GREATER

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GROWING RWANDA ENERGY AWARENESS THROUGH HIGHER EDUCATION

Project Kick-Off

February 6, 2023
INES-Ruhengeri

Paolo Ciampolini
Università degli Studi di Parma

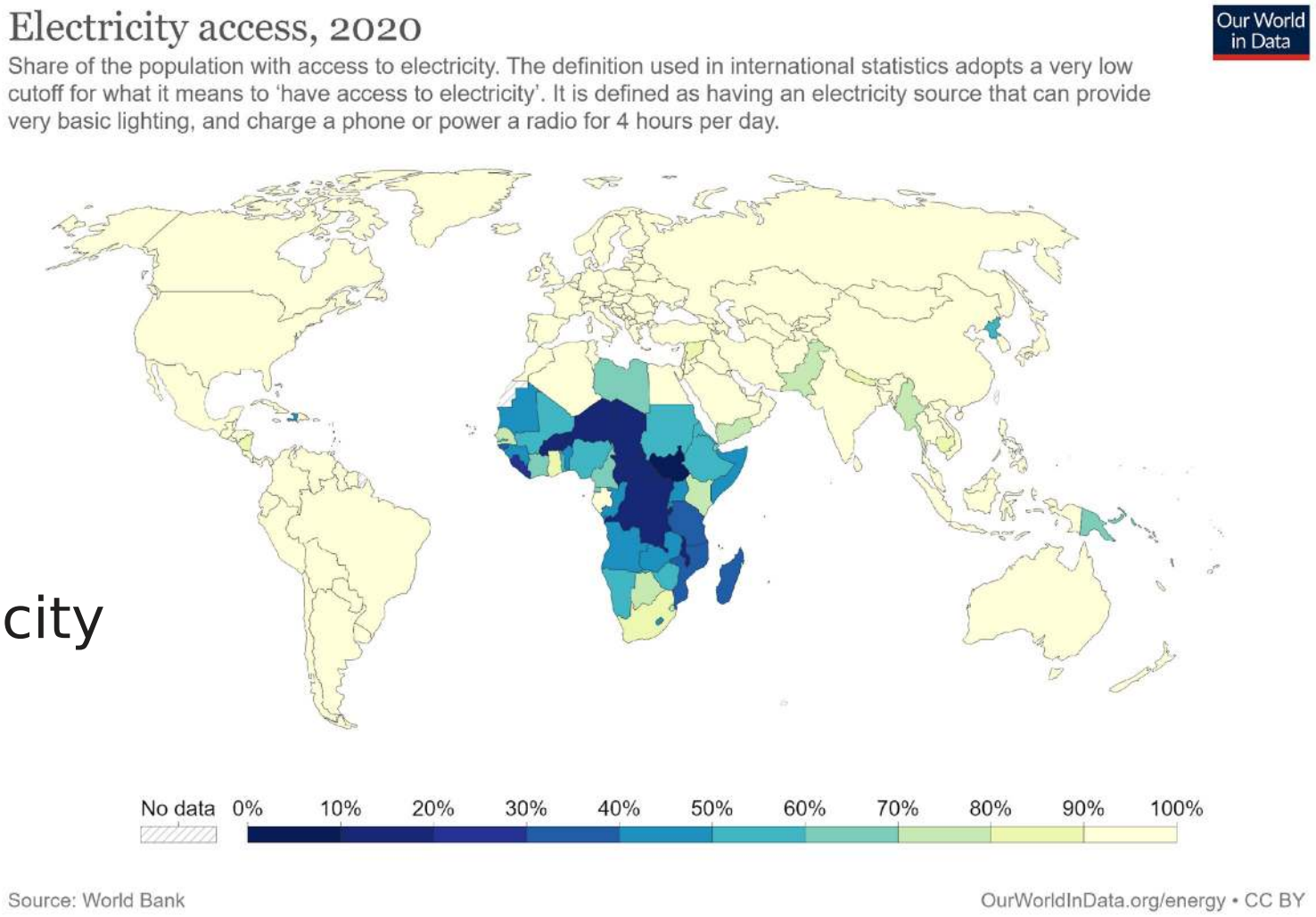
GREATER project rationale

- **Erasmus+ priorities:**
  - Environment and Fight against climate change
  - Digital transformation
- **Supporting Rwanda energy transition and equal energy access:**
  - improving HEIs' education capacity
  - bridging academy and community
  - effective diffusion of clean, renewable energy and green practices
  - boosting green business
- **UN Sustainable Development Goals:**



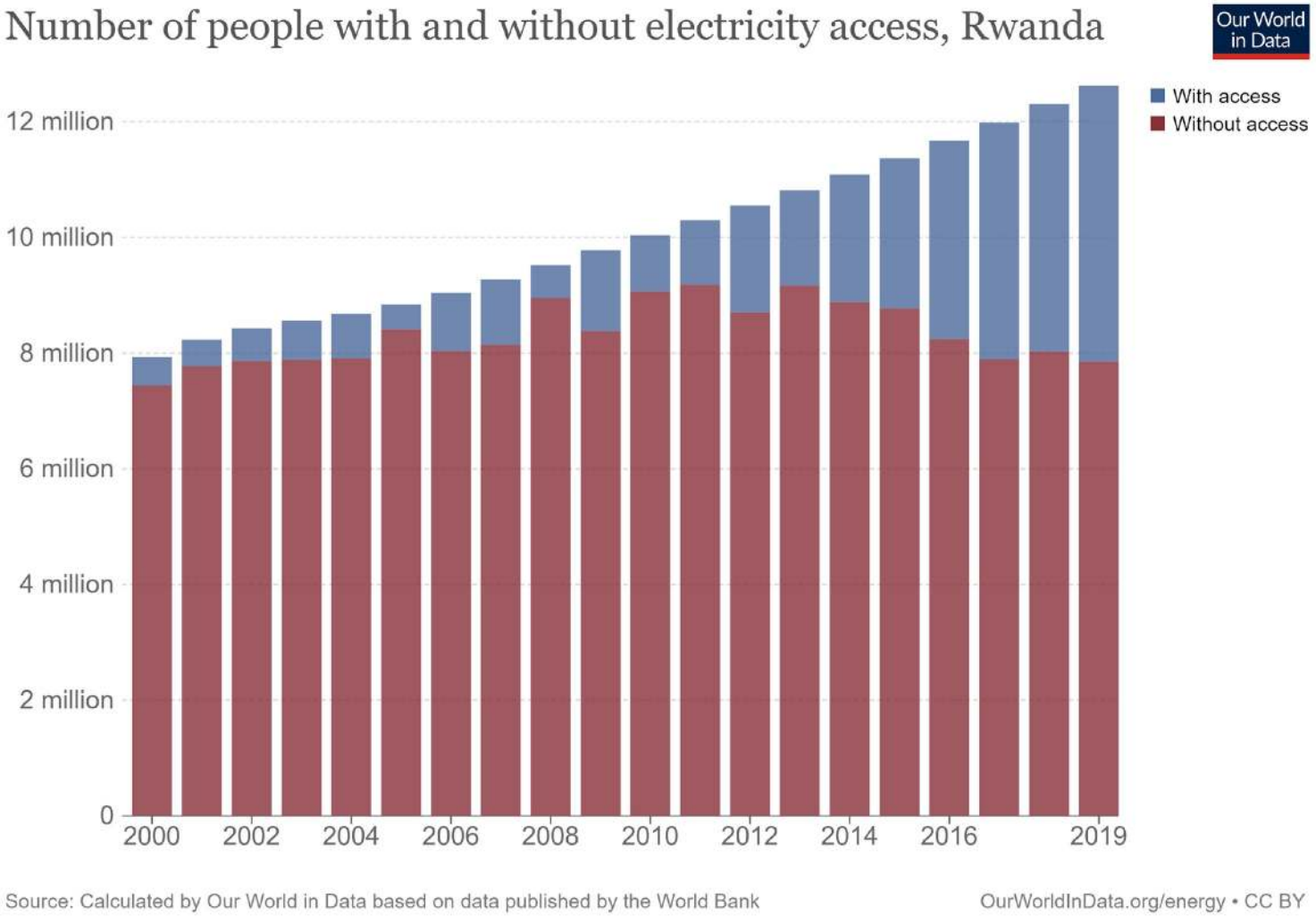
GREATER project rationale

- Electric energy is a key enabler
- Huge inequalities in electricity access
- Energy poverty is a strong limitation to development



GREATER project rationale

- Rwanda electricity access rate is rapidly growing
- Still problems:
  - rural areas
  - limited energy availability
- June 22:
  - 72% households electrified
    - 50% on-grid
    - 22% off-grid (mostly PV)
- 2024 plans:
  - 100% households electrified



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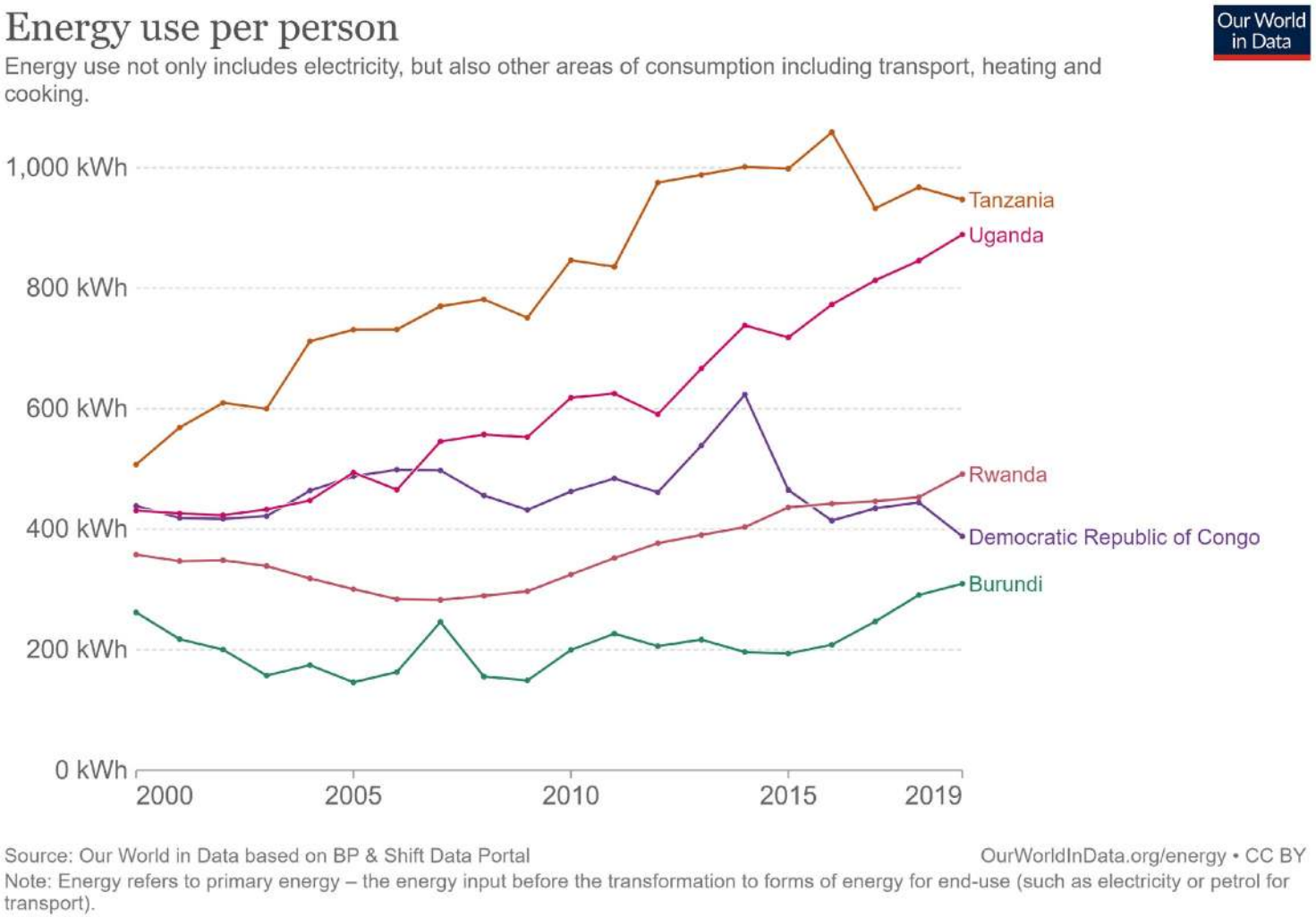
GREATER project rationale

- More energy is being produced
- Population is increasing as well
- Available energy still limited



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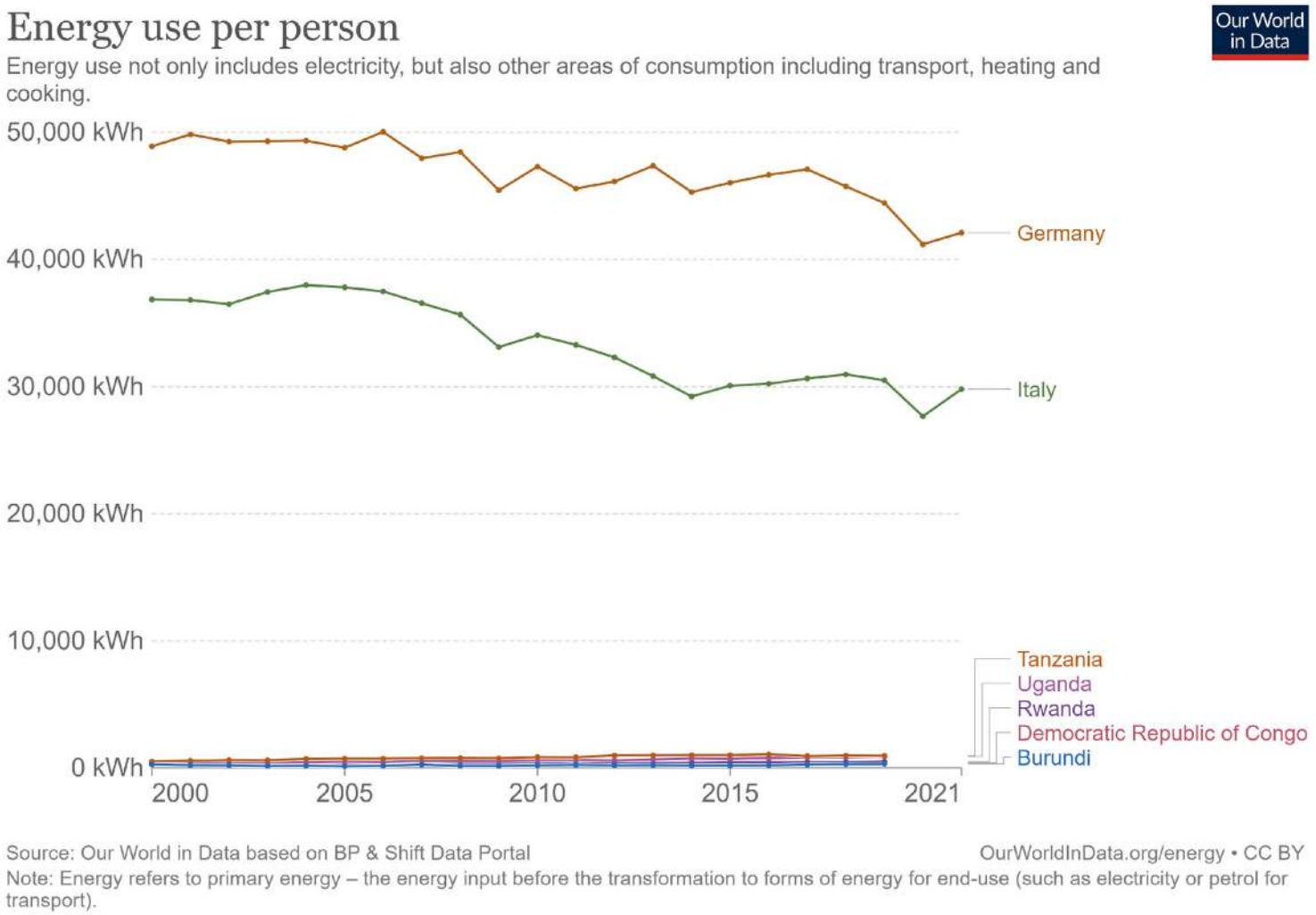
GREATER project rationale

- Rwandan per capita energy use:
  - 62 times less than Italy
  - 90 times less than Germany
  - 160 times less than US



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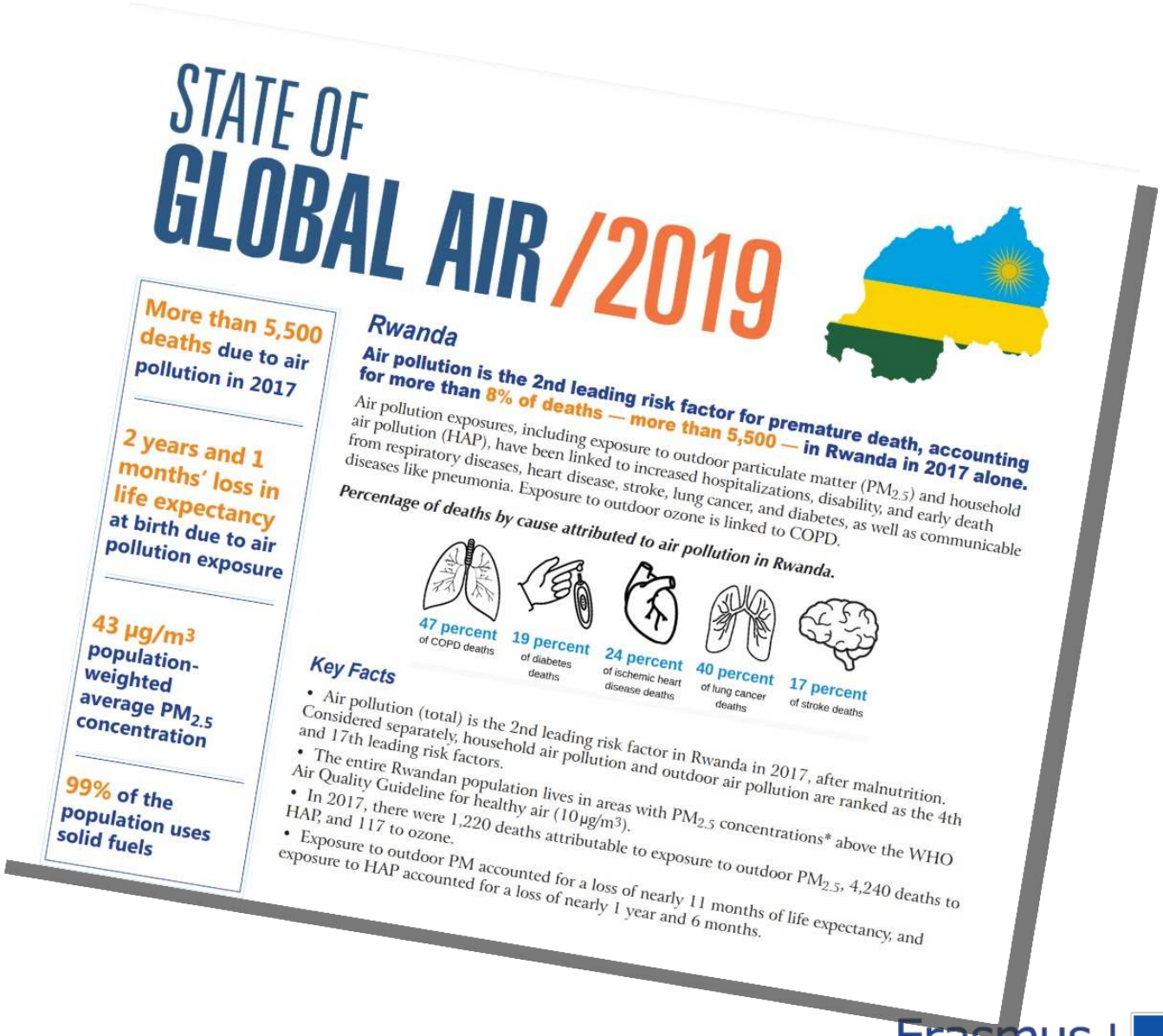
GREATER project rationale

- Need more energy, but:
  - clean
  - safe
  - sustainable

(carbon neutrality to be achieved by 2050)



STATE OF GLOBAL AIR /2019

More than 5,500 deaths due to air pollution in 2017

2 years and 1 months' loss in life expectancy at birth due to air pollution exposure

43 µg/m³ population-weighted average $PM_{2.5}$ concentration

99% of the population uses solid fuels

Rwanda

Air pollution is the 2nd leading risk factor for premature death, accounting for more than 8% of deaths — more than 5,500 — in Rwanda in 2017 alone.

Air pollution exposures, including exposure to outdoor particulate matter ($PM_{2.5}$) and household air pollution (HAP), have been linked to increased hospitalizations, disability, and early death from respiratory diseases, heart disease, stroke, lung cancer, and diabetes, as well as communicable diseases like pneumonia. Exposure to outdoor ozone is linked to COPD.

Percentage of deaths by cause attributed to air pollution in Rwanda.

47 percent of COPD deaths
19 percent of diabetes deaths
24 percent of ischemic heart disease deaths
40 percent of lung cancer deaths
17 percent of stroke deaths

Key Facts

- Air pollution (total) is the 2nd leading risk factor in Rwanda in 2017, after malnutrition. Considered separately, household air pollution and outdoor air pollution are ranked as the 4th and 17th leading risk factors.
- The entire Rwandan population lives in areas with $PM_{2.5}$ concentrations* above the WHO Air Quality Guideline for healthy air (10 µg/m³).
- In 2017, there were 1,220 deaths attributable to exposure to outdoor $PM_{2.5}$, 4,240 deaths to HAP, and 117 to ozone.
- Exposure to outdoor PM accounted for a loss of nearly 11 months of life expectancy, and exposure to HAP accounted for a loss of nearly 1 year and 6 months.

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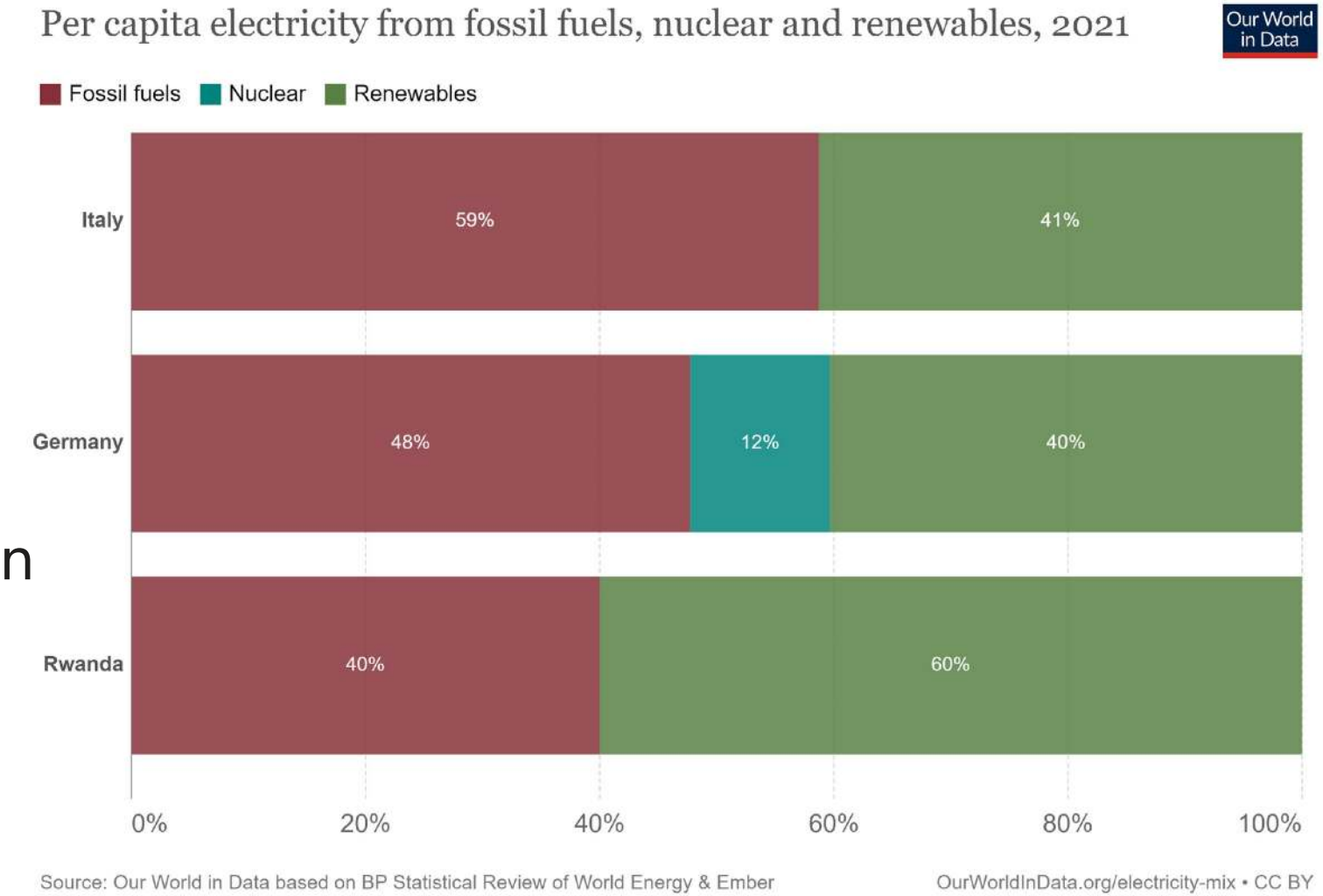
GREATER project rationale

- On a qualitative ground, Rwanda is “doing better” than Europe already
- Quantitatively, access rate and energy production need boost



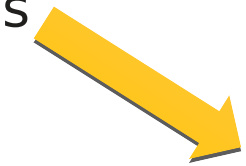
GREATER project rationale

RENEWABLE ENERGY allows for:

- Fast and widespread deployment
- Less infrastructure
- Inexpensiveness
- Environmental friendliness

Key factors for effective exploitation of RE:

- Affordable, reliable and modern technologies
- Availability of skilled professionals
- Environmental awareness





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GREATER project FIGURES

Erasmus+ Programme
Call: Capacity building in the field of higher education (ERASMUS-EDU-2022-CBHE)

Submitted: February 2022
Selected: September 2022 (*overall success ratio: 35%*)
Grant finalized: December 2022

Project start: January 1, 2023
Project end: December 31, 2025

Project cost: 887.295,60 €
EU max contribution: 798.566,00 €

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GREATER project Partnership

University of Parma
Parma, Italy

University of Rwanda
Kigali, Rwanda

University of Technology and Arts
Byumba, Rwanda

Hochschule Niederrhein
Krefeld, Germany

Rwanda Polytechnic
Tumba, Rwanda

Hochschule Bonn-Rhein-Seig
Sankt Augustin, Germany

INES- Ruhengeri
Musanze, Rwanda

CNR - IMEM
Parma, Italy

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GREATER Associated Partners

Associated partners:

- MINEDUC: Rwandan Ministry of Education
- REG - Rwanda Energy Group: leading energy provider
- EPD: Energy Private Developers, a group of private companies in energy sectors.
- CEA-PME: European Entrepreneurs, a large group of European SME Associations, active in supporting European-African trade opportunities and mobility.
- AEM : Fondazione AEM, a foundation from Municipal Electric Energy company in Milan (IT), active in awareness initiatives on equal access to energy.
- NAU: Ivorian Nangui Abrogoua University cooperating with HN in a project quite close toGREATER.
- **Secondary schools:**
  - NDE: École des Sciences de Musanze « Notre Dame de l'Etoile », Ruhengeri
  - APEKI Tumba TVET school, Tumba
  - GSSA: Groupe Scolaire St. André, Kigali
- **NGOs:**
  - VJN: Vision Jeunesse Nouvelle
  - ODEDIM : Organisasion Diocesaine pour l'Entraide et le Developpement Integral de Muyinga, Burundi.

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GREATER project objectives

- **Education of skilled professionals in the Renewable Energy field:**
  - Review/update of 6 current curricula (UR, RP, UTAB, INES)
  - Implementation of 2 new programs (RP, INES)
  - Introduce/update RE and smart (IoT) technologies
- **Provide practice-oriented experience:**
  - Implementation/improvement of classroom labs
  - Implementation of 4 Networked Living Labs
- **Mobility:**
  - Students exchanges
  - Staff exchanges
- **Community engagement:**
  - User-centered design approach
  - Effective outreach strategies, aimed at green awareness
  - Business opportunities

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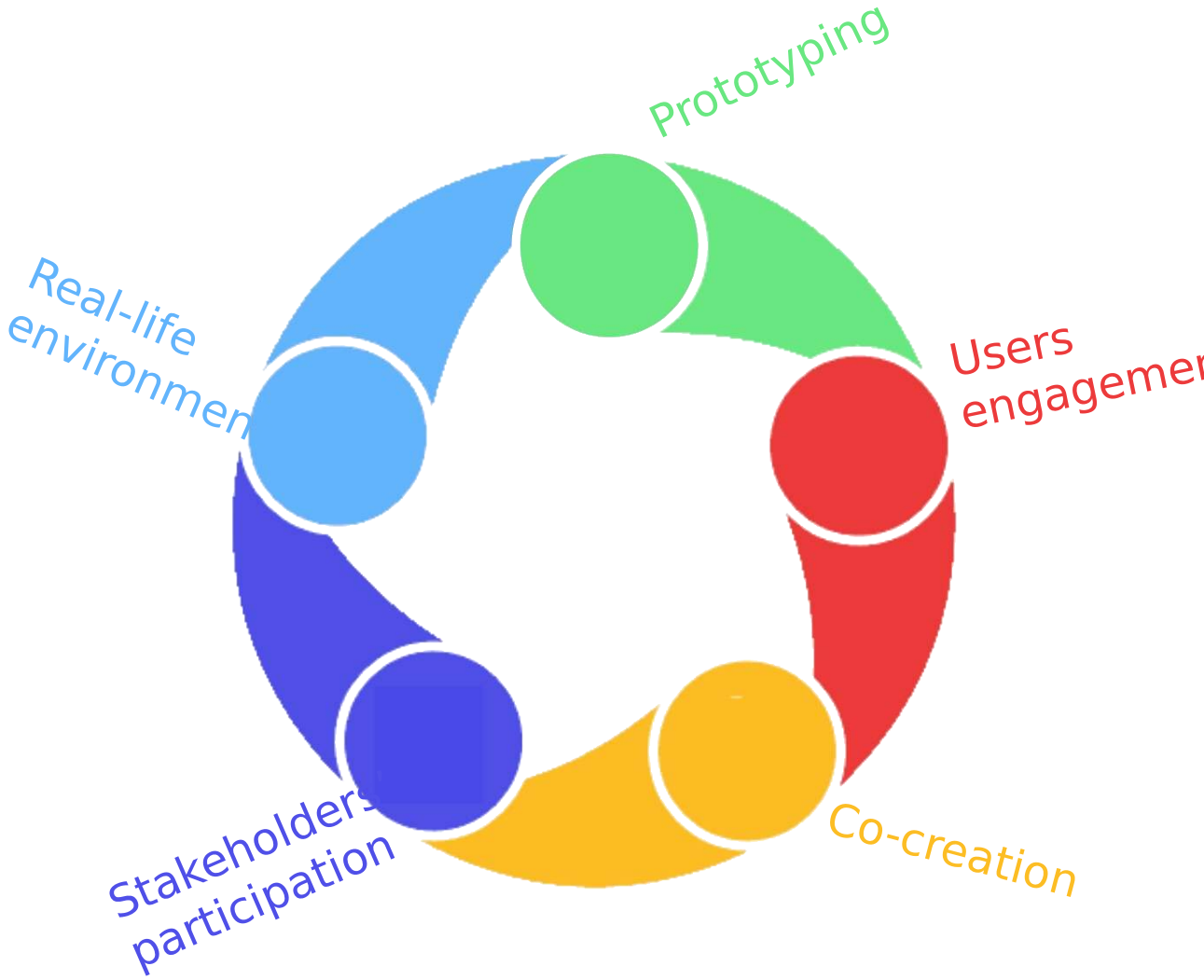
GREATER USER-CENTERED DESIGN

The educational and dissemination design processes will be driven by a user-centered approach:

- Stakeholders (associated partners, community representatives, students, business companies,…) will be involved in the design process since early phases
- Actual needs, expectancies and opportunities coming from different target groups will be taken into account through a suitable methodology



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GREATER project LIVING LABS

*A Living Lab will be an **actual living environment** (home, school, public office, farm, factory,…) where **smart-energy technologies** will be implemented by the project, under the supervision and ownership of participating HEIs. Such sites will serve multiple purpose: **students will be allowed to practice** (thanks to remote connectivity also) **on a realistic scenario**, showing them a comprehensive view of real-word deployment issues. Living labs will be **open to public visits**, so that citizens will access demonstration of low-cost, smart-energy solutions deployed in a familiar environment. Living labs will host **dissemination and transfer initiatives**, providing a key for strengthening **the link between academy and the community**.*

- **Four LL will be implemented**
- **Different use-cases**
  - **IoT technology for remote management and control**
  - **Community hubs, fostering green awareness**

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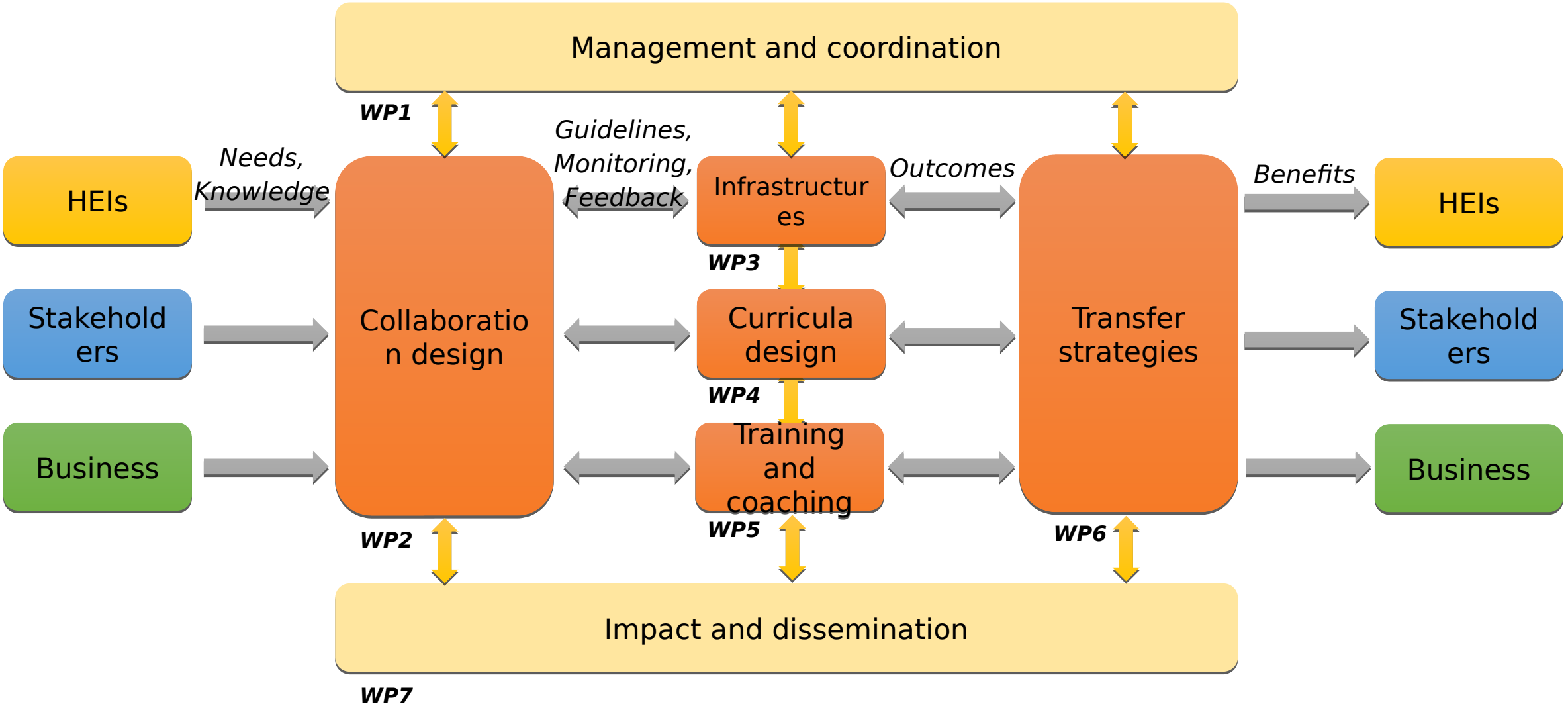
GREATER project architecture



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GREATER project SUMMARY

Rwanda-EU cooperation

Bi-directional students and staff mobility

Focus on Renewable Energy and IoT technologies

8 new or renewed Higher Education curricula

User-centered design approach

Living labs

Transfer activities

Community outreach

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