Andorra: information on national emissions, population and GDP, and mitigation targets

September 22, 2020

Authors:
Annika Guenther[1]
Johannes Guetschow[1]
Affiliations:
1. Potsdam Institute for Climate Impact Research, Germany

TODO

- Table with info on target (main and reclass; emissions from NDC; target quantis + plot).

- GWP: NDC emissions coverted from AR2 to AR4 by national conversion factor (2010–2017, PRIMAP-hist v2.1).

- References!

1 Non-LULUCF emissions and socio-economic data

With national emissions of 581.0 kt CO_2eq, Andorra contributed 0.001% to global emissions in 2017, and in 2030 its share is estimated to stay at a similar level (Table **??**). The estimates for 2030 are based on the downscaled SSP2[1] Middle of the Road marker scenario (dmSSP2), in which Andorra is estimated to emit 578.6 kt CO_2eq in 2030. That change in emissions would constitute a decrease of -0.4% compared to 2017. The pathways dmSSP1–5 show a range of 578.6–578.6 kt CO_2eq in 2030, and 578.6–578.6 kt CO_2eq in 2050. The country's global rank in terms of total emissions per unit of GDP[2] was nan in 2017, and 62 regarding the per-capita emissions (nan and 71 in 2030). In terms of accumulated historical emissions, Andorra contributed to the global 1850–2017 emissions by 0.001%. When only accounting for the years 1990–2017, its contribution stays the same to 0.001%. All of the emissions are

---

[1]**SSPs**: Shared Socio-economic Pathways. Narratives and challenges to mitigation and adaptation: SSP1: Sustainability, Taking the Green Road (low / low); SSP2: Middle of the Road (medium / medium); SSP3: Regional Rivalry, A Rocky Road (high / high); SSP4: Inequality, A Road Divided (low / high); and SSP5: Fossio-fuelled Development, Taking the Highway (high / low).

[2]**GDP**: Gross Domestic Product. Throughout this document the GDP is given as GDP PPP, with PPP being the Purchasing Power Parity.

presented following GWP AR4[3], and exclude emissions from LULUCF[4] (exclLU), and bunkers fuels[5] emissions (exclBunkers).

Table 1: National emissions (dmSSP2), GDP and population for Andorra, together with the emissions per unit of GDP and per capita emissions (all for 2017 and 2030). Additionally, the global share and its rank are displayed.

	Year	Total	Unit	Glob. share	Rank
Emissions	2017	581.0	kt CO_2eq	0.001%	180
	2030	578.6	kt CO_2eq	0.001%	180
GDP	2017	nan	2011 GK\$	nan%	nan
	2030	nan	2011 GK\$	nan%	nan
Emissions	2017	nan	t CO_2eq / 2011 GK\$	nan%	nan
per GDP	2030	nan	t CO_2eq / 2011 GK\$	nan%	nan
Population	2017	77.0	Thousand Pers	0.001%	189
	2030	79.1	Thousand Pers	0.0009%	189
Emissions	2017	7.5	t CO_2eq / Pers	0.5%	62
per capita	2030	7.3	t CO_2eq / Pers	0.4%	71

For Andorra, in 2017 the main emissions share on sectoral level (Fig. **??**) came from the Energy sector (86.7%), followed by IPPU (10.4%), and Agriculture (1.6%). The Kyoto GHG[6] with the highest emissions in 2017 was CO_2, constituting as much as 93.1% of the national emissions. Second largest contributor was HFCs (2.3%), followed by CH_4 (2.3%). The total of F-gases[7] only represented 2.7%. The total CO_2 emissions are expected to be 93.2% of the national Kyoto GHG emissions in 2030 (dmSSP2).

The national GDP decreased in recent years, and the emissions per unit of GDP had an opposite trend (Fig. **??**). The population decreased, while the per capita emissions dropped. Following dmSSP2, the GDP is projected to The emissions per GDP are estimated to Andorra's population is assumed to grow after 2017 but to diminish again before 2050, and the per capita emissions are expected to decline towars 2050.

2   LULUCF emissions

LULUCF emissions data for Andorra are available from the following sources (Fig. **??**): BUR (3rd), BUR (2nd), FAO (2019).

High fluctuations? Data gaps? Difference between sources?

---

[3]**Global Warming Potential (GWP)**: we use GWP values from the IPCC 4th Assessment Report (AR4). They reflect the forcing potential of one kilogram of a gas' emissions in comparison to one kilogram of CO_2 ($GWP_{CO2} = 1$). The GWPs correspond to a 100-yr period and are for CH_4: 25, for N_2O: 298, for SF_6: 22800, and for NF_3: 17200. For the basket of HFC-gases the GWPs from AR4 are in the range 4–14800, and for PFCs 7190–12200. To assess emissions of several GHGs, their emissions are weighted by their respective GWPs and presented in CO_2 equivalents (CO_2eq).

[4]**LULUCF**: Land Use, Land-Use Change and Forestry. Emissions from LULUCF are excluded throughout the document, unless stated otherwise.

[5]**Bunkers fuels**: emissions from international aviation and shipping.

[6]**Kyoto GHG** (Greenhouse Gas) basket: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

[7]**F-gases** (fluorinated gases): basket of HFCs, PFCs, and the gases SF_6 and NF_3. Some F-gases have very long atmospheric lifetimes and high Global Warming Potentials.
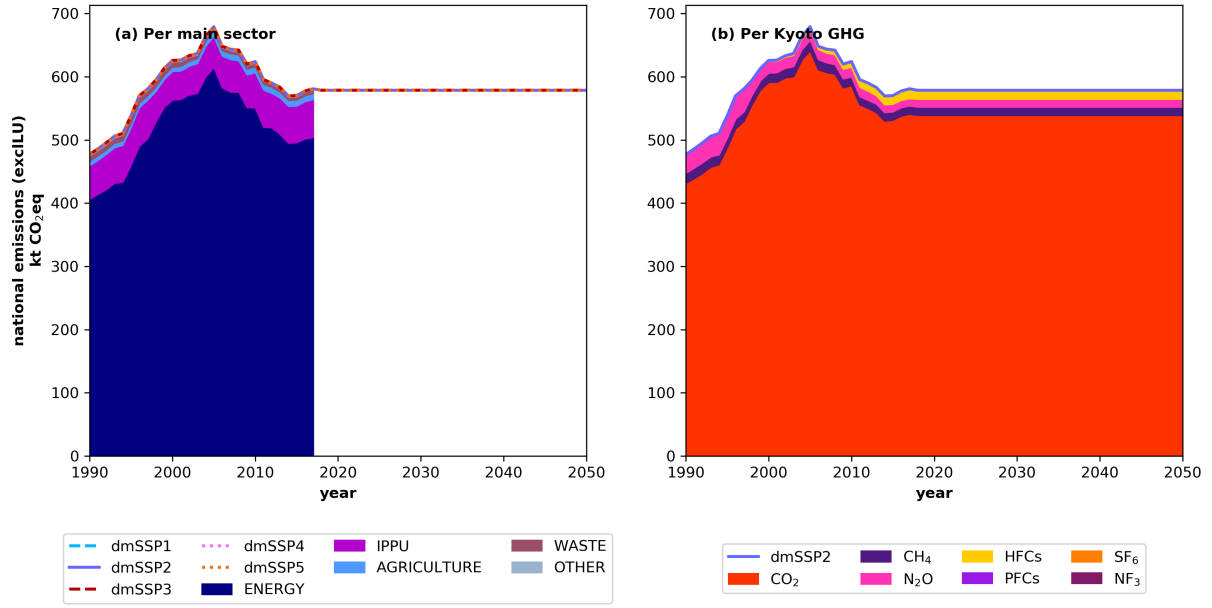
Figure 1: 'Stacked' timeseries of national emissions (exclLU) per main-sector (a) and Kyoto GHG (b). No information available on the sectoral contributions after 2017.
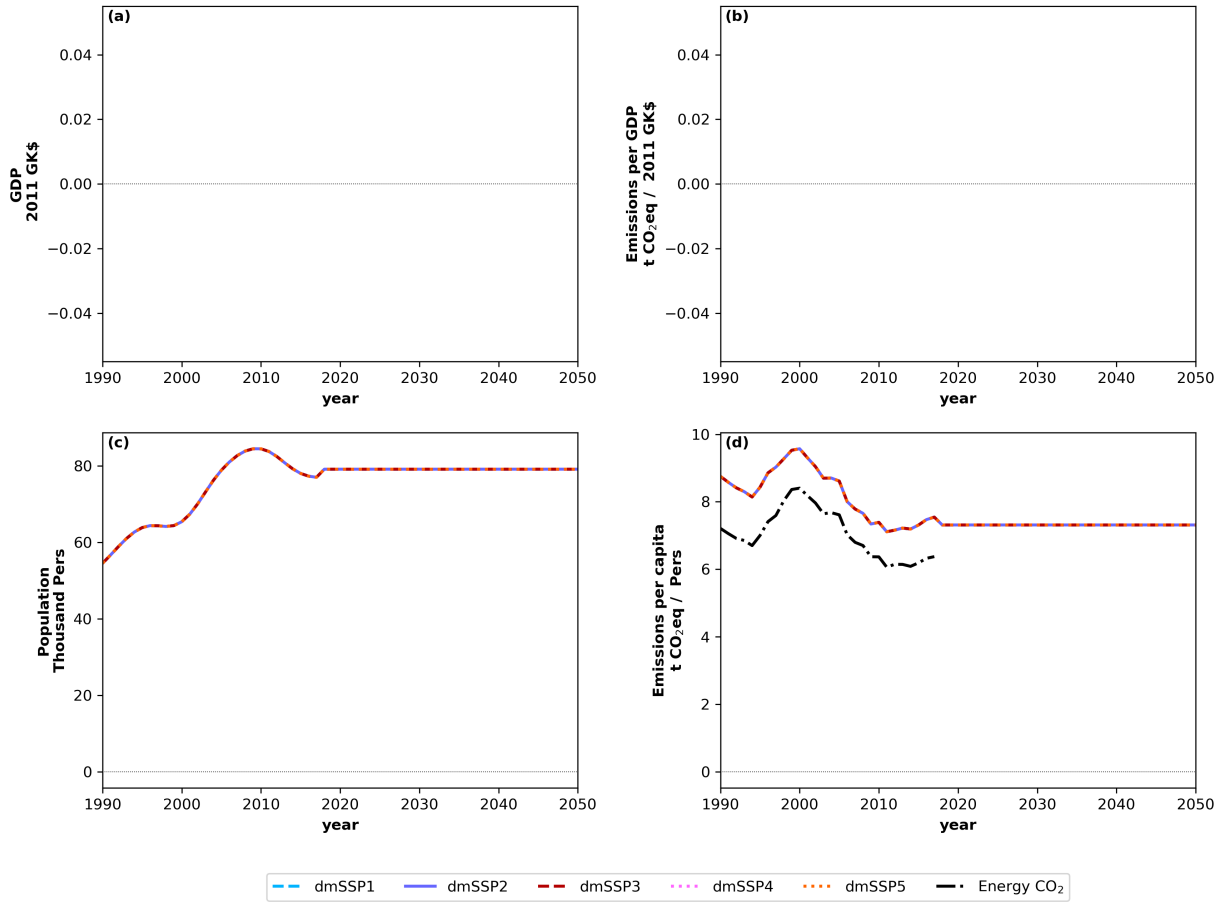

Figure 2: Timeseries of national GDP (a) and population (c), and Kyoto GHG emissions (exclLU, exclBunkers) per unit of GDP (b) or per capita (d).
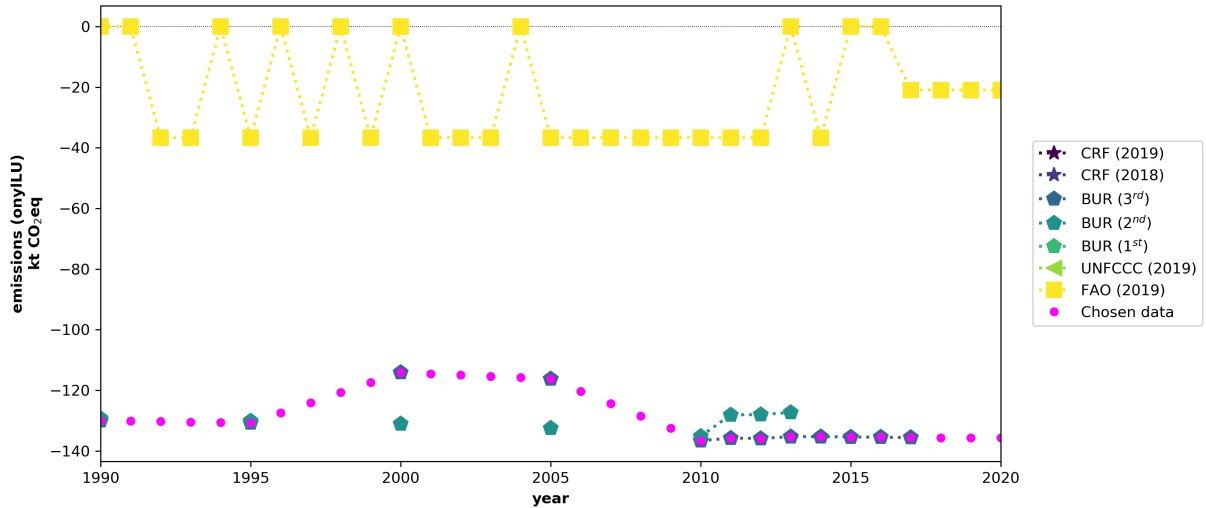
Figure 3: Timeseries of emissions from LULUCF (CO$_2$ plus CH$_4$ and N$_2$O) as available from different data-sources. Indicated in pink are the 'chosen' data, as used in our assessment of Andorra's NDC (if needed). The pink timeseries was inter- and / or extrapolated (interpolation: linear, extrapolation: constant).

3   Mitigation targets (NDC)

Give the %cov for the base and target year (and 2017). Global share for 2030 for the mitigated pathways and % reduction relative to 1990 and 2017. Table with the 'input' data and the resulting targets (like ndcs_targets.csv). Andorra has an NDC, with a GHG mitigation target of the type ABU (absolute reduction compared to Business-As-Usual; main target type). The reclassified[8] target type is ABS (absolute emissions target).

Table 2: Information on Andorra's GHG mitigation target(s).

type	condi.	range	value	tarYr	LU
ABU	uncondi.	best	-0.19 Mt CO$_2$eq SAR	2030	exclLU
ABS	uncondi.	best	0.33 Mt CO$_2$eq SAR	2030	exclLU

4   Data sources and references

PRIMAP-hist v2.1: emissions from PRIMAP-hist are data from the country reported data priority scenario (HISTCR).

---

[8]**Reclassification**: when a country has, e.g., an RBU target (relative reduction compared to Business-As-Usual), and the BAU emissions are provided, it can be quantified based on the given emissions, and is reclassified from type_main RBU to type_reclass ABS (absolute emissions target). Additionally, 'NGT' targets can be reclassified as 'ABU' (absolute reduction compared to Business-As-Usual) if absolute mitigation effects due to planned policies and measures are provided.
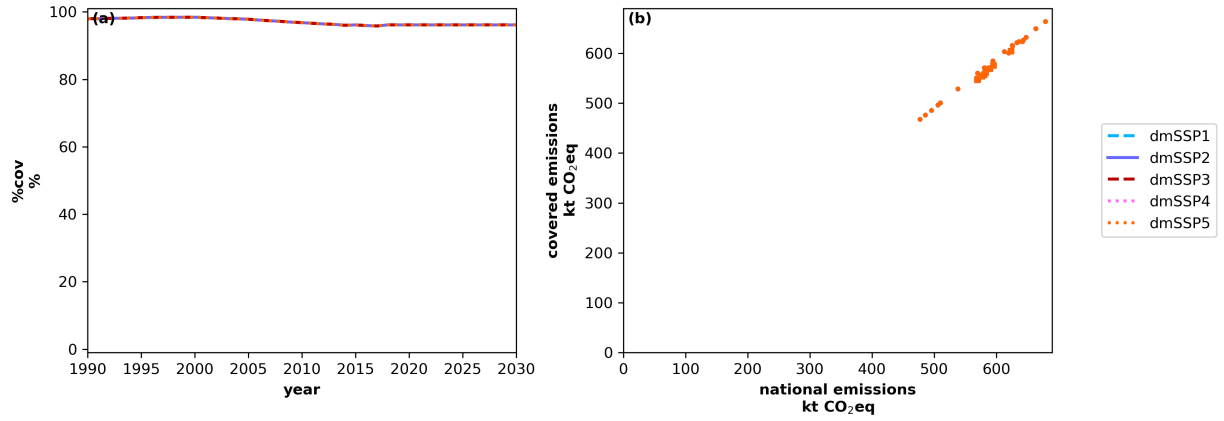
Figure 4: Timeseries of Andorra's national emissions (exclLU) and the share of emissions that is assumed to be covered by Andorra's mitigation target.

Table 3: Information on covered sectors and gases as retrieved from NDC and adapted ('Adap.': used to calculate %cov), and their shares in Andorra's 2017 emissions (exclLU, exclBunkers; total 581.0 kt CO_2eq). If either the sector or gas is assessed as 'not-covered', the emissions from this sector-gas combination are counted as not-covered ($-$). Else the emissions are counted as covered ($+$; covered shares given in bold). (/) means that no information is available. LULUCF: NDC '$-$' and adapted '$-$' (estimated as a net sink of -135.6 kt CO_2eq in 2017; based on the 'chosen' LULUCF emissions).

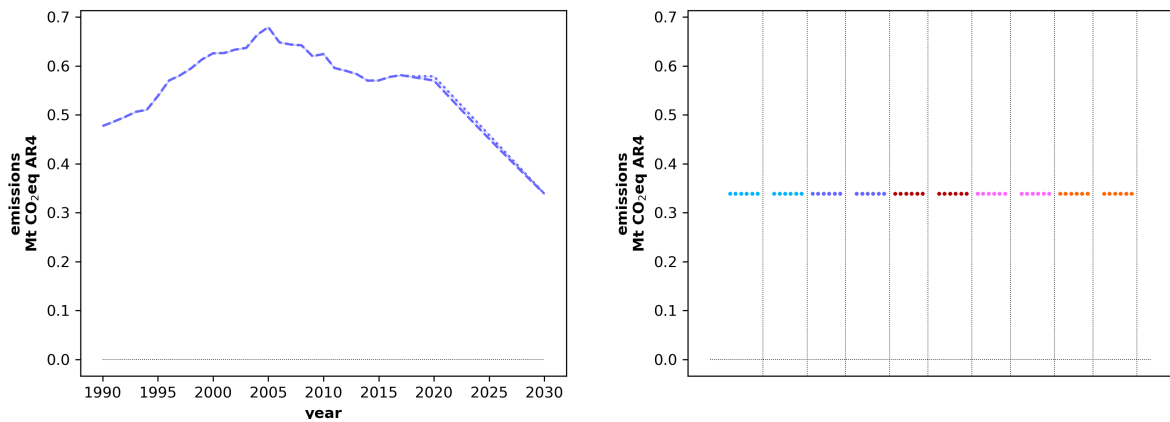|	NDCs	Adap.	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Total
NDCs			+	+	+	/	/	+	/	
Adap.			+	+	+	$-$	$-$	+	$-$	
Energy	+	+	**84.5%**	**1.3%**	**0.9%**	/	/	/	/	86.7%
IPPU	/	+	**7.6%**	**0.0%**	**0.03%**	2.3%	/	**0.3%**	/	10.4%
Agri.	$-$	$-$	0.3%	0.9%	0.3%	/	/	/	/	1.6%
Waste	+	+	**0.6%**	**0.0%**	**0.4%**	/	/	/	/	1.0%
Other	/	$-$	/	/	0.2%	/	/	/	/	0.2%
Total			93.1%	2.3%	2.0%	2.3%	/	0.3%	/	100.0%

Figure 5: Quantified mitigation targets (based on different input data and calculation options). Vertical lines: conditionality / range; colour coded: dmSSP1–5; first / second set of six: prio NDCs / SSPs; set of six: coverage 100, lulucf unfccc, lulucf fao, bl uncondi, const emi, estimated coverage.

5