

ENGINEERING FOR PEOPLE

DESIGN CHALLENGE

**Don't forget to complete
our 3-minute survey!**

bit.ly/efp24survey1



Before we start, please complete the 3-minute survey!



ENGINEERING FOR PEOPLE

DESIGN CHALLENGE

WORKSHOP PART ONE

ASKING THE RIGHT QUESTIONS

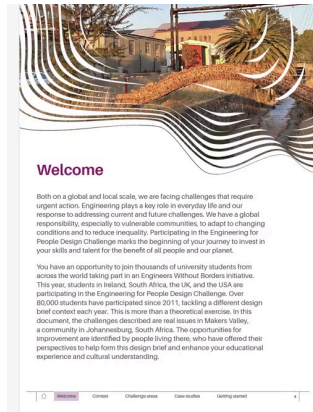
Hello and welcome to this workshop for the Engineering for People Design Challenge.

[Spend a moment outlining the value of these sessions for their design journey - Analysing the context in Part One and Defining the problem in Part two. It's part of the marking criteria, and will ensure your designs are relevant for the community]

ASKING THE RIGHT QUESTIONS

✓ Start exploring the context of the design challenge

✓ See the importance of staying in the problem space



During the first hour of the design challenge workshops we'll be exploring Makers Valley through the design brief, honing our ability to ask the right questions and stay in the problem space. It's so easy to neglect this stage, but it will put us in a really strong position for the 2nd hour of the workshop and beyond.



But before we dive into these activities, let's refresh our memories about the context and design process:

This year's context, Makers Valley, is a collection of suburbs on the eastern edge of Johannesburg in South Africa.



Johannesburg is situated in the northeastern part of South Africa, and has a population of 6.3 million people. On screen is a view towards the city centre from the edge of Makers Valley.



Coming into focus now is eastern Johannesburg, with Makers Valley in the centre.

MAKERS VALLEY

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WHEN COMMUNITY MEMBERS BECOME CHANGEMAKERS

problem solving
innovation
hope sustainability
community
empowerment culture
holistic solutions



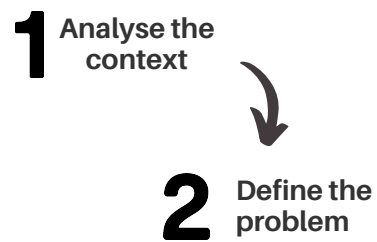
As you'll discover in the resources available to help you, Makers Valley, which is home to over 46,000 people, isn't just a place; it's a thriving community bursting with ideas. Here, community members are empowered to be change makers, tackling urban challenges with ingenuity and determination.

But don't take my word for it - today you have the chance to discover this fascinating context for yourselves.

I'm excited to see how your fresh perspectives and creative solutions can inspire those living and working in Makers Valley today.

Before we dive into the activity, I'm going to briefly revisit the design process and how it links to today's workshop.

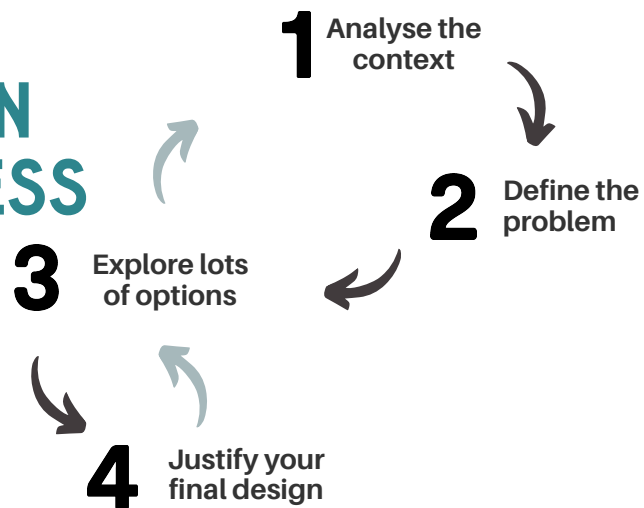
THE DESIGN PROCESS



We really can't underline enough how valuable the design process will be for you not only on this design challenge journey, but also as you develop many of the critical skills that employers are looking for. As a quick reminder, this process starts with analysing the context.

A clearer appreciation for the context will allow you to progress with confidence to the next stage, defining the problem that you want to address.

THE DESIGN PROCESS



At this point things get a bit less linear and a lot more cyclical and iterative. This is because during the process of exploring lots of options, you may realise that your design is going in completely the wrong direction, and that's ok, it's all part of the process!

Go back and reanalyse the context or redefine your problem statement, and document that journey as we want to see this in your submission!

When you're finally ready, you'll need to justify your final design, making a compelling case for how it will positively impact the planet as well as people's lives and livelihoods in Makers Valley.



"It's not that I'm so smart, it's just that I stay with the problems longer."

- Albert Einstein

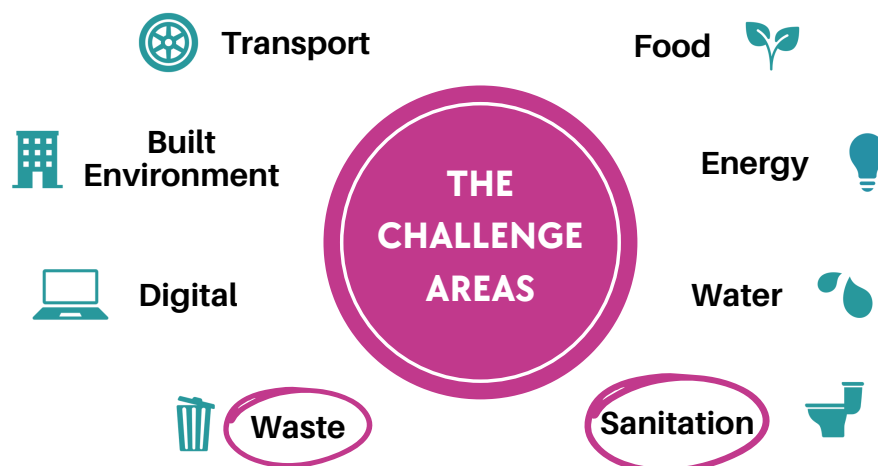
Now, this part of the workshop will be helping us to remain in the problem space for as long as possible, refining our ability to ask the right questions. Why is this such an important exercise?

Well, as Albert Einstein famously said 'It's not that I'm so smart, it's just that I stay with the problems longer'.

This was seen in action during the launch with the Rubik's Cube example, which showed how a linear approach with little understanding of the problem led to a cube that was only solved on one side.

By spending more time understanding how a cube works, and constantly iterating and reworking the different sides of the cube, you can reach a solution that can stand up to scrutiny from all angles.

That's why we're going to spend some time now ensuring we have a strong appreciation for the context...

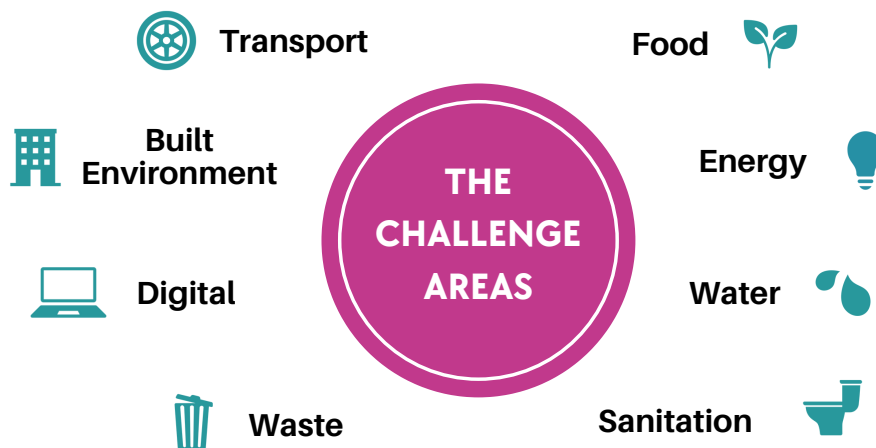


Before we start this activity, it's important that everyone is in groups and is allocated a challenge area that you'll be focusing on for this session.

Now we'll take a moment to allocate your challenge areas for this activity. Your focus will either be (transport, built environment, digital, waste, food, energy, water, sanitation).

While most of these should be clear, it's worth noting that waste refers to solid waste while sanitation involves the safe management, treatment and eventual disposal of water that is contaminated.

Introduce yourselves and confirm your challenge area!



So please take a minute to confirm your challenge area in your teams and also introduce yourselves to any team members.

And to be clear, this won't be the challenge area that you have to continue with for the rest of the design challenge. But remember, that this is a real context and therefore every challenge is connected, so whatever challenge area you end up choosing, make sure you have a solid appreciation for how it interacts with the other 7 areas.

[Pause for clarification of groups, challenge area allocation for the workshop and distributing A3 paper to teams who didn't receive one on arrival]

Now, let's move on to the first part of our activity

ASKING THE RIGHT QUESTIONS

Without looking at the design brief, write a list of **qualitative questions** that will help you build a clear, balanced picture of Makers Valley. For example:

In this first activity, we'll be spending the next 10 minutes or so practising the art of asking the right questions about one of these challenge areas.

This is a great opportunity to get into the habit of asking qualitative questions that build a clear, balanced picture of the context.

This means going beyond the numbers and digging into the different perspectives, insights and opinions of a community.

ASKING THE RIGHT QUESTIONS

Without looking at the design brief, write a list of **qualitative questions** that will help you build a clear, balanced picture of Makers Valley. For example:



Digital

What's the phone signal like for residents?



Built
Environment

What are the preferred construction methods in Makers Valley?



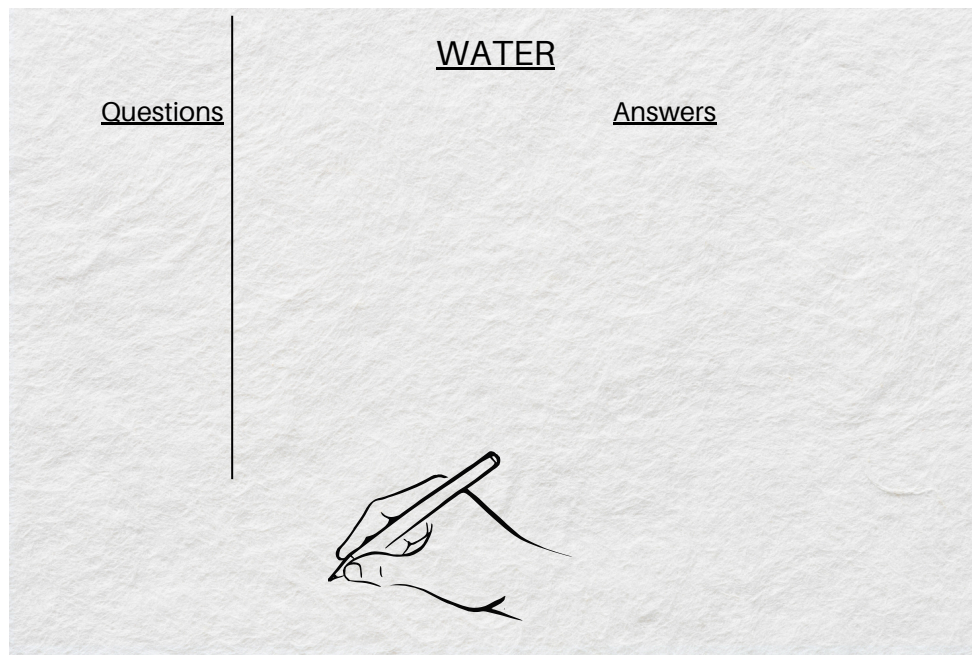
Transport

How accessible are essential services?

This will require you to re-frame your questions so that the complexity and nuance of an answer isn't lost. For example when exploring the digital challenge area, instead of asking 'how many cell towers are there in Makers Valley?' and using that to gauge the quality of phone signal, you could instead simply ask 'What is the phone signal like for residents?', as that will give you a much clearer idea as to whether this is a problem or not for the community.

If your challenge area is the built environment, 'What are the preferred construction methods in Makers Valley?' is an effective way of understanding what local skillsets and building materials can be harnessed, rather than imposing the methods that you might be more familiar with.

As a final example, if your area is transport then 'How accessible are essential services in Makers Valley?' could help you look beyond the colourful bus maps or impressive ad campaigns and gauge whether the transport systems actually meet the needs of the community.



To capture all of your questions, grab your piece of A3 paper and draw a line slightly left of the centre of the page. Put your challenge area at the top and label the columns 'questions and answers'. Now someone else will be reading this later, so make sure it's all legible!

[You can also prepare your own version with the different parts and explain from that instead]

(If students joining virtually) If you're joining virtually, then split up the challenge areas between everyone in the breakout group and come up with questions individually.

ASKING THE RIGHT QUESTIONS

Without looking at the design brief, write a list of **qualitative questions** that will help you build a clear, balanced picture of Makers Valley. For example:



Digital

What's the phone signal like for residents?



Built
Environment

What are the preferred construction methods in Makers Valley?



Transport

How accessible are essential services?

Now that you have your challenge area and questions column ready, we can begin. Remember though that we are looking to come up with qualitative questions here - so anything about Makers Valley that can only be answered with a number is off-limits for today!

See you in 10 minutes.

[Suggested breakdown of 10 minutes group time:

2 minutes: Quick review of the challenge area

6 minutes: Brainstorming qualitative questions

2 minutes: Selecting and refining the best questions

Feedback time: 5-10 minutes for teams to feedback some of their favourite/most relevant questions to the room]

ANSWERING THE QUESTIONS

The next part of this activity will, unsurprisingly, involve answering these questions using the resources on our online portal. But there will be a slight twist: you won't be answering your own questions, but those asked by another team about a different challenge area.

ANSWERING THE QUESTIONS

- Pass your list of questions to another team
- Use the online design brief and resources to find the answers

Therefore, let's start this section by grabbing your A3 sheet of paper and passing it, roughly, clockwise around the room so that everyone is now holding a different set of questions.

[Take a moment for the handover to take place and double check after a minute]

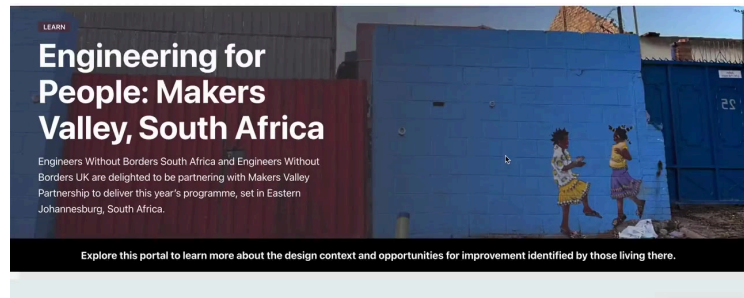
We now have the questions that we'll be answering, so let's turn to where we can find the answers, the Makers Valley portal.

ANSWERING THE QUESTIONS

- Pass your list of questions to another team
- Use the online design brief and resources to find the answers

Head over to
[Engineering-for-people.org](https://engineering-for-people.org)

Password:
SouthafricaEFP



To access the portal, head over to engineering-for-people.org and click the Makers Valley section. You'll be prompted to enter a password, which is on screen now. Once logged in, you'll be able to jump straight into the portal.

Remember, this is just the starting point. As you work through these questions, challenge yourself to go deeper. If you finish early, use this opportunity to build on the existing questions or formulate new ones that explore the challenge area even further. This process of continuous questioning is key to truly understanding the problem space.

Without further ado, you'll now spend some time answering these questions and deepening your understanding of the context.

[Accessing the Portal: 2 minutes

Guide students to engineering-for-people.org and help with password entry if needed. Note that they must click on the portal and not the 'Account' icon at the top of the webpage.

Answering Questions: 10-15 minutes; Students work in groups to answer questions using portal resources.

(Encourage students to go beyond initial answers and explore further if they finish early)

Feedback and Discussion: 5-10 minutes

Depending on time and number of teams, each group or a group from each challenge area can briefly shares one key insight they've gained]

WHAT NEXT?



Sign in to the portal
and complete survey



Explore the design brief
and interactive map

www.engineering-for-people.org

Password: **SouthAfricaEFP**

I hope that you found this first part of the workshop useful. While stats and data will always play a part in design, there is so much complexity and potential to be found once we start asking deeper questions that get to the heart of a place and the communities living there.

We look forward to continuing on in the 2nd part of the workshop soon, which will explore how to navigate defining the problem, but in the meantime don't forget to sign into the portal using the password on screen.

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DESIGN CHALLENGE



BREAK

ENGINEERING FOR PEOPLE

DESIGN CHALLENGE

**Don't forget to complete
our 3-minute survey!**

bit.ly/efp24survey1



So welcome to the second part of the engineering for people design challenge Workshop.

If you haven't done so already please do follow the QR code or the link on screen now and complete the survey.

It'll only take three minutes so I'll leave that up for a second and then we'll jump into today's session



ENGINEERING FOR PEOPLE

DESIGN CHALLENGE

WORKSHOP PART TWO

DEFINING THE PROBLEM

Hello and welcome to part two of this workshop for the Engineering for People Design Challenge.

DEFINING THE PROBLEM

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DESIGN CHALLENGE



Value of staying in the problem space



Working as a team to navigate complexity

The second hour of this design challenge workshops will focus on defining the problems facing Makers Valley and capturing their complexity on paper so that we can confidently start exploring impactful solutions. As previously seen with analysing the context, it's so easy to neglect this stage, but we hope that this session will put you all in a strong position going forward.

Ignore below, just notes.

Value of staying in the 'problem space'

Organising your thoughts/evidence before bringing engineering solutions to the table.
(Students generally don't document this process and it becomes unclear WHY they have chosen a certain challenge area or problem)

Learn more about our resources and the different Challenge Areas from the design brief.

Getting into the habit of justifying your decisions

Building a strong case so that your design can stand up to scrutiny

Making sure there is consensus in your team for why you are designing what you're designing

DEFINING THE PROBLEM

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DESIGN CHALLENGE



Value of staying in the problem space



Working as a team to navigate complexity

On screen now are a collection of images from Makers Valley, including illegal dumping and burning of waste, the increasingly unaffordable minibus taxis and community farming and cooking initiatives which are addressing food insecurity.

These images help capture some of the challenges and opportunities that will need to be considered while in the problem space.

I'll now share more about the resources available to you and then explain the first activity.

Ignore below, just notes.

Value of staying in the 'problem space'

Organising your thoughts/evidence before bringing engineering solutions to the table.
(Students generally don't document this process and it becomes unclear WHY they have chosen a certain challenge area or problem)


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www.engineering-for-people.org


 **Online Portal**

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 **Video Case Studies**

 **Interactive Map**

 **Design Brief**

 **Discord Forum**

Getting started

Borders UK are delighted to be partnering with Makers Valley Partnership to deliver this year's programme, set in Eastern Johannesburg, South Africa.

Explore this portal to learn more about the design context and opportunities for improvement identified by those living there.

Read the design brief

Explore the community

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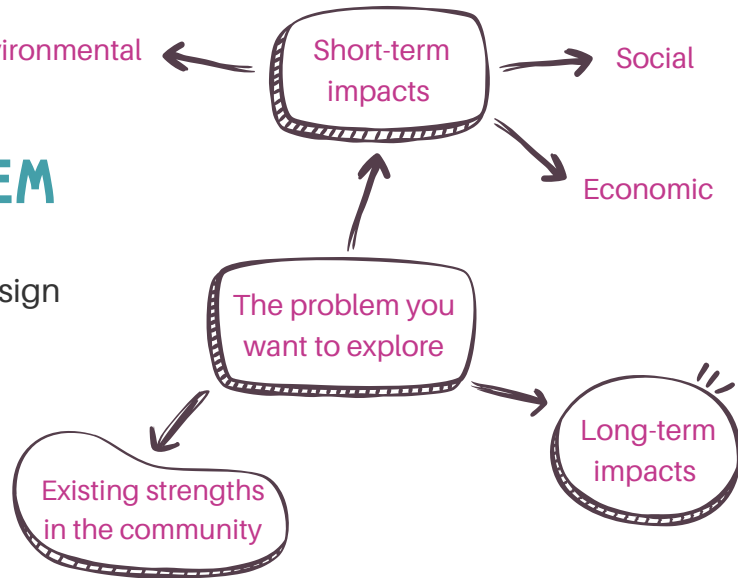
By this point you've hopefully had a chance to explore the resources on our portal, so let's spend a moment highlighting how they can be harnessed during this problem-definition phase.

Let's imagine that you've decided to explore the contamination of the Jukskei River.

You might start in the water section and discover that the river currently suffers severe sewage pollution. This prompts you to explore the sanitation section which provides more detail, as well as a signpost to Romy Stander's case study. For even more depth on this problem; including the health risks to residents, impact on the ecosystem and lost potential for river-based enterprise and community spaces, there's a direct link to a video interview with Romy standing beside the river itself. While the video is playing, another team member could pull up the interactive map to understand the river's path through Makers Valley. As you scan across the map, questions may arise about the projects taking place along the river, which you can ask on the Discord forum.

ACTIVITY 1: MAPPING THE PROBLEM

- Choose a problem from the design brief that you want to explore
- Create a mind map that captures the different aspects of the problem



With that example fresh in our minds, it's time for you to focus in on a problem that your team has identified in Makers Valley, and capture the different aspects of it on a mind map.

This map can include; the people or environments currently experiencing it, the longer term impacts of the problem if it isn't addressed, and the individuals and organisations within the community who are already tackling the problem.

These suggested starting points are on screen now, but you can decide as a team how you want to convey the different aspects of the problem on your page.

You'll have around 10 minutes for this, so grab your A3 paper, agree on a problem from the design brief that you want to explore, and then start mapping it out!

[Problem Selection: 2 minutes

Teams quickly agree on a problem from the design brief to explore.

Mind Mapping: 7 minutes

Groups create mind maps on A3 paper, including all aspects in visual mind map on slide

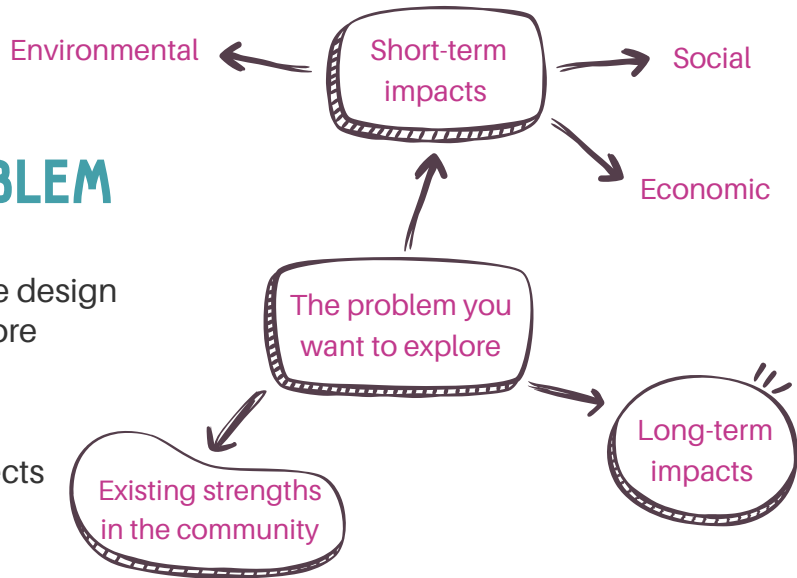
Final Review: 1 minute

Teams review their mind maps and add any last details

Feedback from groups: 5 minutes to hear a selection of aspects that cover the 3 main areas of the mind map (short term, long term and existing strengths)]

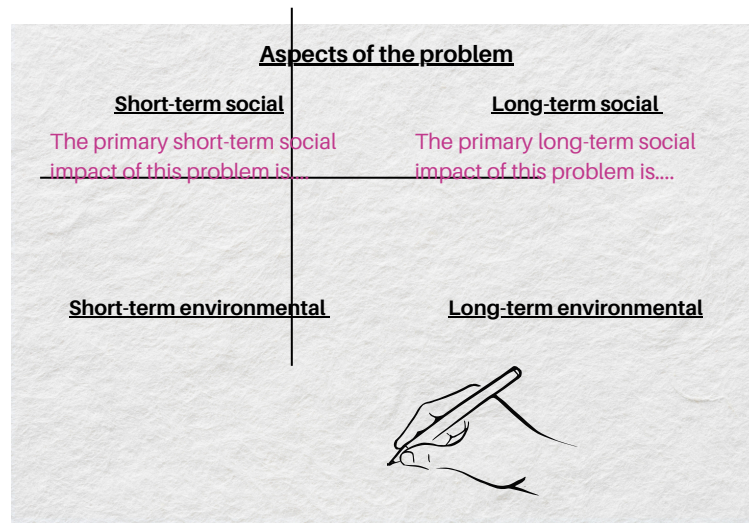
ACTIVITY 1: MAPPING THE PROBLEM

- Choose a problem from the design brief that you want to explore
- Create a mind map that captures the different aspects of the problem



We hope you found that activity helpful, giving you the space to dig deeper into the complexity of problem. We're now going to take parts of your mind map and condense them down into a few concise statements. Why is this step so important? If we're not able to communicate these problems later on to different audiences, then it will be almost impossible to justify why your final design is so relevant to the community and their needs.

ACTIVITY 2: DEFINING THE PROBLEM



Let's start by splitting the page into 4 sections with the short-term social and environmental on the left side, and long-term social and environmental on the right side.

For each of these aspects of the problem, you'll need to write a concise sentence that summarises any relevant information from your mind map. You can use the sentence template on screen as a guide.

To clarify:

Short term aspects refer to anything in your problem that is directly impacting the community now.

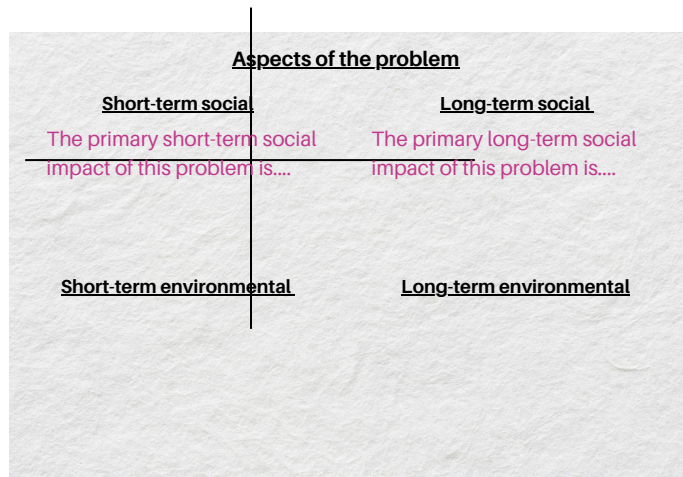
The long term aspects, could be effects that aren't felt yet but WILL happen if things aren't addressed.

ACTIVITY 2: DEFINING THE PROBLEM

- Turn over your piece of paper and split the page into four sections
- Write a concise sentence for each of the four aspects of the problem

Short-term - any aspects of your problem that are directly impacting the community now

Long term - any aspects of your problem that aren't felt yet but will happen if the problem isn't addressed



On screen now is everything you'll need for this 10 minute activity.

[10 minutes for group work: Pulling in relevant information from their mind map to complete as many of the four sentences as they can.

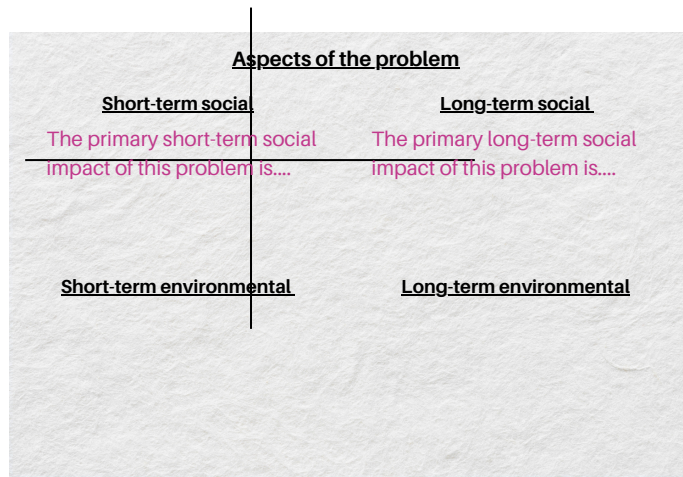
5-10 minutes for group feedback: Ideally there would be a chance to hear a few sentences and also gauge how many teams could find all four aspects within their problem.]

ACTIVITY 2: DEFINING THE PROBLEM

- Turn over your piece of paper and split the page into four sections
- Write a concise sentence for each of the four aspects of the problem

Short-term - any aspects of your problem that are directly impacting the community now

Long term - any aspects of your problem that aren't felt yet but will happen if the problem isn't addressed



Welcome back. You should now have a quite complex, inter-connected mind map on one side of your page, and a much more digestible set of sentences on the other. This synthesising of information is a hugely valuable skill that will be crucial to addressing the global challenges of our time. We only had time to summarise the social and environmental aspects today, but going forward we hope you expand this approach to the economic aspects, as well as the strengths within the community that can be harnessed to address these problems.

AS A TEAM: WHAT ARE YOUR NEXT STEPS IN THE DESIGN CHALLENGE?



[This first line can be tailored to the stage of the design process that your students are in] Now you may not be in a position to move from analysing the context into the problem definition space yet, and that's absolutely fine. This has hopefully provided some inspiration for how to approach it when you're ready.

Given how important consensus is to an effective team, let's spend a few minutes now in your groups agreeing on what your next steps in the design challenge should be. If you're not sure, why not consider replicating today's activity with other problems that you've identified in the brief, or assigning team roles so that you aren't repeating each others work? And if you're really stuck, use this time to raise any queries!

[Give the teams 5 minutes to discuss their next steps]

SUPPORT & RESOURCES



Join the portal and
Discord forum



Continue exploring
the design brief and
interactive map

www.engineering-for-people.org

Password: **SouthAfricaEFP**

I hope you found this workshop useful and wish you all the best as you continue on your design journey.

As your solution starts to emerge and your understanding of the context deepens, I encourage you to get stuck into the Discord forum where members of Makers Valley Partnership and Engineers Without Borders UK and South Africa will be answering your questions about the context.

That's all for today, but I look forward to seeing your final solutions!

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