent dangerous climate change.
 ** rounded

Figure 3 : The relationship between year-on-year percentage change of CO2 and value added products from MPI

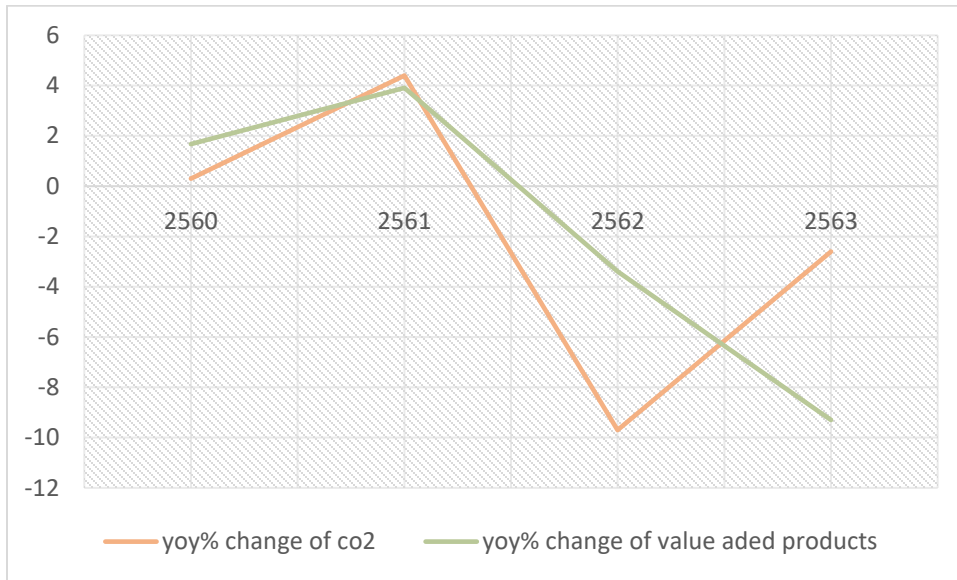


Figure 4 : Relationship between log nighttime light index and green house gases index

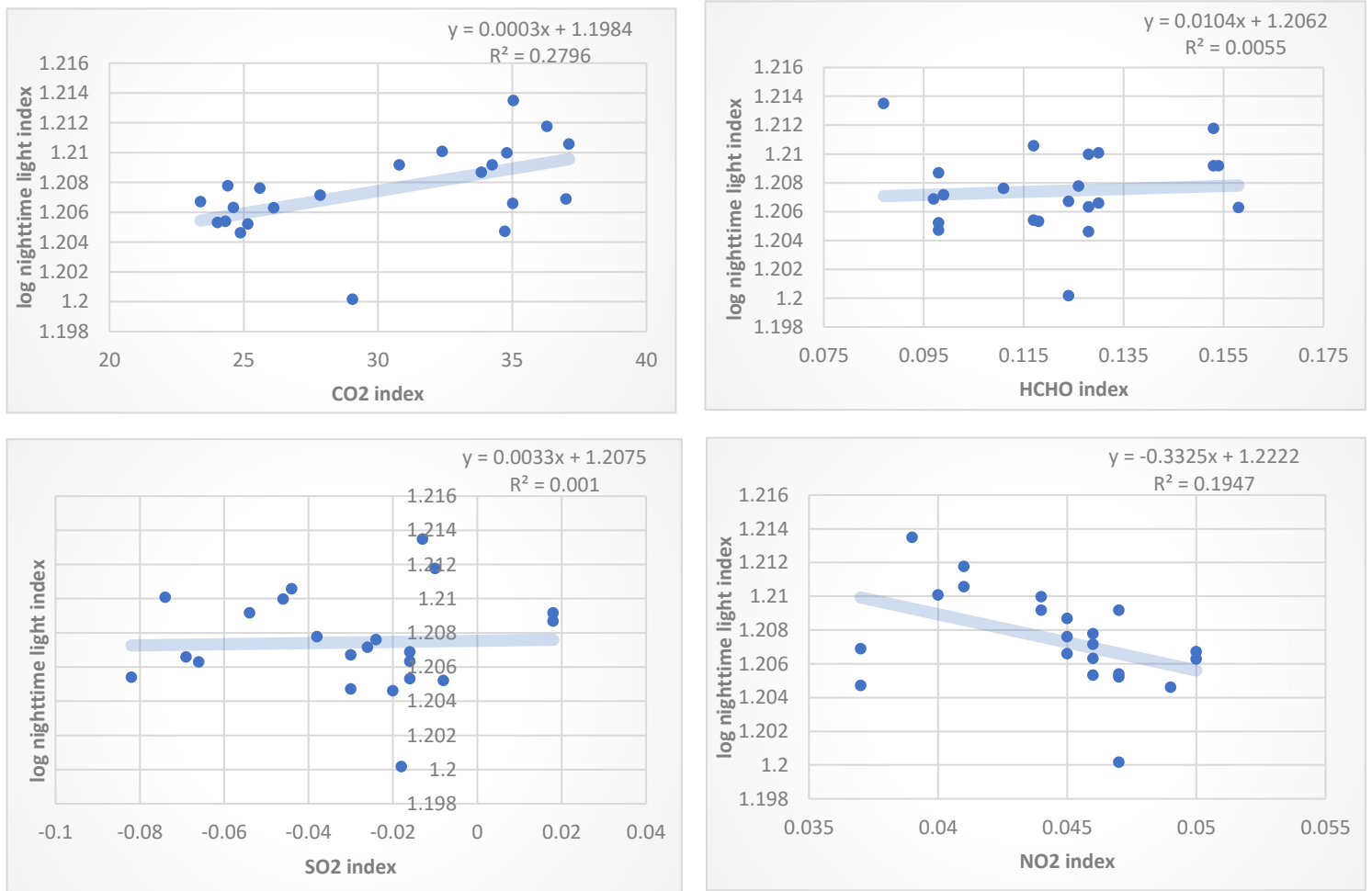


Figure 5 : comparing R² of 4 greenhouse gases index

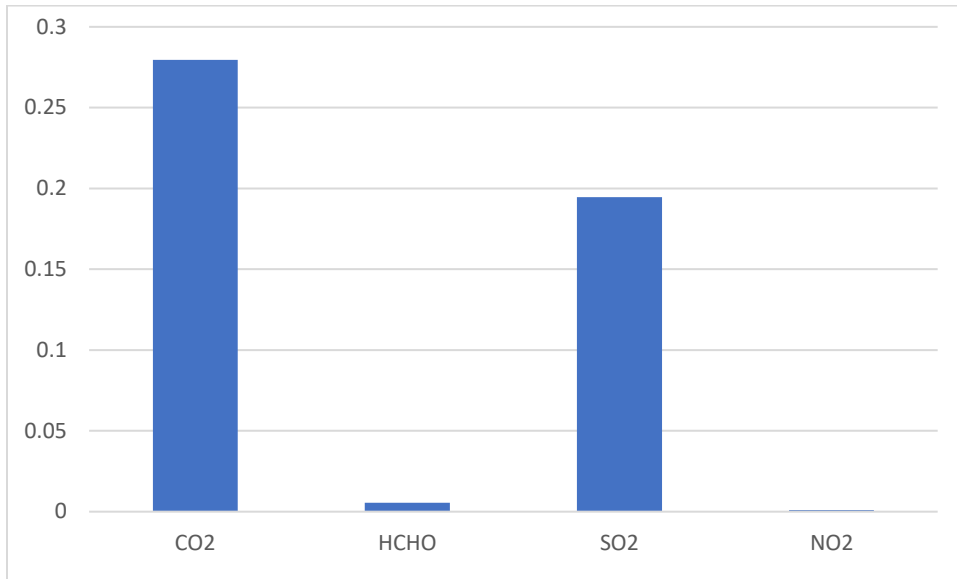
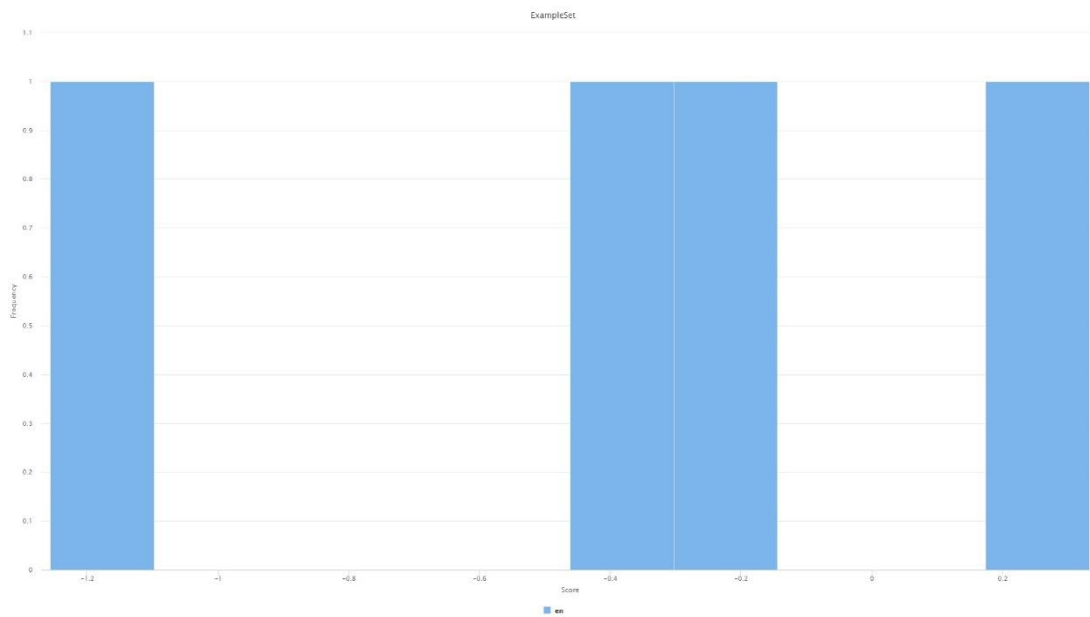


Figure 6 : sentiment index from rapid miner



Mean: -0.372

Min: -1.256

Max: 0.333

Standard deviation: 0.658

