Renewable Energy Policy Solutions

Mathijs Lenderink

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Contents

Executive summary

The Netherlands must reduce their greenhouse gas emission to achieve the goal of the European Union and slow climate change. To achieve these goals in the energy sector, the Netherlands must incentivize the generation and use of renewable energy. To do this I conclude that the following policies are needed: reducing investment costs in renewable energy by increasing subsidies, increase the security of investing in renewable energy projects by introducing a feed-in law and reduce the restrictions on renewable energy projects.

Introduction

Climate change is a growing problem that causes storms, droughts, floods, and a rising sea level. To slow down this climate change countries must reduce their greenhouse gas emission. In this report we will discuss policy solutions to incentivize renewable energy, which will reduce the greenhouse emission in the energy sector. The Netherlands introduced a policy in 2020 changing the energy tax to incentivize the use of renewable energy. But is the change of the energy tax the best incentive to stimulate renewable energy? I will discuss the policy in depth and evaluate the effects similar policies have had in the past years to see if this policy incentivizes enough. Also, I will discuss alternative policies which may work better in achieving the goal of the current policy and compare the effects of policies with the same goal from other countries. This paper compares the following policies: Taxes, tariffs, subsidies, feed-in laws, reducing restrictions and emission limitation. To compare these policies, we will look at the following criteria: political feasibility, administrative feasibility, environmental impact and economic impact.

Background

The economic and industrial progress of the last 300 years came at a cost to the environment. Climate change and global warming are becoming bigger problems by the day. We see an increase in extreme weather conditions such as storms, drought, floods and a rising sea level (Veerabhadran Ramanathan, 2010). Especially the Netherlands is at risk due to the rising sea level as 26% of the country is below sea level and another 29% is at risk for floods.

Global warming is caused by the increase of greenhouse gasses in the atmosphere, it is called the "greenhouse effect". As sunlight shines onto the earth, the energy of the sunlight is absorbed by the earth and then radiated back into the atmosphere as heat. The atmosphere can trap part of this heat because of greenhouse gas molecules in the atmosphere. The emission of extra greenhouse gasses resulted in a more powerful "greenhouse effect" and as more heat was trapped within our atmosphere, the temperature started rising.

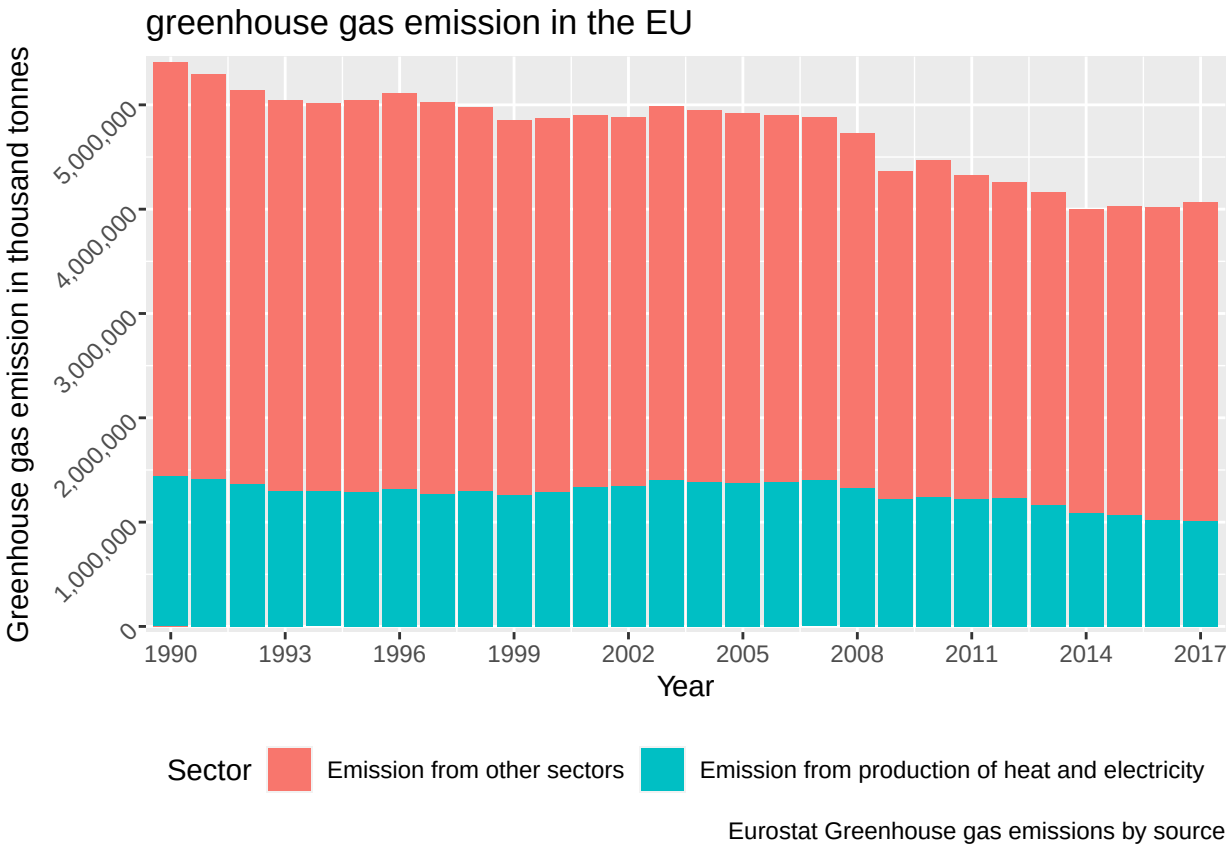
The large use of fossil fuels in industry does not only increase the effect of the "greenhouse effect", but by burning fossil fuels we also cause the depletion of already scarce fuel resources. It is thus not only necessary for the climate to reduce our use of fossil fuels, but it is also necessary because eventually fossil fuel resources will run out. To prevent both from happening we need to switch from fossil fuels to renewable and sustainable energy sources. (Peter H.g. Berkhout, 2004)

```
## data cleanup and creating a dataframe that can be used by ggplot
mydata = read.csv("greenhouse gas EU.csv")
tidyD = select(mydata,"TIME","GEO","SRC_CRF","Value")
tidydf = data.frame(tidyD)
tidydf$Value <- gsub(",","",tidydf$Value)
tidydf$Value <- gsub(" ","",tidydf$Value)
tidydf$Value <- as.numeric(paste(tidydf$Value))

##selecting only the countries I want and renaming a column
EUALL = tidydf[tidydf$GEO=="European Union - 28 countries (2013-2020)",]
colnames(EUALL)[3] <- "Sector"


## Plotting the final graph ##
ggplot(EUALL, aes(x=TIME,y=Value))+
  geom_bar(aes(fill=Sector),data=subset(EUALL,Sector=="All sectors and indirect CO2
  ↪  (excluding memo items)"),stat="identity")+
  geom_bar(aes(fill=Sector),data=subset(EUALL,Sector=="Fuel combustion in public
  ↪  electricity and heat production"),stat="identity")+
```

```
  scale_y_continuous("Greenhouse gas emission in thousand tonnes",breaks =
  ↪  seq(0,6500000,1000000),labels = scales::comma, expand = c(0.01,0))+
  scale_x_continuous("Year",breaks = seq(1990,2017,3), expand = c(0,0.2))+
  labs(title="greenhouse gas emission in the EU", caption = "Eurostat Greenhouse gas
  ↪  emissions by source")+
  theme(legend.position="bottom",axis.text.y = element_text(angle=45))+
  scale_fill_discrete(labels=c("Emission from other sectors","Emission from production of
  ↪  heat and electricity"))
```



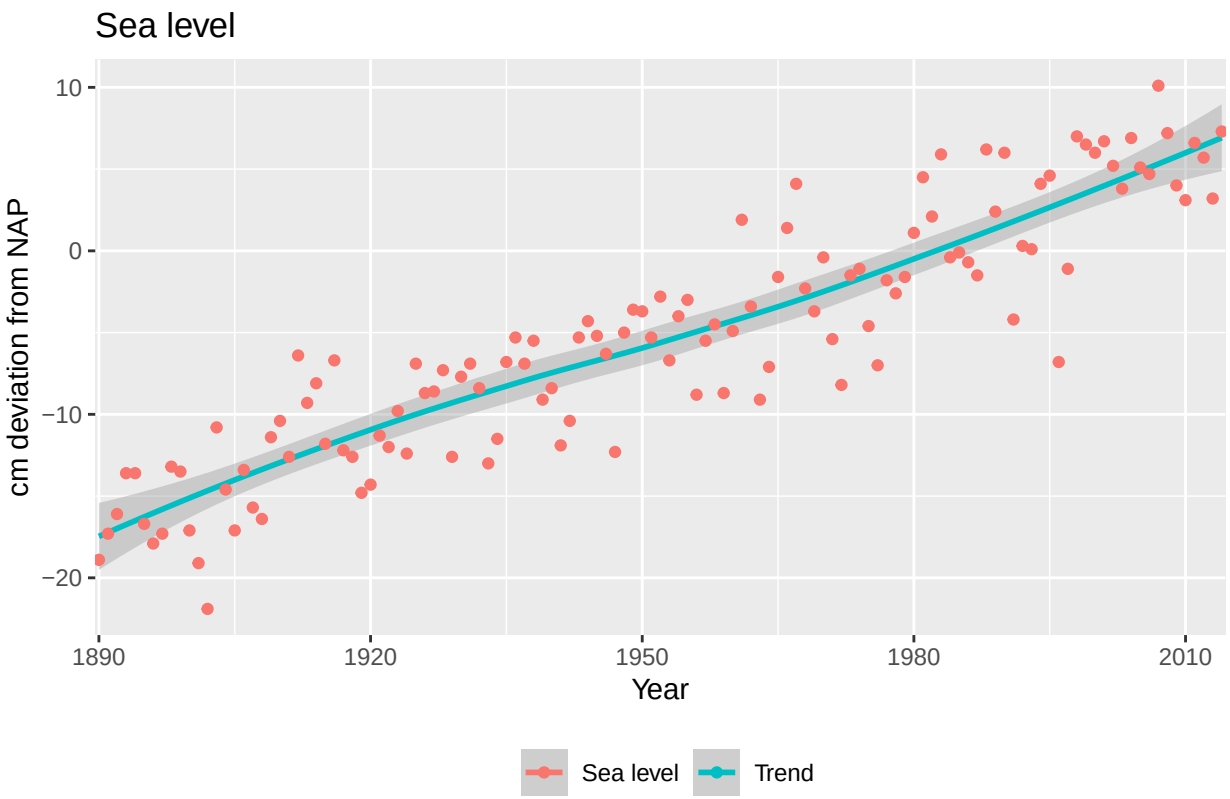

```
## selecting only the data I need
sealevel <- read.xlsx2("sealeveldata.xlsx",1)
sealevel <- sealevel[1:125,]

## changing the structure of the data such that it can be used
sealevel$Year <- as.numeric(as.character(sealevel$Year))
sealevel$cm.deviation.from.NAP <-
↪  as.numeric(as.character(sealevel$cm.deviation.from.NAP))

## plotting final graph
ggplot(sealevel, aes(x = Year, y=cm.deviation.from.NAP))+
  geom_smooth(aes(col = "Trend"))+
  geom_point(aes(col="Sea level"))+
  theme(legend.position="bottom")+
  labs(color="",title="Sea level",y="cm deviation from NAP",caption = "CBS, PBL, RIVM,
  ↪  WUR (2016). Sea level: Dutch coast and worldwide, 1890-2014")+
```

```
  scale_x_continuous(expand = c(0,0.4))
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```



CBS, PBL, RIVM, WUR (2016). Sea level: Dutch coast and worldwide, 1890−2014

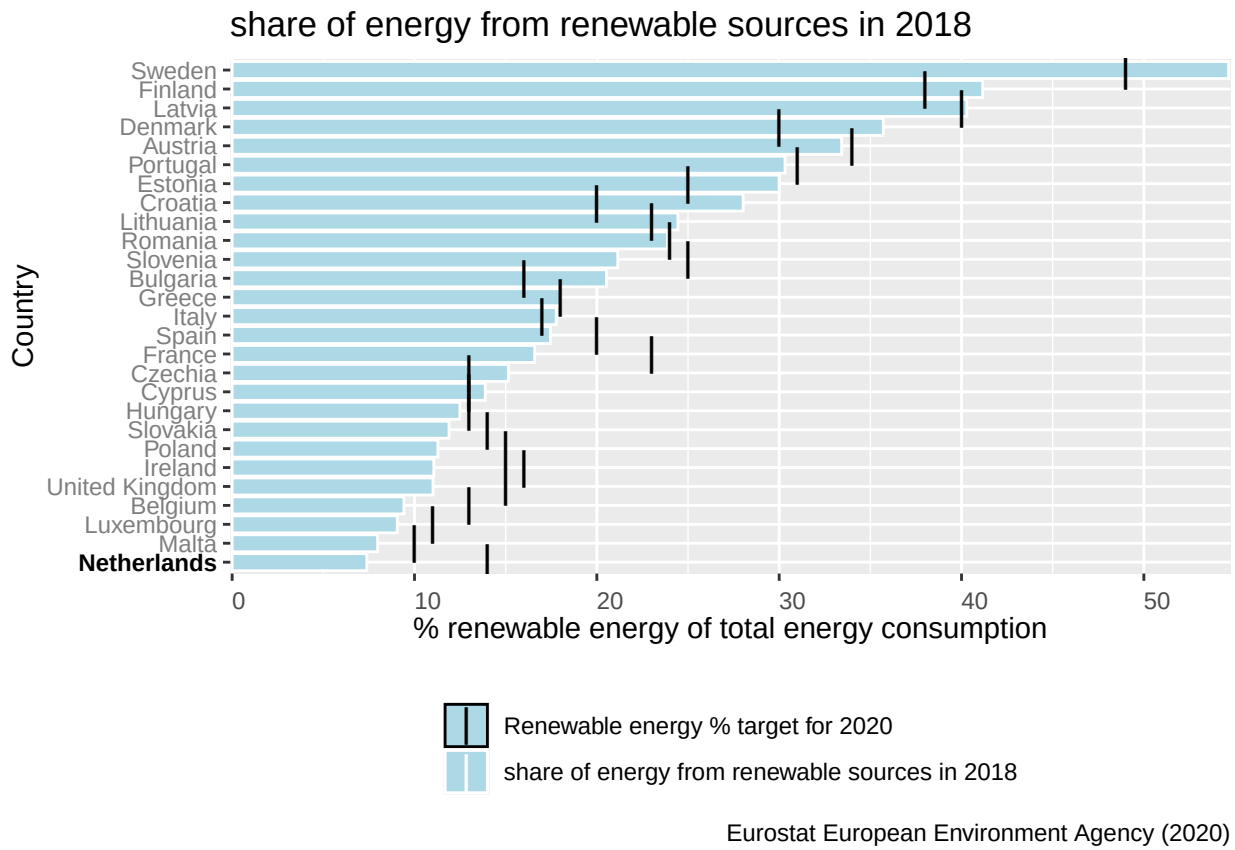
In Figure 1 can be seen that a relatively large portion of the greenhouse gas emission comes from the electricity and heat production. Since most of these emissions can be avoided by using renewable sources it is a sector where policies can have much effect in reducing the greenhouse gas emission. In figure 2 we can see that is necessary as it shows the rising sea level from the year 1890 to the year 2014. On the y-axis there is 'cm deviation from NAP', NAP is a fixed height reference used in sea level measurements. We can see from the trend that the water level has been rising steadily over those years. Part of that rise in the sea level is due to the global warming which exists because of the emission of greenhouse gasses (Meehl GA, 2005).

As governments around the world are trying to move away from fossil fuel as a primary source of energy, so is the European Union. The directive of the European union is that European Union member states should achieve that 32% of their use of energy is from renewable energy in 2030. Each member state is allowed to introduce their own policies to achieve that target. Because of this we see that member states of the European Union differ very much in the share of renewable energy they produce (JEC, 2019).

```
## ordering and changing the structure of the data such that it can be used
renewable <- read.xlsx2("share of renewable energy EU.xlsx",1)
renewable$X2018 <- as.numeric(as.character(renewable$X2018))
renewable$TARGET <- as.numeric(as.character(renewable$TARGET))
renewable <- arrange(renewable,X2018)

## plotting final graph
```

```
ggplot(renewable, aes(x = reorder(GEO, X2018)))+
  geom_col(aes(y=X2018, col = "share of energy from renewable sources in
  ↪  2018"),fill="lightblue")+
  geom_point(aes(y=TARGET,col="Renewable energy % target for
  ↪  2020"),shape=124,size=5,fill="black")+
  labs(caption = "Eurostat European Environment Agency (2020)",title="share of energy
  ↪  from renewable sources in 2018", x = "Country", y ="% renewable energy of total
  ↪  energy consumption")+
  theme(axis.text.x = element_text(angle=0,hjust=0,vjust=0), axis.text.y =
  ↪  element_text(colour =
  ↪  c('black','grey50','grey50','grey50','grey50','grey50','grey50','grey50','grey50','grey50','grey5
  ↪  face = c('bold','plain', 'plain','plain', 'plain','plain', 'plain','plain',
  ↪  'plain','plain', 'plain','plain', 'plain','plain', 'plain','plain',
  ↪  'plain','plain', 'plain','plain', 'plain','plain', 'plain','plain',
  ↪  'plain','plain', 'plain')))+
  scale_y_continuous(breaks = seq(0,70,10),expand = c(0,.1))+
  theme(legend.title = element_blank(),
  ↪  legend.position="bottom",legend.direction="vertical")+
  scale_fill_manual(values="blue",labels=c("share of renewable energy","Emission from
  ↪  production of heat and electricity"))+
  scale_color_manual(values=c("black","white"))+
  coord_flip()
```



In Figure 3 we can see that the share of renewable energy a country consumes differs a lot between member states. At the bottom, the country with the smallest share of renewable energy, we see the Netherlands. Compared to the rest of the European union the Netherlands is lacking behind. It is necessary to increase

our production of renewable energy, not only to achieve the goal of the European Union, but also to prevent the consequences that global warming brings.

To do this, the Netherlands introduced a new policy that would increase the tax on natural gas usage and decrease the tax on electricity usage. This policy is part of the plan by the government to increase the use of renewable energy. The current goals of the Netherlands are that in 2030 70% of the electricity and at least 27% of all energy will be renewable energy. The Netherlands must take the following steps to achieve that (Rijksoverheid, 2019):

- More efficient energy usage.
- Generating electricity less from coal and more from the solar and wind sources.
- Moving away from warmth created by natural gas and moving towards warmth created by renewable sources.
- Stimulating local renewable energy projects, such as solar farms and wind farms.

To achieve these steps and move further to renewable energy the Netherlands has introduced policies over the years. The most important policies are the following (Rijksoverheid, 2019) (Drahmann, 2018): * SDE+, this policy is a subsidy for large renewable energy projects and C02 reducing projects financed by a tariff, the ODE. * Subsidy renewable energy ("Subsidie hernieuwbare energie"), is a subsidy for the advancement in smart technologies related to the generation and storage of renewable energy.

Beside these policies the Netherlands also has taxes on electricity and natural gas usage. Through these taxes they influence the demand for electricity and gas. Peter H.G. Berkhout stated that the increase of taxes increases the price of natural gas and electricity, lowering the demand for natural gas and electricity in households. This research was based on data of the Netherlands between 1995 and 2000 (Peter H.g. Berkhout, 2004).

The policy introduced by the Netherlands in 2020 consisted of the following changes: * The decrease of the tax on electricity by €0.0009 per kWh. * The increase of the tax on natural gas by €0.0399 per cubic meter. * The increase of the tax reduction from € 257,54 to € 435,68 euro * The change in share of contribution to the ODE. The share for companies increases from 50% to 66.6% and the share for households decreases from 50% to 33.3%

The changes in the tax rates are for the first tax bracket. Most households do not exceed the first bracket.

Type	2019	2020
Natural Gas Tax rate per m3	€ 0,35469	€ 0,40301
Electricity Tax rate per kWh	€ 0,11934	€ 0,11822

Policy analysis

Taxes

As the new policy the Netherlands introduced in 2020 is mainly the increase of the tax on natural gas and the decrease of the tax on electricity, we use the research of the paper written by Peter H.G. Berkhout. By increasing the tax on natural gas, the Netherlands influences the demand of natural gas. The effect that (Peter H.g. Berkhout, 2004) saw was that the increased tax, increased the price and thus decreased the demand for natural gas. This is the goal of the government, because by reducing the natural gas usage people stop using gas powered appliances and increase the use of electricity powered appliances such as central heating and cooking appliances. Since natural gas is no renewable energy source, but electricity can be renewable this is an important step in the move to renewable energy. Because of this the tax on electricity is reduced in 2020, hereby making natural gas more expensive and electricity less expensive.

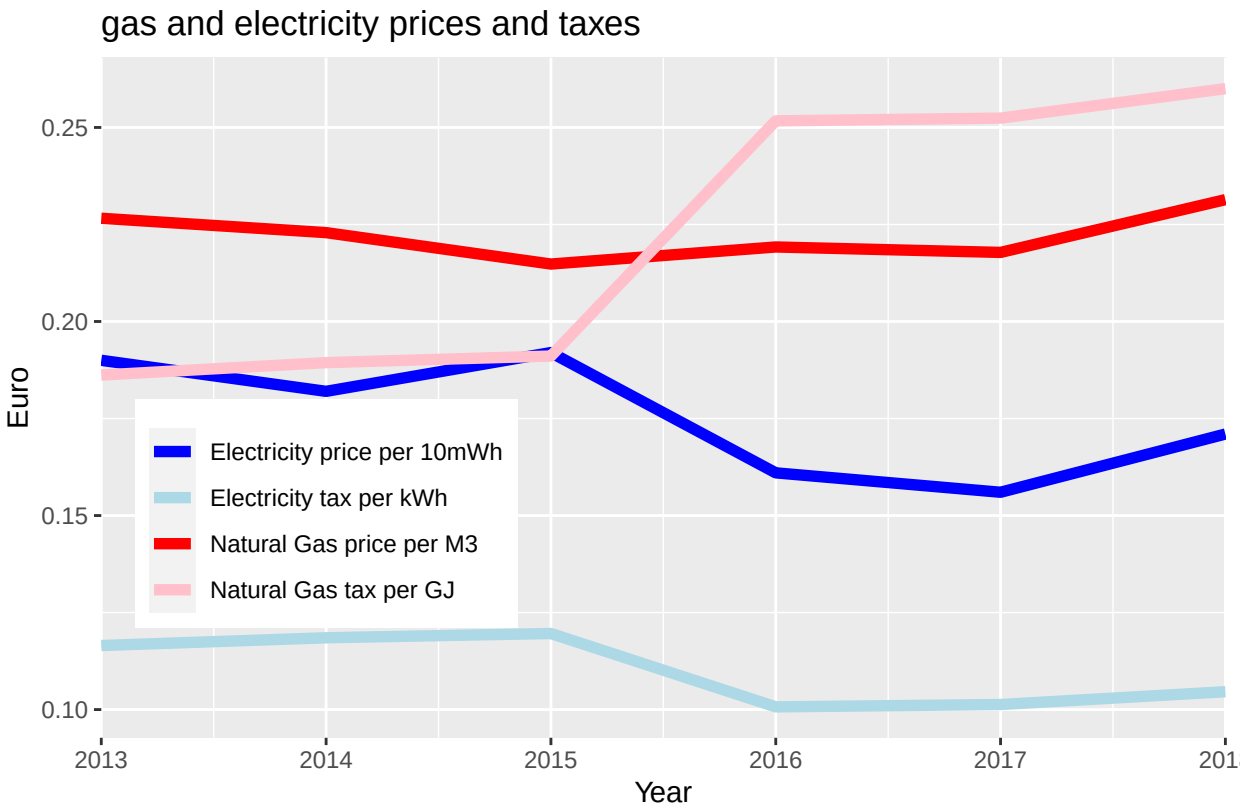
```r
## selecting the data i need
prices <- read.csv("gaselektraprijzen.csv")
prices <- prices[1:6,]

## changing the structure of the data such that it can be used
prices$gas <- as.numeric(as.character(prices$gas))
prices$electricity <- as.numeric(as.character(prices$electricity))

## changing column names for clarity in data
colnames(prices) <- c("Year", "natural_gas_price_per_M3", "natural_gas_tax_per_GJ",
↪  "electricity_price_per_10mWh", "electricity_tax_per_kWh")

## creating dataframe for ggplot
dfprices <- prices %>%
  select(Year, natural_gas_price_per_M3, electricity_price_per_10mWh,
  ↪  natural_gas_tax_per_GJ, electricity_tax_per_kWh) %>%
  gather(key = "variable",value= "value", -Year)

## final graph
ggplot(dfprices,aes(x=Year,y=value))+
  geom_line(aes(color=variable),size=2)+
  scale_color_manual(values=c("blue","lightblue","red","pink"), labels = c('Electricity
  ↪  price per 10mWh', 'Electricity tax per kWh','Natural Gas price per M3','Natural Gas
  ↪  tax per GJ'))+
  theme(legend.direction="vertical",legend.position=c(0.2,0.33), legend.title =
  ↪  element_blank())+
  labs(title="gas and electricity prices and taxes",y="Euro",caption = "CBS "Aardgas en
  ↪  elektriciteit, gemiddelde prijzen van eindverbruikers" ")+
  scale_x_continuous(expand = c(0,0))
```



CBS "Aardgas en elektriciteit, gemiddelde prijzen van eindverbruikers"

In Figure 4 we can see that the tax amount does influence the price. With natural gas less so than with electricity, but the tax does influence the price. We know that a tax decreases the demand by increasing the price (Peter H.g. Berkhout, 2004). However, people and businesses still need electricity, so the next step is to increase the share of renewably generated electricity.

The implementation of tax changes is feasible. Politically it is possible, taxes change every year and it would not be a drastic change. Administrative this policy is easily to implement since the only thing to change would be the tax rates. There would be no new systems or processes needed for this policy. The environmental impact of this policy is certainly positive as these tax changes will influence the demand. Finally, the economic impact and costs are small since the taxes that are paid will be revenue for the government with which the government can stimulate the economy.

Tariff

To increase the share of renewably generated electricity there are multiple policies that can be implemented. The Netherlands implemented a tariff, the ODE. It is an additional tariff over the already existing tax that can be seen in Figure 4. The funds generated by that tariff go directly into the fund for the SDE+. This SDE+ is a subsidy for renewable energy projects that reduce the emission of CO2. This ODE works in two ways. Firstly, it influences the price through the tariff and hereby increasing the price and reducing demand for gas and electricity. Secondly, the ODE finances a part of SDE+ subsidy and hereby incentivizes companies to invest in and research new renewable energy projects.

Part of the new 2020 policy the government implemented was also a change in the ODE. First the ODE was for half generated by the companies and for half by households. Now in 2020 this changed to 2/3 by companies and 1/3 by households. This results in an increased tariff for companies and a decreased tariff for households. Because companies are more likely to easily invest in new renewable energy projects this is a

smart policy. By increasing the share they have to generate for the ODE they are even further incentivized to look for renewable energy options.

The implementation of the policy changing tariffs is feasible. Just as with the implementation of a change in tax rates not much has to change to implement this policy. Politically the change or introduction of a tariff is feasible because it happens often, and most changes are not opposed unless the impact of the change is very large. Administrative the change or introduction of a tariff is feasible, just as with a change in tax rates there are no new systems needed. The environmental impact of a change in tariffs is positive especially if the revenue of the tariff is used to fund the SDE+. This way the tariff does not only have a positive environmental impact through the price increase, but also through the SDE+ fund that subsidizes renewable energy projects. Finally, the economic impact will be small because the revenue created by the tariff will be used by the government to subsidize renewable energy projects and will thus stimulate the economy.

Subsidies

As already listed above the Netherlands has multiple subsidies to incentivize the creation of renewable energy projects. The most important is the SDE+ subsidy, it is the subsidy that has the overall largest budget, 4 billion euros. This subsidy is an exploitation subsidy, which means that producers of renewable energy receive a subsidy for the amount of energy produced. The generation of renewable energy is more expensive than energy generated from fossil fuels. So, without a subsidy the generation of renewable may not be profitable. The SDE+ subsidy will subsidize the difference between cost of generating renewable energy and the market value of the energy generated. Since the cost of generating renewable energy is often higher than the market value of energy this means that when the market price is higher producers receive less SDE+ subsidy and when the market price is lower they receive more SDE+ subsidy (Drahmann, 2018).

Marcella Nicolini and Massimo Tavoni published a journal article about the effectiveness of subsidies for renewable energy. They used data from the following European countries: Germany, France, the United Kingdom, Italy and Spain. From the data they concluded the following: “Thus, our results suggest that these policies have been effective in promoting renewable energy, both in the short run, as we observe a positive relationship with the production of incentivized energy, and in the long run, as there is a positive relationship with the installed capacity.”. The policies they speak about are the subsidy policies in effect in the countries (Marcella Nicolini, 2017).

Politically the change in subsidies is feasible because the Netherlands already changes and introduces subsidies every year. Especially a subsidy with the goal to increase the share of renewable energy will be accepted since it would be in the interest for the government and there is ample evidence that subsidies to increase the share of renewable energy succeed. Administrative the change in subsidies is feasible, especially if the existing system of the SDE+ subsidy is used. The environmental impact of a subsidy is positive, mainly because people and companies would more easily choose the renewable option since the price would be lower. The economic impact would not be positive, even though an increased share of renewable energy is needed for the future the cost is higher than other alternatives.

Other policies to incentivize renewable energy

Feed-in laws

Risk is an important factor for companies to consider before investing in a new project. This too is the case for companies in the energy sector. To incentivize the investment in new renewable energy projects Germany came up with a feed-in system. Germany began in the 1990s with an electricity feed-in law. In 1991 the producers of renewable energy could sell their energy for 90% of the market retail price to utilities which were obligated to purchase the energy. As this system was very favourable for the producers, the market for renewable energy rapidly increased (Fred Beck, 2004). A feed-in tariff is essentially a long term, 15 to

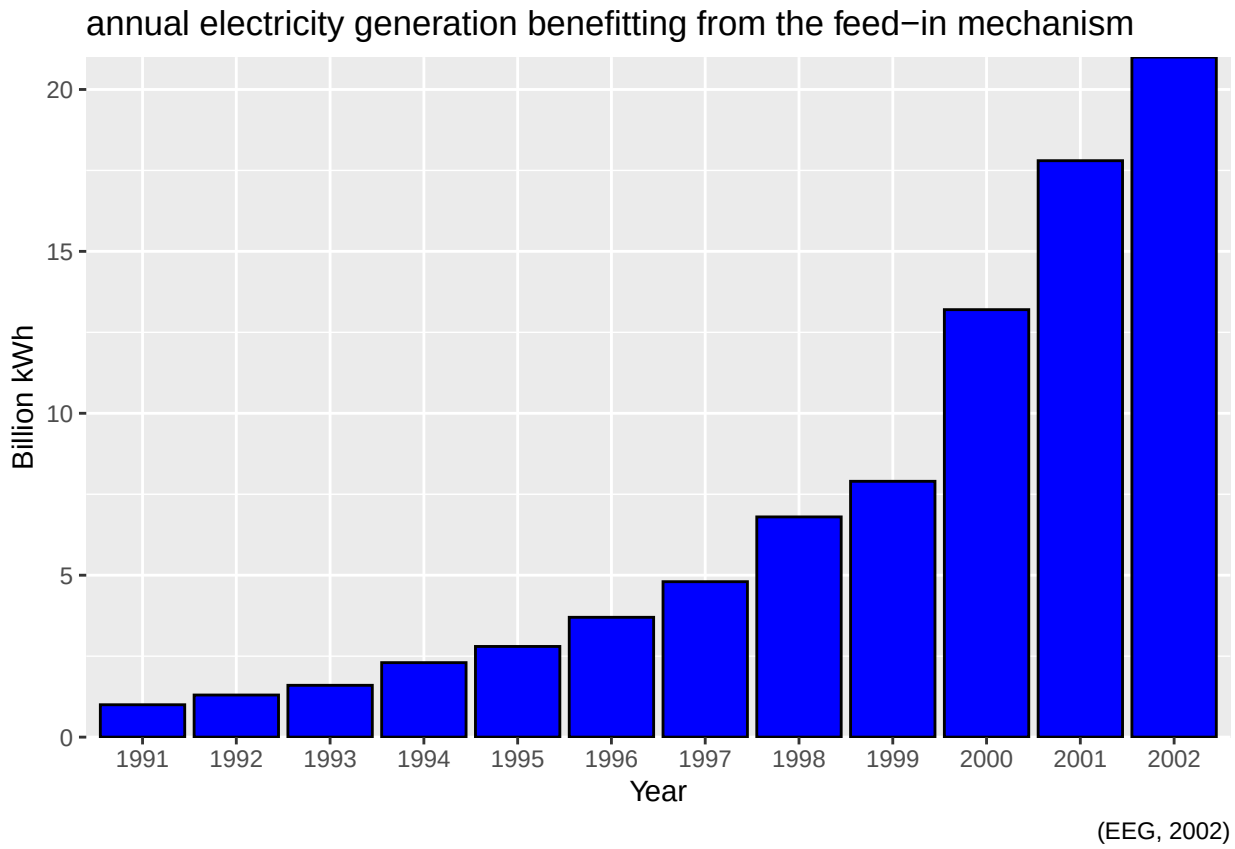
20 years, agreement with cost-based purchase prices of the energy generated. This increases the security when researching and developing renewable energy sources, knowing that the costs are compensated when the energy source would be working.

Feed-in tariff laws are and have been common in many countries. Much like in Germany many countries saw the renewable energy sector increase rapidly, but there is also criticism on this system. As costs were less an issue for energy producers, they were less focused on cost reductions and market developments. These issues were partly addressed after the change in the law that the feed-in tariff would be regularly adjusted to the prices (Fred Beck, 2004).

```
feed <- read.xlsx2("feed-indata.xlsx",1)

## changing the structure of the data such that it can be used
feed$Billion.kWh <- as.numeric(as.character(feed$Billion.kWh))

## final graph
ggplot(feed,aes(x=Year,y=Billion.kWh))+
  geom_col(fill="blue",color="black")+
  labs(title="annual electricity generation benefitting from the feed-in mechanism", y =
  ↪  'Billion kWh', caption ="(EEG, 2002)")+
  scale_y_continuous(expand = c(0,0))
```



The effect of the feed-in tariff in Germany can be seen in Figure 5. From the year 1991 till the year 2002 the renewable energy that was generated with the benefit of this tariff went from 1.2 billion kWh to 21 billion kWh. This shows that the policy certainly worked and accomplished what was hoped for by the policy makers. (EEG, 2002)

Politically the introduction of feed-in laws is feasible because there is evidence that these feed-in laws accomplish their goal of incentivizing the generation of renewable energy. The introduction of a feed-in law for renewable would be administratively feasible since the government can use the system other countries use. These systems would need to be set up and more people would be needed to set up deals with energy producers, so it would be a project for the government to set up a feed-in law. The environmental impact would make up for the work needed to set up the feed-in system. The environmental impact is very positive, evidence shows that the extra security it creates has the effect that much more energy producers are willing to take the risk of renewable energy projects. The economic impact of a feed-in law would not be large. The only real impact is that utilities would have to buy the energy for less than the market retail price, which creates security for the energy producer and utilities have reduced energy costs.

Reducing restrictions on renewable energy projects

Because the Netherlands is quite small for the number of citizens there is not much land available for renewable energy projects such as solar and wind farms. Now most wind farms are at the coastline, partly because of higher wind speeds, but that is not the only reason. The wind and solar farms are not part of the landscape of the Netherlands, because of this the local citizens often try to prevent new solar and wind farms that will be part of their surrounding landscape. Regulation and law also play a vital role in this, because often citizens get their way due to the existing laws and regulations. Therefore, most windfarms are located in Flevoland even though the wind conditions are better in other places.

To reach the renewable energy goals the government of the Netherlands is making more locations available for wind farms offshore. The Netherlands has excellent conditions for offshore wind farms. We have shallow waters, stable wind conditions and an experienced industry. Because of this there is much potential for more reliable renewable energy generation through windfarms off the shore of the Netherlands. In the past years the construction of offshore windfarms is on the rise, but this construction is within "wind farm zones". These zones are made available through regulation and each zone can consist of several wind farms. There are many locations off the shore of the Netherlands where additional zones can be laid out, but are not yet available because of regulation (Ogg, 2018).

```
## data sources: gelderland
↪  (https://nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/aed63a44-4526-45ae-ac8
## turbines and possible locations:
↪  http://nationaalgeoregister.nl/geonetwork/srv/dut/catalog.search#/metadata/603a47f1-c05b-417b-94e9-



## reading in the shapefiles
my_turbines <- readOGR(
  dsn = paste0(getwd(),"/windturbinedata/pgr_POVI_Windturbines_GNN_voorw.shp")
)
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\gamepc\Google Drive\master\2022\Programming\Final Policy paper (without unused gra
## with 660 features
## It has 6 fields
```

```
my_locations <- readOGR(
  dsn = paste0(getwd(),"/windpossible/pgr_POVI_Windenergie_mogelijk.shp")
)
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\gamepc\Google Drive\master\2022\Programming\Final Policy paper (without unused gra
## with 3106 features
## It has 6 fields
```

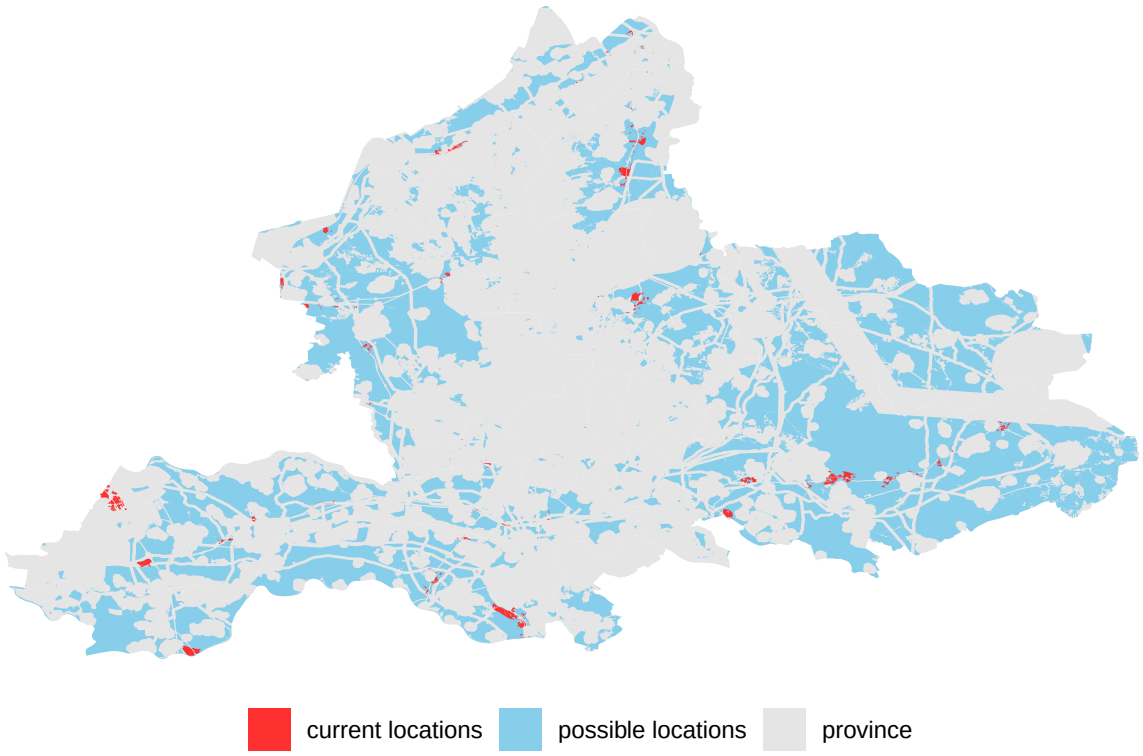
```
gelderland <- readOGR(
  dsn = paste0(getwd(),"/gelderland/pgr_GzBe_Gemeenten.shp")
)
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\gamepc\Google Drive\master\2022\Programming\Final Policy paper (without unused gra
## with 51 features
## It has 5 fields
```

```
## plotting all shapefiles in one ggplot
ggplot() + geom_polygon(data = gelderland, aes(x = long, y = lat, group = group, fill =
↪  "province"))+
  geom_polygon(data = my_locations, aes(x = long, y = lat, group = group, fill =
  ↪  "possible locations")) +
  geom_polygon(data = my_turbines, aes(x = long, y = lat, group = group, fill = "current
  ↪  locations"))+
  theme_void()+
  theme(legend.title = element_blank(), legend.position = "bottom", legend.direction =
  ↪  "horizontal")+
  scale_fill_manual(values = c("firebrick1","skyblue","grey90"))+
  labs(title = "Map of wind turbine locations and possible wind tubrine locations in
  ↪  Gelderland", caption ="Nationaalgeoregister  .")
```

```
## Regions defined for each Polygons
## Regions defined for each Polygons
## Regions defined for each Polygons
```

Map of wind turbine locations and possible wind tubrine locations in Gelderland



By changing regulations and thus reducing the restrictions on renewable energy projects there will be many places that can come available to new projects. This will not only increase the amount of renewable energy projects, but the new projects are then also able to use spots with better conditions than the projects that already exist. Even though citizens may not agree with the new projects, the renewable energy target can be partly achieved by reducing the restrictions on renewable energy projects. As shown in the map in figure 6 there are many locations possible for wind turbines to be placed in the example of Gelderland, a province in the Netherlands. In red we see the wind turbines that are already in place and in blue we see the possible locations for new wind turbines or wind farms. Most of the blue locations are not yet available for new projects due to regulation.

Politically this policy is partly feasible. already the government is making more zones available for renewable energy projects, but citizens often do protest. The political feasibility depends on the circumstances of specific projects. This policy is administratively feasible because the change of a zoning plan is easily done and happens often. The environmental impact would be large and positive, this is mostly because many renewable energy projects would become possible and thus the number of renewable energy projects would increase. Finally, the economic impact would be positive because of the extra jobs created by the projects.

Emission limits

Another way of limiting the use of fossil fuels and incentivizing renewable energy is the creation of emission limits. One form of doing this is auctioning the right of emission by introducing emission cap-and-trade policies. Essentially companies can bid on the right to emit greenhouse gasses. This does not directly incentivize companies to search for renewable energy alternatives, but it does increase their price for producing their product. This method was introduced in the United States. There it was observed that this method was not particularly effective. A company would get an allowance to emit SO2 for every 500MWh of renewable energy generated or 500MHw avoided through increased energy efficiency. This program was not effective

because only one-tenth of the allowances were allocated to energy efficiency or renewable energy. It is now suggested that the ineffectiveness of that program was due to the too low market price for allowances, which made the investment needed for renewable energy not worth it for companies.

From this we can conclude that politically this policy is mostly not feasible, because there is evidence that it does not necessarily work, and large companies would resist the implementation. This policy would be administratively hard to implement since there are many ways to implement and much observation and control is needed for this system to work. The environmental impact would be positive since it increases the price or reduces the emission, but the policy does not always work as it was supposed to as was observed in the United States. The economic impact would depend on the form of emission limitation but would mostly be negative due to restrictions on companies.

Recommendation

There are multiple possible policies to increase and incentivize the use and generation of renewable energy in the Netherlands. From the research in this paper we would recommend the following: * Increase the budget for the SDE+ subsidy, either through an increase of the ODE tariff or higher taxes. * Introduce a policy for a feed-in mechanism for renewable energy producers. * Reduce the current restrictions on renewable energy projects.

Firstly, by increasing the budget for the SDE+ subsidy there would be extra funds available for renewable energy projects, which would stimulate companies to invest in these new projects. These extra funds for the SDE+ subsidy can come from the increase of the ODE or increasing other taxes and reserving more money for the budget of the SDE+ subsidy. Our recommendation is to increase the ODE, because by doing so the price for electricity and natural gas would go up and thus the demand for both would go down. This again is an incentive for people to search for renewable alternatives.

Secondly, introducing a feed-in mechanism for renewable energy producers would make the investment in renewable energy projects safer. Since the feed-in mechanism creates security for the investor, by giving the opportunity to get long-term contracts even before the start of a project, the investor would be more willing to invest in these projects. This would stimulate more companies and investors to invest in renewable energy alternatives.

Finally, by reducing the current restrictions on renewable energy projects many projects would become possible. These projects can then use better locations for wind farms and solar farms, increasing the amount of renewable energy projects. With these policies the Netherlands would increase their share of renewable energy and get closer to the current goal. These policies combined would: increase subsidies and thus reduce investment costs in renewable energy, increase the security of investing in renewable energy and finally make more and better locations available for renewable energy projects.

The goal of the Netherlands for 2020 is that 14% of the energy is produced by renewable sources. In 2018 was this percentage 7.4% and in 2019 this percentage was 8.6%. The policies we recommend are certainly necessary to be able to reach the goals of 32% in 2030.

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