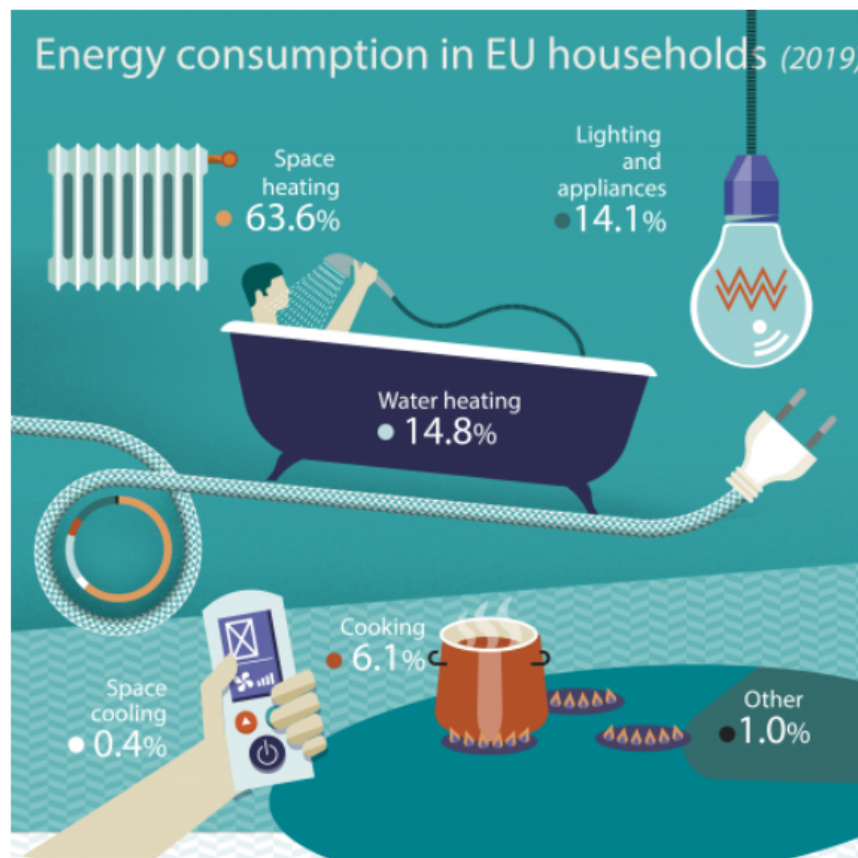1. Behavioural biases are hindering electricity consumption reduction

There is often a sizable discrepancy between peoples' self-reported knowledge, values, attitudes, and intentions, and their observable behaviour—examples include the well-known 'knowledge-action gap' and 'value-action gap'. But neither is household energy consumption driven primarily by financial incentives and the rational pursuit of material interests. In fact, people sometimes respond in unexpected and undesirable ways to rewards and sanctions intended to shift consumers' cost–benefit calculus in favour of sustainable behaviours. Why is this so? Why is household energy consumption and conservation difficult to predict from either core values or material interests? By drawing on critical insights from behavioural economics and psychology, we illuminate the key cognitive biases and motivational factors that may explain why energy-related behaviour so often fails to align with either the personal values or material interests of consumers

2. How is the electricity consumed in EU households?

Energy consumption in EU households (2019)

Space heating 63.6%
Lighting and appliances 14.1%
Water heating 14.8%
Cooking 6.1%
Space cooling 0.4%
Other 1.0%

3. The size of residential energy in the US

Residential energy use accounts for roughly 20% of greenhouse gas (GHG) emissions in the United States... A ranking by state reveals that GHGs (per unit floor space) are lowest in Western US states and highest in Central states. Wealthier Americans have per capita footprints ~25% higher than those of lower-income residents, primarily due to larger homes. In especially affluent suburbs, these emissions can be 15 times higher than nearby neighborhoods. If the electrical grid is decarbonized, then the residential housing sector can meet the 28% emission reduction target for 2025 under the Paris Agreement. However, grid decarbonization will be insufficient to meet the 80% emissions reduction target for 2050 due to growing housing stock and continued use of fossil fuels (natural gas, propane, and fuel oil) in homes.

4. An electricity tracking system (software+hardware).

It's called Sense and uses hardware that connects to the electrical panel and uses machine learning to detect devices and sends data to the user's smartphone via an app. It needs to be installed by an electrician.

Für größere Ansicht Maus über das Bild ziehen

5 VIDEOS

Sense Energieüberwachung – Verfolgen Sie den Stromverbrauch in Echtzeit und sparen Sie Geld – erfüllt strenge ETL/Intertek Sicherheitsstandards

Besuchen Sie den sense-Store

★★★★½ ∨   1.994 Sternebewertungen

Derzeit nicht auf Lager.
Wir arbeiten daran, unseren Lagerbestand so schnell wie möglich aufzufüllen.
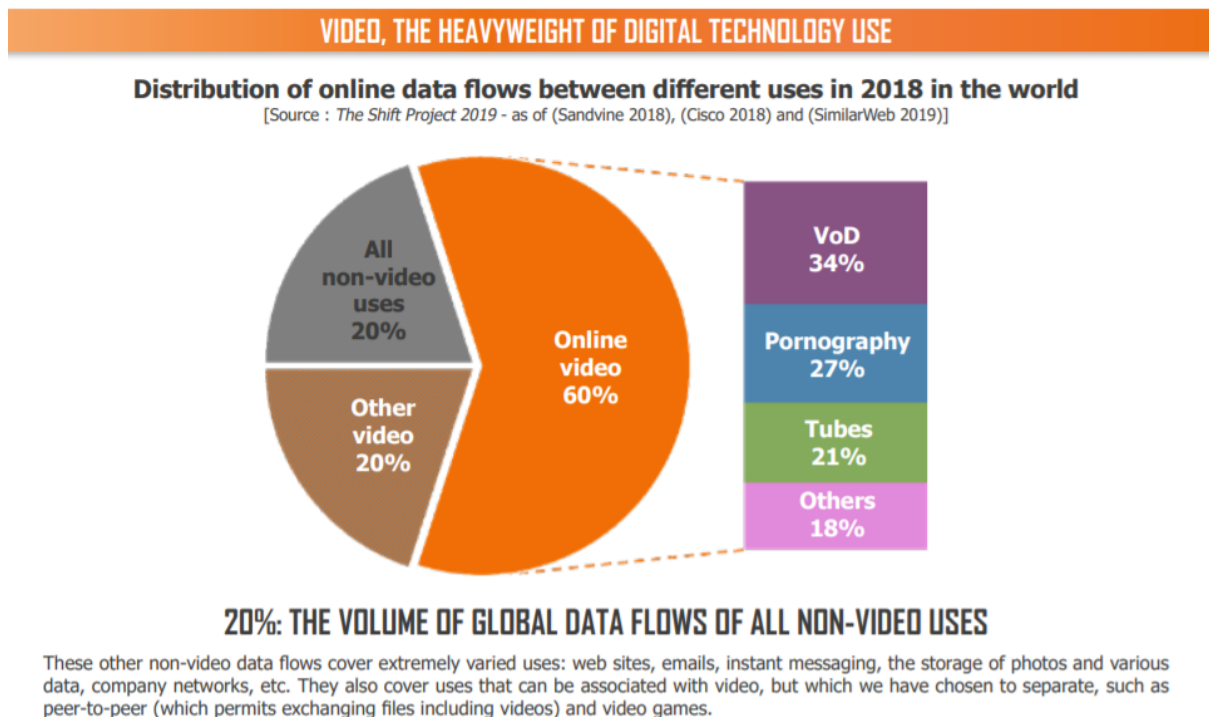
Pattern Name: **Monitor**

- Sinnessparend: Sense spart Energie und Geld, indem er Einblick in die Energienutzung und Aktivität Ihres Hauses bietet. Unterstützt Zeitpläne.
- Sehen Sie, was oben ist. Wissen Sie, was eingeschaltet ist: Verfolgen Sie, wie viel Strom Sie verwenden, wie spät Ihre Kinder nach Hause kommen oder wenn jemand das Kellerlicht auflässt. Sense identifiziert Muster in Ihrem Energieverbrauch, um Ihrer Familie zu helfen, effizienter, informierter und sicherer zu sein.
- Überwachen Sie die Nutzung Ihres Hauses von überall: Echtzeit-Daten über unsere iOS-, Android- und Web-Apps.
- Vermeidet Dissiper: Stellen Sie benutzerdefinierte Benachrichtigungen für wichtige Geräte ein, wie Ihre Ölpumpe, Brunnenpumpe oder Flacheisen.
- Erfüllt strenge Sicherheitsstandards: Sense-Komponenten und System wurden ETL/Intertek für Installation und Betrieb im Inneren des elektrischen Paneels entworfen und zertifiziert.

› Weitere Produktdetails

5. Video streaming dominates online data flows

It represents four-fifths of data flow worldwide. Data centers and storage facilities consume a lot of electricity to operate, those operations and this energy consumption happening "behind the users back", making it not necessarily obvious to the user that he is causing a lot of computation in a data server.
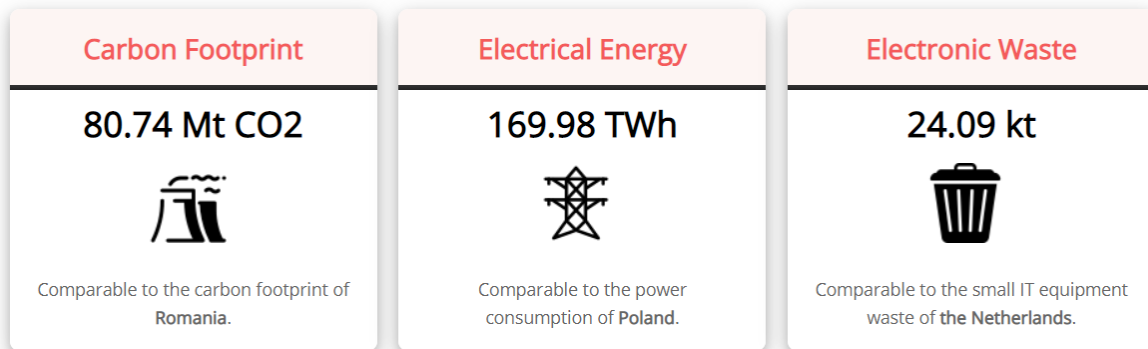
Stored in data centers, videos are transferred to our terminals
(computers, smartphones, connected TVs, etc.) via networks (cables, optical fiber, modems, mobile network antennae, etc.): all these processes require electricity whose production consumes resources and usually involves CO2 emissions

VIDEO, THE HEAVYWEIGHT OF DIGITAL TECHNOLOGY USE

Distribution of online data flows between different uses in 2018 in the world
[Source : *The Shift Project 2019* - as of (Sandvine 2018), (Cisco 2018) and (SimilarWeb 2019)]

All non-video uses 20%
Online video 60%
Other video 20%

VoD 34%
Pornography 27%
Tubes 21%
Others 18%

20%: THE VOLUME OF GLOBAL DATA FLOWS OF ALL NON-VIDEO USES

These other non-video data flows cover extremely varied uses: web sites, emails, instant messaging, the storage of photos and various data, company networks, etc. They also cover uses that can be associated with video, but which we have chosen to separate, such as peer-to-peer (which permits exchanging files including videos) and video games.

6. The bitcoin energy consumption communicated in comprehensible quantities.

It's one thing to see numbers of consumed electricity and produced CO2 but this often does not give the reader a full and understandable picture of what is actually going on. This image shows the electricity use of the Bitcoin network, not only by giving absolute numbers but also by comparing and setting it equal to something the reader can more easily apprehend. It's much easier for one's mind to get a broad picture of the subject this way.

Annualized Total Bitcoin Footprints

Carbon Footprint	Electrical Energy	Electronic Waste
80.74 Mt CO2	**169.98 TWh**	**24.09 kt**
Comparable to the carbon footprint of **Romania**.	Comparable to the power consumption of **Poland**.	Comparable to the small IT equipment waste of **the Netherlands**.

7. How to calculate the consumption of electrical devices

You can calculate the consumption of an electrical device when you know the device's power (measured in watts, W) and the amount of time it is used for. Before calculating the consumption, you should always convert the device's nominal power into kilowatts (1,000 watts = 1 kilowatt) and the period of time the device is used for into hours (30 minutes = 0.5 hours). You can then calculate the device's energy consumption (measured in kWh) by multiplying the device's power (kW) by the time it is in use (h). The following table shows the average electricity consumption of common household appliances.

Appliance	Consumption
Fridge	0.3-0.8 kWh/day
Fridge freezer	0.8-1.6 kWh/day
Freezer	0.5-1.5 kWh/day
Elerctric kitchen stove	1-2 kWh/day
Microwave	0.12-0.2 kWh/10 min
Coffee maker	0.1 kWh/10 min
Electric kettle	0.1 kWh/5 min
Range hood	0.2 kWh/h
Dishwasher	0.6-1.6 kWh/use
Drying cabinet	2.2-2.8 kWh/3 kg
Tumble dryer	2.1 kWh/3 kg

8. European residential sector electricity usage and policy recommendations to reduce it

Despite the fact of significant improvements concerning energy efficiency of home appliances' electricity consumption, the electricity consumption in the EU has increased by 2% per year during the past 10 years. Some reasons are associated with an increased degree of basic comfort and level of amenities and with the widespread utilisation of new types of loads. Wishing to increase the understanding of the energy consumption in the EU households for the different types of equipment including the consumers' behaviour and comfort levels, and to identify demand trends, an energy monitoring campaign was carried out in 12 geographically representative EU countries, accompanied by a lifestyle survey.

The measurements showed that Information Technologies and entertainment loads are the main contributors to the steadily increasing power demand. Latest technology paired with conscious consumer behaviour can decrease the level of consumption. The paper states that based on a bottom up approach the European residential sector potential electricity savings which can be implemented by current technologies and optimized consumer behaviour could achieve 48%.

Ultimately, the authors raise policy recommendations promoting market transformation and behavioural adaptations in the equipment selection and operation.

Annual Average Electricity Consumption per Household
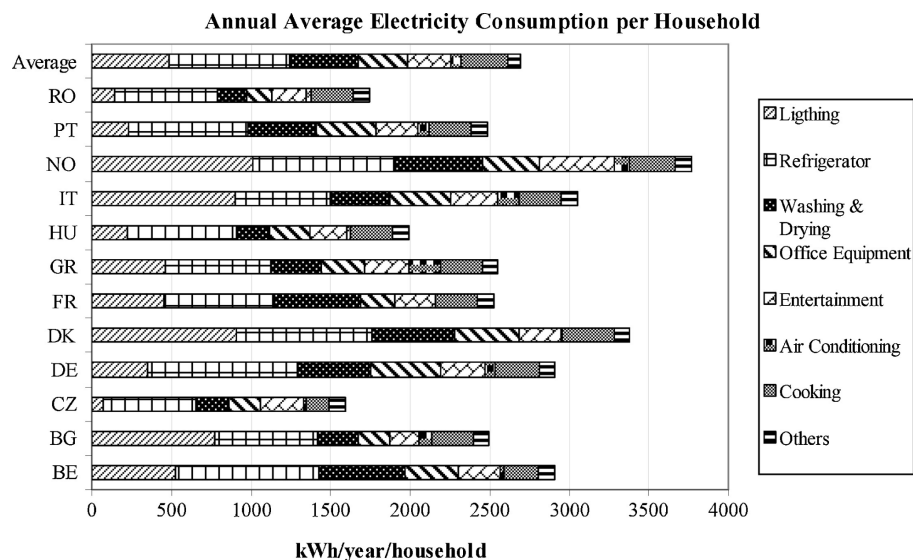
9. Swiss federal administration tips on how to reduce household energy consumption

The booklet is published by the Swiss federal administration for energy, where they present the most effective and easy to implement energy saving tips. An estimated 10% of Electricity Used in a typical Swiss Household is wasted by Devices that are in Stand-By Mode instead of turned off completely, according to the BfE (Bundesamt für Energie). This and other tips to reduce not just the energy consumption in general, but also reducing the electricity usage in household environments. Maybe some consumers are also not aware how much energy is used by cooking devices, since they are mainly used to generate heat. The paper is relevant for our project, since we are also searching for ways to bring the

information and awareness to reduce the electricity consumption in households. On the right an example by putting a pan lid on top for cooking.

10. Case study: Game that facilitates electricity consumption reduction

In this case study, they designed a family game to explore whether this could be an effective and fun approach for raising the awareness of family members towards their energy use and, in the long run, to provide an effective tool for affecting their habits regarding sustainable behavior. The design of the family game implemented the metaphor of electricity as flowing liquid, fostered fun experiences and supported competitive and social elements. Dutch families with children, aged 5-11 years, participated in the design and evaluation of the concept. They used this approach to raise awareness among households where they're wasting a lot of electricity. Since we are also looking at ideas which include a social gamification aspect, this is partially relevant, since it contains information about which aspect influenced the members of the household the most regarding their consumption.

11. Being aware of consumption does not mean you reduce it

This research consisted of three studies conducted with different samples within a selection of households where a smart meter was installed as part of the smart meter implementation program in the Netherlands...In the sample with measured energy consumption, we did not find a significant reduction in electricity and gas consumption during this research. Yet in the questionnaires, the application users reported more energy awareness and indicated to have made more investments and changes in their behavior than the reference group. Most app users started using the first app they found and did not explore the other options. The interview results indicate that, after an initial learning period, the app was used to monitor the electricity and gas consumption levels, rather than to lower them. In line with other research into feedback, the interview results suggest that the apps could be more effective with information that is more actionable and meaningful with respect to one's own specific situation and goals for the household. Further exploration is recommended with respect to how the design of such apps can encourage a wide audience not only to monitor their consumption but also guide them in taking action to change their consumption levels.

12. App examples for energy consumption reduction and tracking

Trying to control the energy consumption and costs of your home or business? We've compiled a list of 15 smartphone apps and tools that will help you keep track of your energy consumption.
Keep in mind, even if you do a great job at tracking and conserving your energy, you're still doing yourself a disservice if you're paying a [much higher electricity rate than the rest of the country](#).

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2. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households#Energy_consumption_in_households_by_type_of_end-use
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7. https://www.caruna.fi/en/our-services/energy-efficiency/average-consumption-of-electrical-devices
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12. https://www.electricchoice.com/blog/green-apps-track-energy-usage/