20 May 2021

'Paris model' reporting for the water sector in Denmark

Contents

1 Reporting information for the water sector under the 'Paris model'

1.1 Background

The 'Climate plan for a green waste sector and circular economy[1]' political agreement of 16 June 2020 establishes that: *"A 'Paris model for an energy- and climate-neutral water sector' must be implemented. Under the model, the Ministry of Environment and Food of Denmark will urge all drinking water and waste water companies subject to the Danish Water Sector Act to report their ambitions in relation to energy consumption, energy production, CO2 emissions, nitrous oxide emissions and methane emissions to the Danish Environmental Protection Agency in the lead-up to 2030."* This scheme and the reporting it involves are optional for companies.

The purpose of the aforementioned reporting is to get the water companies to increase their focus on energy and climate performance so that the water sector is in a position to contribute to national climate-related targets and ambitions to an even greater extent. The sector and the government also believe that if the Danish water sector can prove that it is possible to become energy- and climate-

[1] https://www.regeringen.dk/media/9591/aftaletekst.pdf

neutral, this will help to motivate the water sectors in other countries to become energy- and climate-neutral themselves and reduce global emissions of greenhouse gases.

In autumn 2020, a reporting model was developed based on the background report published by the government's 'Waste and water, circular economy' climate partnership of[2] 16 March 2020, which envisions energy and climate neutrality in the water sector by 2030. Data about the water companies' climate footprint from consumption of chemicals, buildings and construction as well as transport activity are not covered by the model, as the view was taken that the figures belong elsewhere in the national climate accounts, and that it would be too laborious administratively for the companies to calculate this.

There has never been any expectation of total precision for all the parameters in question in the predicted development reported by the companies, nor is the reporting binding for the companies. The ambitions will be reported based on current knowledge and will use the expected developments at the participating companies as their starting point. As such, the results presented here should also be interpreted with some caution and seen as an initial attempt and first step towards outlining – and hopefully providing a helpful tool for – the water sector's road to energy and climate neutrality.

1.2 High level of commitment from sector

On 1 December 2020, 227 drinking water companies and 100 waste water companies subject to the provisions of the Danish Water Sector Act received a questionnaire asking them about their energy and climate ambitions – in five-year intervals up to 2035 - together with a letter from Environment Minister Lea Wermelin, urging them to take part in the study.

Although participation was optional, the Danish Environmental Protection Agency subsequently received reports from 105 drinking water companies and 81 waste water companies. The reports are representative of 75% of the water volume charged for the drinking water companies under the Danish Water Sector Act and 87% of the water volume charged for the waste water companies.

The large amount of support for the study tells us that the work to improve its energy and climate accounts is a focus in the water sector. Many companies also went beyond filling out the questionnaire with their anticipated values for developments by adding comments and further explanation of their calculations, which could be used in other work in the future.

1.3 The water sector's road to energy neutrality

Water companies subject to the provisions of the Water Sector Act have to submit reports each year for the Danish Environmental Protection Agency's performance benchmarking, which includes reporting data on energy consumption and production. The information reported for 2019's performance benchmarking reveals 70% overall self-sufficiency for energy at waste water companies, with certain waste water companies even producing more energy than they use. For drinking water companies, meanwhile, the options are less obvious when it comes to producing energy for internal use, so their self-generation is limited.

Figure 1 shows us how the reported, anticipated net energy consumption is set to develop up to 2035 for the drinking water and waste water sectors, as well as for the sector as a whole. It also shows us that the group of waste water companies that have been submitting information using the current reporting basis can expect to be energy-neutral by 2030, if looked at as a whole, while the drinking

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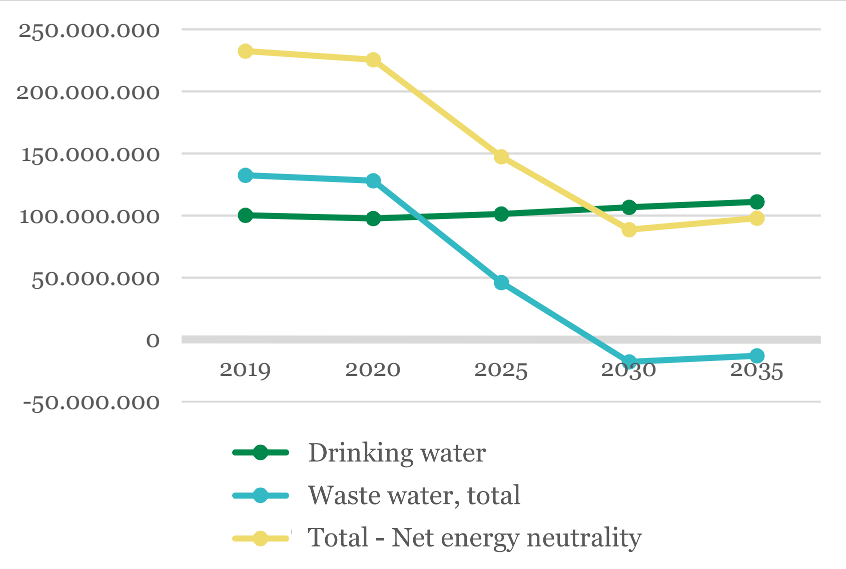
[2] https://mfvm.dk/fileadmin/user_upload/klimpartnerskab_afrapportering-for-affald-vand-og-cirkulaer-oekonomi.pdf

water companies cannot – within this same period of time – meaning that the water companies as one combined group cannot achieve the target either.

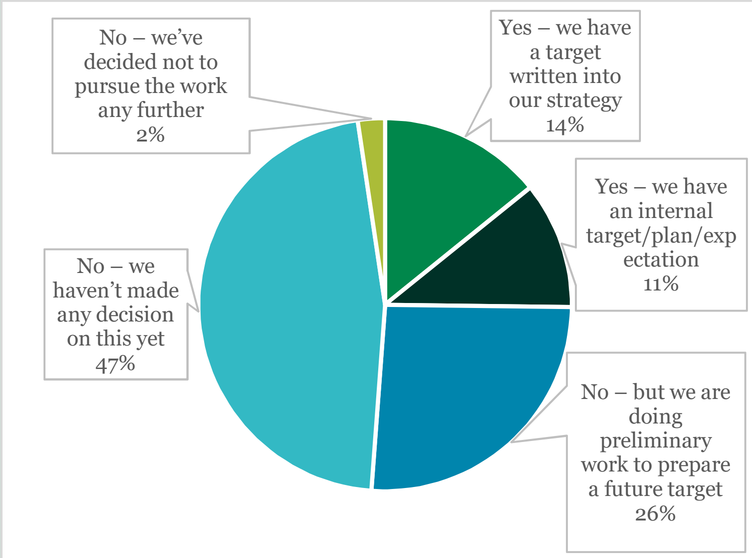
FIGURE 1. Anticipated net energy consumption (kWh)



Due to the ways in which the model has been delimited, some forms of energy production are not included; this is because the benefit gained is generally attributed to a different sector, and this presumably could bring that sector as a whole closer to energy neutrality e.g. production of district heating for the district heating company in the respective supply area. Looked at in relation to the climate account, however, energy looks set to decrease further and further proportionally as a result of the energy mix changing to include more green power and the subsequent lower emission factor for electricity.

Otherwise, the reported information tells us that relatively few companies have any actual target adopted for energy neutrality strategically or internally; see Figure 2. As such, the companies' input in this area is only formalised in set targets to a limited degree.

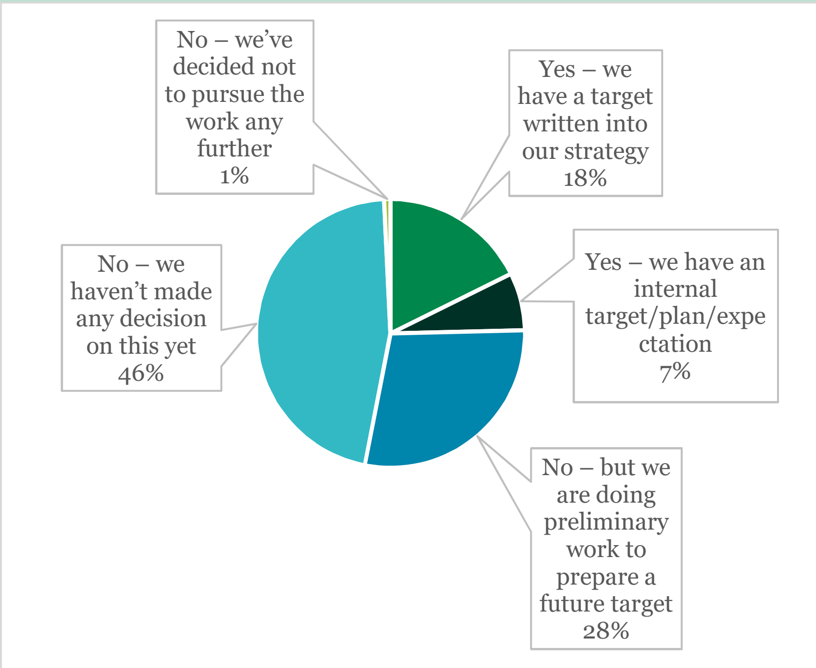
FIGURE 2. Target set for energy neutrality



1.4 The water sector's road to climate neutrality

As established in Figure 3, only a limited number of companies have formalised a climate neutrality target in their strategy or adopted this type of target internally – just one in every four companies, the same as for energy neutrality. This has not stopped many companies from being very active in this area, however.

FIGURE 3. Target set for climate neutrality



In the case of drinking water, the reports submitted for the Paris model provide data for energy consumption and production as well as for afforestation, while in the case of waste water, data is provided for energy consumption and energy production, nitrous oxide emissions from treatment processes, methane emissions from biogas tank leakage, nitrous oxide emissions from the discharge of nitrogen, and methane emissions from septic tanks.

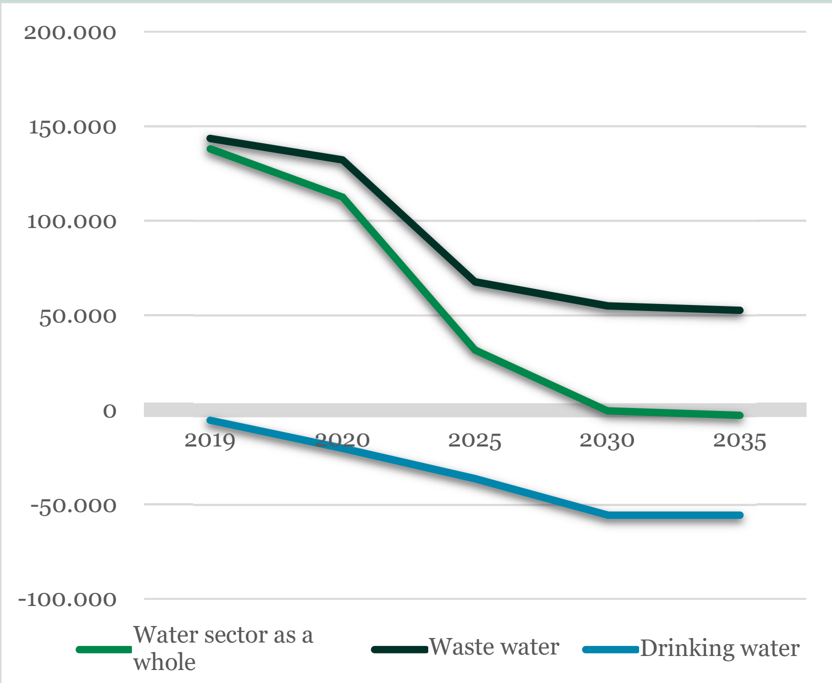
Finally, drinking water and waste water companies both have the option to describe any other CO2 limiting activities. For the waste water companies, the volume of nitrogen removed (including the nitrous oxide emissions into nature avoided as a result) is also reported.

Figures 4a and 4b below show calculations of the climate contribution with and without the impact on climate of the nitrogen being removed respectively. Figure 4a therefore shows the anticipated development of the overall climate contribution for the participating drinking water and waste water companies and for all the participating water companies when the effect of removing nitrogen is *not* factored in.

FIGURE 4a. Anticipated climate contribution

Reduction in nitrous oxide discharge into nature as a result of removing nitrogen from waste water not included

(CO2 equivalents, tonnes)



The figure shows us that the group of drinking and waste water companies taking part are expected, as a whole, to become climate-neutral by 2030 according to the reported data. Based on the provisional information, the drinking water sector is already climate-neutral, while the waste water sector has some way to go, albeit with the participating waste water companies moving in the right direction i.e. envisaged to reduce overall emissions by more than 60% from approx. 143,000 tonnes of CO_2 equivalents in 2019 to approx. 55,000 tonnes of CO_2 equivalents in 2030.

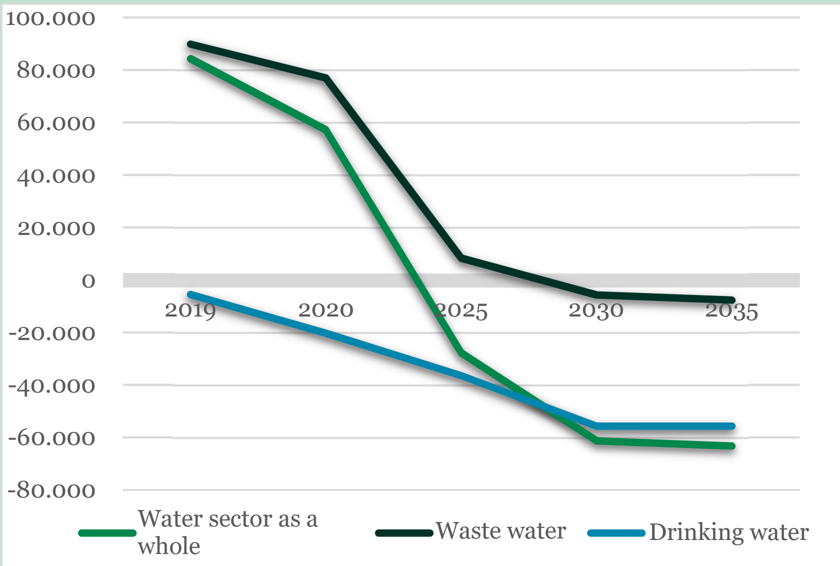
In the case of drinking water, it is the large CO2 contribution made by afforestation that helps the participating companies to reach their climate neutrality target. The CO2 contribution made by energy consumption is also decreasing considerably, not as a result of a fall in consumption, but rather as a result of more green power and a decreasing emission factor for electricity.

In the case of the waste water companies, it is nitrous oxide emissions from the treatment process that 'swing the balance', with more than 70,000 tonnes of CO_2 equivalents emitted in 2030. The calculations take into account the upward adjustment of the national emission factor by DCE Aarhus Universitet[3], i.e. a factor of 2.6 in spring 2021, as well as the introduction of threshold values for nitrous oxide emissions from 2025, which are expected to reduce emissions.

There is some uncertainty around direct emissions of nitrous oxide and methane generally, and new studies of methane leakage from biogas production may mean the estimate of overall emissions may increase at a later date. The expectation is that knowledge of nitrous oxide emissions and methane leakage will increase in the coming years, which may help to create more precise calculations. At the same time, it is thought that use of new and existing technologies could help to reduce greenhouse gas emissions from the water sector significantly.
Section 2 of the data basis goes into further detail on the assumptions made in the calculations of nitrous oxide emissions from the treatment process and methane leakage from biogas production.

It is not just during the treatment process that nitrous oxide is formed at the plants – this also happens if waste water is left untreated in nature, which unfortunately is often the case, e.g. in developing countries. Whether or not this issue should be factored into a climate account for Denmark is a topic of discussion, as the country has been removing the vast majority of its nitrogen in recent times. If the country elected to factor in the nitrous oxide avoided in nature as a result of removing the nitrogen, the participating water companies would, as a whole, become climate-neutral much earlier, e.g. as outlined in Figure 4b, and the participating waste water companies would also reach that same target by 2030.

FIGURE 4b. Anticipated climate contribution, incl. nitrous oxide avoided in nature. (CO2 equivalents, tonnes)



[3] The aforementioned update was based on new results from studies carried out as part of the 'Environment Technology Development and Demonstration Programme' ('Miljøteknologisk Udviklings- og Demonstrationsprogram', MUDP): https://mst.dk/service/nyheder/nyhedsarkiv/2020/dec/nyt-viden-om-renseanlaeggenes-klimabelastning/

1.5 Paris model challenges and further development

The reports and subsequent processing of data have resulted in a series of challenges being identified, including how to delimit what counts towards the energy and climate account. Section 2 of the data basis provides us with a few relevant examples here. In general, the model developed has to balance a desire for simplicity and transparency, on the one hand, with consideration of specific local conditions and relatively complex processes, on the other hand.

At the same time, there is also considerable uncertainty around the data, which means that further work must be done to develop the model and improve the data basis. The Danish Environmental Protection Agency would like to factor the large number of challenges identified into the further development of the model as much as possible by working closely with the water sector and relevant experts.

1.6 How is the water sector going to reach its target?

As outlined in the review above, the water sector – based on the reports submitted by the participating companies – has good prospects as a whole when it comes to achieving climate neutrality by 2030, if we factor in the significant contribution made by afforestation. There is still some way to go for the waste water sector, however, primarily due to nitrous oxide emissions, if we do not factor in the nitrous oxide avoided in nature as a result of nitrogen being purified. Taking the reports as the basis, the expectation is that the waste water sector will be energy-neutral by 2030; the same expectation does not apply to the drinking water companies and the water sector as a whole. Generally speaking, there could be a need to consider whether the energy targets should be put to one side in order to achieve the climate goals, i.e. a certain trade-off between the two.

The provisional findings tell us in any case that the water sector has already come a long way and that a large number of measures have been implemented or are planned. The large amount of backing for the reporting of information and the many suggestions for improvement are, alongside the provisional findings, clear indication that the water sector can reach its target and achieve energy and climate neutrality as a whole by 2030. This is set to be boosted by greater knowledge and a larger number of tools becoming available to help with meeting the targets.

The process that is already underway would be a useful way of supporting the energy and climate initiatives of the water companies in the long term, with the Danish Environmental Protection Agency keenly anticipating further collaboration and knowledge-sharing with the water sector and other relevant stakeholders.

On multiple occasions during the reporting process, the water companies have highlighted the shortcomings of financial regulation and other legislation. With regard to waste, the climate agreement of 16 June 2020 already contains two items for financial regulation and its significance for specific incentives to re-use the phosphorus in sludge and waste water and, more generally, to exploit internal resources efficiently for the benefit of consumers, including in relation to gasification.

There are already many good initiatives in place, in other words. It is thought that a new round of reporting, based on an updated and improved model, will follow in a few years to support future efforts at the water companies.

2 The data basis

2.1 Summary tables

The tables below provide an overview of the participating drinking and waste water companies' expectations regarding energy and climate neutrality. Please note that the calculation of the effect on the climate of nitrous oxide emissions from the treatment process takes account of the adjusted emission factor and the introduction of a threshold value from 2025; cf. page 15.

Energy neutrality in the water sector, kWh

	2019	2020	2025	2030	2035
Drinking water	100,131,264	97,500,711	101,314,466	106,557,623	111,067,952
Waste water, transport	90,497,126	93,933,158	90,010,256	93,237,037	91,378,946
Waste water, treatment	41,845,132	34,107,495	-43,917,142	-111,231,322	-104,461,572
Waste water, total	*132,342,258*	*128,040,653*	*46,093,114*	*-17,994,285*	*-13,082,626*
Total - Net energy neutrality	**232,473,522**	**225,541,364**	**147,407,580**	**88,563,338**	**97,985,326**

Climate neutrality in the water sector, Kg Co2 equivalents

	2019	2020	2025	2030	2035
Energy consumption, drinking water	11,658,880	10,740,158	5,250,061	1,017,078	1,067,508
Afforestation, drinking water	-17,213,037	-30,442,535	-41,309,886	-56,647,140	-56,647,140
Energy consumption, waste water (Transport)	10,549,706	10,307,237	4,487,615	1,179,324	1,155,665
Energy consumption, treatment plant	10,583,914	5,353,870	-11,040,179	-19,274,968	-19,172,574
Nitrous oxide emission from treatment process	102,664,440	104,152,853	71,908,988	73,323,988	72,704,175
Methane emission, biogas plant	9,949,467	10,871,220	6,358,358	6,247,959	5,681,097
Emission of nitrogen – nitrous oxide emission	9,771,681	8,650,032	8,066,363	8,026,363	7,820,923
Loop septic tanks – methane emission		-469,865	-2,244,636	-2,883,796	-3,400,772
Other CO2-limiting activities		-6,653,327	-9,806,514	-11,588,249	-12,199,078
Total - C02 effect calculation	**137,965,052**	**112,509,642**	**31,670,169**	**-599,441**	**-2,990,195**
Reduction compared to 2019 (%)	*0%*	*18%*	*77%*	*100%*	*102%*
Nitrogen removed – nitrous oxide avoided in nature	-53,689,216	-55,273,743	-59,415,375	-60,694,748	-60,279,338
Total – incl. nitrous oxide avoided in nature	**84,275,836**	**57,235,899**	**-27,745,206**	**-61,294,189**	**-63,269,533**
Reduction compared to 2019 (%)	*0%*	*32%*	*133%*	*173%*	*175%*

2.2 Reporting tables

The tables below are based on the reporting form that the participating companies filled out, and outline the data repor companies. Please note that the calculation of the effect on the climate of nitrous oxide emissions from the treatment p of the adjusted emission factor and the introduction of a threshold value from 2025; cf. page 13.

Table 1: Energy consumption, drinking water

	kWh						m3		
Year	Electrivity purchased [A]	Heat/district heating purchased [B]	Heat produced with oil [C]	Heat produced with natural gas [D]	Electricity sold [E]	Heat sold [F]	Water volume charged	Water volume in invitations	%
2019	97.207.999	3.929.255	1	202.588	488.579	720.000	221.555.582	293.874.171	75%
	Ambitions / expected performance:								
2020	96.344.703	3.083.199	49.651	328.728	1.553.570	752.000	224.273.995		
2025	114.624.898	2.804.045	0	313.071	1.277.549	15.150.000	236.280.363		
2030	122.907.789	2.762.897	0	218.259	1.381.322	17.950.000	243.670.181		
2035	127.544.161	2.637.480	0	212.119	1.375.808	17.950.000	246.444.244		

	Carbon footprint calculation for drinking water company, kg		
Year	Carbon footprint for electricity [G]	Carbon footprint for heat [H] Note 1)	Overall carbon footprint
Formula:	= (A-E)*EF(electricity)	= (B-F) *EF(district heating) +C*EF(Oil) +D*EF(natural gas)	= G + H
2019	11.412.892	245.988	11.658.880
2020	10.521.816	218.342	10.740.158
2025	5.667.367	-417.306	5.250.061
2030	1.458.318	-441.240	1.017.078
2035	1.514.020	-446.512	1.067.508

Note 1) In 2019, [C] and [D] were deducted from [B] , and [F] from [E] to avoid counting twice.

Emission factors:

EF(Electricity), kg/kWh	EF(disctrict heating), kg/kWh	EF(Oil), kg/kWh ('rounded' to 0.27 equating to 75 kg/GJ due to several possible oil types)	EF(Natural gas), kg/kWh
0,118	0,068	0,270	0,205
0,111	0,059	0,270	0,205
0,050	0,039	0,270	0,205
0,012	0,032	0,270	0,205
0,012	0,032	0,270	0,205

Table 2: Afforestation

Year	Hectares of forest before 2010 [A]	Hectares of forest 2010-2014 [B]	Hectares of forest 2015-2019 [C]	Hectares of forest 2020-2024 [D]	Hectares of forest 2025-2029 [E]	Hectares of forest 2030-2034 [F]
2019	853,82	1096,02	1017,925			
	Ambitions / expected performance:					
2020				1883,48		
2025					1363,465	
2030						1293,7
2035						

Part B – calculation of carbon footprint

Year	Tonnes						TOTAL (kg)
2019	-4.952	-6.357	-5.904				-17.213.037
2020	-7.257	-6.357	-5.904	-10.924			-30.442.535
2025	-7.257	-9.316	-5.904	-10.924	-7.908		-41.309.886
2030	-7.257	-9.316	-8.652	-16.010	-7.908	-7.503	-56.647.140
2035	-7.257	-9.316	-8.652	-16.010	-7.908	-7.503	-56.647.140

Table 3: Energy consumption, waste water in the sewer system (Transport)

Year	kWh							m3		
	Electricity purchased [A]	Heat/district heating purchased [B]	Heat produced with oil [C]	Heat produced with natural gas [D]	Electricity sold [E]	Heat sold [F]	Natural/town gas sold [G]	Water volume charged in the sewer system's catchment area	Water volume in invitations	%
2019	87.843.496	2.627.211	0	126.497	100.078	0	0	242.273.562	279.886.510	87%
	Ambitions / expected performance:									
2020	93.160.183	2.518.607	0	123.628	1.869.259	0	0	232.256.920		
2025	89.908.023	2.312.613	0	80.896	2.291.277	0	0	239.525.462		
2030	92.994.911	2.298.343	0	75.188	2.131.404	0	0	246.323.568		
2035	91.015.539	2.280.947	0	69.933	1.987.474	0	0	249.833.801		

	Carbon footprint calculation for transport, kg		
	Carbon footprint for electricity [J]	Carbon footprint for heat [K]	Total carbon footprint
Formula:	= (A-E)*EF(electricity)	= B*EF(district heating) + C*EF(oil) + D*EF(natural gas) - F*EF(district heating) - G*EF(narural gas/town gas) Note 1)	= J + K
2019	10.353.723	195.983	10.549.706
2020	10.133.293	173.944	10.307.237
2025	4.380.837	106.777	4.487.615
2030	1.090.362	88.962	1.179.324
2035	1.068.337	87.328	1.155.665

Note 1) In 2019, [C] and [D] were deducted from [B] , and [G] from [F] to avoid counting twice

Emission factors:

EF(Electricity), kg/kWh	EF(district heating), kg/kWh	EF(Oil), kg/kWh ('rounded' to 0.27 equating to 75 kg/GJ due to several possible oil types)	EF(Natural gas), kg/kWh
0,118	0,068	0,270	0,205
0,111	0,059	0,270	0,205
0,050	0,039	0,270	0,205
0,012	0,032	0,270	0,205
0,012	0,032	0,270	0,205

Table 4: Energy consumption, waste water treatment plants

Year	kWh								m3
	Electricity purchased [A]	Heat/district heating purchased [B]	Heat produced with oil [C]	Heat produced with natural gas [D]	Electricity sold [E]	Heat sold [F]	Natural/town gas sold [G]	Biomass supplied to external energy producer [H]	Water volume charged in the treatment plant's catchment area
2019	279.423.276	28.063.341	773.173	7.784.490	59.919.536	147.412.934	56.181.284	10.685.395	246.228.698
	Ambitions / expected performance:								
2020	263.237.441	18.888.570	781.398	8.522.878	75.565.128	113.995.775	53.601.000	14.160.888	235.153.534
2025	269.211.975	14.727.992	682.622	8.875.170	77.646.354	166.057.769	78.700.000	15.010.778	244.293.376
2030	266.381.554	14.901.643	478.500	8.256.650	86.909.825	219.375.041	79.000.000	15.964.803	253.560.302
2035	262.720.468	14.861.859	393.500	8.245.597	83.834.572	210.583.620	79.600.000	16.664.803	258.182.814

	Carbon footprint calculation for treatment , kg			
Year	Carbon footprint for electricity [J]	Carbon footprint for heat [K]	Carbon footprint for external biomass [L]	Total carbon footprint
Formel	= (A— E) * EF (electricity)	= B * EF (district heating) + C * EF (oil) + D * EF (natural gas) – F * EF (district heating) - G * EF (natural/town gas) Note 1)	= H * EF (district heating)	= J + K - L
2019	25.901.441	-14.590.920	726.607	10.583.914
2020	20.831.627	-14.642.264	835.492	5.353.870
2025	9.578.281	-20.033.040	585.420	-11.040.179
2030	2.153.661	-20.917.755	510.874	-19.274.968
2035	2.146.631	-20.785.931	533.274	-19.172.574

Note 1) In 2019, [C] and [D] were deducted from [B] , and [G] from [F] to avoid counting twice

Tabel 5: Nitrous oxide emission from treatment process

Year	Inlet water volume, m3	N in inlet to treatment plant, kg [X1]	Outlet water volume, m3	N in outlet from treatment plant, kg [X2]	For any emission factor calculated based on company's own measurement or any expected emission factor, see Note 2)	EF_{N2O} (New standard = 0,84%, but from 2025 with half of 70% discharged N)	Carbon footprint (Kg CO_2ekv.)*	Any external biomass recieved at the plant, kg
Formula							= X1*EF_{N2O}*(44/28)*298	
2019	652.426.219	26.099.359	638.593.375	3.169.249		0,840%	**102.664.440**	**314.504**
	Ambitions / expected performance:							
2020	620.710.601	26.477.744	611.015.543	2.870.898		0,840%	**104.152.853**	**379.450**
2025	628.532.636	28.124.164	621.011.272	2.748.470		0,546%	**71.908.988**	**390.000**
2030	621.746.670	28.677.582	613.206.013	2.755.481		0,546%	**73.323.988**	**300.000**
2035	604.771.222	28.435.168	596.072.096	2.690.484		0,546%	**72.704.175**	**-3.978.197**

Table 6: Methane emissions from leakage at biogas plants

Year	Produced biogas, Nm3 [Z]	Methane content of biogas, kg [Z1]	Carbon footprint (based on standard measures of leakage), kg	Average leakage percent % [a]	Carbon footprint (**partially** based on own measurement), kg
Formula	Z	=Z *0,65*0,72	= Z1 * 0,013*25		=Z1*a *25
2019	46.322.507	21.678.933	7.045.653	1,84%	9.949.467
	Ambitioner / forventet performance:				
2020	48.330.782	22.618.806	7.351.112	1,92%	10.871.220
2025	53.041.344	24.823.349	8.067.588	1,02%	6.358.358
2030	56.662.719	26.518.153	8.618.400	0,94%	6.247.959
2035	56.113.128	26.260.944	8.534.807	0,87%	5.681.097

Table 7: Nitrogen removed - nitrous oxide in nature prevented

Year	N in the inlet to treatment plant, kg [X1]	N in the outlet from treament plant, kg [X2]	Carbon footprint in kg
	Entered in table 5	Entered in table 5	=(X1-X2) *0,005*(44/28) *298
2019	26.099.359	3.169.249	53.689.216
	Ambitions / expected performance:		
2020	26.477.744	2.870.898	55.273.743
2025	28.124.164	2.748.470	59.415.375
2030	28.677.582	2.755.481	60.694.748
2035	28.435.168	2.690.484	60.279.338

Table 8: Emisson of nitrogen - nitrous oxide emission

Year	N in the outlet from treatment plant, kg [X1]	Waste water overflow, m3	N from waste water overflow, kg [X2]	Rain water overflow, m3	N fom rain water outlet, kg [X3]	N to nature in total, kg [Y]	Carbon footprint, kg
Formula	X1		X2		X3	Y=X1+X2+X3	=y *0,005*(44/28)*298
2019	3.169.249	36.713.451	496.048	273.714.824	508.088	4.173.384	9.771.681
	Ambitions / expected performance:						
2020	2.870.898	33.506.362	396.084	229.248.569	427.358	3.694.339	8.650.032
2025	2.748.470	26.683.552	275.115	230.732.929	421.475	3.445.060	8.066.363
2030	2.755.481	23.148.363	242.879	239.237.561	429.617	3.427.977	8.026.363
2035	2.690.484	21.035.930	217.449	242.910.288	432.303	3.340.236	7.820.923

Table 9: Septic tanks - methane emission

Year	Number of properties that are sewered [U]	Avg. Emission of methane calculated per property, kg [X5]	Reduction in methane emitted, kg, [V]	Carbon footprint, kg
Formula		=0,047*0,1488*2,16 *365 = 5,51	=U * 5,51	= 25*V = 137,84*U
	Ambitions / expected performance:			
2020	-3.411	5,51	-18.795	-469.865
2025	-16.295	5,51	-89.785	-2.244.636
2030	-20.935	5,51	-115.352	-2.883.796
2035	-24.688	5,51	-136.031	-3.400.772

Table 10: Other CO2-limiting activities that is not included in the above tables

Year	Drinking water - carbon footprint, kg	Waste water - carbon footprint, kg	**Total - carbon footprint, kg**
2020	-647.735	-6.005.592	-6.653.327
2025	-345.888	-9.460.626	-9.806.514
2030	-88.610	-11.499.639	-11.588.249
2035	-91.269	-12.107.808	-12.199.078

2.3 Assumptions and challenges – a few examples

A few general assumptions have been made in the calculations of the greenhouse gas emissions – more specifically the calculation of nitrous oxide emissions from the process at the treatment plants, whereby it is assumed that all treatment plants have emissions in 2019 and 2020 equating to the new national emission factor of 0.84%, as set by DCE Aarhus Universitet, calculated in relation to the inflow of nitrogen. This was done because the previous emission factor of 0.32% was used in the questionnaire, resulting in uncertainty around interpretation of the reports when the emission factor was updated subsequently.

From 2025 onwards, the assumption will be simplified: all treatment plants of at least 30,000 PE, equating to 70% of the nitrogen inflow, will reduce nitrous oxide emissions by half, while treatment plants below 30,000 PE will have the same emissions. To provide some background for this calculation, the climate agreement has confirmed the introduction of threshold values for nitrous oxide emissions from treatment plants of at least 30,000 PE, which is being done to halve their emissions.

For waste water companies that have biogas production, methane leakage is calculated as 1.3% of methane included in the quantity of biogas produced, unless the company has reported its own measurements. This is consistent with the figures that DCE/Aarhus University[4] uses when calculating the national emissions. There is significant uncertainty around this leakage percentage, with new studies indicating that the leakage may be somewhat higher and from multiple sources.

Ultimately, all reports that fall into the category 'any other CO2 limiting activities' are factored in, even if there are doubts in some cases as to whether the activities can be included; at the same time, there is major uncertainty around some of the reports, having not been subject to any final quality check. The contribution made by this item is not particularly large in any case, and the companies' comments during the reporting process indicate that the reporting model lacks reporting options for a series of items potentially providing relevant input, and as such have not been factored in.

Comments in the water companies' reports are generally indicative of certain concrete challenges posed by the work with the Paris model for energy and climate neutrality in the water sector.

For instance, there is a desire for uniform and transparent emission factors, but also a desire for the option of including emission factors calculated locally. In the case of emission factors for electricity,

[4] https://dce2.au.dk/pub/SR193.pdf, pages 9 and 29.

for example, constant updates and confusion around the factor at a number of companies have proven a challenge.

Several companies have highlighted that calculating methane leakage in connection with biogas production is too simplistic, as it fails to consider the different ways in which sludge can be managed and biogas can be produced.

One general problem highlighted by the companies is the definitional delimitation of what can be included in the energy and climate accounts. The drinking water companies in particular highlight that they have very few other tools available if there is no option of afforestation or the inclusion of climate effects of transport, buildings etc.

One major issue that is creating uncertainty, especially among the waste water companies, is the delimitation of the energy production which happens in other sectors or companies, but is based on the resources of the water company, e.g. heat from biogas production at the energy company or heat pumps, which produce heat at district heating companies. The use of sludge for different purposes, such as composting, fertilising agricultural land, combustion or as construction materials, is also mentioned as a factor that should be given consideration.

A number of companies also highlighted simplification in the case of power for sewerage at properties in dispersed residential settlements where the same calculation method is used regardless of whether the housing is permanently inhabited, a second home or an allotment.

Finally, there is a desire for the Danish Environmental Protection Agency to provide a better data basis for the companies' reporting, e.g. forecasts of rainfall based on the normal year.