Sustainability in Research Infrastructures

SUSTAIN ABLE DESY.

Dr. Kathrin Schulz

Hamburg, 18 November 2024

HELMHOLTZ SPITZENFORSCHUNG FÜR GROSSE HERAUSFORDERUNGEN

DESY.

Scientific dimension – The Consequences

Temperature rise in Germany

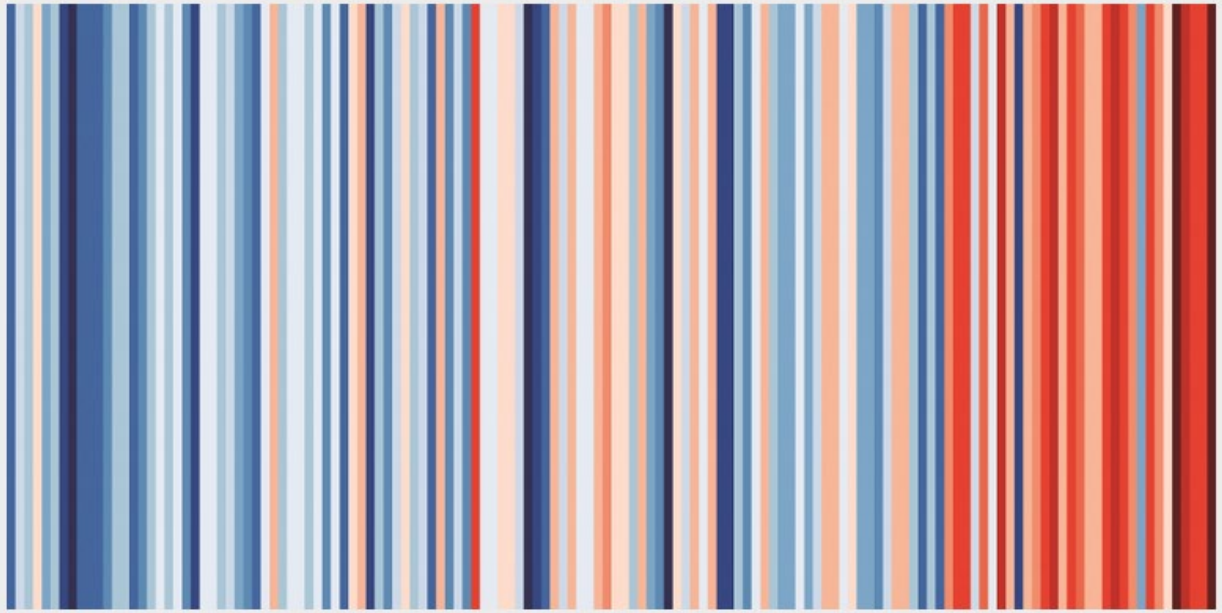

Abbildung 1: Durchschnittstemperatur Deutschland zwischen 1881 und 2018

Durchschnittstemperatur für Deutschland zwischen 1881 und 2018 (jeder Streifen steht für ein Jahr, Basis ist der Datensatz des DWD)

Quelle: Ed Hawkins / showyourstripes.info

Scientific facts: Research Centers as scientific institutions have to act accordingly!

Communication dimension

Securing social and political legitimacy

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Balancing:
Research organisations must take scientific knowledge into account – without unduly restricting its own scientific work!

Sins for research

Sünden für die Forschung

Expeditionen, Teleskope und Großgeräte belasten das Klima. Langsam kommt es zum Umdenken

Von Ralf Nestler

Reisen oder nicht? Diese Frage stellen sich viele Forscherinnen und Forscher. Denn: Die pandemiebedingten Beschränkungen sind weitgehend abgeschafft, sie könnten wieder durchstarten zu Expeditionen, Speziallaboren und Konferenzen. Doch die Reisen belasten das Klima und vergrößern weiter den CO_2-Fußabdruck der je nach Disziplin ohnehin oft deutlich über dem Durchschnitt liegt.

Das liegt unter anderem an großen Forschungsbauten aus Beton und Stahl, die zudem viel Strom verbrauchen. Die Astronomie mit ihren Teleskopen und Rechenzentren gehört eindeutig zu den großen Emittenten. Doch auch die Teilchenphysik mit ihren Beschleunigern und die Umweltforschung – Stichwort Expeditionslogistik – tragen zum Klimawandel bei.

„Können Universum nicht auf Kosten des Planeten erforschen“

Wie viel, das lässt sich kaum fassen. Der „Klimaabdruck“ einer Spiegeloptik, einschließlich Herstellung, eines Gebäudes oder von Dienstreisen, kann geschätzt werden. Studien haben daher eine gewisse Unsicherheit, können Tendenzen jedoch deutlich machen.

Demnach sind in der Astronomie die Infrastrukturen der dominierende Fak-

Fahrt fürs Klima. *Der Polarstern hat auf der „Mosaic“-Expedition rund 7000 Tonnen Schiffsdiesel verbraucht.* Foto: dpa/AWI

DER TAGESSPIEGEL

Brandbrief für Klimaschutz

02.09.2020, 17:34 Uhr

Dicke Luft bei Helmholtz

Mitarbeiter der Forschungsorganisati
Klimaschutz. VON JAN KIXMÜLLER

Trouble‘s brewing @ Helmholtz

SPIEGEL Wissenschaft

Studie zu Emissionen

Wie klimaschädlich darf Grundlagenforschung sein?

In China soll ein riesiges Neutrino-Observato
ökologische Auswirkungen diskutiert. Das Be
Astronomen und Astronominnen angekomm

How climate-damaging is basic research allowed to be?

Von **Christoph Seidler**
16.01.2021, 19.12 Uhr

Towards sustainable infrastructures

Research infrastructures as part of the solution

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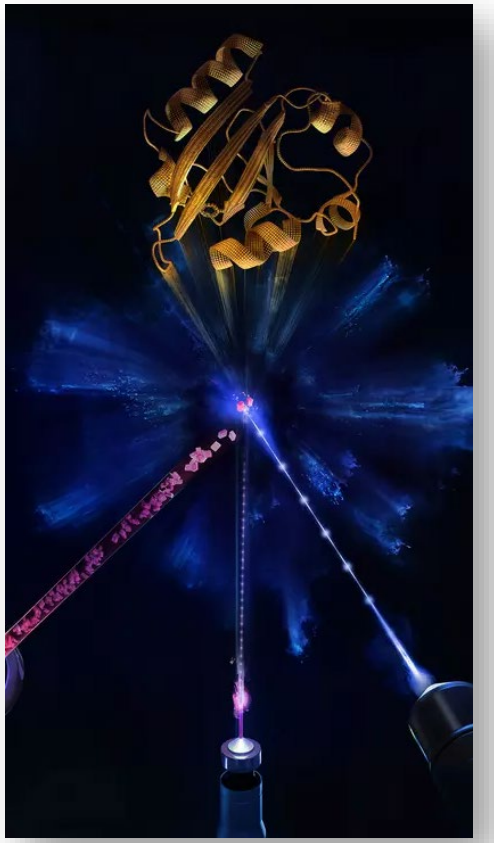
- Challenges for our society are increasing and need a solution much more quickly.
- This requires a detailed and fundamental understanding of the structure of matter, processes in materials and biological processes.
- Large-scale scientific infrastructures is essential for this.
- Researchers use them to investigate the most diverse facets of matter, from fundamental properties to applications in innovative and sustainable materials and biosystems.
- Examples are vaccines, materials for the circular economy, novel catalyst …



Towards sustainable infrastructures

Understanding sustainability

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Large-scale Research Infrastructures

Research for Sustainability = WHAT

| Contribution to UN Sustainable Development Goals

Sustainable Research = **HOW**

| Use of renewable energies

What is part of sustainability?

Dimensions - Resources - Stakeholders

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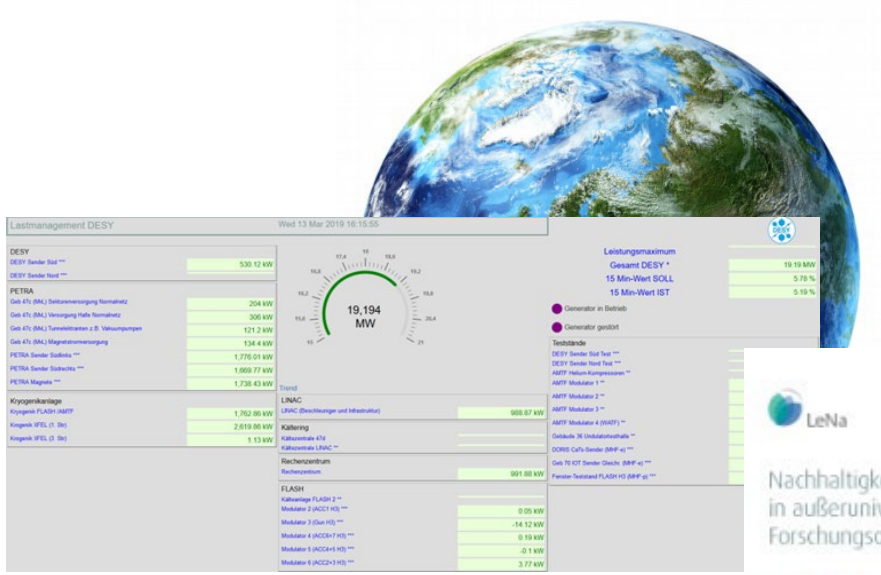
Dimensions

- Protection of our environment
- Economic efficiency
- Social responsibility

Resources

- Staff and guests
- Infrastructure
- Equipment
- Raw materials and supplies
- Energy
- Financial resources
- Data and knowlegde



LeNa Fields of action

- Organisational management
- Research
- Human resources
- **Buildings and infrastructures**
- Supporting processes

Sustainability Management in Non-University Research Organisations

Buildings and Infrastructure

Buildings

- 40% of final energy consumption in Germany is in the use in buildings.
- Research infrastructures have special needs on ventilation and cooling.
- The operation itself also requires resources such as electricity and operating materials.
- This is why they play a central role towards climate neutrality.

| HZB Living Lab Building-integrated PV

- ➢ Development of holistic energy concepts and introduction of energy management
- ➢ Use of renewable energies and integration of own resources such as waste heat or building-integrated photovoltaics
- ➢ Certification of new buildings according to the Sustainable Building Assessment System (BNB) with the silver standard
- ➢ Green walls and roofs, also in terms of rainwater management

| DESY Hall 36 Greening

Buildings and Infrastructure

Research for (our own) infrastructures

- This is where research and infrastructure come together and our own research makes us more sustainable:
  - R&D for more energy / resource-efficient components like solar cells or energy storage
  - Reflected consideration, e.g. for permanent magnets
  - Big Data → Green IT and concepts for data reduction
  - Automation of systems
  - Remote access to the experimental facilities

| KIT Test field for energy efficiency and grid stability

| GSI Green IT Cube (supercomputing center)

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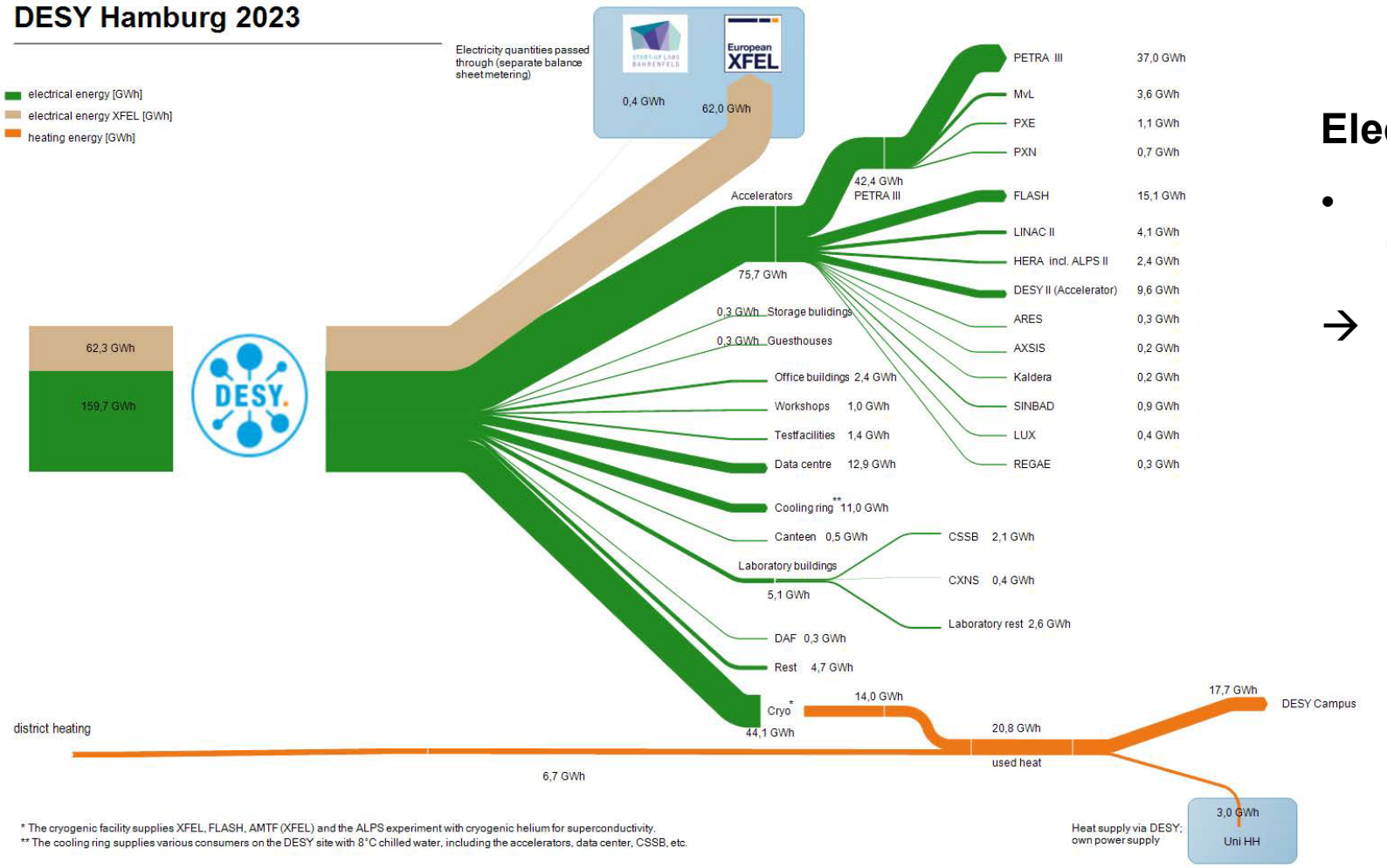
Flash lights – Energy monitoring system



Electricity, heating, cooling and water

- Development of a monitoring system with a central database

→ Identification of potential savings and greater awareness of energy consumption

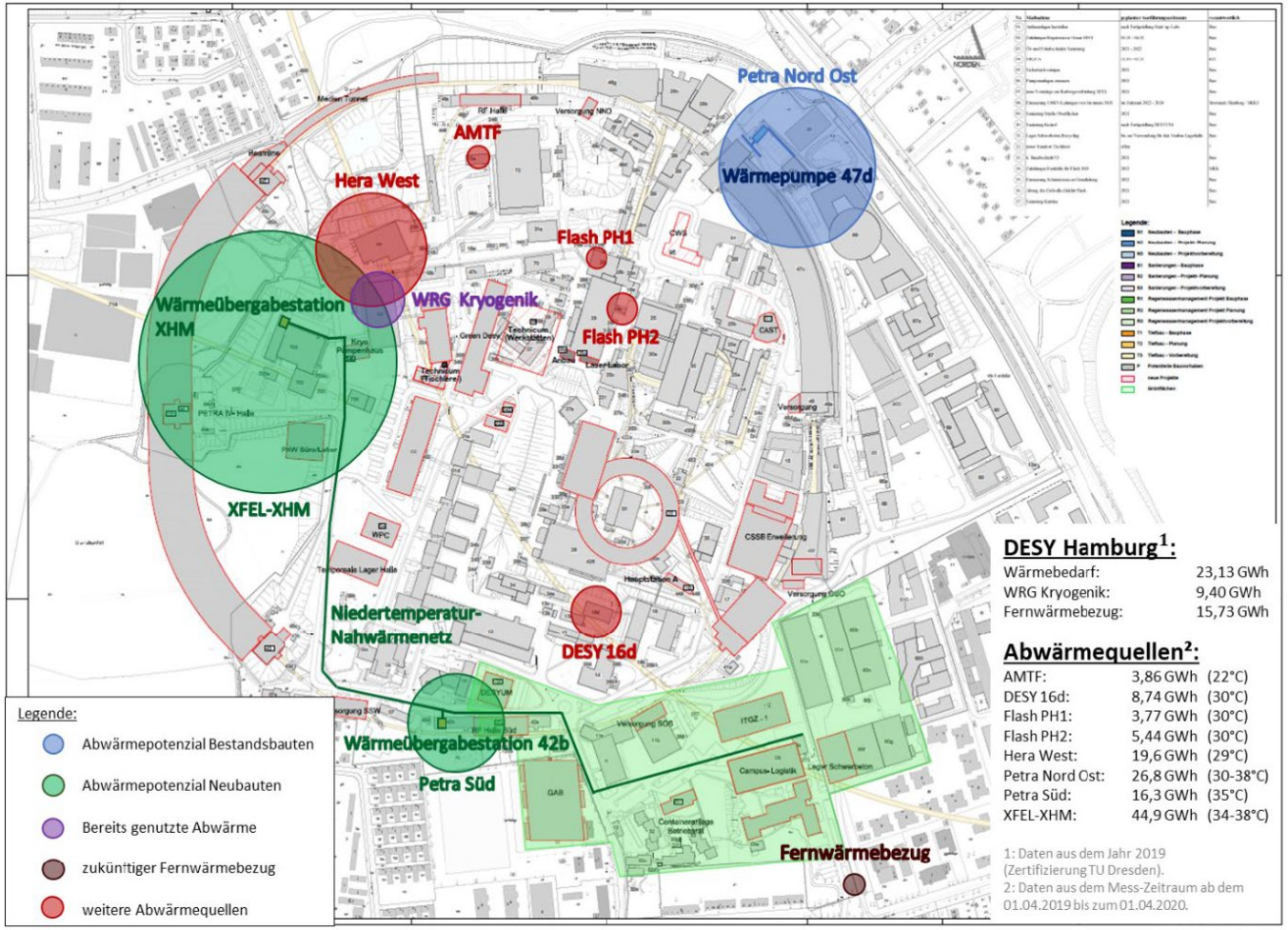
- Comparison electricity only:
  - DESY appr. 50,000 households
  - DESY+XFEL appr. 72,000 households

Source: Consumption depends on the size of the household. Average household with 2 people consumes 3,106 kWh (https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Umwelt/UGR/private-haushalte/Tabellen/stromverbrauch-haushalte.html)

Best of @ DESY

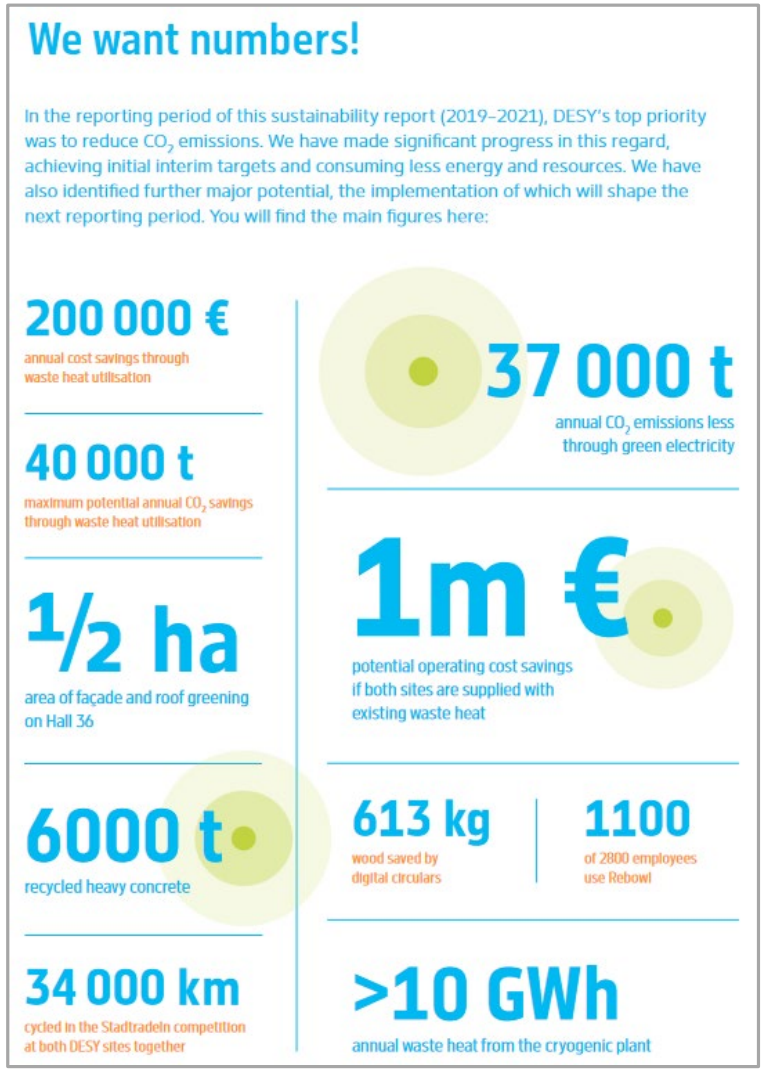
Flash lights – Use of waste heat

- Waste heat from cryogenics covers about 70% of the total heat requirement (Research project)
- Very high potential from the waste heat from the accelerators (Research project in collaboration with HAW)
- **Funding** of **EUR 8 million** to implement the
  → Low-temperature system for new buildings
  → Supply of the existing buildings
  → Realization until approx. 2027



Want to know more?

DESYs sustainability report



https://sustainability.desy.de

Thank you !

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