Passive House: Accepting the Challenge

Fraser Lovie (University of Aberdeen) & Steff Bell (Future Komfort)

Headline Sponsor

CarbonCredentials

Passive House: Principles

Steff Bell (Future Komfort)

Headline Sponsor

CarbonCredentials

Passive House Approach

The Passive House Standard is based on the following principles:

- Energy conservation comes before energy generation
- Adopt a fabric first approach
- Internal comfort is a key element of design
- Create a healthy, safe and pleasant environment to both work and live

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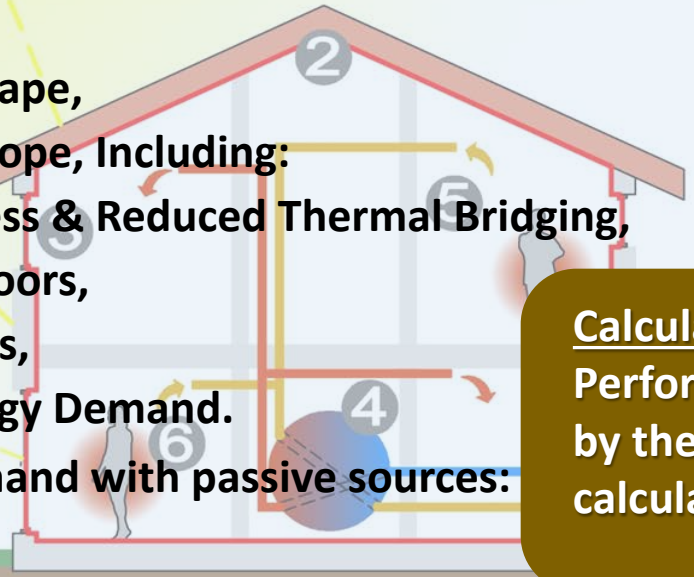
Passive & Low Energy Buildings...

What is a Passive House?

• A Passive House is a building in which a comfortable interior climate can be maintained without active heating and cooling systems. The house heats and cools itself, hence the term “passive”. [FEIST 1988]

Key Elements of a Passive House

1. Optimised Orientation & Shape,
2. An Enhanced Building Envelope, Including:
   - Super Insulation, Air-Tightness & Reduced Thermal Bridging,
3. PH Approved Windows & Doors,
4. PH Approved MVHR Systems,
5. Reducing the Buildings Energy Demand.
6. Meet the reduced heat demand with passive sources:
   - Solar gains & internal gains



Calculations:
Performance is verified by the use of the PHPP calculation tool.

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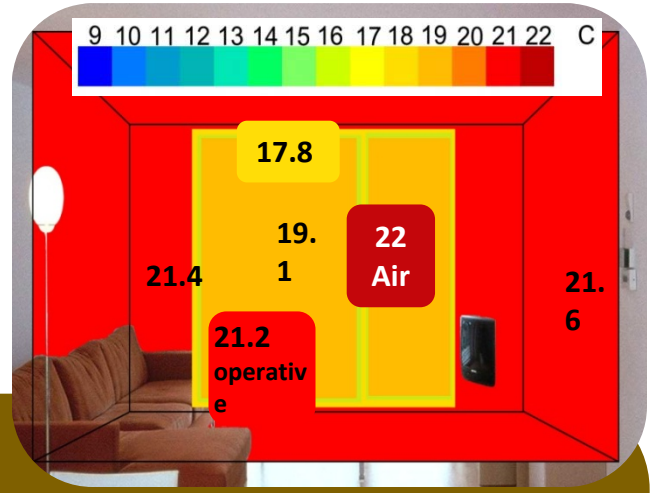
Understanding Passive House

- Passive House is a comfort standard as well as an energy standard.
- Passive House construction adopts a fabric first approach
- Can be used for any type of building



Passive House Criteria:

Criteria	New Build (Dom/Non-Dom)	Retro-Fit
Space Heating Demand:	≤ 15 kWh/(m²a)	≤ 25 kWh/(m²a)
Heating Load:	≤ 10 W/m²	≤ 10 W/m²
Primary Energy Demand:	≤ 120 kWh/(m²a)	≤ 120 kWh/(m²a)
Pressure Test Result	≤ 0.6 ach	≤ 1.0 ach
Overheating Frequency:	≤ 10%	≤ 10%

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Passive House Advantages

- Up to 90% reduced energy demand
- Improved thermal comfort levels
  - (warm in winter, cool in summer)
- Excellent indoor air quality
- Reduced maintenance & running costs
- The backbone for low-energy, sustainable, zero-carbon buildings

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Passive & Low Energy Buildings...

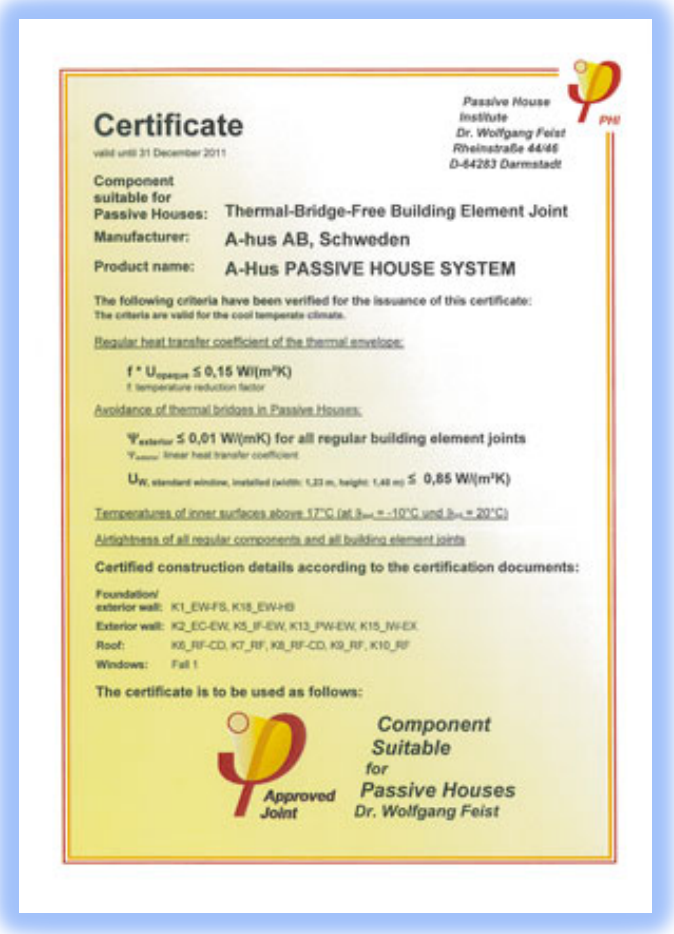
Understanding Passive House

Certified Passive House Products

PHI have a number of Certified and approved products and components.

These make certification and design easier with more peace of mind.

If certified products are not used all performance values must be verified by an independent testing facilities to PHI standards.


Certificate

valid until 31 December 2011

Passive House Institute
Dr. Wolfgang Feist
Rheinstraße 44/46
D-64283 Darmstadt

Component suitable for Passive Houses: Thermal-Bridge-Free Building Element Joint

Manufacturer: A-hus AB, Schweden

Product name: A-Hus PASSIVE HOUSE SYSTEM

The following criteria have been verified for the issuance of this certificate:
The criteria are valid for the cool temperate climate.

Regular heat transfer coefficient of the thermal envelope:

$f * U_{opaque} \leq 0{,}15$ W/(m²K)
f: temperature reduction factor

Avoidance of thermal bridges in Passive Houses:

$\Psi_{exterior} \leq 0{,}01$ W/(mK) for all regular building element joints
$\Psi_{exterior}$: linear heat transfer coefficient

U_W, standard window, installed (width: 1,23 m, height: 1,48 m) $\leq$ 0,85 W/(m²K)

Temperatures of inner surfaces above 17°C (at ϑ_{ext} = -10°C und ϑ_{int} = 20°C)

Airtightness of all regular components and all building element joints

Certified construction details according to the certification documents:

Foundation/ exterior wall: K1_EW-FS, K18_EW-HB
Exterior wall: K2_EC-EW, K5_IF-EW, K13_PW-EW, K15_IW-EX
Roof: K6_RF-CD, K7_RF, K8_RF-CD, K9_RF, K10_RF
Windows: Fall 1

The certificate is to be used as follows:

Approved Joint

Component Suitable for Passive Houses
Dr. Wolfgang Feist

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Passive & Low Energy Buildings...

Exercise

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Case Study: Rocking Horse Nursery

Fraser Lovie (University of Aberdeen)

Headline Sponsor

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Potted History

- Old building a Nursery since 1989 but parts date to 1700s!
- No longer fit for purpose and action needed …
- … long process, but agree to purpose-built replacement.

- Uni keen on sustainable build + parents / architect push …
- … adoption of a Passive House project.

- Novice client, architect and main contractor …
- … complex project … budget pressure & some delays …
- … but completed in time for new session and on-budget.

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Green Gown Awards 2016
Winner


Case Study Video

Challenges

- ***Physical***: site conditions.
- ***Professional***: inexperienced Design Team.
- ***Financial***: cost of components and whole-life.
- ***Environmental***: dual-accreditation esp. BREEAM.
- ***Emotional***: heightened expectations & oversight.
- ***Technical***: Grand Designs moments.
- ***Methodological***: site discipline.

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Passive & Low Energy Buildings...

Green Gown Awards 2016
Winner


ALAN WIGHT
Cycling Scotland

Lessons Learned

- ***Procurement***: clearly emphasised sustainability
- ***Location***: size, orientation and design
- ***Servicing***: e.g. size of plant room
- ***Specification***: avoid over-specification e.g. under-floor.
- ***Utilisation***: e.g. solar PV or solar thermal
- ***Adaptability***: contractor willingness to adapt / learn.
- ***Teamwork***: collective buy-in

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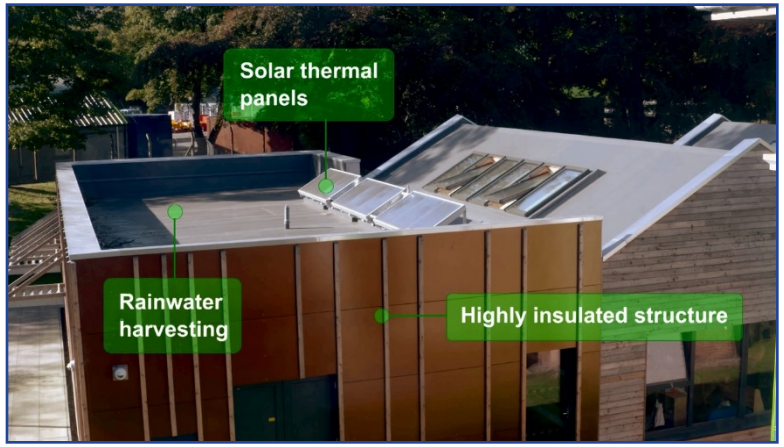
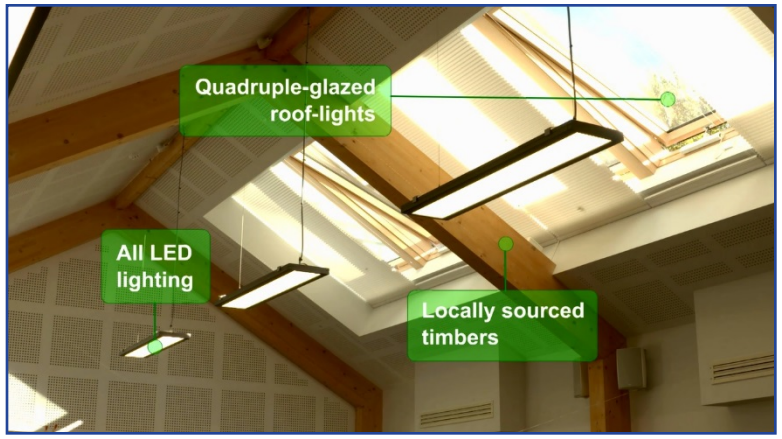

Solar thermal panels
Rainwater harvesting
Highly insulated structure


Quadruple-glazed roof-lights
All LED lighting
Locally sourced timbers


Locally sourced larch cladding

Green Gowns … Differentiation

- Small project … so carbon wasn't enough.
- Sustainability elements & local sourcing … now the norm.
- Sector firsts great … but whole sector is innovating.

- ***Skills***: local businesses up-skilled
- ***Approach***: teamwork and shared endeavour
- ***Exterior Space***: outdoor / adventurous play
- ***Stakeholder***: engagement of parents, staff
- ***Public Eng***: May Festival, Feist visit, Pecha Kucha
- ***Comms***: lots of articles, open days.
- ***Nursery Sector***: visibility and interest inc. from Govt

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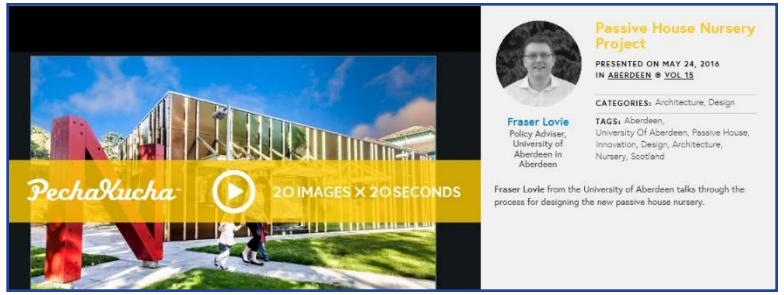
Green Gown Awards 2016
Winner



UK PASSIVHAUS OPEN DAYS 2015

13 - 15 November

WHEN

SAT 14th 2pm & 3pm

Max people/tour: 15
20 min presentation followed by 30 min tour.

Completed and occupied in August 2015, the Rocking Horse Nursery caters for 78 children of staff and students at the University of Aberdeen. The scheme designed by BMJ Architects, in close conjunction with all stakeholder, is awaiting Passivhaus certification. An air source heat pump and solar thermal panels provide renewable energy, and 80% of the building envelope is designed to be sustainably sourced.

WHERE

Lecture Theatre NK1, New King's building
Rocking Horse Nursery
King's College Campus
Aberdeen
AB24 3FX

Nearest Station/ Stop:
Aberdeen Train Station

BOOKING

Steff Bell

steff@futurekomfort.com
07748 985 917

Parking available at Regent Walk

UoA ROCKING HORSE NURSERY

TEAM

The University of Aberdeen
Future Komfort / Herz & Lang
BMJ Architects
Burns Construction
Cameron & Ross
KJ Tait Engineers
W.I. Talbot

Summary

- Reinforced internal commitment to sustainable buildings.
- Made converts of previous sceptics.
- Very encouraging energy data.
- Significant reduction in carbon over old building.
- Confident local contractor.
- Award winning.
- **But above all … a first-class early years setting.**

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Rocking Horse Nursery Project
Green Gown Winner 2016: Built Environment (Large)

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Coming up next…

Telling the world: Sustainability reporting on a crowd sourced platform

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Telling the world: Sustainability reporting on a crowd sourced platform

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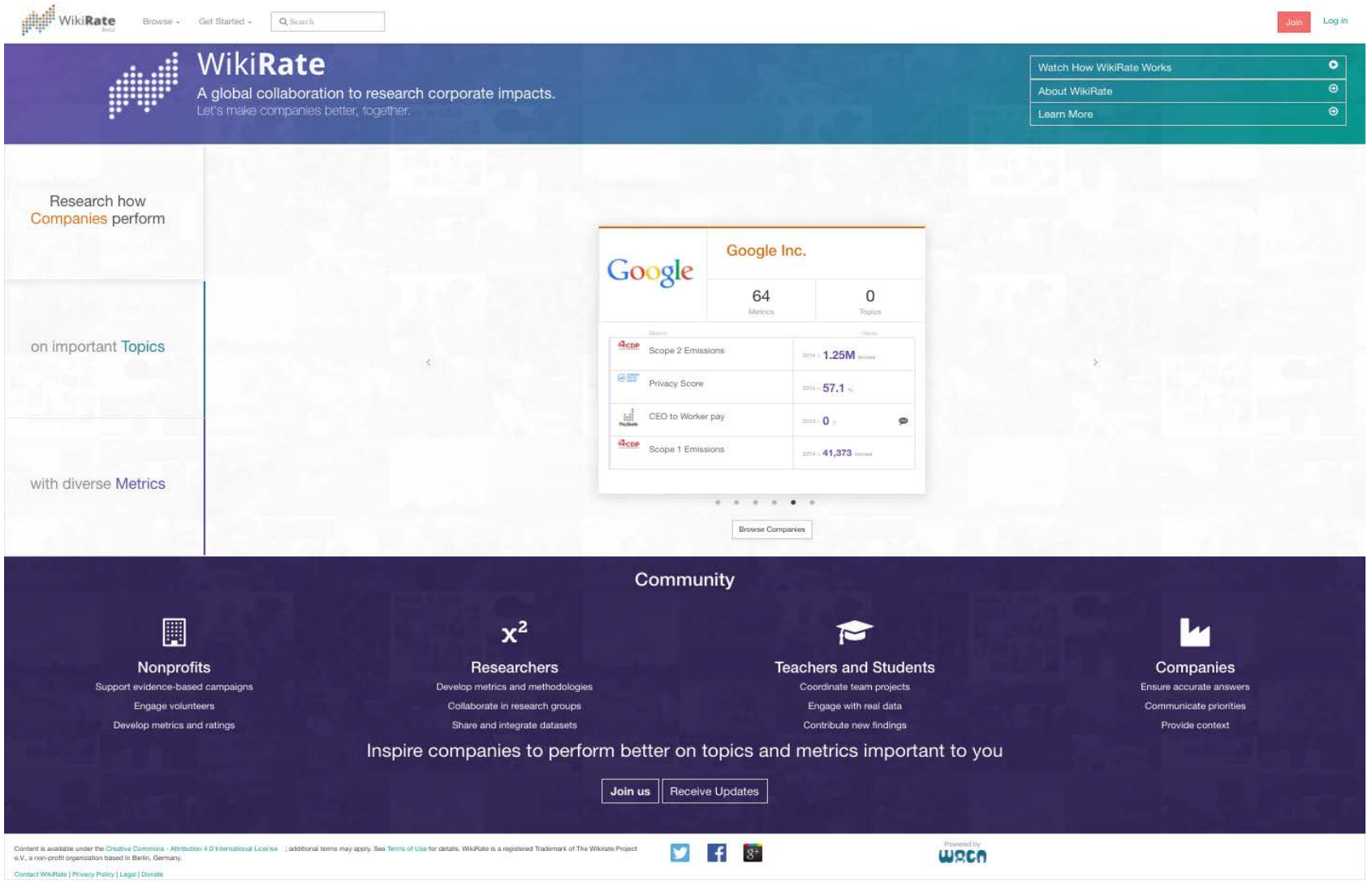
Introduction

- Share university data on an innovative online platform
- Map university data / metrics across the SDGs
- Enable universities to identify what they are doing to contribute to the SDGs
- Provide students with practical, applied research to develop first hand knowledge of sustainability reporting

Context

- Institutions of Higher Education devote significant time and resources to sustainability reporting efforts
- Not much is available for cross-institution comparison other than general ratings
- Students are not often engaged in this work which can lead to concerns about relevance and greenwashing

Overview of the WikiRate Platform



Overview of the WikiRate Platform

- An open, editable Wiki platform that allows cooperative creation and knowledge sharing in a structured, dynamic way

- Building an empirical base for quantitative (and qualitative) organisational research and ratings on Environmental, Societal and Governance impacts

- WikiRate is a student engagement, research tool and database

WIKIRATE

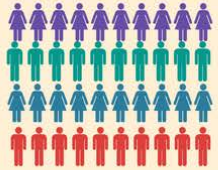
Feb 2017 Counts:

Users, Metrics & More

SINCE ITS LAUNCH,

1,560 **ACCOUNTS**

1,314 since 01 February 2017 = 19% increase



METRICS **716**

GRI, HESA, STARS, and other standards-based metrics with...

...values that have been researched by students & volunteers with...

METRICS VALUES

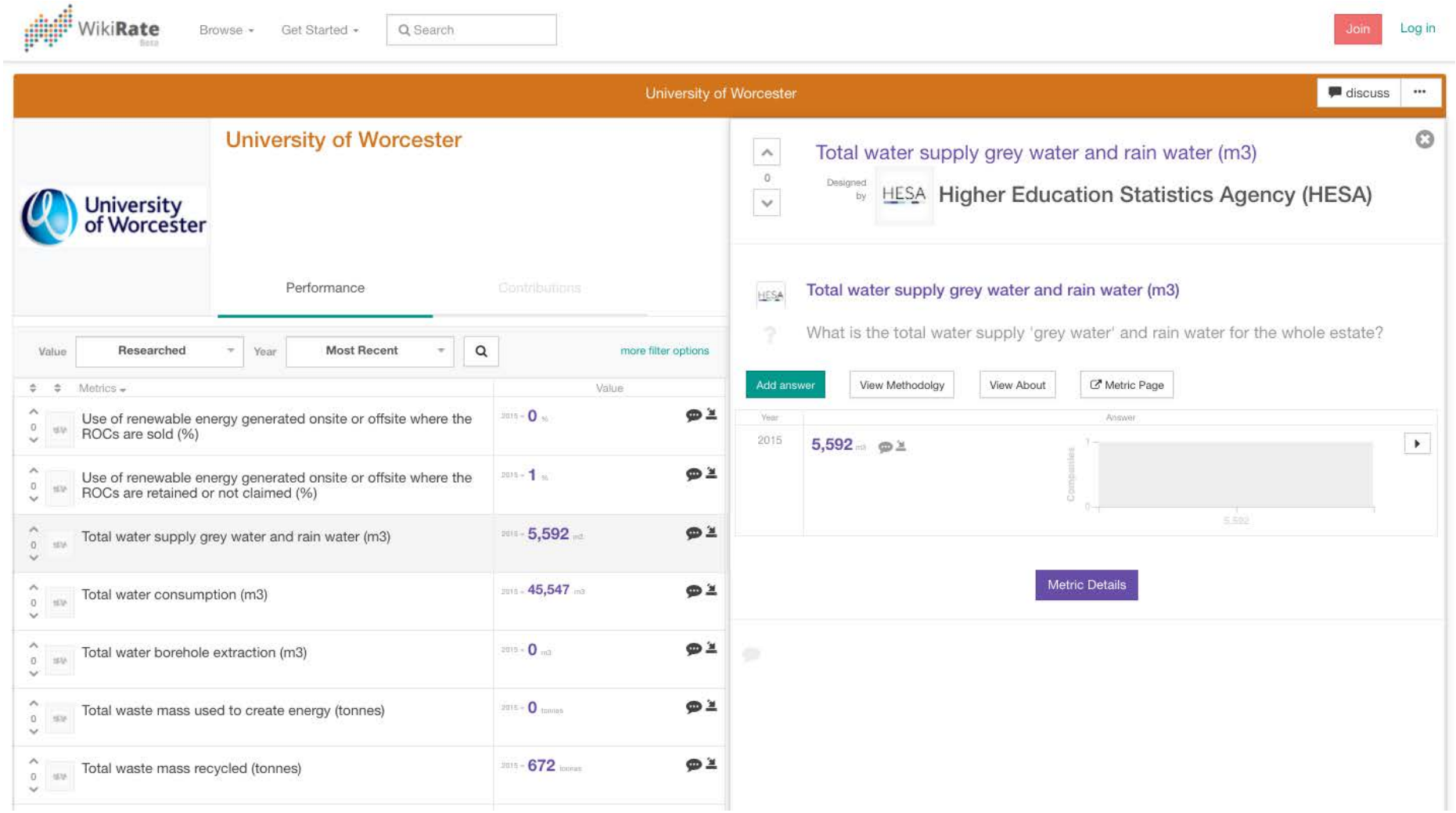
196,083

32,330 **SOURCES**

Corporate Social Responsibility Reports, Conflict Minerals Reports, Modern Slavery Statements, and other public resources

LET'S MAKE COMPANIES BETTER, TOGETHER!

Open Data


WikiRate
Browse
Get Started
Search
Join
Log in
University of Worcester
discuss
University of Worcester
University of Worcester
Performance
Contributions
Value
Researched
Year
Most Recent
more filter options
Metrics
Value
Use of renewable energy generated onsite or offsite where the ROCs are sold (%)
0
Use of renewable energy generated onsite or offsite where the ROCs are retained or not claimed (%)
1
Total water supply grey water and rain water (m3)
5,592
Total water consumption (m3)
45,547
Total water borehole extraction (m3)
0
Total waste mass used to create energy (tonnes)
0
Total waste mass recycled (tonnes)
672
Total water supply grey water and rain water (m3)
Designed by
HESA
Higher Education Statistics Agency (HESA)
Total water supply grey water and rain water (m3)
What is the total water supply 'grey water' and rain water for the whole estate?
Add answer
View Methodolgy
View About
Metric Page
Year
Answer
2015
5,592
Metric Details

Open Data


1 NO POVERTY
5 GENDER EQUALITY
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES

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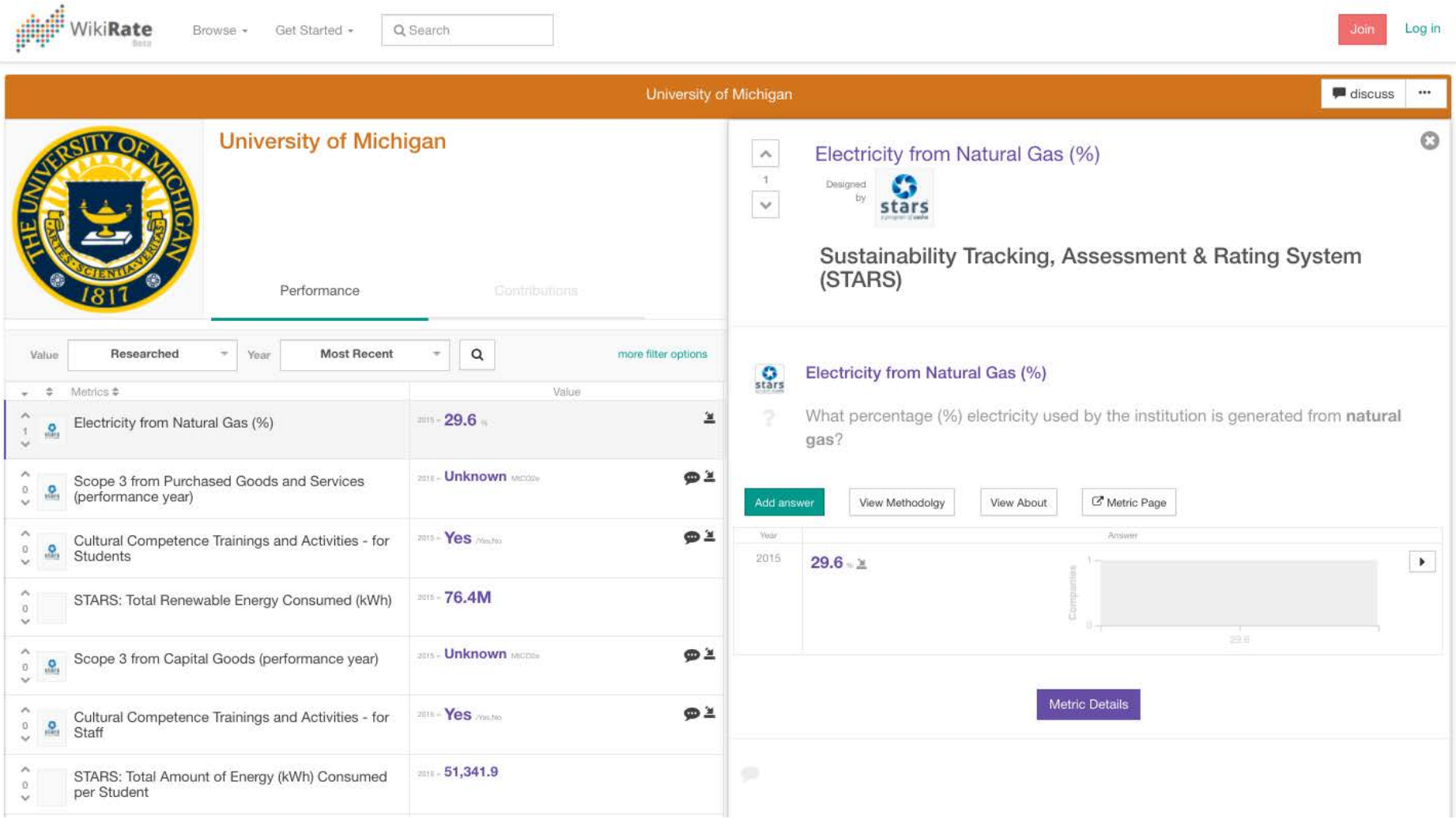
Lancaster University
21st ANNUAL CONFERENCE
28-30 MARCH 2017
GLOBAL GOALS:
LOCAL ACTION
CarbonCredentials


WikiRate
Browse
Get Started
Search
Join
Log in
University of Michigan
discuss
University of Michigan
Performance
Contributions
Value
Researched
Year
Most Recent
more filter options
Metrics
Value
Electricity from Natural Gas (%)
2015 - 29.6 %
Scope 3 from Purchased Goods and Services (performance year)
2015 - Unknown MtCO2e
Cultural Competence Trainings and Activities - for Students
2015 - Yes /Yes,No
STARS: Total Renewable Energy Consumed (kWh)
2015 - 76.4M
Scope 3 from Capital Goods (performance year)
2015 - Unknown MtCO2e
Cultural Competence Trainings and Activities - for Staff
2015 - Yes /Yes,No
STARS: Total Amount of Energy (kWh) Consumed per Student
2015 - 51,341.9
Electricity from Natural Gas (%)
Designed by
stars
Sustainability Tracking, Assessment & Rating System (STARS)
Electricity from Natural Gas (%)
What percentage (%) electricity used by the institution is generated from natural gas?
Add answer
View Methodolgy
View About
Metric Page
Year
Answer
2015
29.6 %
Companies
Metric Details

UN SDGs


1 NO POVERTY
5 GENDER EQUALITY
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES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GLOBAL GOALS:
LOCAL ACTION
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SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Project Objectives

1. Analyse the University of Michigan's Sustainability Tracking, Assessment & Rating System (STARS) report and associated data.

2. Compare with Higher Education Statistics Agency (HESA) data for the University of Worcester.

3. Identify common metrics and add to a newly created campus sustainability WikiRate platform.

4. Map results against the 17 UN Sustainable Development Goals (SDGs) to stimulate discussion around the metrics, reporting, and the application of the SDGs.

Student Engagement

- Validating and tagging metrics to the SDGs
- Understanding the SDGs in the context of their own institution
- Findings presented to senior staff at the University of Michigan
- Insight into sustainability and social responsibility reporting and what is required
- Research available for others to use, learn from and build upon

Initial Findings

- Students identified and created new metrics, e.g. Average student debt
- Develop a framework to enable universities to better understand how metrics link to specific SDGs
- Enable universities to connect business strategies and teaching with the global priorities of the SDGs
- Facilitate the online dialogue and discussion associated with the research and mapping process
- Creating innovative methods and pedagogies to provide students with the skills and knowledge they need to thrive in a sustainable future

Discussion

- Have a go http://wikirate.org/
- Next steps
- Are you interested in mapping your university HESA data?

Keep in touch!

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