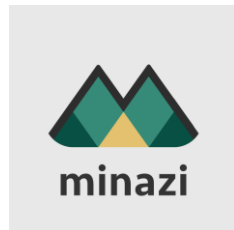


Race and Racism in the engineering sector

Imperial College
London



About Me



Aakeen Parikh MEng FRSA

Net Zero Innovation Project Manager

Director and Lead Consultant – Minazi Consulting

Educational Background

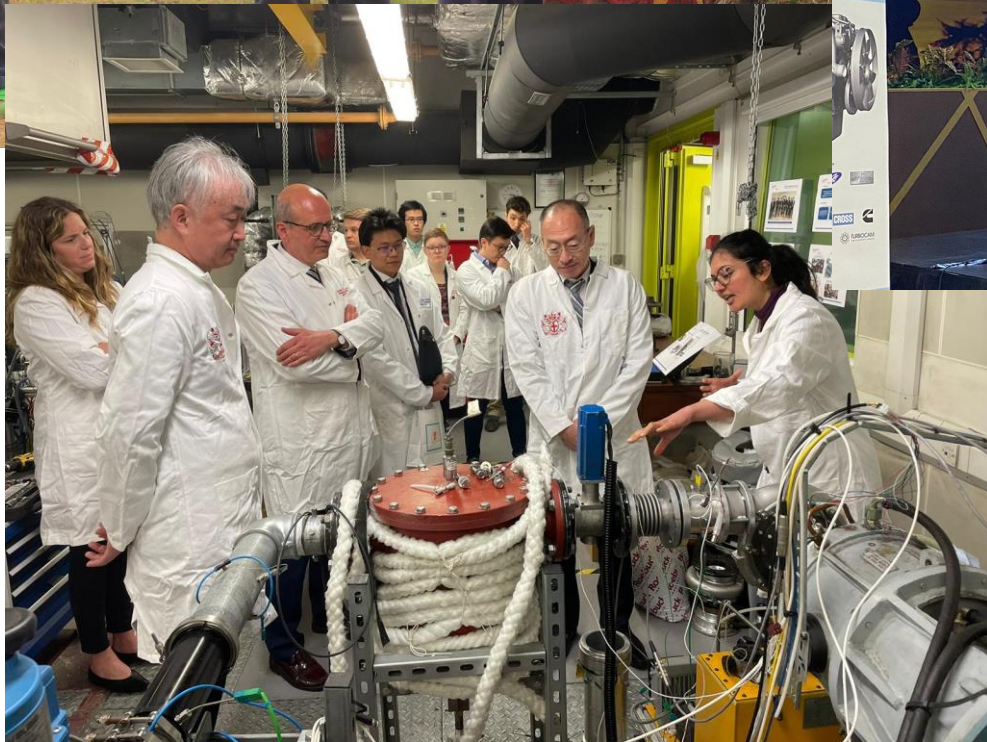
2012-2014: State school

2014-2016: College

2014-2019: Mechanical Engineering with Placement Year
(Imperial College London, 2014-2019)

Placement in BHGE Farnborough

2019-2023: PhD Candidate, Imperial College London



Today's Lecture

- Racial equality
- Systematic racism
- Status of racial inequality within the engineering sector
- Tailoring the engineering course for BAME students
- Colonial impact
- Key areas for racial equality in the engineering sector
- Designing for racial equality
- Engineering pipelines and future of engineering
- Danger of a 'western' perspective in the design bias
- Final remarks: Decolonising the engineering sector

The case for racial equality in EDI/DEI

Diversity

- People differ. This difference is a strength.

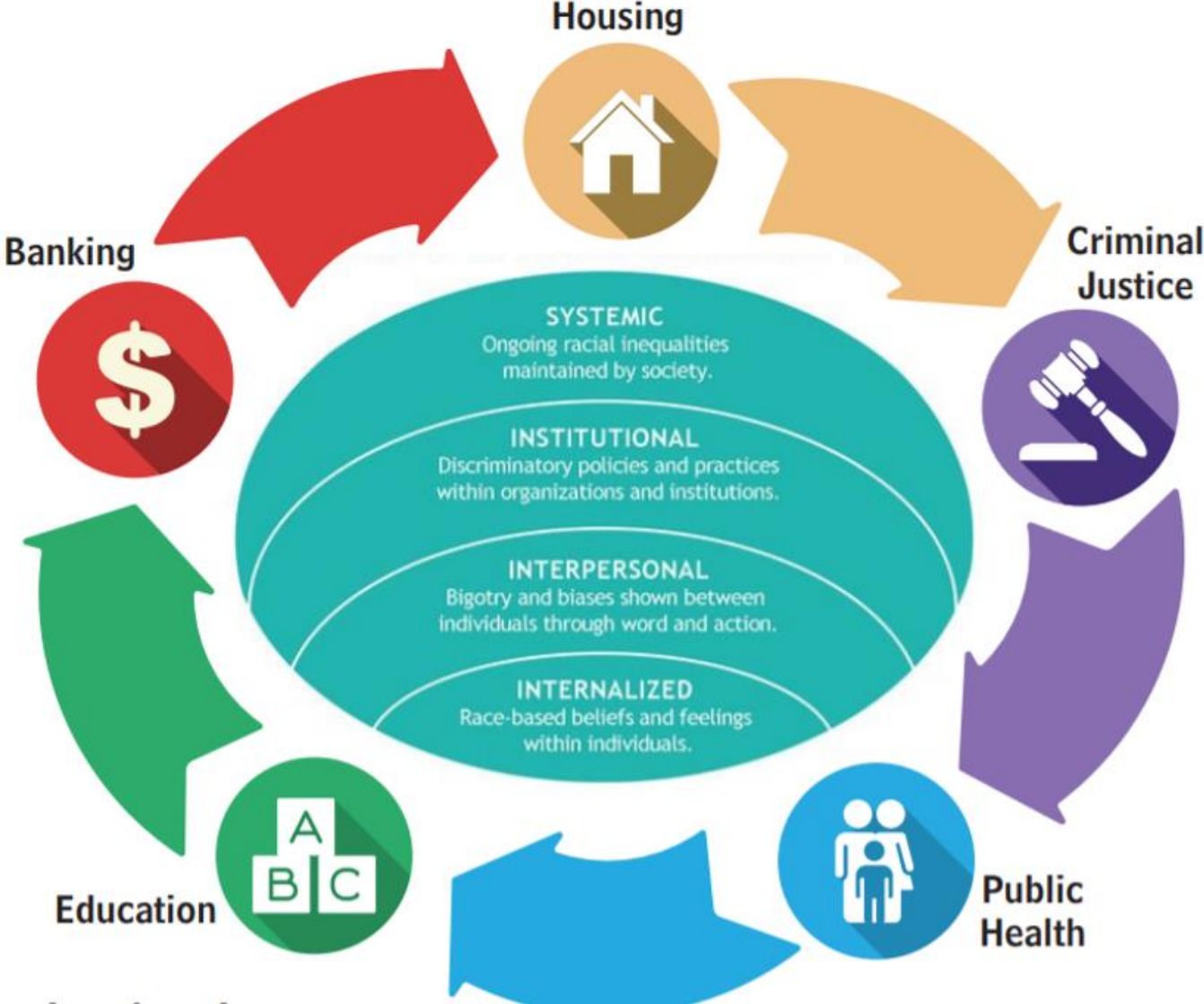
Equity

- A society is 'equitable' when there is fair access to opportunity and advancement for all people

Inclusion

- We need environments where people feel welcomed, respected and supported to participate

What is systematic racism



Common metrics to assess systematic racism

1. Wealth disparity
2. Employment
3. Education
4. Criminal justice
5. Housing
6. Surveillance
7. Healthcare

What is the point of all of this?

racial equality is a human right.

After everything we've seen this month...

**We have to remember to stand up for
equality, justice and humanity.**

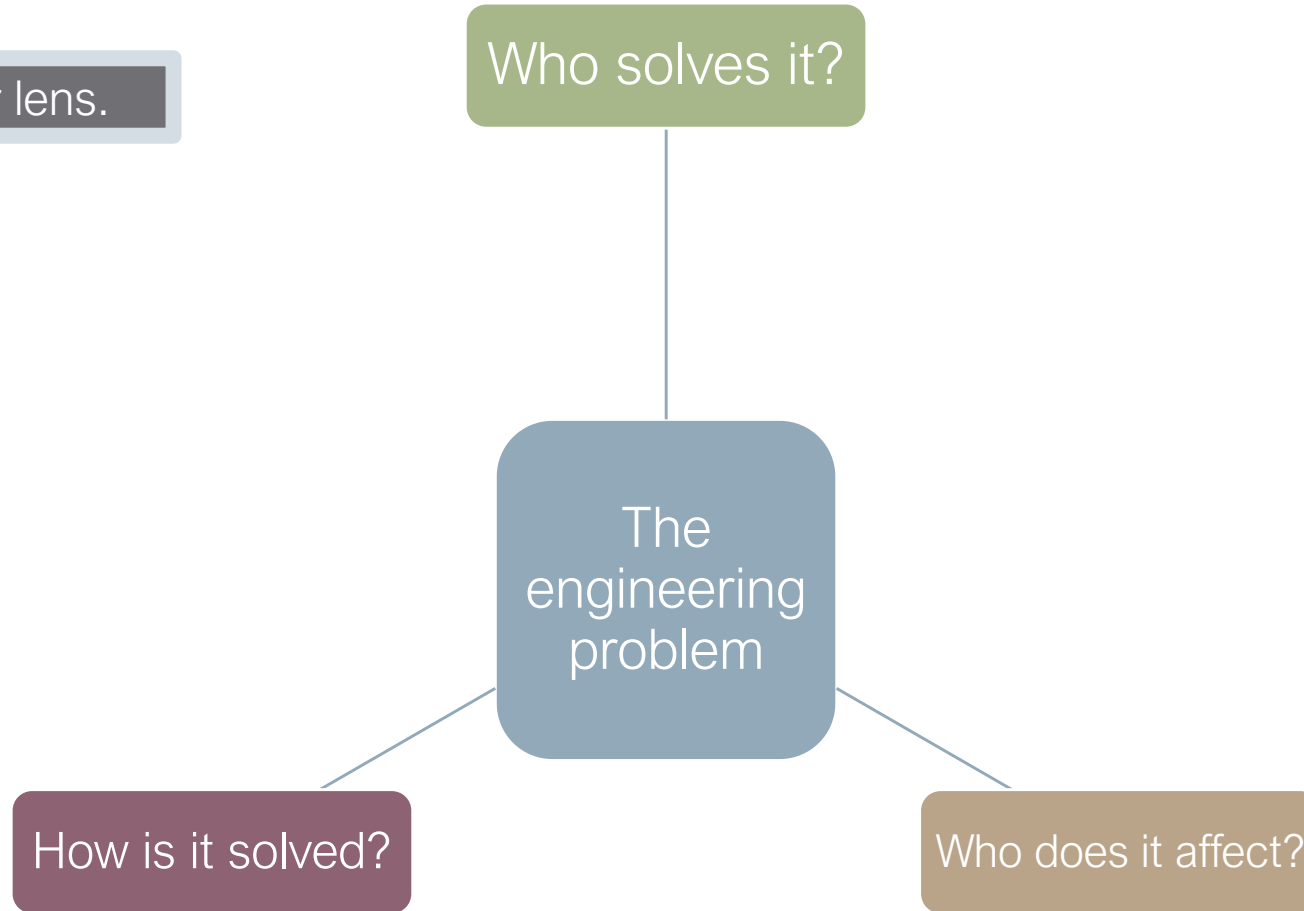
**Any war that threatens human peace, is a
war worth fighting against.**

Why does systematic racism matter for engineering?

- **Access to engineering education:** Engineering education should be accessible to all people regardless of colour/ethnic backgrounds
- **Access to equal job opportunities:** Future employment, job prospects & the ability to climb up the wealth ladder
- **Right to equal treatment:** Engineering is not perceived to be inclusive & teams suffer from lack of diversity
- **Right to products that support their needs:** Products and services are not designed for everyone
- **Built environment:** Development happens disproportionately in some regions more than others; wealthy areas get wealthier

How can you influence racial equality in engineering?

Reflect with a wider lens.

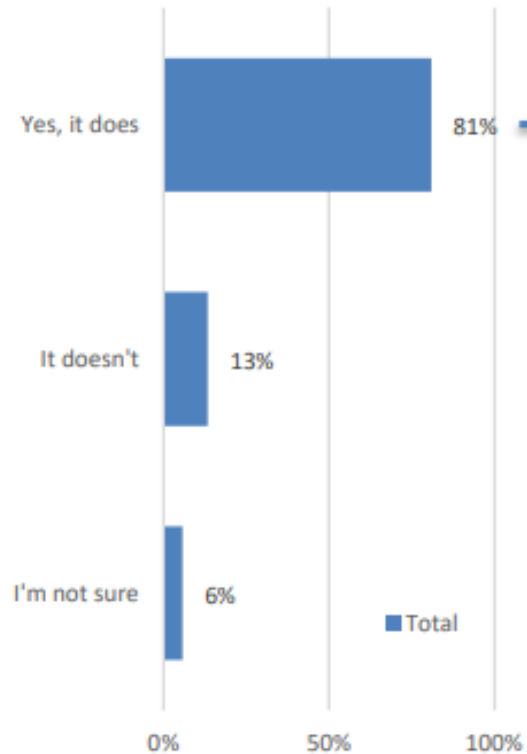


Status of Racial Inequality

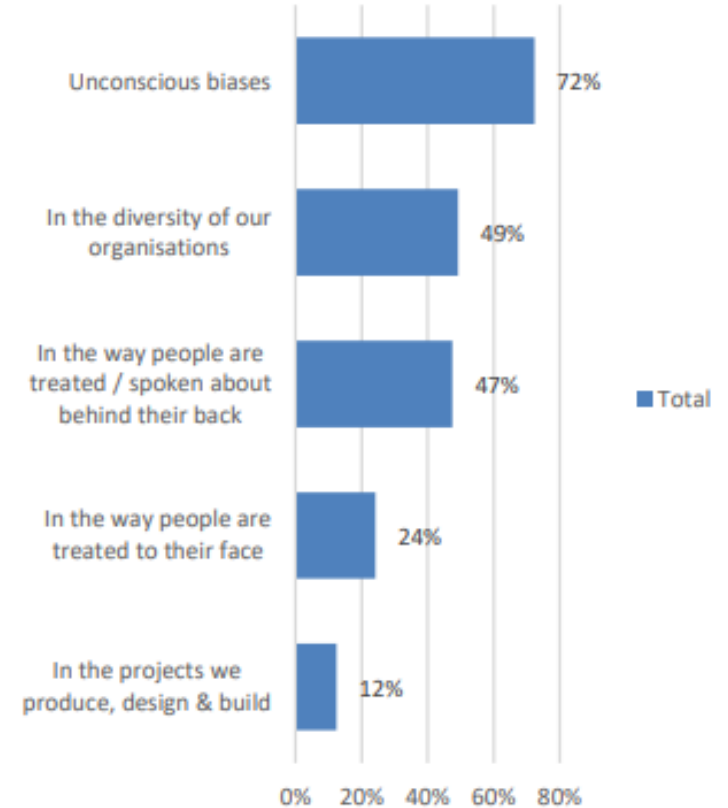
Statistics on BAME workforce in engineering sector

ICE found evidence of indirect racism towards employees in a report conducted following the murder of George Floyd

Does racism present itself in your industry and projects?



How does it present itself?



Statistics from the RAEng Report

- Only 9% of engineers in the UK are from Black, Asian or minority ethnic backgrounds despite 27% of first-degree qualifiers in engineering being from these groups.
- Black engineering graduates are more than twice as likely to be unemployed six months after graduation than their white counterparts.

- **People with BAME backgrounds account for only 9.6% of senior leaders** in the top 10 largest technology firms (as at Nov 2018). 74.5% of technology boards and 70.6% of senior executive teams in the top technology firms have no BAME members.
- Approximately 11% of senior leaders in the top tech firms are from BAME backgrounds (7.7% of senior executives and 12.9% of directors are from minority ethnic backgrounds).

Taken from ELA Committee: Call for Evidence for Equity in the STEM workforce (Jan 2021)

Original statistic: Inclusive Tech Alliance Report (2018)

Debate and Discussion

10 Mins Break

How can engineering courses be tailored to students from BAME backgrounds?

"Allow BAME students to present to wider group on colonies' input into engineering, choose topics / project on development"

"Have events which include everyone rather than having very separate societies (probably get a BAME group of students to decide on how to best do this)"

"Have sheet problems / coursework options more contextual to their societies / life experiences."

"BAME Professors, using examples from different backgrounds, Black History Month, Culture Days"

"Visibility on BAME Lecturers, buddy systems, a lot of extra curriculums involved drinking. And food that didn't cater for my food restrictions. Those that used to progress further would be the ones drinking with lecturers and seemed to be in the know. The whole uni culture was not kind to those that didn't eat and food options were always limited."

"Create extra design classes or update the design curriculum to be more accessible for those who didn't have the opportunity to learn about design prior to university"

"The course could have a larger number of BAME students in positions of authority"

Let's do a social experiment

Have you heard of these names?

- Isambard Kingdom Brunel (Infrastructure)
- Leonardo Da Vinci (Painter & inventor)
- Elon Musk (Tesla)
- George Stevenson (Railways)
- Thomas Edison (Electricity)
- Frank Whittle (Turbojet Engines)
- James Watt (Steam Engine)
- Henry Ford (Ford Car Company)

**Is engineering
'magnificence' gifted to
white men?**

Have you heard of these names?

- Elijah McCoy (lubrication for train bearings)
- Fazlur Rahman Khan (Skyscrapers – tube principle)
- Norbert Rilleux (Sugar production vacuum evaporator)
- James West (Microphones)
- Shirley Jackson (Caller-ID)
- Kalpana Chawla (First Indian American Woman in Space)
- Ellison Onizuka (aerospace engineer)



Mary Jackson



Dr. Mae Jemison



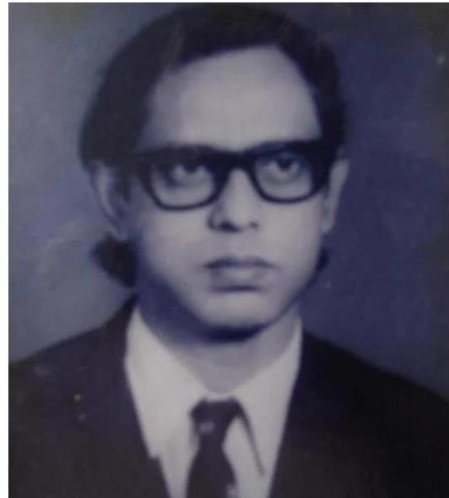
Fazlur Rahman Khan



Lin Yanying



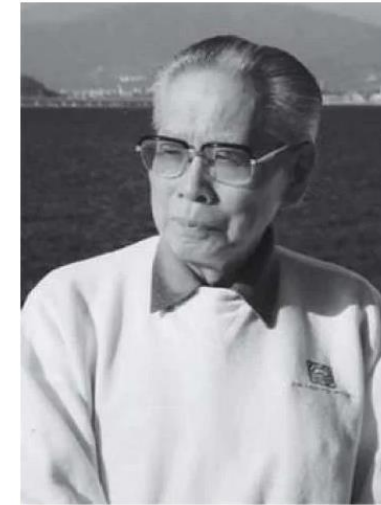
Katsuko Saruhashi



Abdus Suttar Khan



Rajeshwari Chatterjee



Tetsuzo Akutsu

<https://www.asiaresearchnews.com/content/giants-history>

<https://www.britishengines.co.uk/blog/black-engineers-through-history/>

<https://www.biography.com/news/katherine-johnson-black-female-science-technology-engineering-mathematics>

<https://www.engineersrising.com/blog/8-inspiring-black-women-engineers>

<https://www.scijournal.org/articles/famous-asian-scientists>

Imperial College Alumni: Anna Mani



Anna Mani (23 August 1918 – 16 August 2001) studied meteorological instruments at Imperial College London. Dedicated to accuracy, she became an expert at designing meteorological instruments, such as ozone and radiation measuring devices, and started a company to manufacture them.

Part 2: Historical context of racial inequality

LITTLE MISS

**ALWAYS READY TO RUIN THE VIBES BY
TALKING ABOUT COLONIALISM**



Engineering (as an art, science and industry) is deeply connected to why the world looks the way it does.

And it is essential in influencing what the world will look like in the future.

Colonial Impact (Reflection)



Colonial Impact (Reflection)



Colonial Impact

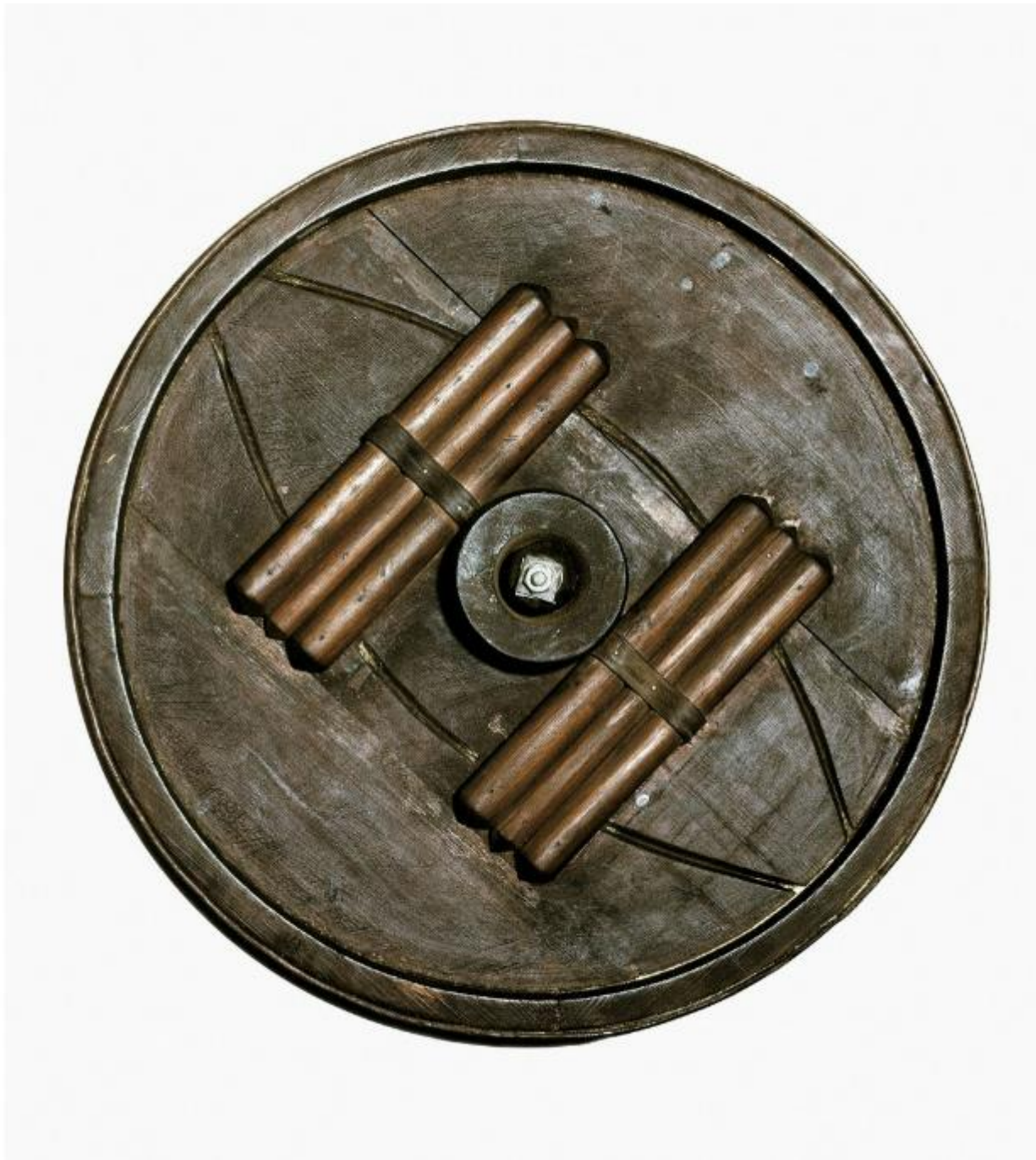
Colonialists believed that they brought technology to “build” and “empower” cities, countries or colonies

A number of studies show that this has not been the case.

- *“Historians have shown how irrigation projects promoted as the key to economic regeneration in the countryside in fact led to environmental tragedy for Indian farmers”*
 - Engineering the Empire: British Water Supply Systems and Colonial Societies, 1850–1900



Mohenjo-Daro and Dholavira, the two major cities of the Indus Valley, are the best examples of advanced water management and drainage systems. **The Great Bath of Mohenjo-Daro of the Indus Valley is considered the “earliest public water tank of the ancient world” (Mujumdar and Jain, 2018).**



The wheel was invented in
Mesopotamia:

Mesopotamia today:
Iraq, Kuwait, Turkey and Syria

What do images of Iraq/Syria
conjure up today?

Colonial Impact: Railways in India

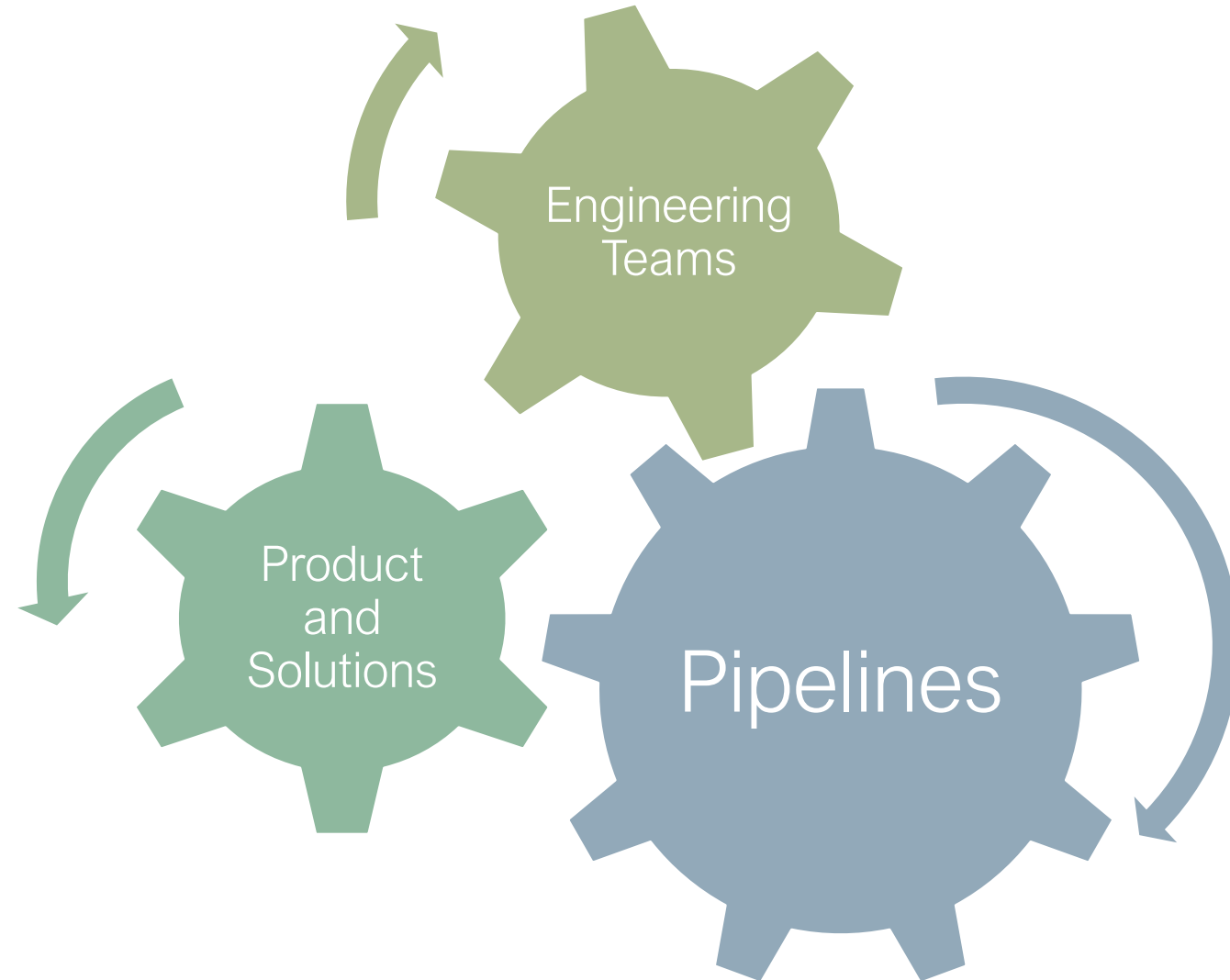
(Long Abstract: Read in your own time)

The building of the railways in India was cited by the poll as one of the major contributions to the country... the railways themselves were conceived by the East India Company, whose sole purpose was to benefit “the commerce, government and military control of the country”, not the common people.... They also had a major impact on the people of Britain, particularly those who invested in them, providing a healthy return. Investors got a doubling on their investment, paid from Indian, not British, taxes...

As already intimated the sole purpose of the infrastructure was to benefit the occupying powers, with human cargo being a second thought. Racist approaches to their use, and also their running, prevailed. Second class carriages were inadequate in size, resulting in overcrowding for the local and largely non-British population... Non-whites were not permitted to work on the railways either, at least not as ticket collectors or operatives... Indian mechanics became so adept in the workshops in the 1800's during the building of the railway infrastructure that they soon became able to make better and more competitive engines than those being made in Britain... This led to legislation being imposed to prevent competitive production..As an addendum to the story, many of the practises of the Indian engineers were later co-opted into modern day production methods, a lasting legacy for engine manufacture in the UK today.

https://research-information.bris.ac.uk/ws/portalfiles/portal/213149208/How_the_West_Was_Won_FINAL.pdf

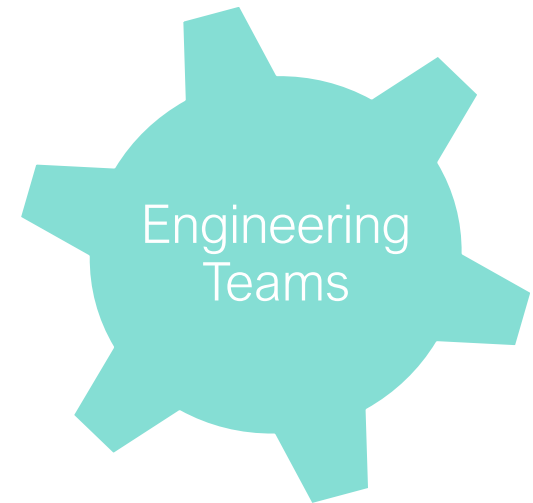
Key areas for racial equality in the engineering sector



What could be preventing graduates from joining engineering teams?

- What is happening to all the graduates?
- Could lack of inclusivity and diversity in the team be a contributing factor?

Recently, I was the *only female and ethnic* person at a site visit for one of the projects I manage. A room full of 7 white, over 40s men...
Would I have 'fit' in if I applied for a job there? Probably not.



“You can feed the pipeline with as many BAME engineers as possible, but if they’re not feeling welcome, then there is no point.” – Nav Sawhney



Looking beyond degrees

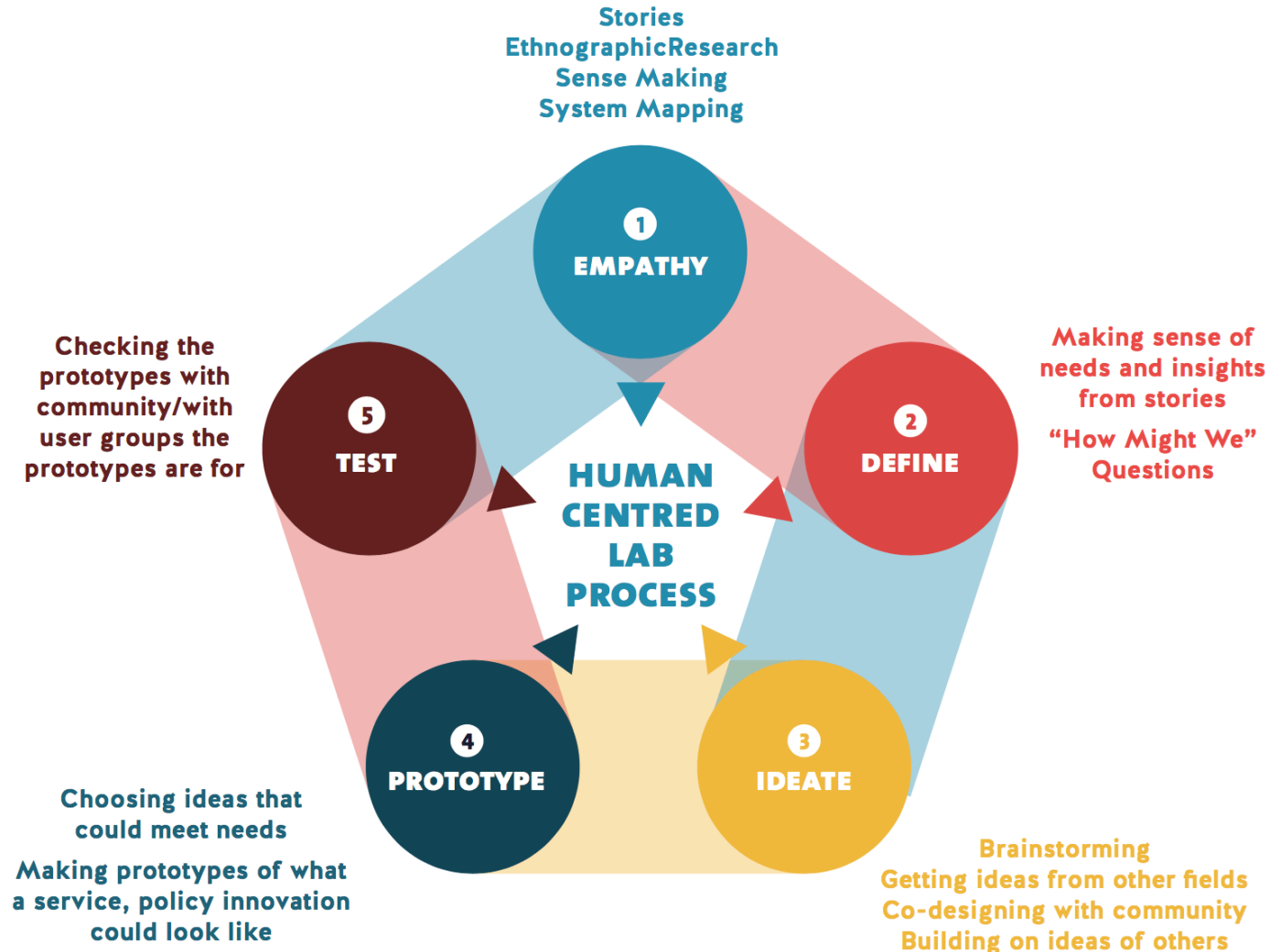
- Degree → 'look we have diversity and social mobility'
- Employer → Everyone has a degree, what else do you do?
- People from working class backgrounds or economically disadvantaged backgrounds are unable to tap into additional extra-curriculars, perceived differently at interviews due to biases [speak or talk differently].
- A friend once told me that his company tried to improve their diversity quota but found it difficult because consultants with a 'posh-English' accent were better perceived than a 'cockney' or 'international' accent → "not a right fit for the company"

In order to address the prevalence of racial inequality in the engineering sector in the UK...

We need to address:

1. Education; making universities more inclusive in admissions, access to low SEBs, inclusive for ethnic minorities
2. Progression: making jobs more accessible for people coming from ethnic backgrounds, pathway to progress easier as well
3. Workplace: Working environment needs to be more inclusive and supportive

Designing for racial equality



Human-centred design

Human-centered design (HCD) is an **approach** to problem solving, commonly used in design and management frameworks that develops solutions to problems by involving the **human** perspective in all steps of the problem-solving process.



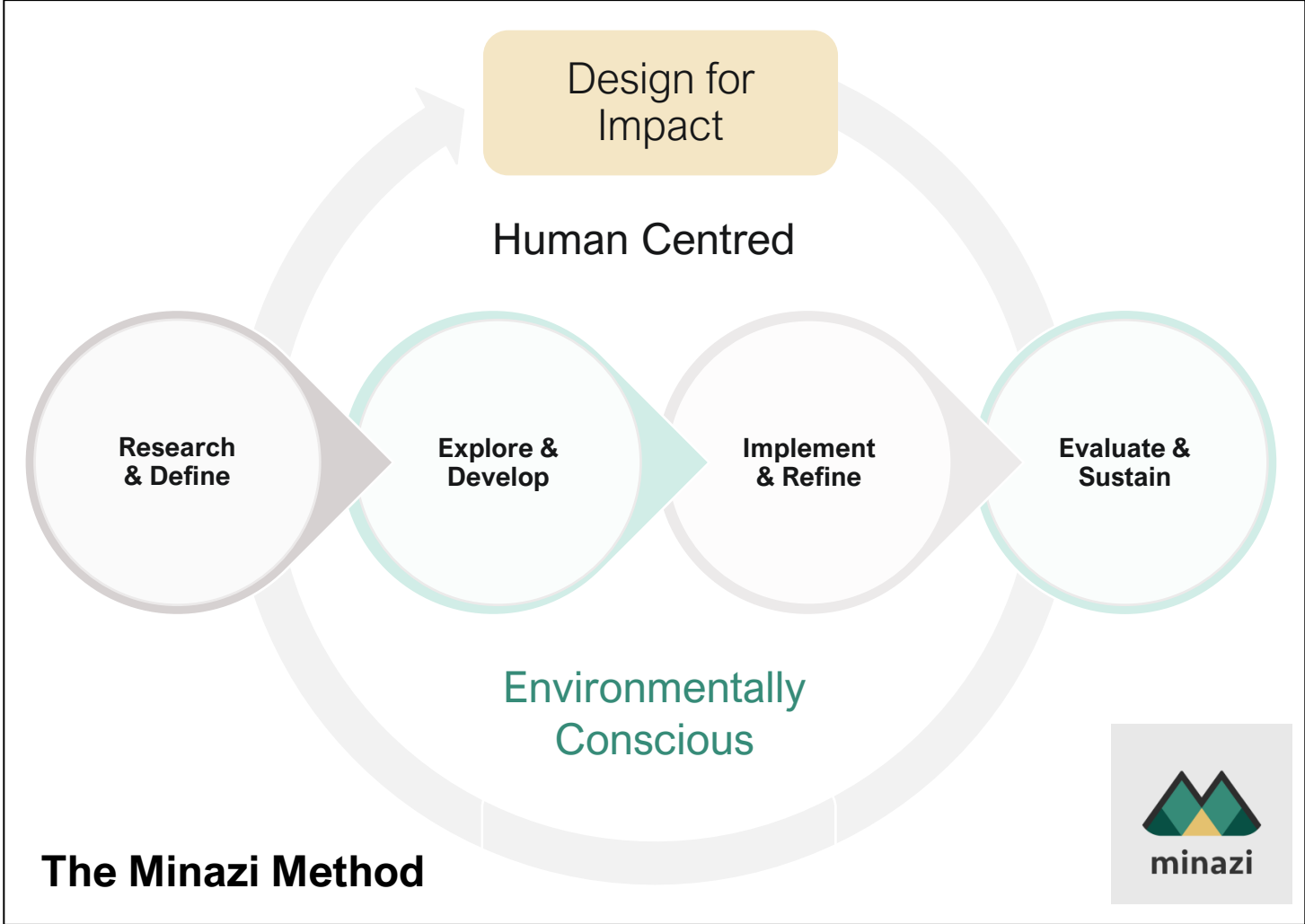
[https://en.wikipedia.org/wiki/Human-centered_design#:~:text=Human%2Dcentered%20design%20\(HCD\),of%20the%20problem%2Dsolving%20process.](https://en.wikipedia.org/wiki/Human-centered_design#:~:text=Human%2Dcentered%20design%20(HCD),of%20the%20problem%2Dsolving%20process.)

key humanitarian principles

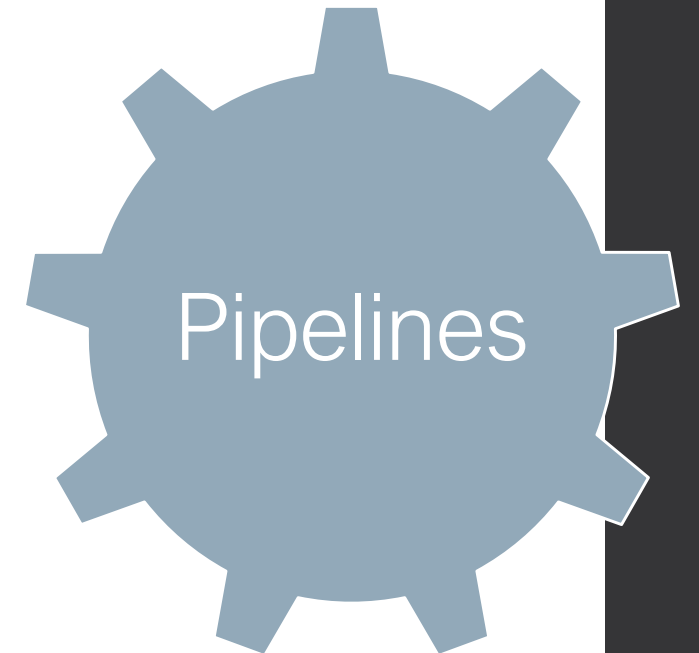
- empathise
- one size does not fit all - do no harm
- think big; build small
- be humbly ambitious
- design for dignity
- design for ownership and localisation
- measure impact not use
- design with and not just for

Designing for social and sustainable impact

This social and cultural context is very important as in many cases socioeconomic background, geographical constraints and political restrictions limit the design space.



Engineering the future



Why does the pipeline matter in engineering?

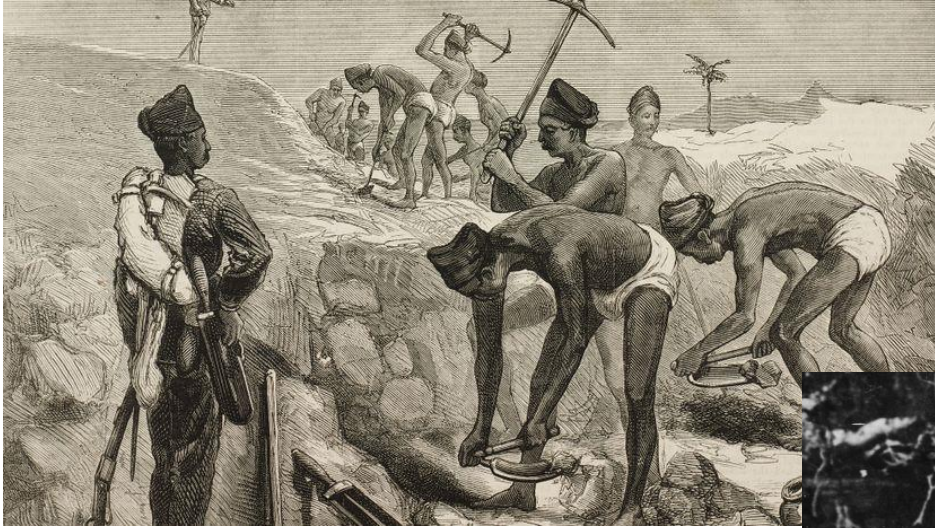
1. Engineering in the 'real world' is not textbook science. The science is what excites engineers, but it is usually not pursued without context
2. Contextually, engineers have always solved problems that are directly related to people and their quality of life.
3. The engineering industry is vast, interconnected and hugely influential and deeply embedded within the system of the world.
4. How the industry works, what it prioritises and who runs the industry has a direct impact on how things develop in the future
5. Simply put, it has always mattered.

Are engineering & geopolitics linked?

Absolutely.

Raw materials come from somewhere. Where do they come from?
How is the supply chain linked? Is there a chance of exploitation?
How can you investigate?

Exploitation in the past



Exploitation in the present



Dingela Moyo (PDPM) · 3rd+
Portfolio Manager at Bidvest Facilities Management
5d

The richest continent

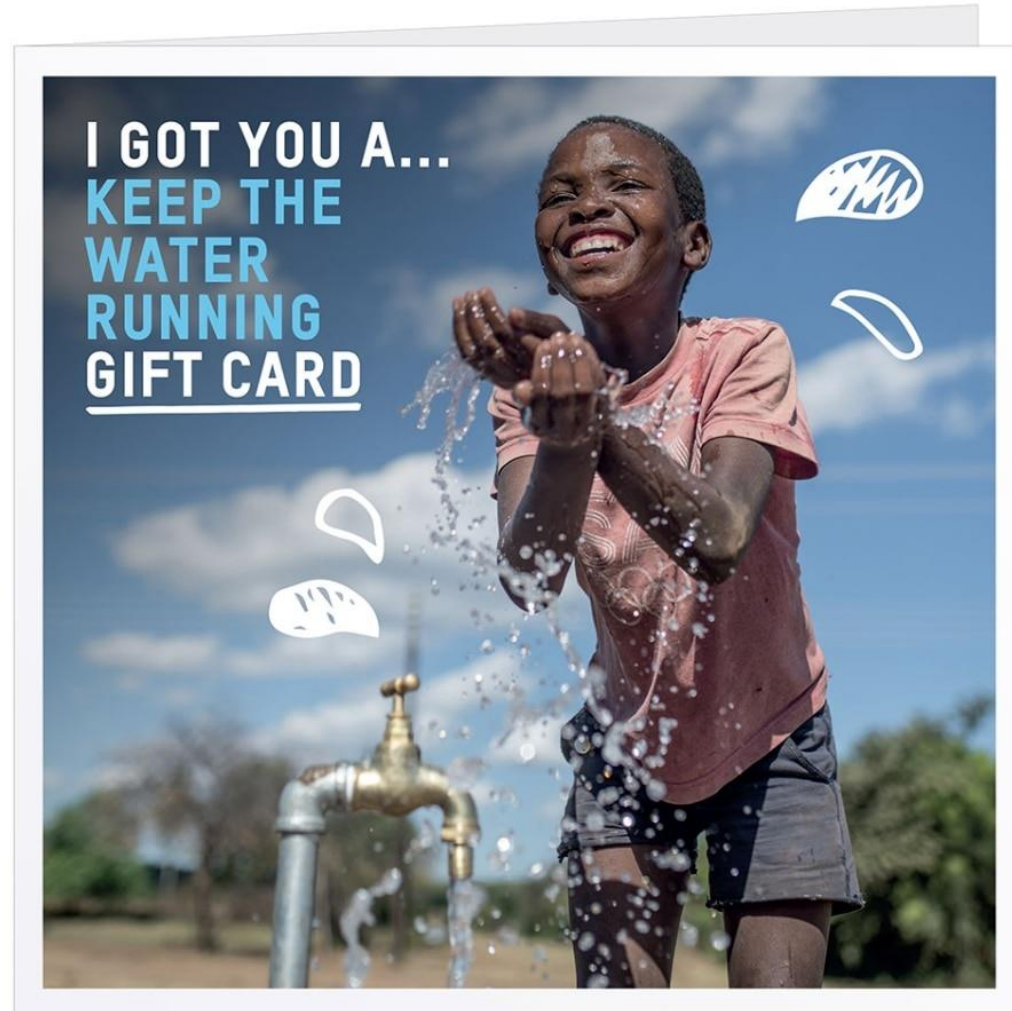


<https://theconversation.com/earth-day-colonialisms-role-in-the-overexploitation-of-natural-resources-113995#:~:text=Colonialists%20saw%20%E2%80%9Cnew%E2%80%9D%20territories%20as,state%2Dmaking%20and%20capitalist%20development.>

Resist the urge to 'white-wash' because of a subconscious belief that the western way of doing things is the best way of doing things. There are too many examples of this going wrong.



How the global north wants to see the global south



To believe that the rest of the world needs to look like the West, is the single most problematic, colonial belief that prevents true global empowerment from actually being achieved.

Some common beliefs about the developing world

- **The developed world is 'clean'; the developing world is 'unclean'** UK/USA are somehow not polluted countries/continents but yet LARGEST creator of waste; where does it go?
- **The developed world is 'environmentally friendly'** 'Green revolution' resulting in 'shaming/growth restrictions' on developing countries; despite the current global energy crisis being a result of the industrial revolution which propelled wealth in UK and USA
- **The developing world is politically unstable.** Resources are being 'snatched' from developing communities, then, society is conditioned into believing that the 'global south' requires help from the great almighty western aid force.

To engineer the future in a way that is racially just, engineering has to address issues that affect people of colour, empower people of colour and are engineered by people of colour.

Decolonising the engineering sector

- Use 'Modern' or recent examples
- Teach historical context and raise awareness of engineering history
- Understand the socioeconomic and political context of the problem
- Be mindful of the 'design biases

Thank you

Further Reading

- Why I'm no longer talking to white people about race: Reni Eddo-Lodge
- Natives: Akala
- Half of a yellow son: Chimamanda Ngozi Adichie
- The fire next time: James Baldwin
- Edward Said: Orientalism
- Things fall apart: Chinua Achebe
- I am thunder: Muhammed Khan
- Prisoners of Geography: Tim Marshall
- Poor Economics – Abhijeet Banerjee and Esther Duflo
- Shock Doctrine – Naomi Klein
- The price of inequality – Joseph Stiglitz

Discussion

Critique;

What did you disagree with, feel was under evidenced, or otherwise missing in detail?

Discussion

New;

What was new to you? How did your positionality affect how you received or interpreted this information?

Discussion

Implement;

Identify something at Imperial which we could change to improve racial equity.
How would you make this change?

IMPERIAL

Provide feedback!

If you used this resource, please take the time to fill out this form to provide your feedback.

If you have any questions or require more information about the REET (Resources for Embedding EDI in Teaching) project, please contact the Project Lead using the following contact details:

Chloe Agg c.agg@imperial.ac.uk

<https://forms.office.com/e/pHBZpniFvB>

