

On the way towards sustainable user facilities

Specific contribution Research Field Matter

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User Facilities and Sustainability Outline

- 1. The challenge
- 2. User facilities as part of the solution
- 3. Basis and commitment
- 4. Overview of status quo and next steps

3.1. Buildings and infrastructures (= Specific responsibility for large scale user facilities)

3.2. Research

- 3.3. Organizational management
- 3.4. Human resources
- 3.5. Supporting processes
- 5. Conclusion

TOGETHER WE ARE SUSTAIN ABLE.



User Facilities and Sustainability The Challenge(s)



| Planetary Boundaries (including Climate Change) Credit: J. Lokrantz/Azote based on Steffen et al. 2015



Unstable energy supply and prices

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User Facilities and Sustainability **Public Perception**

Balancing:

Research Infrastructures have to take scientific knowledge into account – without unduly restricting its own scientific work

Sünden für die Forschung

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

VON RALF NESTLE

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.-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 Expediti-.Können onslogistik - tragen zum Klimawandel Universum Wie viel, das lässt nicht auf sich kaum fassen. Kosten des Der "Klimaabdruck" Planeten einer Spiegeloptik, einschließlich Hererforschen" stellung, 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.

Sins for research

Foto: dpa/AWI



Studie zu Emissionen

Wie klimaschädlich darf Grundlagenforschung sein?

In China soll ein riesiges Neutrino-Observatorium entstehen. Schon vor Baubeginn wird über ökologische Auswirkungen diskutiert. Das Beisp Astronomen und Astronominnen angekommen

Von Christoph Seidler 16 01 2021 19 12 Uhr

How climate-damaging is basic research allowed to be?



Mitarbeiter der Forschungsorganisation fordern weitreichende Maßnahmen für sofortigen

Brandbrief für Klimaschutz

Klimaschutz, von JAN KIXMÜLLER

Dicke Luft bei Helmholtz

02.09.2020, 17:34 Uhr



Trouble's brewing @ **Helmholtz**

User Facilities and Sustainability What and How





| HZB Living Lab Building-integrated PV

Sustainable Research = How



Usage of eco-power

Research for Sustainability

User facilities as part of the solution

- Global challenges increase
- Detailed understanding of the structure of matter is essential for overcoming these challenges
- Deepening this understanding is the mission of the research field Matter
- Large scale user facilities with their exceptional capabilities are essential for that





Research for Sustainability

User facilities as part of the solution

- Examples include:
 - Tailor-made energy materials
 - Novel catalysts
 - Understanding the interaction of molecules, cells and tissue
 - Quantum materials for the digital revolution
 - Materials for the circular economy
 - And many more





User Facilities and Sustainability Basis and Commitment

Commitment and common understanding is established

- Sustainability commitment and policy of the Helmholtz Association
- Handbook for sustainability management in non-university research organisations (LeNa) and its five Fields of Action



User Facilities and Sustainability Basis and Commitment

Center level:

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- Sustainability managers and working groups in place in all centers (top – down)
- Grass roots initiatives (bottom – up)





Helmholtz level:

- Helmholtz Sustainability Working Group
- Sustainability Task Force
- Yearly Sustainability Summits (SuSu) next: 10./11.October 2023 at KIT

Sustainable Research Overview LeNa



1 - Buildings and Infrastructures

Part 1 "Normal" civil construction

- <u>Status quo / in preparation:</u>
 - Energy concepts, Energy management + monitoring
 - Renewable energy; photovoltaic etc.
 - Greening of walls and roofs; rainwater management
 - Waste heat usage and heating optimization
 - Sustainable civil construction certified by BNB Silver Standard
- <u>Next steps:</u>
 - Implement sustainable construction for <u>all</u> new projects
 - Find solution to justify higher invest cost by lower operation costs (amortization, intracting)





| DESY Hall 36 Greening



| HZB Living Lab Building-integrated PV

1 - Buildings and Infrastructures

Part 2 – Specific technologies and access

- Status quo / in preparation:
 - R&D for more efficient technical components
 - E.g. Permanent magnets \rightarrow save energy, but use critical materials
 - Cooperation with several Living Labs (FB Energy)
 - Development of remote access (demonstrator)
 - Digitization of research operations (e.g. Digital LEAPS)
 - EU and other projects (I.FAST, LEAPS, ESSRI etc.)
 - Green IT
- <u>Next steps:</u>
 - Life cycle assessment for technical components
 - Expansion of automatization and remote access



KIT Test field for energy efficiency and grid stability



| GSI Green IT Cube (supercomputing center) HELMHOLTZ

2 – How to do research

- Status quo and in preparation:
 - Research in societal responsibility (BMBF supported project: LeNa shape)
 - Discussion rounds at HGF Sustainability Summits
- <u>Next steps:</u>
 - Results of LeNa shape
 - More networking and strategic use of developments
 - Target group-specific communication and training measures to raise awareness





| HGF Discussion at Sustainability Summit 2019

3 – Organisational Management

- Status quo and in preparation:
 - Strategy processes
 - Sustainability Management
 - Knowledge transfer
 - Leadership competences
 - Compliance officer
- <u>Next steps:</u>
 - Update strategies on a regular basis
 - Formulate climate goals
 - Support sustainability relevant research and tech transfer



HEREON Hosting GERICS Climate Service Center Germany

ALLIANZ DER WISSENSCHAFTSORGANISATIONEN

Alliance of Science Organisations seeks to contribute to achieving the goal of climate neutrality

tatement 13 September 2021

| Alliance of Science Organisations in Germany on Climate Neutrality

4 – Human Resources

- Status quo and in preparation:
 - Mobile work
 - Strategic HR development
 - Efforts for diversity, equality
 - Audit "work and family"
 - Health management, company-facilitated sports activities
- <u>Next steps:</u>
 - Further develop and monitor mobile work
 - New hybrid access modes for users





5 – Supporting Processes

- Status quo and in preparation:
 - Business travel (reduction, avoid flights, compensation)
 - Mobility (e-mobility, public transport, bicycle-friendly employer, job-ticket)
 - Digitization in administration
- <u>Next steps:</u>
 - Expand sustainable procurement



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HZDR Plans for bicycle access and charging stations for E-cars



DESY Savings by changing campus info to digital

User Facilities and Sustainability Conclusion

- Sustainability is a big global challenge
- User facilities are part of the solution
- user facilities have a special responsibility to become ever more sustainable (as they use large amounts of energy and other resources)
- of good achievements have been reached the last few years
- clear path ahead (including a few challenges to overcome)

Alelerating



Although permanent magnets can significantly reduce the energy consumption of accelerators, their use of rare earths requires best practices, as discussed by experts at the latest I.FAST workshop.

13 MARCH, 2023 | By Andrea Klumpp (DESY), Denise Völker (DESY) & Mike Seidel (PSI/EPFL)



Permanent magnets require large amount of rare earths, often mined in precarious conditions for both the workers and the ervironment. (Credit: Sebastian Pichler/Unsplash)

Depending on their type and application, accelerator-driven research infrastructures consume large amounts of electricity from the grid, ranging from a few MW to 100 MW for the largest facilities. When it comes to sustainability, energy consumption is naturally the first issue that comes to mind, but it also comprises many more important categories, such as the use of the scarce resources of water and helium, the carbon footprint of buildings and underground tunnels, and the environmental impact of critical materials, and in particular rare earths.

In recent years, new synchrotron light source projects have used increasingly accelerator magnets made from blocks of permanent magnet material. A major advantage of these

| Report about workshop in critical materials February 2023 with engagement of all partners in Matter