



Lifestyle test Calculation Criteria- Norway

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Abstract

The following document lists the data sources and the calculation logic and assumptions behind the Lifestyle Test. This document focuses on the Lifestyle Test for Norway.

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Lifestyle test Calculation Criteria- Norway

The Lifestyle Test helps people see their climate impact and reduce it. It calculates quickly and accurately the private CO₂e footprint, and based on this, recommends tailored actions – to make a plan towards a lifestyle with less climate impact. The app blends climate and behavioural sciences to give people a clear starting point and to motivate action. The goal is to inspire as many people as possible to shift towards 1.5-degree lifestyle by 2030, and beyond.

Methodology in general

The Lifestyle test quantifies the individual's climate impact across four key domains: housing, transport, food, and other consumption. The carbon footprint includes the impact of daily activities determined by lifestyle choices, excluding greenhouse gas (GHG) emissions resulting from public services and financial activities. Thus, the lifestyle carbon footprint does not consider GHG emissions from for example public health care or education services, business travel, or investments.

In essence, to calculate the carbon footprint of a consumption category, the quantity of consumption (measured in kg, euros, kWh, km, etc.) is multiplied by the corresponding carbon emission factor (kgCO₂e * kg, euros, kWh, km, etc.).

The test calculates the carbon footprint using consumption-based accounting instead of production-based accounting. Production-based accounting focuses solely on direct emissions from domestic production activities within specified geographical boundaries.¹ In contrast, consumption-based accounting covers both direct emissions in a country and embodied emissions of imported goods while excluding emissions associated with exported goods.²

¹ Official statistics for production-based emissions from Norway are calculated by Statistics Norway and the emissions were 63 million tons CO₂ in 2023. <https://www.ssb.no/en/natur-og-miljo/miljoregnskap/statistikk/utslipp-fra-norsk-okonomisk-aktivitet> The same accounting method, but in a more limited version, are the emissions statistics reported to UNFCCC annually. <https://www.ssb.no/en/natur-og-miljo/forurensning-og-klima/statistikk/utslipp-til-luft>

² Official statistics for consumption-based emissions from Norway are calculated with the global environmentally extended MRIO database, EXIOBASE and coupled with SSB datasets (CaFEAN2-model) by XIO Sustainability AS on behalf of The Norwegian Environment Agency. This is a top-down method for calculating consumption-based emissions. The emissions were 77 million tons CO₂ in 2021. <https://www.miljodirektoratet.no/aktuelt/nyheter/2024/november-2024/to-tredelar-av-utsleppa-fra-forbruket-vart-skjer-i-andre-land/>

The test employs the bottom-up Life Cycle Assessment (LCA) method and physical units, (e.g., weight of food, transport distance, and residential living area) rather than amounts of expenditure, except for the consumption domain for purchases. The carbon footprint of purchases is calculated using the top-down environmentally extended input-output (EEIO) method and monetary units.

For a more in-depth understanding of the methodology behind consumption-based accounting, refer to the report *"1.5-Degree Lifestyles: Towards a Fair Consumption Space for All"* by Akenji et al. (2021), specifically pages 32 to 35.

The PSL test is based on average Norwegian consumption levels and carbon footprints, which are then adjusted according to users' answers to the test questions. The average data in Norway are mainly derived from the report *"Towards a Fair Consumption Space for All: Options for Reducing Lifestyle Emissions in Norway"* by Akenji et al. (2024).

For example, in the housing category, heating emissions are estimated based on the average heating demand in Norway. This baseline value is then adjusted according to the user's home type, age, and renovation status. The final consumption amount is multiplied by the carbon intensity associated with the selected heating method.

Although the baseline for most carbon footprint calculations is based on average Norwegian values, in some cases, it is more practical to ask users directly about their consumption. For example, in the transport category, users are asked their driving distances in kilometers, rather than relying on the average Norwegian personal car usage per person as a baseline.

This method is chosen to ensure that the test remains user-friendly and that participants can answer the questions without needing to look up additional information. For example, in the case of heating, asking users to provide their heating consumption in kilowatt-hours (kWh) would be impractical, as most people may not know this information offhand.

The consumption data for Norway are collected from the latest available sources in 2023. Most data are from consumption in 2022. In some cases, there has been no available statistics on certain types of consumption from the years 2022. In these cases, the most recent, relevant data has been used (Akenji et al. 2024).

Methodology for the 2030 target

The 2030 emissions reduction target is set to 2500 kg CO₂e per person. This target is based on an analysis of the necessary reduction of emissions from lifestyle carbon footprint that would be in line with the Paris agreement and 1,5-degree climate change. The methodology reflects the principle of Common but Differentiated Responsibilities and Respective Capabilities, but simply assuming that the remaining carbon budget should be distributed equally by 2030. You

can read more about the methodology in the report “1.5-Degree Lifestyles: Targets and options for reducing lifestyle carbon footprint” by Akenji et al. 2019, pages 5 to 9. ³

Calculation criteria used in the Lifestyle Test in Norway

Housing

The environmental impacts of living considered in the PSLifestyle tool include construction and maintenance, the heating of dwellings, and the use of electricity and water and heating the water to bathing temperature at home.

Household members

The test begins with a question on the number of household members.

More people per m² means less emissions per person. We proportion the energy consumption and the emissions from construction of your home to all household members. The average household size for Norway was 2,12 persons in 2022. (Statistics Norway, 2024)

Living area

A bigger living area would typically mean higher emissions. However, the living area of your house will be divided by the number of people living in your household. The average living space per person for Norway is 71 m² in the year 2022 (Oppøyen, M. S., 2023).

Renting or owning your home

This question is only used to filter the tips that you receive after calculating the carbon footprint. The purpose of this is to reduce the number of tips that are not relevant for you. There are no calculations related to this question.

Building type

The kind of house you live in - single family detached house, flats, or terraced house – will impact the footprint calculated from your living area. Detached houses and terraced houses have a construction and maintenance footprint of 6,9 KgCO₂e/y/m² and flats have a construction and maintenance footprint of 8 KgCO₂e/y/m² (Saari, 2001; Salo et al., 2016). The

³ The remaining carbon budget is rapidly shrinking as emissions global emissions has been continuing to rise. Thus for the Norwegian report “Towards a fair consumption space for all: Options for reducing lifestyle emissions in Norway” by Akenji et al. 2024, a new analysis was done to set at target towards 2035 that would be in line with 1,5 degree scenario taking into account the remaining carbon budget at the time of the analysis. The target towards 2035 was found to be 1,4 tons CO₂e per person.

factor considers the land-use change, the manufacturing of materials and the construction, and the maintenance and demolition of the building. The lifecycle of the building is assumed to be 80 years. The emissions are higher per m² for flats due to generally higher use of emissions intensive materials like concrete and cement. Choosing the response “Other” will give you the same values as for flats.

In addition, this question calculates an average electricity and heating energy consumption per building type and m². The value is adjusted according to the answers to the following questions.

Electricity

The average electricity consumption is 6270 kwh per person per year (Akenji et al. 2024)

The carbon intensity of grid electricity in Norway is low, at 46 gCO₂e/kWh, compared to the European Union (EU) average of around 250 gCO₂e/kWh¹² (EEA 2023b). The average carbon intensity of Norway’s electricity mix is based on production, imports, exports and consumption. Around 90% of the gross electricity consumption is based on domestic production, and the remaining 10% of electricity is imported (Statistics Norway n.d.a). Thus, the average electricity consumption mix (i.e. electricity that is used locally) is based on the domestic production, and the value is adjusted for power transfers with neighbouring countries.

The emission intensity of grid electricity accounts for direct emissions from electricity production, indirect emissions from fuel production or the manufacturing of renewable energy infrastructure, and emissions related to land use change. (Akenji et al. 2024)

The test does not include any questions that determine whether a user consumes more or less electricity than the average Norwegian. Estimating this can be challenging for users. Additionally, the test does not ask about the type of electricity used, and everyone is assumed to rely on grid electricity. In Norway, the grid electricity intensity is already very low, meaning that it does not differ significantly from 100% renewable sources. As a result, the choice of electricity source has minimal impact on GHG emissions.

When the house is built

The question is based on the assumption that the age of a building is correlated with the level of insulation and technical standards, i.e., older buildings have lower levels of insulation than newer buildings.

In Norway the standards for energy efficiency in new built houses has been updated in 1987, 2010 and 2016. These standards define the energy needed for heating. (Multiconsult 2023) In addition the test distinguished between houses built before and after 1960. Houses built before 1960 are assumed to follow energy label F according to Norwegian TEK-building codes and standards.

Primary heating method

The question concerning the primary heating method of the respondent's home considers the most commonly used heating methods in the country. (Bøeng, 2023) Electricity is the main heating source in Norway, followed by district heating. The emission factor for district heating is 0.03 kgCO₂e/kWh, which is a weighted average based on the share of fuel types used in production (Statistics Norway 2023). An air-source heat pump is usually used as a complementary heating system, but when used as a primary heating method, there are probably more air-source heat pumps in use than one. Emission intensities for other heating sources are based on data from Ecoinvent 3.9 database (Wernet et al., 2016).

Energy renovation

This question concerns energy renovation that will contribute to lowering the need for heating compared to the energy standard of the construction year of the building. It is assumed that small energy renovations will not impact the calculations, medium renovations will decrease the heating demand with 5 % and big renovations will decrease the heating demand with 30-33 % depending on the construction year. For older buildings the heating demand reduction is larger than for new ones.

Location in Norway

The location of home defines how much less/more heating energy is needed in comparison to the average consumption of heating energy. For example; homes in Northern Norway and Innlandet have space heating requirements that are more than 20% higher than Southern and Western Norway. (Statistics Norway, 2012)

Heating and indoor temperature

Considering room temperature, the test considers that higher room temperatures require more heating than lower temperatures. An estimation of a 2-degree rise in temperature equals a 10% increase in heat energy is applied, as outlined in Motiva, 2019.

Showering

Most of the residential water usage consists of showering, and the greatest potential for reducing greenhouse gas (GHG) emissions lies in minimizing shower duration (EEA, 2023). Therefore, the test have a question regarding the showering habits. The amount of water used, and the heating demand are estimated based on the shower duration provided by the user. It is estimated that 12 litres of water are consumed per minute of showering (Motiva 2023).

The emissions associated with showering include the production of residential water, residential wastewater treatment, and the heating of shower water. Emission intensity values for water production and wastewater treatment are sourced from Ecoinvent 3.9. The calculations assume that approximately one-third of the total water used is hot water (Motiva

2023). Additionally, the method of water heating is assumed to be the same as user's space heating method. The heating methods emission intensities are from EcolInvent 3.9.

Mobility

The transport section does not rely on average Norwegian transport consumption data. Instead, it directly asks users about their transport consumption and calculates emissions based on their responses. To make the test user friendly, the test presents questions in easily understandable units. For example, flight distances are measured in hours rather than kilometres.

The test only asks about private travel, not business travel, as these emissions are not considered to belong to the private carbon footprint of a person. Also, the test does not have any questions regarding international cruises and ferries or leisure boats. This is not due to these transport modes not having a climate impact, but due to lack of necessary relevant statistics and emissions factors on passenger km from international cruises and leisure boats for Norway.

Driving

The carbon footprint from driving is calculated from the annual number of kilometers driven, type of fuel and the average number of people in the car. The emissions consist of the fuel or energy consumption, the manufacturing and maintenance of the car and the emissions from building the road infrastructure. The generated emissions are divided between the average number of people in the car, and therefore it is asked how many people usually travel with you in a car. The more people, the less emissions are allocated to each person. The emission factors for car production, maintenance and constructed road infrastructure are derived from EcolInvent 3.9.(Wernet et al., 2016). The emission from fuel combustion for different fuel types are based on The Norwegian Environment Agency's emission calculator (see Akenji et al. 2024 for reference).

Public transport

Public transport includes travel by bus, train, tram, domestic passenger ferries and metro. The relative shares of the different means of public transport are based on Norwegian statistics as presented in the report (Akenji et al. 2024). The shares were used as a basis for calculating a weighted average emission factor for public transport (0.016 kgCO₂e/passenger-km). The emission factors of different means of transport are based on the emission factors described in the report by Akenji et al. (2024)

Air travel

Emissions from air travel are estimated based on the number of hours a user spends flying in a year, considering the average airspeed of commercial planes, which is approximately 800 km/h according to statistics reported by airline companies (Schiphol.nl).

The fuel consumption per passenger during a flight is influenced by various factors, including the air fleet, aircraft occupancy rate, and the allocation of emissions between passengers and cargo. In the PSL test, the carbon footprint of flying incorporates not only fuel use but also embedded emissions from aircraft and airports, as well as the impact of increased atmospheric radiative forcing.

Air traffic contributes to atmospheric radiative forcing through the release of fine particles at high altitudes and alterations in cloud cover. While there is considerable uncertainty in these estimates, recent research suggests that 66% of the climate impact of aviation comes from sources other than the direct impact of the carbon dioxide in fuel (Lee et al., 2020). Consequently, to account for these additional causes of radiative forcing, it is justifiable to multiply the carbon footprint of aviation fuel consumption by a factor of three. Carbon intensities of flying are sourced from Ecoinvent 3.9.

Walking or biking

Walking and biking are considered to be carbon-free alternative means of transport and not part of the footprint calculation. This question is asked to be able to offer more precise actions after taking the test.

Food

General assumptions

The carbon footprint of food considers the diet composition, the quantities consumed, and food waste. Energy required for cooking and cooling food ingredients at home is included in the living section, while grocery shopping trips are part of the transport section.

To define diet composition, the test asks how much the user eats of different food groups that most affect the carbon footprint, such as meat, fish, dairy, and beverage consumption. For food groups not explicitly addressed, the test assumes adherence to the average Norwegian diet. The average Norwegian diet is based on statistics from The Norwegian Directorate of Health (Helsedirektoratet, 2022a)

If the user eats less or no meat, fish, and dairy, these are substituted by plant-based alternatives. Questions on food consumption in terms of portions and average portion sizes are based on *EatForHealth* numbers (National Health and Medical Research Council, 2021). Some questions combine multiple food groups, with the share of average Norwegian consumption between these groups taken into consideration. For example, in the beverage consumption question, the emission intensity is calculated based on the average shares between coffee, tea, juice, soft drinks, beer, and wine.

Carbon intensities for different food groups comes from the Norwegian report, Akenji et al. 2024. Intensities are primarily from the *ecoinvent* 3.9 database (Wernet et al. 2016) and when specific intensities were unavailable in *ecoinvent*, *AGRIBALYSE 3.1* (2022) is used. For meat

and dairy products, the test uses national intensities from van Oort, B., & Andrew, R. (2016). The system boundary for carbon intensities is cradle-to-store.

Eating habits

The first question asks about your type of diet. If you answer yes to eating meat, an average for the other food types will be the base assumption for your footprint. For a pescatarian, the carbon footprint of other foods is multiplied by a factor of 1.8. In the case of vegetarians, this multiplier increases to 2.0. Lastly, for a vegan, the carbon footprint of these other foods is multiplied by 2.25. This is because the pescatarians, vegetarians, and vegans do not eat less in absolute terms but would have to consume more of these other food categories to have a sufficient intake of nutrients. The multipliers are based on Sitra's calculations.

Food categories

The ingredients with significant climate impact have been classified into various categories in the questionnaire: red meat / pork, chicken, fish, and eggs / hard and soft cheeses / dairy products / drinks. As for the test in general, the categorization is based on CO₂e emissions.

When answering the questions an average portion size was calculated for each category and a portion-specific weighted emission factor was calculated based on the percentage of the various ingredients in the portion.

The choices you make during the test will modify your emissions according to your answers. This means that if your answer to the questions indicate that you eat either less or more than the average Norwegian this will affect the overall footprint.

Red meat

Red meat was classified under its own category due to having higher emission factors than other foods. Average Norwegian consume annually approx. 23 kg of red meat (The Norwegian Directorate of Health from 2022) and it makes up 25% of the average Lifestyle Carbon Footprint of food (Akenji et al 2024). The emission factors for red meat are based on national intensities from van Oort, B., & Andrew, R. (2016).

Hard and Soft Cheese

This category includes soft and hard cheese products made from cow's milk. Norwegians consume annually approximately 17 kg of cheese per person (The Norwegian Directorate of Health from 2022), accounting for 8% of an average lifestyle carbon footprint for food. The emission factors for hard and soft cheese are based on national intensities from van Oort, B., & Andrew, R. (2016).

Pork, Chicken, fish, or eggs

Annually, Norwegians consume an average of 25.2 kg of pork, 21.6 kg of poultry, 31.5 kg of fish and other seafood, and 13.5 kg of eggs and egg products per person (The Norwegian

Directorate of Health from 2022). The emission factor of pork is slightly higher than that of other foods in the category but, on the other hand, significantly lower than the emission factor of beef. The grouping of foods is based on CO₂e emissions. Different foods are proportioned based on how these are consumed on average. Pork, poultry, fish and eggs account for 6%, 3%, 7% and 2% of an average lifestyle carbon footprint for food, respectively. The emission factors for these foods are based on national intensities from van Oort, B., & Andrew, R. (2016).

Dairy products

Milk and dairy products were highlighted as the fourth category since their high consumption has an effect on the carbon footprint. Norwegians consume annually approximately 77 kg of liquid milk and approximately 55 kg of other dairy products (excluding cheese) per person (The Norwegian Directorate of Health from 2022). The categories under dairy products are liquid milk, concentrated milk, cream and cream products, and fermented milk products. Dairy products (other than cheese) account for 13% of an average lifestyle carbon footprint for food (Akenji et al. 2024). The emission factors for these foods are based on national intensities from van Oort, B., & Andrew, R. (2016).

Beverages

Emission intensities for beverages are sourced from Agribalyse 3.1 for soft drinks, juices, beer and wine and for coffee and tea from ecoinvent 3.9.

Food waste

The calculations of food waste include GHG emissions from biowaste treatment and the additional food production needed for the wasted food. The carbon intensity of biowaste treatment is sourced from ecoinvent 3.9 (Wernet et al., 2016). It is worth noting that the majority of the climate impact of food waste arises from food production rather than biowaste management.'

An average share of food waste is added to the base footprint from food and adjusted according to your answer. On average 40 kg of the food waste per person happens in the households, according to statistics from Norsus from 2020 (Stensgård et al 2021). The emission factor for food waste was calculated based on an average diet. It is assumed that items within sub-components are wasted in the same proportion as those consumed.

Consumption and cottages

In addition to food, transport and housing, the private carbon footprint typically consists of emissions from purchases of other types of consumer goods, services and leisure activities. A comprehensive bottom-up estimation of the carbon footprint of all of these other consumption domains would require numerous questions. In order to maintain the user friendliness of the

test the questions focus only on a few key aspects of this section, including GHG emissions from purchases of goods and the leisure use of cottages.⁴

To align consumption categories with PSL test calculations, the test does not use the average carbon footprint results from the Norwegian report (Akenji et al 2024) and data is instead sourced from Eurostat using the latest available values from 2019 (EuroStat, Final consumption expenditure of households by consumption purpose (COICOP 3 digit), 2019). Below there is a list of the used COICOP classes for goods and leisure.

Household Goods

- Clothing & Footwear (C03)
- Furnishing, Household Equipment, and Routine Household Maintenance (C05)
- Miscellaneous Goods and Services (C12)
- Audio-Visual Equipment (C091)
- Books, Paper, and Magazines (C095)
- Hobby Goods & Outdoor Equipment (C092 and 50% of C093)
- Telephone and Telefax Equipment (C083)
- Tobacco (02.3)

The climate impact of purchases is calculated using carbon intensities from *Exiobase 3.8.2* (Stadler et al., 2021). To align consumption amounts with *Exiobase* carbon intensities, conversion from consumer prices to basic prices is necessary.

Shopping habits

The test includes a question on users' shopping habits and purchases, allowing them to specify whether they buy more, the same amount, or less than the average Norwegian. Consumption is adjusted by 30% accordingly.

Second-hand:

Clothes, shoes and accessories/ Electronics/ Furniture and interior

Choosing second-hand items, such as clothing or electronics, contributes to a reduced climate impact by prolonging the use time of items. The *PSLifestyle* test includes a question on

⁴ In addition to purchases of goods and the use of cottages the Norway report (Akenji et al. 2024) includes the consumption of services and leisure activities. This difference affects the average footprint per person and is one of the reasons why the average footprint per person in Norway in the PS lifestyle test is slightly lower (7,6 tonn CO₂e) than the average footprint in the Norway report (7,8 tonn CO₂e).

second-hand clothing, electronics and furniture. Users can indicate how often they purchase second-hand items, selecting from never, seldom, 50%, or always. The climate impact of clothes, electronics and furniture is then reduced by 0%, 10%, 50%, or 80%, respectively, based on their response.

The carbon footprint of clothing, electronics, and furniture is determined based on users' response to the shopping purchases question. The test uses the average Norwegian distribution of these categories within the total goods-related carbon footprint. Specifically, clothing, electronics, and furniture account for 10%, 23%, and 19% of the average Norwegian carbon footprint for goods, respectively (EuroStat, 2019).

Cottages, size, number of users and days used

The carbon footprint of cottages includes construction and maintenance of the buildings, land use emissions and heating and electricity use. The carbon intensities used are based on the Norwegian report (Akenji et al. 2024). The carbon footprint is calculated based on the size of the cottage(s) and the number of weeks it is used by the user. The resulting emissions are then divided by the number of people who regularly use the cottage.

Action Recommendations

Once the lifestyle test is completed, actions are recommended directly based on the responses of the lifestyle test. The recommendations you receive taking the test are based on the Avoid, Shift, Improve (ASI) framework developed originally for sustainable transformation of the transport-sector but later applied more broadly to reduce the environmental impact of production and consumption systems, amongst other by the IPCC. (IPCC 2022)

The recommendations are sorted under the relevant consumption domain, indicating from which consumption domain it will mainly reduce the emissions.

Within each consumption domain the recommendations are filtered according to your individual footprint and the answers you gave to the questions. For example, if you answered that your diet is plant-based only, you will not receive any recommendations related to meat and dairy products.

The recommendations are also designed to make it possible to approach the 2030 target of 2500 kg per person. The most impactful actions within each domain, and relevant to your footprint, are presented first. These actions are chosen to make the necessary reduction impact to reach or approach the 2030 target. However, there are also a long list of recommendations that are there to inspire to any climate action, small or big, so that anyone can find something to be inspired by. Achieving the transformation necessary to reduce climate change does not depend on one major action, but rather a multiplicity of actions taken at all levels.

There is also a small group of tips that are not footprint calculations. These are actions that are more difficult to quantify in terms of CO₂ emissions. They can be defined as a handprint, that

is: something positive that you do to create climate related social changes in your society or community. These actions are marked with a light bulb instead of an emissions reductions-calculation.

Calculation of the recommendations

After completing the Lifestyle Test, users receive personalized recommendations for actions to reduce their carbon footprint. The mitigation potential of these actions is calculated based on the user's responses. However, for actions where the test does not collect specific information about individual habits, the mitigation impact is assumed to be the same for all users and is based on the average Norwegian footprint.

For example, when it comes to reducing driving or flying, the test asks users directly about their travel habits. This allows for a personalized calculation of the mitigation potential based on the individual's responses. In contrast, for actions such as recycling waste or washing clothes at lower temperatures, the test does not gather specific data on current habits. As a result, all users receive the same mitigation potential for these actions, which is based on average Norwegian data. For major reduction opportunities—such as driving or flying less and adopting a more plant-based diet—the mitigation potentials are calculated based on the user's specific answers.

An example of this is the action “Try eating according to the Nordic Nutrition Guidelines”. The emission reduction for this action is calculated based on the assumption that you replace all of your carbon footprint from food with a diet according to the Nordic Nutrition Guidelines 2023. In addition to changing the composition of your diet, this will also slightly reduce your overall consumption of food compared to the average.

The PS lifestyle team are continuously working to evolve the logic behind the action recommendations to improve the test.

Contact

For further details on the methods and calculations please contact us at post@klimatesten.no

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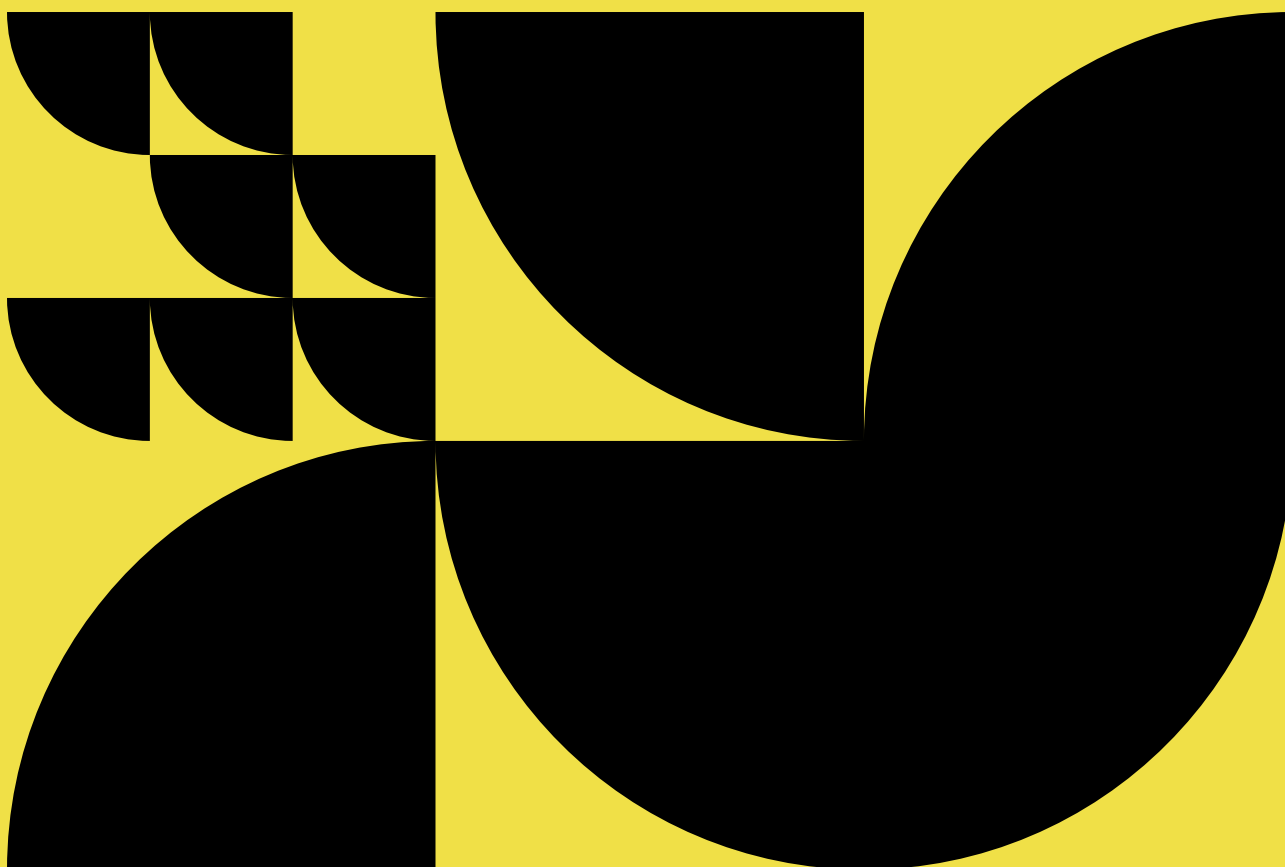
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