

1. Background

Novo Nordisk analyses and understands carbon emissions at the product level. This document presents the Product Carbon Footprint of one year treatment with FlexPen® in combination with a range of APIs, including the use of NovoFine® needle, hereafter referred to as the [API brand name] FlexPen® carbon footprint, e.g. NovoRapid® FlexPen® carbon footprint.

Full carbon footprint reports for the APIs, device and needle are available.

The data presented in this document supports marketing claims and Q&As about the product's carbon footprint. The data should not be used for comparison with competitor products or for claims related to 'green' or 'environmentally friendly' products.

2. Product carbon footprint methodology

The carbon footprint of a product is calculated by adding the greenhouse gas emissions (in kg CO₂ equivalents) from different stages of the product lifecycle as shown in the figure below. The product carbon footprint of one year of treatment is calculated by adding the contributions from the active pharmaceutical ingredient (API), the device and the needle¹.



The Novo Nordisk carbon footprint calculations follow the Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices², which is built on international life cycle assessment standards. The reports are third-party reviewed by PricewaterhouseCoopers Advisory.

The carbon footprint calculations are based on production data from 2019 (except waste which is based on 2015 production data) and cover use in three major markets: Europe, the US and Japan. The calculations are made using Excel and the life cycle assessment tool GaBi.

The [API brand name] FlexPen® carbon footprint consists of three elements: API, device and needle. The key assumptions for each of these elements are given below.

¹ Including the packaging for devices and needles.

² Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices, GHG Protocol Product Life Cycle Accounting and Reporting Standard, November 2012. At: http://ghgprotocol.org/sites/default/files/ghgp/Summary-Document_Pharmaceutical-Product-and-Medical-Device-GHG-Accounting_November-2012_0.pdf. Accessed May 2021

- **API:** The daily dose is 40 units of insulin, which corresponds to the WHO guidelines³ for defined daily dose (DDD). The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults. The average daily dose of liraglutide is 1.2 mg/day, except for the US daily dose of 1.8 mg/day.
- **Device:** FlexPen® with a U100 cartridge contains 300 units of insulin. When used with liraglutide, the cartridge contains 18 mg of active ingredient.
- **Needle:** Novo Nordisk recommends discarding the needle after use. However, market research shows that most patients use the needle several times⁴. To reflect an average patient, the one-year treatment scenario is based on the use of one needle per day, which can be considered a conservative estimate.

3. Product carbon footprint of one-year treatment

The [API brand name] FlexPen® carbon footprint is 11-23 kg of CO₂ equivalents per year, corresponding to 30-63 g of CO₂ equivalents per day. The results for each of the APIs and country scenarios are included in Appendix A.

To put this into perspective for a non-expert, it is possible to compare the carbon footprint to other consumables.

One year of treatment with [API brand name] FlexPen® corresponds to driving 91-193 km in an average new car in Europe. The CO₂ emissions per km data are based on an EU-28 average published by Eurostat⁵.

It is estimated that the daily environmental impact (using carbon footprint as a proxy) of diabetes treatment using [API brand name] FlexPen® is equivalent to a cup of tea⁶. According to Cichorowski et al. (2015), the cradle-to-grave carbon footprint of Darjeeling tea including cultivation and brewing is 0.15 kg of CO₂ equivalents per litre of tea⁷. A 40 cl cup of tea will thus have a carbon footprint of 60 g of CO₂ equivalents. It must be acknowledged that “a cup of tea” is an ambiguous measure and there are many different types of tea and brewing methods, but the calculation gives a good indication of the size of the impacts related to the treatment of diabetes.

A comparison with air travel shows that the carbon footprint of 14-29 years of treatment with [API brand name] FlexPen® corresponds to a flight from London to New York. This is calculated on the basis of data from the ICAO Carbon Emissions Calculator⁸.

³ WHO Collaborating Centre for Drug Statistics Methodology (WHOC): DDD Definition and general considerations. http://www.whocc.no/ddd/definition_and_general_considera/. Accessed Sep 2021.

⁴ Roper U.S. Diabetes 2014 Patient Study. Insulin devices market. GfK, November 2014

⁵ Eurostat (2019). Average carbon dioxide emissions per km from new passenger cars. http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=t2020_rk330&plugin=1. Accessed Sep 2021.

⁶ This is not the case for Victoza on the Japanese market

⁷ Cichorowski et al. (2015). Scenario analysis of life cycle greenhouse gas emissions of Darjeeling tea. *Int J Life Cycle Assess* (2015) 20:426–439

⁸ ICAO (International Civil Aviation Organization) (June 2018). Carbon Emissions Calculator. <http://www.icao.int/environmental-protection/CarbonOffset/Pages/default.aspx>. Accessed Sep 2021.

The carbon footprint has inherent uncertainties and should be regarded as an indicative level and not as a precise measure. The uncertainties relate to the data collected from Novo Nordisk production, the data on carbon footprint for each of the processes (e.g. plastic granulate production), carbon footprint impact factors and the key assumptions (e.g. distribution patterns). Moreover, the calculations take into account that Novo Nordisk sources renewable energy through certificates, which results in a lower carbon footprint than if average electricity was used.

The plastic footprint from devices and needles (excluding packaging) in the treatment with FlexPen® is 0.86 kg plastic per patient per year, except for Victoza, where the plastic footprint is 0.46 kg per patient per year. Including packaging increases the plastic footprint for Victoza to 0.79 - 0.87 kg plastic/patient/year (depending on the market) and to 1.20 - 1.29 kg plastic/patient/year (depending on the market) for the remaining treatments. See Table 6 and Table 7 in Appendix A for more details.

4. Reducing the product's carbon footprint

Novo Nordisk strives to reduce carbon footprint throughout the product lifecycle, and [API brand name] FlexPen® is produced with the environment in mind.

Our environmental strategy, Circular for Zero, and the certified ISO14001 Environmental Management System drive continuous improvements in our environmental performance by setting high ambitions and integrating environmental considerations into daily business activities. Moreover, life cycle assessment is an integrated part of our device product development process.

Novo Nordisk is using 100% renewable electricity at all production sites⁹.

⁹ Novo Nordisk Annual Report 2020, p.12 - https://www.novonordisk.com/content/dam/nncorp/global/en/investors/irmaterial/annual_report/2021/Novo-Nordisk-Annual-Report-2020.pdf

5. Appendix A: Product carbon footprint results and comparisons

Table 1. Carbon footprint of treatment in the European market.

Brand name	API [kg CO ₂ -eq./yr]	Device incl. cartridge [kg CO ₂ -eq./yr]	Needle [kg CO ₂ -eq./yr]	One year treatment [kg CO ₂ -eq./yr]	Daily treatment [g CO ₂ -eq./yr]
NovoRapid® FlexPen®	1.0	8.4	2.9	12	34
NovoMix® FlexPen®	1.0	8.4	2.9	12	34
Levemir® FlexPen®	5.7	8.4	2.9	17	47
Victoza®	3.7	4.2	2.9	11	30
Mixtard® FlexPen®	0.9	8.4	2.9	12	33
Insulatard® FlexPen®	0.9	8.4	2.9	12	33
Actrapid® FlexPen®	0.9	8.4	2.9	12	33

Table 2. Carbon footprint of treatment in the US market.

Brand name	API [kg CO ₂ -eq./yr]	Device incl. cartridge [kg CO ₂ -eq./yr]	Needle [kg CO ₂ -eq./yr]	One year treatment [kg CO ₂ -eq./yr]	Daily treatment [g CO ₂ -eq./yr]
NovoRapid® FlexPen®	1.0	8.5	2.6	12	33
NovoMix® FlexPen®	1.0	8.5	2.6	12	33
Levemir® FlexPen®	5.7	8.5	2.6	17	46
Victoza®	5.5	6.4	2.6	14	40
Mixtard® FlexPen®	0.9	8.5	2.6	12	33
Insulatard® FlexPen®	0.9	8.5	2.6	12	33
Actrapid® FlexPen®	0.9	8.5	2.6	12	33

Table 3. Carbon footprint of treatment in the Japanese market.

Brand name	API [kg CO ₂ -eq./yr]	Device incl. cartridge [kg CO ₂ -eq./yr]	Needle [kg CO ₂ -eq./yr]	One year treatment [kg CO ₂ -eq./yr]	Daily treatment [g CO ₂ -eq./yr]
NovoRapid® FlexPen®	1.0	13.9	3.2	18	50
NovoMix® FlexPen®	1.0	13.9	3.2	18	50
Levemir® FlexPen®	5.7	13.9	3.2	23	63
Victoza®	3.7	7.0	3.2	14	38
Mixtard® FlexPen®	0.9	13.9	3.2	18	49
Insulatard® FlexPen®	0.9	13.9	3.2	18	49
Actrapid® FlexPen®	0.9	13.9	3.2	18	49

Table 4. Comparison with driving a car. Number of km travelled in an average new car.

Brand name	EU	US	JP
NovoRapid® FlexPen®	105	103	153
NovoMix® FlexPen®	105	103	153
Levemir® FlexPen®	144	142	193
Victoza®	91	122	116
Mixtard® FlexPen®	103	101	152
Insulatard® FlexPen®	103	101	152
Actrapid® FlexPen®	103	101	152

Table 5. Comparison with air travel. Years of use corresponding to a flight from London to New York

Brand name	EU	US	JP
NovoRapid® FlexPen®	25	26	17
NovoMix® FlexPen®	25	26	17
Levemir® FlexPen®	18	18	14
Victoza®	29	21	23
Mixtard® FlexPen®	25	26	17
Insulatard® FlexPen®	25	26	17
Actrapid® FlexPen®	25	26	17

Table 6. Plastic footprint for the different elements required for yearly treatment with FlexPen [g plastic/year]. *Note that FlexPen is a prefilled device and therefore the cartridge is already included within the device.*

Brand name	Device	Cartridge	Needle	Packaging		
				All	EU	US
NovoRapid® FlexPen®	802	-	62	333	333	430
NovoMix® FlexPen®	802	-	62	333	333	430
Levemir® FlexPen®	802	-	62	333	333	430
Victoza®	401	-	62	331	331	411
Mixtard® FlexPen®	802	-	62	333	333	430
Insulatard® FlexPen®	802	-	62	333	333	430
Actrapid® FlexPen®	802	-	62	333	333	430

Table 7. Plastic footprint of one-year treatment with FlexPen with and without packaging materials [kg plastic/year].

Brand name	One year treatment excl. packaging	One-year treatment incl. packaging		
	[device, cartridge, and needles]	All	EU	US
NovoRapid® FlexPen®	0.86	1.20	1.20	1.29
NovoMix® FlexPen®	0.86	1.20	1.20	1.29
Levemir® FlexPen®	0.86	1.20	1.20	1.29
Victoza®	0.46	0.79	0.79	0.87
Mixtard® FlexPen®	0.86	1.20	1.20	1.29
Insulatard® FlexPen®	0.86	1.20	1.20	1.29
Actrapid® FlexPen®	0.86	1.20	1.20	1.29

References

- Aspart carbon footprint, Novo Nordisk, Sep 2021
- Detemir carbon footprint, Novo Nordisk, Sep 2021
- Liraglutide carbon footprint, Novo Nordisk, Sep 2021
- Human insulin carbon footprint, Novo Nordisk, Sep 2021
- FlexPen® carbon footprint, Novo Nordisk, Sep 2021
- NovoFine® carbon footprint, Novo Nordisk, Sep 2021



Third party verification of Novo Nordisk Carbon Footprint reports

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Novo Nordisk has commissioned PricewaterhouseCoopers Advisory (PwC) to review several carbon footprint reports for diabetes products prepared by Novo Nordisk. The critical review (CR) was done according to the ISO/TS 14 071¹, ISO 14 040², ISO 14 044³ recommendations and also according to the “Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices” recommendations. The CR expert is independent from Novo Nordisk and was not involved in the making of the study. To ensure consistency with the principles and requirements of the standards and guidance (ISO/TS 14 071, ISO 14 040, ISO 14 044, and Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices) on life cycle assessment, the CR was performed by the following LCA expert of PwC: Christophe Drevelle.

The CR of the study appraises the following:

- the methods used are consistent with the standards ISO 14040 and 14044 and Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices;
- the methods used are scientifically and technically valid;
- the data used are appropriate and reasonable in relation to the goal and scope of the study;
- the interpretation reflects the limitations identified and the goal of the study;
- the report is transparent and consistent.

During this period, different oral and written exchanges have been held between PwC and Novo Nordisk, including clarification exchanges regarding the CR comments, and the production of new versions of the carbon footprint reports by Novo Nordisk. Novo Nordisk has taken into account all the comments and has modified and improved its report.

The 2020/2021 study is in conformity with the standards ISO 14040 and 14044 and Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices.

Note: this is an extraction of full version of verification report from PwC. The more detailed verification report is available.

A handwritten signature in blue ink, appearing to read 'Sylvain Lambert', with a horizontal line underneath.

Neuilly-sur-Seine (France), December 22nd, 2021

Sylvain Lambert
Partner of Sustainable Development Department

¹ ISO/TS 14071 (2014): Environmental management -- Life cycle assessment -- Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044 (2006)

² ISO 14040 (2006): Environmental management -- Life cycle assessment -- Principles and framework

³ ISO 14044 (2006): Environmental management -- Life cycle assessment -- Requirements and guidelines

