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INTRODUCTION

Carbon taxation is a policy tool that has been gaining more widespread utilization in the last decade. In the beginning of the 1990's, a few countries from Northern Europe were the only countries to adopt a carbon tax. However, since then several other countries have experimented with carbon taxation policies with 18 countries in the world currently having adopted carbon taxation schemes on a national scale. More may follow as several other countries are considering the employment of the policy tool to further their climate change mitigation goals. The countries that have implemented a carbon taxation policy are comprised of a diverse list including countries with varying levels of development.

Carbon pricing practices in general are expected to spread in the near future, partly as a result of the impact of the agreement reach at the Paris Conference. At the outcome of the conference, nearly all of the country's in the world have taken on climate change mitigation commitments for the first time in history. It is expected that carbon taxation policies will gain new ground under the new global climate change regime as the participant parties will be compelled to design new climate change policies in order to keep their emission levels below the targets they have outlined in their Intended Nationally Determined Contributions(INDC).

Carbon taxation stands out as one of the main policy tools that Turkey can choose to utilize in designing a climate change mitigation strategy. For this reason, it is important to examine different carbon tax applications and identify the failures and successes in different cases. This policy report thus aims to analyze different carbon taxation policy examples in the world by looking at 9 different cases. The cases that will be analyzed are chosen with a view to provide examples from a variety of countries with significantly different conditions and from different parts of the world. The countries that are examined include the industrialized countries Finland, Sweden, United Kingdom, France, Japan and Australia, the emerging economies of Chile and South Africa and a sub-state level actor in British Columbia, Canada. Looking at these examples can hopefully provide meaningful insights for Turkey which should consider using a carbon tax design for the aim of furthering its climate change mitigation targets.

FINLAND

In 1990, Finland became the first country to implement a carbon taxation policy for the purpose of curbing its carbon emissions. The tax was designed as a component of Finland's excise tax on fossil fuels used for transportation and heating[1]. The policy scheme covered the utilization of all transport fuels, coal, and natural gas and included the heating, electricity generation, and transportation sectors. When the tax was first initiated, the tax rate was set as around 1.12 Euros per ton of CO_2[2]. The specifics of the policy underwent several changes in the following decades. The tax rate was most recently increased in January 2016 with the intention of further encouraging the use of low carbon heating fuels and increasing the competitiveness of peat and natural gas compared to coal in the

1 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 9

2 'Nachmany, Michal, Fankhauser,, Sam, Davidová, Jana, Kingsmill, Nick, Landesman, Tucker, Roppongi, Hitomi, Schleifer, Philip, Setzer, Joana, Sharman, Amelia C., Singleton, Stolle, Sundaresan, Jayaraj and Townshend, Terry Climate Change Legislation in Finland, An Excerpt From The 2015 Global Climate Legislation Study A Review of Climate Change Legislation in 99 Countries'(2015), p. 4, accessed from http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/FINLAND.pdf on 12.8.2016

heating industry[3]. As of 2016, the carbon tax applied on transport fuels was 66 US dollars per ton of CO_2 and the tax applied on heating fuels was 62 US dollars per ton of CO_2[4].

The tax was originally based only on carbon content but was subsequently changed to become a combination of a carbon and energy tax with a 60% carbon and a 40% energy component. A major reform was undertaken in 1997 when the tax rates were highly increased and the tax was changed again to become a pure carbon tax[5]. Another major reform took place in 2011 when the carbon tax was split again into two taxes, one based on carbon content and another based on energy. The tax rates were thus adjusted between the carbon and the energy components. Additionally, peat was introduced to be covered under the carbon tax with the reform in 2011[6].

There were several exemptions from the tax at its inception. Partial exemptions were granted for peat and natural and the wood industry was completely exempt from the tax. Other exemptions included fuels used as raw material or inputs for manufacturing[7]. The exemptions were designed to protect key industries in the country from international competition. For example, the wood industry was regarded as an important export industry and the aim was to maintain its comparative advantage in international markets.

Another important factor that encouraged several changes in the carbon taxation scheme was related to developments in the other Northern European countries regarding carbon pricing. After the integration of the Northern European countries' electricity markets under the Nordic Electricity Market, the Finnish industries felt disadvantaged since the other Northern European countries exempted energy intensive industries in their carbon pricing schemes. This prompted change in Finland's carbon tax design to partially exclude energy intensive industries[8].

Currently, fuels used for commercial sea and air transportation are exempt from the tax as well as fuels used for electricity generation. Electricity is taxed separately but the rate of the tax is not based on carbon content. Instead, as an alternative incentive for emissions mitigation, tax refunds are available for electricity generated from renewable sources[9].

Reportedly, the revenues from the carbon tax amounted to around 800 million US dollars for the year 2013[10]. The revenues generated from the tax flow directly to the central governmental budget without any earmarking for a special purpose[11]. There are a number of tax policies used to make the tax revenue neutral such as a reduction in income taxes and corporate taxes. The tax cuts are used as a method for transferring income from the higher income group to the lower income groups[12].

3 World Bank Group and Ecofys, 'Carbon Pricing Watch 2016, An advance brief from the State and Trends of Carbon Pricing 2016 report, to be released late 2016'(2016), p. 10

4 Ibid, p. 6

5 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 9

6 'Nachmany, Michal, Fankhauser,, Sam, Davidová, Jana, Kingsmill, Nick, Landesman, Tucker, Roppongi, Hitomi, Schleifer, Philip, Setzer, Joana, Sharman, Amelia C., Singleton, Stolle, Sundaresan, Jayaraj and Townshend, Terry Climate Change Legislation in Finland, An Excerpt From The 2015 Global Climate Legislation Study A Review of Climate Change Legislation in 99 Countries'(2015), p. 4, accessed from http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/FINLAND.pdf on 12.8.2016

7 Ibid.

8 Vourch, Ann and Jimenez, Miguel, 'Enhancing Environmentally Sustainable Growth in Finland'(2000), OECD Economics Department Working Papers, No. 229, p. 31

9 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 9

10 Carl, Jeremy and Fedor, David, 'Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world'(2016), Energy Policy, Volume 96, pp. 50-51

11 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 9

12 Carl, Jeremy and Fedor, David, 'Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world'(2016), Energy Policy, Volume 96, p. 56

According to the estimations of the Finnish government, the country's CO_2 emissions were reduced by around 4 million metric tons between the years 1990 and 1998 as a result of the application of the carbon tax. This figure corresponds to around 7% of the 57 million metric tons of emissions recorded in the country for the year 1998[13]. Overall, it can be said that Finland's carbon tax has been partially successful in reducing the country's carbon emissions despite the fact that a large part of the country's economy is protected from the carbon tax with a comprehensive system of exemptions.

SWEDEN

Sweden was one of the countries that closely followed Finland with the introduction of its carbon tax in 1991. When the tax was launched, the rate was set as 250 Swedish Krona, or around 44.37 US dollars per metric ton of CO_2[14]. The tax was introduced as part of a broader reform in the energy sector. Energy taxes had generally played an important role in Sweden both as a source of tax income and as a policy instrument. The carbon and energy taxes in the country are closely connected and have to be inspected with regard to one another. With the introduction of the new tax, the existing energy taxes were subsequently cut by 50% and the two tax mechanisms co-existed side by side[15].

The main sectors covered under the carbon tax system included natural gas, gasoline, coal, fuel oil, liquefied petroleum gas and home heating oil[16]. With the introduction of the new tax system, several industrial sectors were exempted from the energy tax and were compelled to pay only 50% of the carbon tax rate. The industries that were allowed to pay a lower proportion of the carbon tax amount included manufacturing, agriculture, co-generation plants, forestry and aquaculture[17]. On the other hand, households and the service sector were fully covered by the tax.

Over the years, the fraction of the carbon tax employed to the industrial sector was changed several times. The obligation was further reduced to 25% in 1991 only to be risen again to 50% in 1997[18]. Between the years 1999 and 2004, the carbon tax rate rose to 105 US dollars while the rate for the industrial sector stayed at 27 US dollars per ton[19]. Over time, carbon tax exemptions also increased for the installations operating under the EU ETS. Direct exemptions were not provided for all the GHG emissions covered under the EU ETS but exemptions were gradually provided[20]. The latest exemption included the district heating plants participating in the EU ETS starting from the year 2014[21].

The differentiation of the carbon tax across different sectors had some undesired distortionary effects on the behavior of companies, especially between the years 1993 and 1997 when the tax difference between the fuels used in industry and the other sectors was overly high. As a result, some industries sold their by-products to the district heating companies while they

13 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 9

14 Ibid, p. 11

15 Bengt Johansson, 'Economic Instruments in Practice 1: Carbon Tax in Sweden', Swedish Environmental Protection Agency, p. 3, accessed from https://www.oecd.org/sti/inno/2108273.pdf on 3.8.2016

16 Wang, Xueman and Murisic, Maya, 'Towards a Workable and Effective Climate Regime, Chapter 19: Taxing carbon: Current state of play and prospects for future developments'(2015), World Bank, p. 271, accessed from http://voxeu.org/sites/default/files/file/wang%20and%20murisic.pdf on 3.8.2016

17 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 11

18 Bengt Johansson, 'Economic Instruments in Practice 1: Carbon Tax in Sweden', Swedish Environmental Protection Agency, p. 4, accessed from https://www.oecd.org/sti/inno/2108273.pdf on 3.8.2016

19 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 11

20 Wang, Xueman and Murisic, Maya, 'Towards a Workable and Effective Climate Regime, Chapter 19: Taxing carbon: Current state of play and prospects for future developments'(2015), World Bank, p. 271, accessed from http://voxeu.org/sites/default/files/file/wang%20and%20murisic.pdf on 3.8.

21 World Bank, 'Background Note: Putting a Price on Carbon with a Tax', p. 3, accessed from http://www.worldbank.org/content/dam/Worldbank/document/Climate/background-note_carbon-tax.pdf on 8.6.2016

themselves burned fossil fuels. This effect caused by the tax design prevented the full emissions reduction benefits of the tax from being realized[22].

The revenues collected from the tax are directed to Sweden's general government budget. The amount of revenues collected from the tax were relatively steady between the year 1993 and 2000, but started to gradually increase starting from 2000[23]. A total of nearly 3.7 billion dollars were collected by the carbon tax for the year 2013[24].

The carbon tax applied in the country rose steadily over the years from around 44 US dollars per ton of CO2e at its inception to reach nearly 140 US dollars in 2016. As of 2016, the carbon tax rate in Sweden is applied at 137 US dollars per metric ton[25]. This makes the Swedish carbon tax rate the highest in the world by a wide margin. The carbon tax employed in the country is generally regarded as successful and effective on the sectors that it is applied on. It has also been one of the longest standing carbon taxes in the world.

There were several attempts made at assessing the impact of the carbon tax on the emissions stock of the country. The Swedish Ministry of the Environment estimated that the CO2 emissions of the country were reduced by 15% between the years 1990 and 1995 as a result of the carbon tax[26]. Moreover, it was estimated that the countries emissions would be 20-25% higher by the year 2000 if the policy changes in 1990 had not been made. 90% of this reduction was found to be linked to the reformed tax system whereas the remaining 10% were caused by the use of investment grants and energy efficiency programs[27]. Overall, the Swedish domestic greenhouse gas emissions declined by 24% between 1990 and 2014 in which the carbon tax was applied. In the same period, the country's GDP increased by 62%, demonstrating that the de-coupling of carbon emissions from economic growth was achieved in the country[28].

UNITED KINGDOM

United Kingdom's carbon price floor(CPF) came into effect in 2013, changing the existing Climate Change Levy Regime. Prior to the application of the carbon price floor, the UK Climate Change Levy(CCL) was the main policy tool aimed at climate change mitigation in the country[29]. The CCL imposed taxes on electricity, natural gas and liquefied petroleum gas, being applicable to the industrial, commercial, agricultural, public and service sectors[30]. However, the rates of the tax were not based on carbon content.

The new policy tool CPF effectively applies a tax on fossil fuels used in electricity generation including gas, solid fuels, and liquefied petroleum gas by employing carbon price support rates(CPS) based on carbon content[31]. Electricity generators with a combined generation capacity of less than 2 MW's are exempt from the

22 Bengt Johansson, 'Economic Instruments in Practice 1: Carbon Tax in Sweden', Swedish Environmental Protection Agency, pp. 7-8, accessed from https://www.oecd.org/sti/inno/2108273.pdf on 3.8.2016

23 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 11

24 Carl, Jeremy and Fedor, David, 'Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world'(2016), Energy Policy, Volume 96, pp. 50-51

25 World Bank Group and Ecofys, 'Carbon Pricing Watch 2016, An advance brief from the State and Trends of Carbon Pricing 2016 report, to be released late 2016'(2016), p. 6

26 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 12

27 Bengt Johansson, 'Economic Instruments in Practice 1: Carbon Tax in Sweden', Swedish Environmental Protection Agency, p. 8, accessed from https://www.oecd.org/sti/inno/2108273.pdf on 3.8.2016

28 Speech by Minister for Energy Ibrahim Baylan at Friends of Fossil Fuel Subsidiary Reform, COP21, accessed from http://www.government.se/speeches/2015/12/speech-by-ibrahim-baylan-atfriends-of-fossil-fuel-subs idiary-reform-cop21/ on 4.8.2016

29 United Kingdom Government, accessed from https://www.gov.uk/green-taxes-and-reliefs/climate-change-levy on 25.7.2016

30 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 13

31 World Bank, 'Background Note: Putting a Price on Carbon with a Tax', p. 4, accessed from http://www.worldbank.org/content/dam/Worldbank/document/Climate/background-note_carbon-tax.pdf on 8.6.2016

tax and the geographical coverage of the tax includes only - Great Britain, excluding Northern Ireland. Overall, it is estimated that approximately 25% of the country's emissions are covered under the tax[32].

The main purpose of the introduction of the carbon price floor was to provide a stable carbon price signal as the price of the allowances issued under the EU ETS system proved to be very volatile. Therefore, the main target of the new policy scheme was determined as the electricity generation sector covered under the EU ETS[33].

The tax rate was set around 9.55 £ per ton of CO_2 equivalent or around 15.75 US dollars for the year 2014 and rose to around 26 US dollars per ton of CO2 equivalent for 2016[34]. In 2014, the government announced that a cap of 18 £ ton of carbon equivalent would be applied until the year 2020, effectively freezing the tax rate for the until that year[35].

On the year 2013, the total revenues collected by the carbon price floor amounted to 1530 US dollars[36]. There are no specific provisions for earmarking the revenues generated by the tax for a special purpose, and the revenues are transferred into the general budget.

FRANCE

France has launched its carbon tax on 2014, putting a charge on domestic consumption of energy products not covered by the EU ETS. Initially, the main fossil fuels subject to the tax were gas, heavy fuel oil, and coal. Starting from 2015, the tax was extended to cover transport fuels and heating oil[37]. The initial tax rate was determined to be around 8 US dollars per ton of CO2 equivalent. The rate was increased to 17 US dollars (14.5 Euros) per ton CO2 equivalent in 2015 and to 25 US dollars (22 Euros) in 2016[38]. For the year 2014, the revenues collected by the tax amounted to 452 million US dollars[39]. The revenues are intended to be used in energy transition plans with the main target of boosting employment in the green energy sector[40].

Long term targets were also set for the future tax levels with the adoption of the Law on the Energy Transition to Green Growth in July, 2015. With the passing of the law, it was decided that the carbon tax rate would be increased to 56 Euros per ton of CO2e by the year 2020 and to 100 Euros by the year 2030. The law also sets the country's target of reducing the GHG emissions by 40% 2030 with respect to the 1990 levels[41]. According to Segolene Royal, the French Environment Minister, the announced future rise in carbon tax rates will provide visibility to the business community on how the prices will evolve and the higher taxes on fossil fuels will be offset by lower levies on other products making the future increases in the tax revenue neutral[42].

32 World Bank Group and Ecofys, 'State and Trends of Carbon Pricing 2014'(2014), p. 83

33 World Bank Group and Ecofys, 'State and Trends of Carbon Pricing 2014'(2014), p. 83

34 World Bank Group and Ecofys, 'Carbon Pricing Watch 2016, An advance brief from the State and Trends of Carbon Pricing 2016 report, to be released late 2016'(2016), p. 6

35 World Bank Group and Ecofys, 'State and Trends of Carbon Pricing 2014'(2014), p. 83

36 Carl, Jeremy and Fedor, David, 'Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world'(2016), Energy Policy, Volume 96, pp. 50-51

37 World Bank, 'Background Note: Putting a Price on Carbon with a Tax', p. 2, accessed from http://www.worldbank.org/content/dam/Worldbank/document/Climate/background-note_carbon-tax.pdf on 8.6.2016

38 World Bank Group and Ecofys, 'Carbon Pricing Watch 2016, An advance brief from the State and Trends of Carbon Pricing 2016 report, to be released late 2016'(2016), p. 6

39 Carl, Jeremy and Fedor, David, 'Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world'(2016), Energy Policy, Volume 96, pp. 50-51

40 Platts, 19.12.2013, 'France adopts 2014 budget; carbon tax on fossil fuels', accessed from http://www.platts.com/latest-news/electric-power/london/france-adopts-2014-budget-carbon-tax-on-fossil-26563408 on 20.7.2016

41 World Bank Group and Ecofys, 'State and Trends of Carbon Pricing'(2015), p. 45

42 Bloomberg, 23.7.2015, 'France Passes New Energy Law Quadruples Carbon Price' accessed from http://www.bloomberg.com/news/articles/2015-07-23/france-passes-new-energy-law-quadruples-carbon-price on 19.7.2016

Additionally, the government has recently announced plans to introduce a carbon price floor for the electricity sector in the country. The carbon price floor is set to be included in the 2017 finance bill as the French government seeks to motivate broader European action towards climate change mitigation[43].

Since the policy mechanism has only recently been established, it is too early to assess its effectiveness. However, it can be argued that the carbon tax in France is set to play an important role in the country's future especially with the longer term targets in place for considerably increasing the rates.

JAPAN

Japan is currently the only Asian country that is employing a carbon tax. 'Japan's Tax for Climate Change Mitigation' became operational on 2012, covering emissions from the use of all fossil fuels based on their CO2 content[44]. A CO2 emission factor is used for each sector to ensure that the tax rate is equal to 289 JPY or around 3 US dollars per ton of CO2 across all sectors[45].

The tax rates are set to be raised in three stages in a timeframe of three and a half years reaching the targeted 289 JPY at the end of the period. Exemption and refund measures are provided for certain fields that are deemed strategic, despite the modest initial tax rate. Considerable measures are included in the carbon tax scheme in order to avoid the heavy burdening of specific industries. These include oil used for petrochemical products production, imported coal, coal used for electricity generation in Okinawa, heavy oil used for agriculture, forestry and fishery and domestic oil asphalt[46].

The revenues collected from the tax were estimated to be 39.1 billion JPY for the first year and 261.3 billion JPY annually starting from the year 2016. The Japanese government plans to use the revenues in promoting low carbon growth by taking energy saving measures, promotion of renewable energy and clean and efficient use of fossil fuels. Some of the specific measures outlined by the Japanese government include 'promotion of domestic business location for innovative low-carbon technology-intensive industries, installation of energy-saving equipment by small and medium-sized enterprises, introduction of financial assistance for local governments to promote energy-saving and renewable energy sources'[47].

The rate of the tax in Japan can be considered relatively low when compared to carbon tax designs in other developed countries, especially Northern European countries such as Sweden and Finland. However, the Japanese government still expects that a significant reduction in the carbon emissions of the country will be realized through the utilization of the tax. According to the estimations made by the Japanese government, a reduction of between 0,5% and 2,2% in the country's emissions will be realized by 2020 compared to the 1990 levels as a result of the employment of the policy tool[48].

CHILE

Chile can be considered as one of the frontrunners among the developing countries in terms of taking ambitious action in the struggle against climate change. The carbon tax approved by the Chilean government is one of the centerpieces of the country's efforts in reducing its carbon emissions. If the tax proves

43 The Guardian, 17.5.2016, 'France sets carbon price floor', accessed from https://www.theguardian.com/environment/2016/may/17/france-sets-carbon-price-floor on 19.7.2016

44 World Bank, 'Background Note: Putting a Price on Carbon with a Tax', p. 2, accessed from http://www.worldbank.org/content/dam/Worldbank/document/Climate/background-note_carbon-tax.pdf on 8.6.2016

45 World Bank Group and Ecofys, 'Carbon Pricing Watch 2016, An advance brief from the State and Trends of Carbon Pricing 2016 report, to be released late 2016'(2016), p. 6

46 Ministry of the Environment, The Government of Japan, accessed from https://www.env.go.jp/en/policy/tax/env-tax/20121001a_dct.pdf on 10.8.2016

47 Ibid.

48 Ibid.

to be effective, it can help to demonstrate that carbon pricing policies can work in emerging economies.

The Chilean Parliament approved the adoption of a national carbon tax in 2014, making Chile the first South American country to tax carbon emissions. The tax will be charged on the electricity generation sector. The measuring of CO2 emissions from thermal power plants is set to begin by 2017 and the tax is set to be applied on the power sector starting from 2018[49].

The tax covers the electricity generation sector, applying to all electricity generation facilities with a capacity equal to or larger than 50 MW. The scheme doesn't cover emissions from other prominent sectors such as industry, transport, commercial and residential sectors[50]. The rate of is set to be 5 US dollars per ton of carbon released for the year 2018. Reportedly, the tax is intended to play a central part in the country's voluntary target of cutting its GHG emissions by 20% by the year 2020 compared to 2007 levels[51]. The amount of the tax is liable for fluctuation depending on the exchange rate on the day of payment, since the level is calculated over US dollars[52]. Initial studies suggest that around 50% of energy produced in the country will be taxed under the carbon taxation instrument[53].

SOUTH AFRICA

South Africa is another good example of an emerging economy that is pursuing action against climate change by employing a carbon taxation mechanism. In 2013, a policy paper was issued by the government for public comment regarding the introduction of a carbon tax. The carbon tax is planned to cover all direct carbon emissions from fuel combustion and from non-energy related industrial processes. The scheme was set to be operational starting from January 2016[54], but later the adoption of the tax was delayed to be started from January 2017[55]. Under the draft legislation, the full tax rate is envisioned to be around 8 US dollars per ton of CO2 equivalent but offsets can be used for compliance and tax exemptions starting from 60% up to a maximum of 90%. This means that the effective tax rate will actually be between 0.4 and 3 US dollars per ton for most sectors. There are also plans to increase the tax rate by 10% on an annual basis until the year 2020. The draft of the carbon taxation is currently being revised following a public consultation process in the country[56].

The tax will function as a fuel input tax and will be covering all stationary direct emissions from fuel combustion and industrial processes. A tax system imposing the levy directly on emissions was also considered but such a system was found not to be feasible. All entities that emit more than 100,000 tons of GHG emissions annually or consume electricity that result in more than 100,000 tons of GHG emissions will be compelled to report their emissions[57]. It is reported that the tax will be covering around 80% of the

49 Reuters, 27.9.2014, 'Chile becomes the first South American country to tax carbon', accessed from http://uk.reuters.com/article/carbon-chile-tax-idUKL6N0R-R4V720140927 on 18.7.2016

50 Benavides, Carlos, Gonzales, Luis, Diaz, Manuel, Fuentes, Rodrigo, Garcia, Gonzalo, Palma-Behnke, Rodrigo and Ravizza, Catalina, 'The Impact of a Carbon Tax on the Chilean Electricity Generation Sector'(2015), Energies 8, p. 2675

51 Reuters, 27.9.2014, 'Chile becomes the first South American country to tax carbon', accessed from http://uk.reuters.com/article/carbon-chile-tax-idUKL6N0R-R4V720140927 on 18.7.2016

52 World Bank Group and Ecofys, 'State and Trends of Carbon Pricing'(2015), pp. 42-43

53 Wang, Xueman and Murisic, Maya, 'Towards a Workable and Effective Climate Regime, Chapter 19: Taxing carbon: Current state of play and prospects for future developments'(2015), World Bank, accessed from http://voxeu.org/sites/default/files/file/wang%20and%20murisic.pdf on 3.8.2016

54 World Bank, 'Background Note: Putting a Price on Carbon with a Tax', pp. 272-273, accessed from http://www.worldbank.org/content/dam/Worldbank/document/Climate/background-note_carbon-tax.pdf on 8.6.2016

55 World Bank Group and Ecofys, 'Carbon Pricing Watch 2016, An advance brief from the State and Trends of Carbon Pricing 2016 report, to be released late 2016'(2016), p. 11

56 Ibid.

57 Department of National Treasury Republic of South Africa, 'Carbon Tax Policy Paper'(2013), p. 12

country's total emissions[58]. However, in the first phase of the carbon tax implementation agriculture, forestry, land use and waste sectors will be completely exempt from the carbon tax due to difficulties in measurement of emissions[59]. According to the vision of the government, the carbon tax and the accompanying tax incentives will provide the necessary incentives to shift the economy towards a low carbon growth path[60].

The revenues generated by the tax will be used in a combination of 'soft earmarking', tax shifting and tax incentives. A part of the revenues will be used for programs promoting low carbon growth such as 'Independent Power Producers Program', Electricity Demand Side Management Program', 'Enhanced Free Basic Energy Program and 'Carbon Capture and Storage Rebate'. It is also envisioned that some of the existing taxes will be reduced or not be increased such as the electricity levy and a variety of environmental tax incentives will be provided such as an energy efficiency savings tax allowance[61].

Several studies that modeled the macroeconomic impact of a carbon tax for South Africa have shown that the carbon tax can be an important tool for achieving the mitigation targets of the country with a low cost to the country's economy[62].

58 World Bank, accessed from http://www.worldbank.org/en/results/2015/10/19/implementing-carbon-tax-south-africa on 18.8.2016

59 Department of National Treasury Republic of South Africa, 'Carbon Tax Policy Paper'(2013), p. 54

60 Wang, Xueman and Murisic, Maya, 'Towards a Workable and Effective Climate Regime, Chapter 19: Taxing carbon: Current state of play and prospects for future developments'(2015), World Bank, p. 268, accessed from http://voxeu.org/sites/default/files/file/wang%20and%20murisic.pdf on 3.8.2016

61 Morden, Cecil and Janoska, Peter 'Carbon Tax Policy Paper'(2014), Department of National Treasury Republic of South Africa

62 Ibid.

BRITISH COLUMBIA (CANADA)

The carbon tax mechanism in Canada's province of British Columbia is one of the foremost examples of the policy mechanism employed in a sub-state actor. It is also the first example of a carbon tax application in North America, the province having launched its carbon tax in 2008. The initial tax rate was set as 10 Canadian dollars per metric ton of CO_2[63] and was gradually increased to reach the equivalent of 23 US dollars on 2016[64].

The tax is applied on fuels used for road, rail marine, and air transportation within the borders of British Columbia, fuels used to generate heat for households such as natural gas and fuels used in industrial processes such as producing cement and drying coal. However, fuels exported from the province, fuels used in agriculture and all non-fossil fuel emissions like those from industrial processes, landfills and forestry are left out of the coverage of the tax[65]. Moreover, inter-jurisdictional transportation is left out of the scope of the tax such as fuels used by ships or planes traveling to or from British Columbia[66]. When the tax was first introduced, around 77% of all the GHG emissions in the province were covered but the figure dropped to 70% in 2012 as a result of the increase in non-combustion emissions from growing natural gas production[67].

63 Harrison, K. (2013), "The Political Economy of British Columbia's Carbon Tax", OECD Environment Working Papers, No. 63, OECD Publishing, p. 9 accessed from http://dx.doi.org/10.1787/5k3z04gkkhkg-en on 10.8.2016

64 World Bank Group and Ecofys, 'Carbon Pricing Watch 2016, An advance brief from the State and Trends of Carbon Pricing 2016 report, to be released late 2016'(2016), p. 6

65 Rivers, Nicholas and Murray, Brian 'British Columbia's revenue-neutral carbon tax:A review of the latest "grand experiment" in environmental policy'(2015), Energy Policy 86, p. 676

66 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, pp. 16-17

67 Harrison, K. (2013), "The Political Economy of British Columbia's Carbon Tax", OECD Environment Working Papers, No. 63, OECD Publish-

The amount of tax revenues collected by the mechanism is quite large, reaching around 1100 US dollars for the year 2013[68]. British Columbia's carbon tax is designed to be revenue neutral in order to encourage low carbon growth without increasing the tax burden on its citizens. A binding legislative commitment was made at the inception of the tax in order to ensure that all carbon tax revenues are returned to the households and firms[69]. Several measures taken by the government for this aim include rebates in personal income tax, a 'climate action tax credit' for low-income households, a business rate cut, a corporate tax rate cut and additional cuts in industrial and farm property taxes. Also, a one-time check of 100 Canadian dollars was distributed to the residents of British Columbia in 2008[70]. It is also compulsory for the British Columbia Ministry of Finance to annually prepare a three-year plan which outlines the measures that will be taken for the recycling of the carbon tax revenues[71].

It has been generally accepted that the British Columbian carbon taxation scheme has been successful for the most part. The tax system has enjoyed considerable public support and has achieved a significant level of emissions reduction without compromising economic development. It was estimated that the tax mechanism would reduce the carbon emissions from British Columbia by 3 million metric tons annually by the year 2020[72]. Between the years 2008 and 2011, British Columbia succeeded in reducing its emissions per capita from the sources covered by the carbon tax by 10%. Whereas, the rest of Canada only managed the reduce their emissions from the same sources by 1% in the same period[73]. Also, it was reported in 2014 that since the inception of the carbon tax, fuel use in British Columbia dropped by 16% while it rose by 3% in the rest of Canada[74].

There are conflicting views on the equity implications of the carbon tax scheme in British Columbia. Some researchers have been criticizing the program for not fully compensating the low income households due to increased energy prices. However, other studies such as the research undertaken by Beck et al suggest that this criticism is unfounded and the tax scheme has been employed equitably over the society[75].

AUSTRALIA

As the country with the highest per capita GHG emissions in the world, the mitigation needs of Australia are considerable[76]. In 2012, A carbon tax policy was implemented in the country to address this problem. However, the carbon tax experiment in the country has been short lived as the tax only stayed operational for a period of two years. The tax was introduced in 2012 and was repealed in 2014, making Australia the

ing, p. 9 accessed from http://dx.doi.org/10.1787/5k3z04gkkhkg-en on 10.8.2016

68 Carl, Jeremy and Fedor, David, 'Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world'(2016), Energy Policy, Volume 96, pp. 50-51

69 Harrison, K. (2013), "The Political Economy of British Columbia's Carbon Tax", OECD Environment Working Papers, No. 63, OECD Publishing, p. 9, accessed from http://dx.doi.org/10.1787/5k3z04gkkhkg-en on 10.8.2016

70 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 17

71 Rivers, Nicholas and Murray, Brian 'British Columbia's revenue-neutral carbon tax:A review of the latest "grand experiment" in environmental policy'(2015), Energy Policy 86, p. 676

72 Sumner, Jenny, Bird, Lori and Smith, Hillary, 'Carbon Taxes: A Review of Experience and Policy Design Considerations'(2013), National Renewable Energy Laboratory, p. 17

73 Wang, Xueman and Murisic, Maya, 'Towards a Workable and Effective Climate Regime, Chapter 19: Taxing carbon: Current state of play and prospects for future developments'(2015), World Bank, p. 272, accessed from http://voxeu.org/sites/default/files/file/wang%20and%20murisic.pdf on 3.8.2016

74 The Globe and Mail, 9.8.2014, 'The shocking truth about B.C.'s carbon tax: It works', accessed from http://www.theglobeandmail.com/opinion/the-insidious-truth-about-bcs-carbon-tax-it-works/article19512237/ on 20.7.2016

75 Beck, Marisa, Rivers, Nicholas, Wigle, Randall and Yonezawa, Hidemichi, 'Carbon tax and revenue recycling: Impacts on households in British Columbia'(2015), Resource and Energy Economics 41, p. 60

76 Spash, Clive L. and Lo, Alex Y., 'Australia's Carbon Tax: A Sheep in Wolf's Clothing?'(2012), The Economic and Labour Relations Review Vol. 23 No. 1, p. 68

first and only country to abolish a carbon tax[77].

The tax introduced in 2012 put a levy of 23 Australian dollars per ton of CO2 equivalent on selected fossil fuels consumed by large industrial facilities and government bodies. The tax levels were indexed to inflation and rose to 24.15 US dollars on 2013 and to 25.4 US dollars on 2014[78]. The scheme applied to facilities that emit more than 25000 tons of CO2 equivalent on a yearly basis. Transport fuels and the agricultural sector were completely left out of the coverage of the tax, however there were plans to include heavy on-road vehicles under the taxation scheme starting from 2014[79]. In effect, the tax would only cover large electricity generators and large industrial plants in the country. Despite this, it was estimated that the carbon tax would cover around 60% of the country's total emissions[80].

Additionally, several measures were taken to offset the impact of the tax on some sectors. The income taxes were reduced and pensions and welfare payments were slightly increased to cover the expected increases in prices. Several additional compensation mechanisms were also introduced for some affected industries.

Despite the tax scheme left major parts of the country's emissions outside of its coverage, a report by the Australian National University estimated that the policy mechanism managed to cut the carbon emissions of the country by 17 million tons in 2013. This figure marks the highest emissions reduction in the country in 24 years of records. It is reported that a large part of this reduction originated from the electricity sector[81]. In 2013, it was reported that electricity generation using the highly polluting lignite coal for nine months had fallen by 14% compared with the same period a year early. Electricity generation by using conventional coal had also fallen by 5% in the same period while electricity generated by renewable sources increased by 28%. Although other factors have also played a part in this change in electricity generation, it can be argued that the employment of the carbon tax played a large role in this large change in the electricity generation mix between the two years[82]. The trajectory that the country's emissions followed after the repeal of the tax clearly shows that the carbon tax was at least partially successful. As soon as the tax was abolished, the emissions caused by the electricity generation sector started to rise rapidly as a result of the increased utilization of lignite due to falling prices[83].

After its implementation, the carbon tax failed to receive widespread support from the society. The policy instrument was one of the hotly debated topics prior to the elections in 2013, with the leader of the Liberal Party Tony Abbott promising to revoke the tax if elected. After the victory of the Liberals in the election, the tax was repealed in accordance with the pre-election promise[84]. After the repeal of the carbon tax, the government set up the Emission Reduction Fund from the consolidated revenues[85]. It is estimated

77 The Guardian, 17.8.2016, 'Carbon tax is gone: Repeal bills pass the Senate', accessed from http://www.theguardian.com.au/story/2423819/carbon-tax-is-gone-repeal-bills-pass-the-senate/?cs=8 on 3.8.2016

78 Government of Australia, accessed from http://www.cleanenergyregulator.gov.au/Infohub/CPM/About-the-mechanism on 16.8.2016

79 ABC, 14.2.2012, 'Farming and the carbon tax: what's in store?', accessed from http://www.abc.net.au/news/2011-07-15/carbon-tax-farmers/2795816 on 14.8.2016

80 Government of Australia, accessed from http://www.cleanenergyregulator.gov.au/Infohub/CPM/About-the-mechanism on 16.8.2016

81 The Sydney Morning Herald, 13.7.2014, 'Fall in Greenhouse Gas Emissions Largest in 24 Years', accessed from http://www.smh.com.au/environment/climate-change/fall-in-greenhouse-gas-emissions-biggest-in-24-years-20140613-zs7be.html on 7.8.2016

82 The Age, 10.5.2013, 'Carbon price working? Coal slumps, Clean energy soars', accessed from http://www.theage.com.au/federal-politics/political-news/carbon-price-working-coal-slumps-clean-energy-soars-20130509-2jals.html on 13.8.2016

83 The Guardian, 19.12.2014, 'Politics in 2014: the Coalition dished out slogans, and its sentence is clear', accessed from https://www.theguardian.com/australia-news/2014/dec/19/politics-in-2014-the-coalition-dished-out-slogans-and-its-sentence-is-clear?CMP=share_btn_tw on 13.8.2016

84 The New York Times, 24.7.2014, 'A Carbon Tax's Ignoble End, Why Tony Abbott Axed Australia's Carbon Tax', accessed from http://www.nytimes.com/2014/07/25/opinion/julia-baird-why-tony-abbott-axed-australias-carbon-tax.html on 13.8.2016

85 Australian Government, 'Emissions Reduction Fund White Pa-

that only a third of the country's emissions reduction target of 5% will be able to be met by the new policy tool by 2020[86].

The governments rationale in repealing the carbon tax mainly involved the argument that the tax was hurting the livelihoods and citizens and having a negative impact on the economy and the country's international competitiveness. It is argued that the costs of living would be significantly reduced, electricity and gas prices would decrease and economic growth would be promoted with the repeal of the tax[87].

A General Overview

Country	Date Operational	Current Level (USD per ton of CO2e)	Sectors Covered	Utilization of Revenues	Exemptions from the Tax
Finland	1990	62(heating) - 66(transportation)	Economy-wide	Corporate Tax Cuts Income Tax Cuts	Full Exemptions for Several Sectors Partial Exemptions for Energy Intensive Industries
Sweden	1991	137	Economy-wide	Corporate Tax Cuts Income Tax Cuts Energy price adjustments	Partial Exemptions for Industry and facilities Operating under EU-ETS
British Columbia	2008	23	Economy-wide	Corporate Tax Cuts Income Tax Cuts Rebates granted to low-income households	Fuels exported Agriculture Non-fossil fuel emissions from industrial processes, landfills and forestry Inter-jurisdictional transportation
Japan	2012	3	Economy-wide	Earmarking for the Promotion of Low Carbon Economy	Exemptions for Strategic Sectors
United Kingdom	2013	26	Electricity Generation	Transferred to Government Budget without earmarking	Generators with capacity lower than 2 MW
France	2014	25	Economy-wide	Earmarking for Promotion of Green Energy	Facilities covered by EU-ETS
South Africa	2017	8	Economy-wide	Earmarking for Low Carbon Growth + Tax Shifts and Tax Incentives	Partial Exemptions for Several Sectors Agriculture, Forestry, Land use and Waste sectors exempt for the first phase
Chile	2018	5	Electricity Generation	Not specified	Generators with capacity lower than 50 MW

per'(2014), accessed from https://www.environment.gov.au/system/files/resources/1f98a924-5946-404c-9510-d440304280f1/files/emissions-reduction-fund-white-paper_0.pdf on 7.8.2016

86 The Sydney Morning Herald, 13.7.2014, 'Fall in Greenhouse Gas Emissions Largest in 24 Years', accessed from http://www.smh.com.au/environment/climate-change/fall-in-greenhouse-gas-emissions-biggest-in-24-years-20140613-zs7be.html on 7.8.2016

87 Government of Australia, Ministry of Environment, accessed from https://www.environment.gov.au/climate-change/repealing-carbon-tax on 15.8.2016

The main features of the carbon tax policies employed in the cases studied can be viewed in the table above. Carbon tax policy designs that are being employed around the world differ in a wide range of ways. The main distinctions are whether the tax is applied on the whole economy or only on selected sectors, how the revenues are used and whether there are partial or full exemptions made available for certain sectors. The level of taxation also differs greatly from only around 3 US dollars per ton in Japan to 137 US dollars per ton employed in Sweden. Each tax design is tailor made for the specific conditions in each country and in many cases has evolved over time to adjust to changing conditions.

IMPORTANT POINTS FOR TURKEY

Looking at the case studies, there are several takeaways that can be drawn for a future carbon tax that can be employed in Turkey.

- Pursuing climate change action by adopting carbon pricing measures has for long been viewed to mainly be the responsibility of rich industrialized nations. However, carbon pricing mechanisms are lately being adopted by countries that still have significant development needs. Carbon tax policies are currently adopted in countries like Chile, South Africa and Mexico and several other developing countries are considering the employment of similar measures. There currently is a consensus that significant amounts of action should be undertaken by the developing world for the global increases in temperature to be contained at relatively safe levels. Therefore, the possible employment of a carbon taxation mechanism in Turkey should not be readily dismissed by pointing out at the levels of economic development. Rather, the focus of the discussion in the country should be how best to design the carbon pricing policies so that maximum amounts of GHG mitigation can be achieved with minimum harm to the country's developmental prospects and without exacerbating the country's dependence on imported energy sources.

- Setting the right level for the tax is of utmost importance for a carbon tax mechanism to be successful. As an emerging economy, Turkey can't be expected to initiate its carbon tax at a level comparable to the high rates of well-established tax schemes in industrialized countries. The tax rates applied in developing countries such as South Africa and Chile can provide a better measure for determining the initial level of a potential carbon tax level to be employed in Turkey. Initiating the carbon tax at an overly high level can impede the country's competitiveness and risk the survival of the policy mechanism due to opposition from the public. Just as the country's climate change responsibilities shouldn't be disregarded in favor of economic development, the country's developmental needs should not be disregarded for the purpose of furthering its climate change mitigation objectives. Any policy design should consider both problems and include provisions to address both issues in a holistic manner.

- There is also the need the specify a clear timetable for gradually increasing the tax levels into the future. A gradual increase would give time for businesses to adapt to new conditions and can help to minimize any potential negative effects on the economy. Also, with long term targets for increases in the tax level, a long term mitigation target can be realized by providing the economic actors with the necessary signals for transitioning to a low carbon mode of production. In the cases that were examined, the tax rates were gradually increased over time, and some countries like France have adopted targets well into the future for preparing their economies in advance. Long term planning and providing an outlook into the future should be key aspects of a successful carbon pricing policy design.

- Designing an economy-wide tax would be the most ideal choice since such a scheme would offer the most efficient opportunities for emission reductions across a wide range of sectors. It has been observed from sev-

eral cases like Sweden that applying varying tax rates for different sectors can cause distortionary effects in the economy and prevent the full benefits of the tax from being realized. However, it may also be necessary to protect key sectors which can potentially be adversely affected especially in terms of international competitiveness. Also, in some cases, there may be concerns that carbon taxation can exacerbate import dependence in energy sources. In several cases such as the carbon tax systems in Finland and Japan, special exemptions were provided to protect the industries that are deemed strategic. Such provisions will likely be needed to designed in a potential carbon tax system that will be employed in Turkey. Overall, there is a need for a careful balance to be struck between applying the tax as uniformly as possible across the economy and between the need to protect key industries by introducing specific exemptions.

- Instead of adopting a completely new structure and the accompanying changes in legislation, it can be easier to frame the new tax on the structure of the existing taxes. Fuel input taxes that are already being employed can be important in this regard. Some tax systems such as in Finland and South Africa are designed as fuel input taxes at their inception to avoid the additional costs of designing a completely new tax structure. Such an approach could reduce the costs associated with the implementation of the new tax scheme.

- Another key decision that needs to be made is how the revenues collected from the carbon tax will be used. In this regard, the two main options are designing the tax as revenue neutral by offsetting the additional effects of the tax by providing relief from other taxes through various means or earmarking the additional revenues for a specific use such as the promotion of low carbon energy sources. A revenue neutral tax can garner more support from the public while the emission reduction impacts would be greater if the revenues are used for additional mitigation programs. Both options are currently being used by different countries and in some systems a combination of the two options is being utilized.

- Carbon taxes can potentially have negative impacts on low income households by increasing energy prices and making livelihoods more expensive. In Turkey, a significant portion of the population still live below the poverty threshold. It is important to consider the potential effects of the tax on these households and apply the necessary provisions to protect these segments of the population from any negative effects. Such design elements are incorporated into several carbon tax designs such as that in British Columbia. A portion of the revenues collected from the tax can potentially be used to promote social justice.

- The impacts of a policy mechanism on a country's emission stock and the economy can be hard to single out since a plethora of other factors also influence the outcomes. However, to be able to modify the carbon tax over time as necessary, there is a need to estimate its effects. Therefore, an effective monitoring and verification system has to be set up. Clear emission reduction targets for the tax should be specified in order to assess the success of the tax and modifications should be made if the expected results from the tax are not achieved.

- Ensuring sustained public support for the tax is another critical point for the success of the policy instrument. Application of an additional tax is usually not a popular policy from the view of the general public even if the tax is designed to be revenue neutral. The carbon tax experiment in Australia shows that in the absence of public acceptance, even relatively successful carbon taxation policies can be overturned in a relatively short amount of time. Therefore, the rationale behind the employment of the policy should be clearly communicated to the public through various means in order to increase support for the policy well in advance of its implementation.

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Carbon Taxation Policy Case Studies

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