Reshaping **Transport**

Playbook

HIGH VOLUME TRANSPORT APPLIED RESEARCH

UK International Development

Partnership | Progress | Prosperity

UK ENGINEERS WITHOUT BORDERS

Contents

Opening perspectives

Welcome to the Reshaping Transport Playbook!

This playbook is designed with one purpose - to be a guide for educators and decision makers to embrace the changing demands of the transport sector. As innovation accelerates and sustainability becomes urgent, teaching must adapt to prepare learners for the challenges ahead.

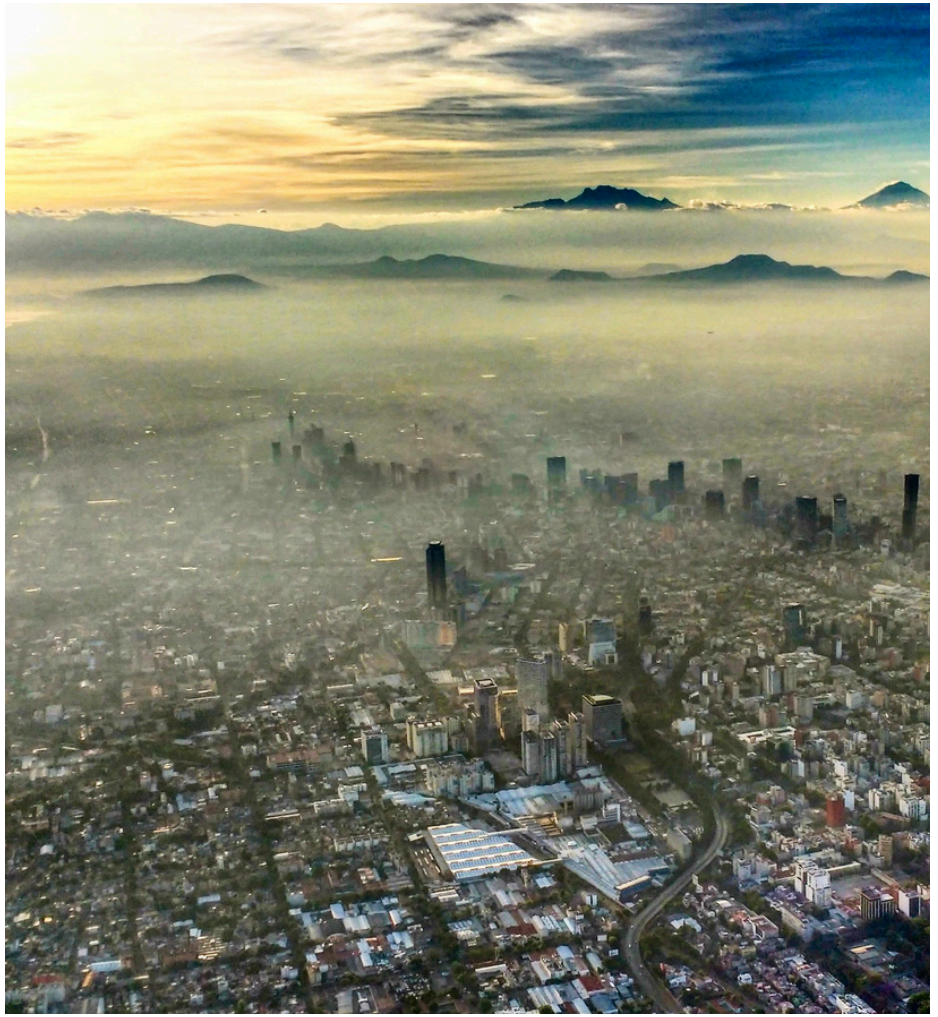
Transport shapes every aspect of our lives - how we travel, deliver goods, and design cities. Yet, today's systems are often unfair and unsustainable, prioritising a few while leaving many without access to safe, affordable mobility. They also harm the planet, contributing to environmental degradation.

The IPCC's 6th Assessment Report (2023) emphasises the urgent need to transform transport systems. A just transport system ensures freedom and dignity for all, while a sustainable one supports, rather than harms, our environment.

This playbook is a call to action. With practical tools and strategies, it helps you inspire learners to rethink transport and build a better future.

Let's get started!

Constance Agyeman
Engineers Without Borders UK



Getting started

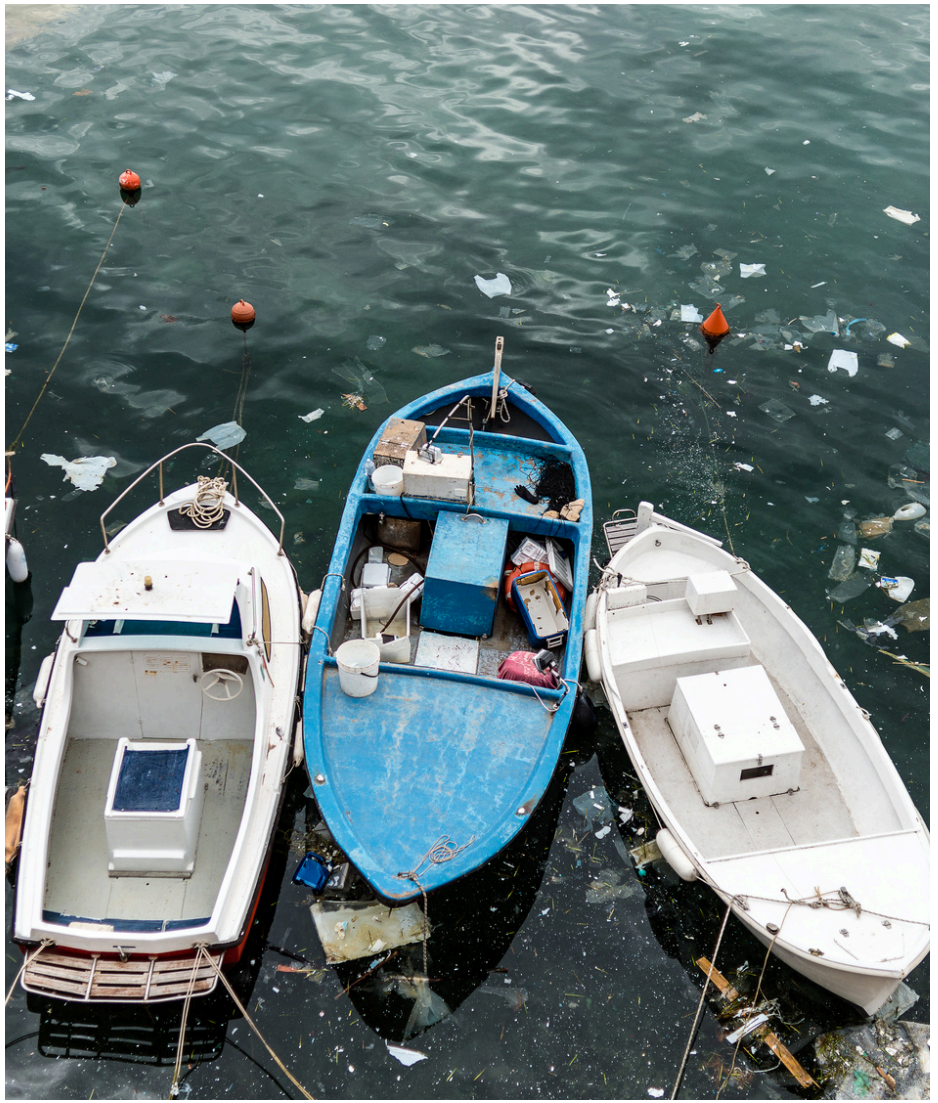
What is the playbook?

The *Reshaping Transport Playbook* is a practical guide for engineering educators and facilitators to adapt their teaching methods to meet the evolving challenges of the transport sector.

It focuses on bridging critical gaps in sustainability, inclusion, and ethics within engineering education, enabling students to develop the skills to improve lives and protect the planet.

Grounded in insights from over 150 research studies and 40 projects from the High Volume Transport (HVT) Applied Research Programme - an initiative funded by UK Aid that undertakes research into sustainable transport development in Low Income Countries across Africa and South Asia - the playbook is further enriched by contributions from more than 50 experts, learners, and advocates, including valuable perspectives from the Global South.

At its core, the playbook introduces five actionable "plays" designed to help educators engage with the complex and urgent topic of sustainable mobility. These plays offer accessible and relevant starting points for teaching, whether integrated into modules or training sessions, while encouraging deeper exploration of this essential subject.



Who is it for?

The *Reshaping Transport Playbook* is designed for educators and facilitators, and other professionals working in the transport and infrastructure sectors. The five "plays" focus on:

- Exploring the diversity of transport both globally and locally.
- Addressing inequalities and dynamics in transportation systems.
- Centering education on the lived experiences of the majority worldwide.

Educators in both academic and vocational settings can use the playbook to bridge gaps in transport education, whether or not transport is part of their current curriculum. It can be tailored to all educational levels -pre-university, undergraduate, and postgraduate - by adjusting the complexity of research and exercises to suit each stage of learning. It is especially valuable for those preparing future professionals who may work in low and middle-income countries.

The playbook is also beneficial for:

- Senior leadership shaping educational strategies.
- Transportation professionals aligning practices with sustainability goals.
- Policymakers designing actionable, sustainable urban mobility systems.

By offering practical tools and strategies, the playbook empowers diverse audiences to drive meaningful change in transport education and practice.

Educators

Educators can integrate the five plays into modules and use them to generate student project briefs, sparking discussions on sustainable mobility and fostering critical thinking. The playbook also provides opportunities for research projects, such as analysing transport systems and policy impacts.

Learners

Learners can use the playbook for self-study or in lessons where an educator facilitates the use of plays. Case studies and exercises help develop skills in data analysis, policy evaluation, and project management. Learners can use the plays in workshops within study groups or run extra-curricular design challenges with peers or student societies, developing key skills for real-world impact.

Benefits of using the playbook

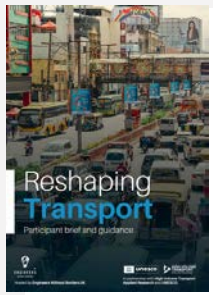
1. **Contextual understanding:** Explains the importance of evolving transportation education and provides a strong rationale for change.
2. **Practical guidance:** Supplies actionable strategies, activities, and session plans for effective teaching.
3. **Empowering educators:** Supports educators in becoming change makers and offers inspiration and starting points for further development in teaching practices.
4. **Addressing gaps:** Focuses on closing educational gaps in sustainability, inclusion, and ethics within engineering, especially related to transportation.
5. **Student preparation:** Equips learners to tackle complex urban mobility challenges with enhanced awareness and skills.
6. **Resource access:** Provides essential information, real-world insights, and reference materials to integrate sustainable mobility into curricula.

Your package of resources

Key materials

Reshaping Transport Playbook

The playbook is part of a wider suite of resources to help you explore and integrate sustainable mobility and high-volume transport into your teaching and learning.



Reshaping Transport Project Brief

This project brief is designed to be shared with learners as part of Play D. It provides resources to deepen understanding of the sector's challenges and initiatives addressing them.

This brief was tested during the *Reshaping Transport Design Challenge*, an eight-week virtual design challenge run in 2024, which brought together over 200 engineering educators, learners, and mobility professionals worldwide to develop sustainable mobility solutions for Low- and Middle-Income Countries (LMICs).

Global Responsibility Competency Compass

The playbook aligns with competencies required to practise globally responsible engineering, as set out in the Global Responsibility Competency Compass.

Optional resources

HVT - Research Reviews

A comprehensive review of over 150 research materials and 40 projects across HVT's focus areas: Regions, Inclusion, Access, Infrastructure, Climate Change, Policy and Planning, and Crisis Response.

Reshaping Transport Crowdsolve

Explore 50+ ideas for sustainable mobility and high-volume transport proposed during the design challenge.

Introducing the plays

Plays are structured by:

- **Suggested learning outcomes:** Knowledge, skills and mindsets students are expected to develop. *
- **Introductory materials:** Provide a concise summary of the module's purpose and how it connects to sustainable mobility.
- **Session plan:** A step-by-step framework for delivering the session, including key topics.
- **Case studies:** Real-world examples that bring the concepts to life, demonstrating practical applications.
- **Discussion points:** Prompt questions and themes to explore in discussion.
- **Reference materials:** Curated list of resources linked to sessions and to support further teaching and learning.

We recommend that all plays are used within a module or learning series, as they reflect a learning journey. Plays can be run chronologically or could run alongside student projects.

*Note that care has been taken to ensure the learning outcomes align with the various accreditation requirements (at an international level with the Graduate Attributes and Professional Competencies (WFEO and UNESCO) and specific national requirements such as IAPC (AHEP4 (UK), ABET (US) or ECSA (SA)). This guidance might be of use for when you are developing module-level intended learning outcomes.

A

The case for sustainable mobility

To understand the importance of global responsibility and the role of sustainable mobility and transport for the global majority.

B

Ecosystem mapping

To value the importance of interdisciplinary collaboration to address challenges and maximise opportunities in the sustainable mobility and high volume transport ecosystem.

C

Multi-criteria for decision making

To navigate how multiple considerations influence designing sustainable mobility and high volume transport.

D

Generating student projects

To design globally responsible sustainable mobility and high volume transport solutions for the global majority using real-world contexts.

E

Reflection

To critically evaluate the insights gained from exploring sustainable mobility and high-volume transport solutions, considering the perspectives of the global majority.

A The case for sustainable mobility

The case for sustainable mobility

Introduction to the play

Purpose

To understand the case for sustainable mobility that works for the global majority.

Educator Note

Making the case for sustainable transport lies in preparing learners to think beyond conventional engineering practices and consider the socio-economic and environmental contexts of their work. The global majority often faces unique challenges that western-centric models do not address adequately, leading to ineffective and unsustainable outcomes. Engineering education must emphasise the unique needs of these regions, preparing future engineers and transport professionals to design solutions that are not only contextually relevant and inclusive but also sustainable and resilient to climate change. Achieving globally responsible outcomes requires solutions that are adaptable to diverse and evolving needs.

Suggested learning outcomes

1. Describe the sustainable mobility hierarchy and its relevance to the global majority.
2. Reflect on personal and others experiences of transport.
3. Recognise the role of globally responsible practice.
4. Apply relevant concepts from the required disciplines within the context of sustainable mobility and high volume transport.

Definitions

- **Sustainable mobility**: Systems and practices in transportation that reduce environmental impact while being economically and socially beneficial.
- **High volume transport** (**HVT**): Transport systems designed to move large numbers of people or goods efficiently.
- **Transport hierarchy**: A framework prioritising transport modes from most to least sustainable, promoting lower-impact options first, also known as the sustainable mobility hierarchy.
- **Global majority**: A term referring to the collective population of countries in Asia, Africa, Latin America, and the Caribbean, representing most of the world's population. These regions share experiences of underrepresentation, economic disparity, colonial histories, and systemic challenges while driving transformative opportunities. (Also often referred to as the Global South or Low- and middle-income countries)

The case for sustainable mobility

Session plan

Session: The case for sustainable mobility

Timeframe: 90 minutes

Methods: Information, interrogation, reflection

Useful materials: Reshaping Transport Design Brief, Transport Hierarchy, Global Responsibility Competency Compass

Context

Transport is vital to global economic development, driving market access, growth, and social mobility. However, creating sustainable high volume transport infrastructure is challenging, especially for the global majority, due to cost, resource limitations, and accessibility barriers. Addressing this requires a commitment to global responsibility, prioritising environmentally sustainable solutions such as public transit, walking, cycling, electric vehicles, and shared mobility. Compact urban development and reduced reliance on single-occupancy vehicles are also key. Importantly, integrating the lived experiences of diverse communities ensures transport systems are inclusive, responsive, and socially equitable.

Session overview

This session has four exercises that support a foundational understanding of why sustainable transport is an important topic for learners to explore, from recognising the significance of the role it plays in our lives to why globally responsible practice is critical.

1 Recognise the significance

2 What key words?

3 Transport experiences

4 Globally responsible practice

The case for sustainable mobility

1

Recognise the significance

Duration: 15 minutes

This is an information sharing exercise that provides context for learners and orients them to consider the global majority. Use the Design Brief as an information source.

Activity

Use slides or briefing sheets to present the following

- **Define key terms** and set the context for sustainable transport.
- **Acknowledge that sustainable transport is crucial** to development, reducing carbon emissions, mitigating climate change, and promoting healthier communities.
- **Highlight economic and social benefits**. Emphasise that sustainable transport supports economic growth, reduces travel costs for communities, and enhances access to jobs, education, and services.
- **Promote equity and inclusion**. Present sustainable transport as a pathway to improving transport equity, ensuring that solutions cater to marginalised and under-resourced communities, particularly considering the needs of the global majority.
- **Reflect on the significance transportation** has on our everyday lives and why globally responsible engineering is the way forward to more just transportation systems.

The case for sustainable mobility

2

What key words?

Duration: 30 minutes

This is an exercise focused on identifying, understanding, and reinforcing key terminology related to a particular topic. It is an active learning activity where learners engage with core concepts through critical thinking.

Activity

Based on the information provided in the slides or briefing sheet, learners should identify key words related to sustainable transport. Here are a few suggestions to get started:

Global majority **Inclusion** **Sustainability** **Modes of transport** **Mobility hierarchy** **Shared models**

- **Define:** Learners should start by writing their own definition, then utilise an AI tool (i.e. Chat GPT, Gemini, Co-pilot) to solicit an AI definition.
- **Visualise:** Learners can also source imagery related to the keyword to understand how those words are currently represented.
- **Verify:** They should then find a definition outlined in an academic paper or other research source for verification
- **Reflect:** Finally note down reflections from the exercise

Using AI Tools

When exploring a new topic, AI tools like large language models can support critical thinking, yet they also require significant energy, water, and resources (even if we don't see that impact directly). While these tools can be valuable, it's important not to rely entirely on them. Where tempted, use AI to complement your own human judgment and reflection from your own learning and experiences, fostering a balanced approach.

Reflection prompts

- What similarities or differences do you notice between your original definition and the AI-generated one?
- How does the academic definition compare to both your definition and the AI definition?
- What patterns or themes can you identify in the imagery associated with this keyword? Is it representative of the global majority?

The case for sustainable mobility

2

What key words?

	Key words		
Own definition Write your own definition			
AI definition Source AI definition(s)			
AI imagery Source imagery related to the keyword			
Verification Find a definition outlined in research/academic paper			
Reflection What do you observe in the similarities or differences?			

The case for sustainable mobility

3

Transport experiences

Duration: 30 minutes

This exercise emphasizes personal experiences in designing sustainable transport systems, offering unique insights into real-life challenges and needs. Considering these perspectives ensures solutions are based on the real-life challenges and needs of users, making them more likely to be effective.

Activity

- **Individual reflection (5 minutes):** Ask learners to write a short paragraph about their own most memorable or routine transport experience, focusing on any challenges or positive aspects they encountered. Encourage them to consider elements like accessibility, cost, comfort, time, and safety.
- **Group discussion (10 minutes):** Divide learners into small groups and have them share their reflections with each other. Encourage them to listen for common themes or unique differences in their experiences.
- **Global perspective (5 minutes):** Provide brief profiles or case studies of transport experiences from communities in the global majority (e.g., challenges faced by the global majority or innovative solutions in under-resourced areas).
- **Global comparison (10 minutes):** Ask learners to compare these with their own and peers' reflections.

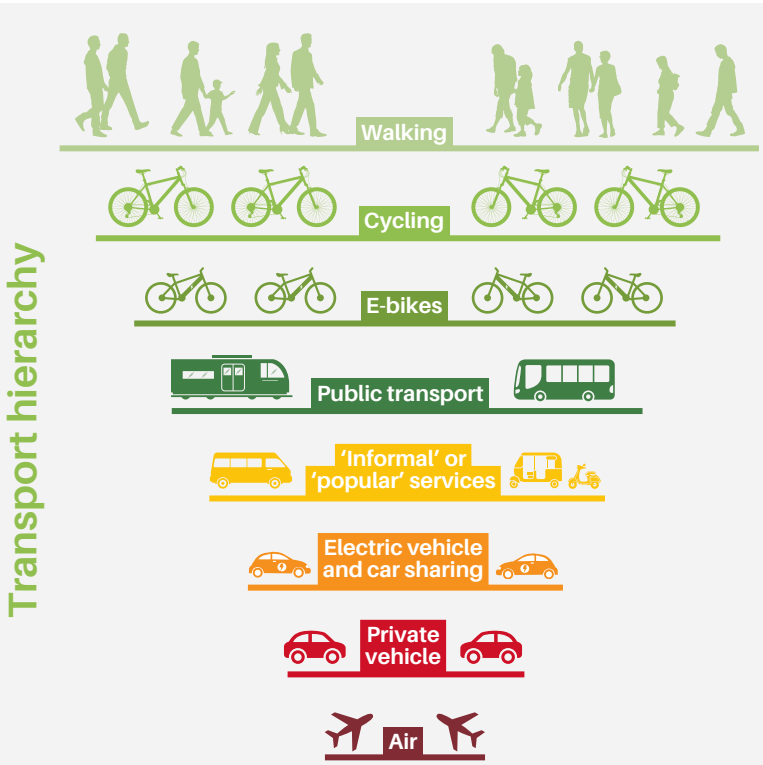
Reflection prompts

- What similarities and differences did you observe between your experiences and those from global majority communities?
- How do these insights highlight areas for improvement or consideration in designing inclusive, sustainable transport systems?

The case for sustainable mobility

3

Transport experiences



The sustainable mobility transport hierarchy is a conceptual framework that prioritises modes of transportation based on their environmental, social, and economic sustainability. It can be used as a prompt for this exercise.

Additional exercise

Learners may also want to consider the proportion of time they spend on each mode of transport. And compare this to the proportion of time they think is spent by the global majority on each mode of transport. Useful to identify a particular persona within the global majority as they are not a homogenous group.

The case for sustainable mobility

4

Globally responsible practice

Duration: 15 minutes

Globally responsibility in design is vital because it ensures that systems are equitable, inclusive, and considerate of the environmental, economic, and social impacts on a local and global scale. Such practices help create solutions that not only meet local needs but also support sustainable development and reduce disparities for communities, especially those in the global majority. This exercise helps learners explore what it means to be globally responsible practitioners.

Activity

- **Introduction (5 minutes):** Introduce the 4 Principles of Global Responsibility expressing the need for those working in and around engineering to commit to global responsibility
- **Group discussion (10 minutes):** In small groups or one large group ask learners to reflect on how the principles of global responsibility helps to place value on important things and prompt good questions in the design/reflection process

Reflection prompts

- How can I ensure my designs or projects meet the needs of all people while staying within the ecological limits of the planet?
- Have I considered the full lifecycle impact of my project, from resource extraction to end-of-life disposal or reuse?
- What steps can I take to respect and incorporate local knowledge and cultural contexts into my designs or solutions?
- How can I incorporate principles of circularity and sustainability to create solutions that thrive within planetary boundaries?

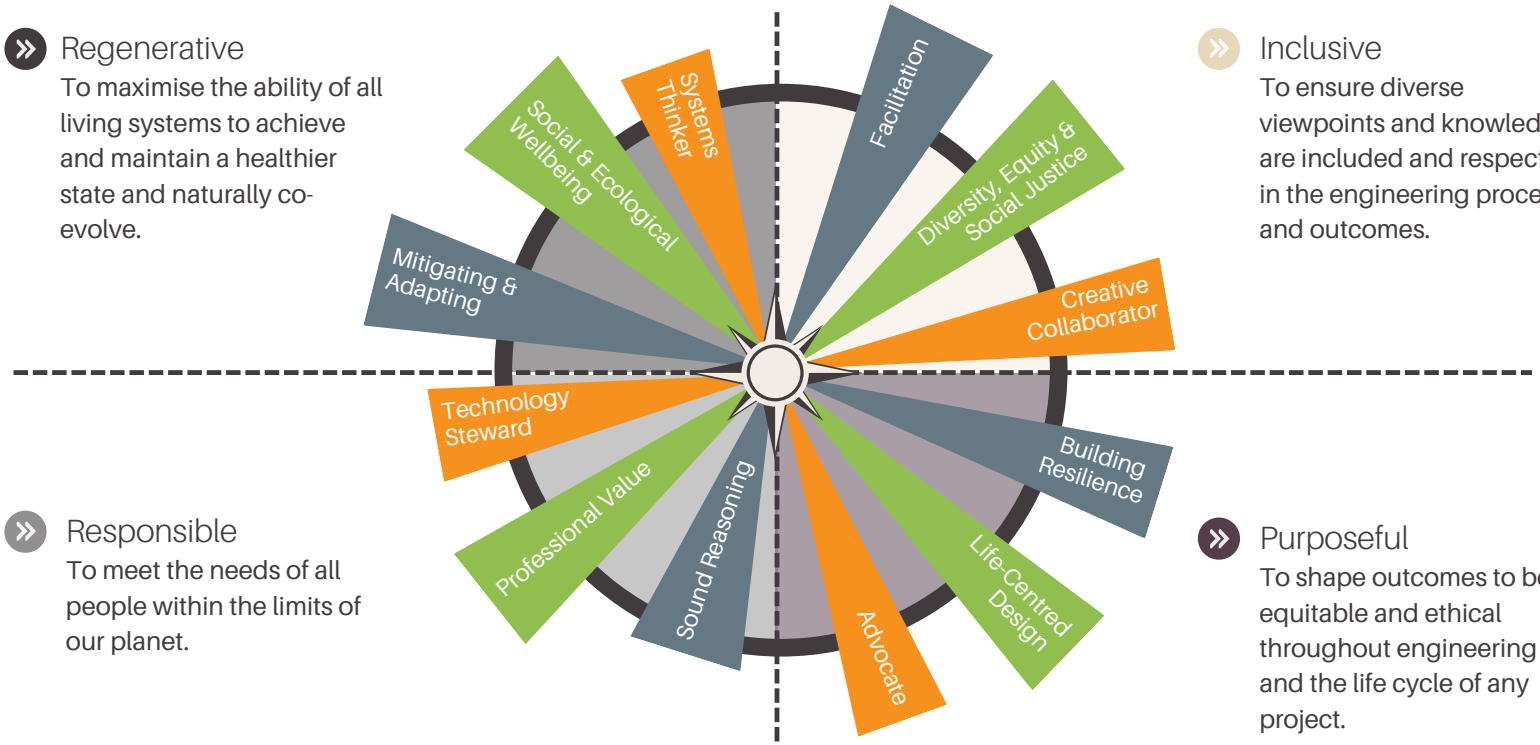
The case for sustainable mobility

4

Globally responsible practice

Regenerative
To maximise the ability of all living systems to achieve and maintain a healthier state and naturally co-evolve.

Inclusive
To ensure diverse viewpoints and knowledge are included and respected in the engineering process and outcomes.



Responsible
To meet the needs of all people within the limits of our planet.

Purposeful
To shape outcomes to be equitable and ethical throughout engineering and the life cycle of any project.

Embed the principles

Learners can go deeper or focus on certain competencies in the session if time permits. The important thing is to continue to use the principles as a guide to think about questions they continue to ask as they work through the following plays. To further understand how to embed these principles into day to day practice, we have developed a Competency Compass that identifies the key competencies required to deliver on the four principles of globally responsible engineering. After the session, learners are encouraged to download the Compass and use the provided template to develop an action plan.

The case for sustainable mobility

Sandbox

Commuting Challenges in Nairobi, Kenya (Africa)

Mary, a teacher living on the outskirts of Nairobi, faces significant challenges commuting to work each day. Her journey involves using matatus (privately owned minibuses) that are often overcrowded, unreliable, and subject to sudden fare increases. These commutes are further complicated by harassment she often encounters, adding to her stress and sense of vulnerability. Traffic congestion exacerbates the situation, causing unpredictable delays and extended travel times. Despite these challenges, the matatu system is a vital means of transport for many residents, providing economic opportunities for drivers and conductors. The potential for improvement lies in developing more reliable and regulated public transport systems that are safe and affordable for all.

Safety Concerns in Delhi, India (Asia)

Ravi, a college student in Delhi, relies on public buses and the metro to travel to and from school. While the metro system is generally efficient and well-maintained, the streets and bus stops present safety concerns, especially for young people travelling during early mornings or late at night. Poor street lighting, lack of pedestrian infrastructure, and high traffic volumes make it risky for him and others to navigate the journey safely. Initiatives focused on improving urban infrastructure, such as better lighting offer opportunities to enhance commuter safety and encourage the use of public transport.

The case for sustainable mobility

Sandbox

The Perils and Opportunities of walking in Accra, Ghana (Africa)

Kwame, a market vendor in Accra, often walks to and from his market stall due to the high cost of public transport and the proximity of his home. While walking is an affordable and common mode of transport for many, Kwame faces significant challenges on his daily route. The lack of well-maintained pavements and crossings forces him to navigate busy streets alongside fast-moving vehicles, putting him at constant risk of accidents. This is particularly hazardous during the rainy season when roads become slippery, and floods make walking even more dangerous.

Despite these challenges, walking presents opportunities for fostering healthier lifestyles and reducing environmental impact. Investments in pedestrian-friendly infrastructure, such as pavements, bridges, and safe crossings, could transform walking into a more viable option.

- A Pan-African Capacity Building Programme on Inclusive Climate Resilient Planning for Active Mobility: Final Report

The case for sustainable mobility

Sandbox

Resources

HVT Research

- State of Knowledge Final Report on Urban Transport
- Capacity Building in Sustainable Urban Mobility for Low Income Countries
- Climate-resilient transport: A policy guide
- Launch of the Transport Decarbonisation Index, a diagnostic toolkit
- New toolkit launched to support LMICs access climate finance
- ODA Reporting for Transport
- OECD DAC indicators and amendments
- Framework to collect and analyse gender disaggregated travel data from public transport ticketing systems
- Supporting the next generation of NDCs and the SDG Decade of Action
- Access to Climate Finance - World Resource Institute Archives

Read, watch, listen

- SLOCAT Transport, Climate and Sustainability Global Status Report – 3rd Edition
- TUMI (Transformative Urban Mobility Initiative) Sustainable Mobility Podcast Collection
- Sustainable Transportation
- Reshaping transport for a cleaner environment and fairer society: 15 min presentation

Tools

- Global Responsibility Competency Compass
- Reimagined Degree Map

Useful links

- United Nations Sustainable Development Goals
- Nationally Determined Contributions (NDCs)

B Ecosystem mapping

Ecosystem mapping

Introduction to the play

Purpose

To value the importance of interdisciplinary collaboration to address challenges and maximise opportunities in the sustainable mobility and high volume transport ecosystem.

Educator Note

Understanding the transport ecosystem is crucial in preparing learners to appreciate the complexity and interconnectedness of sustainable transport. By examining the ecosystem, learners can identify the various stakeholders, resources, and infrastructure elements involved in transport solutions. This holistic view enables them to understand how technological advancements, policy decisions, and social behaviours collectively shape transport outcomes.

Suggested learning outcomes

1. Identify social and cultural implications in communities related to local, regional, and global transport systems.
2. Recognise the value of collaboration, cooperation, and knowledge sharing within and across disciplines, promoting innovation.
3. Apply interdisciplinary approaches in solving complex engineering problems.

Definitions

- **Transport ecosystem:** The integration of technology, infrastructure, and policy to ensure that transportation systems contribute positively to communities and the environment.
- **Interdisciplinary approaches:** An interdisciplinary approach to sustainable transport combines insights from fields like engineering, urban planning, environmental science, social policy, and economics to create comprehensive, equitable, and innovative solutions for sustainable mobility systems.
- **Communities:** A group of individuals or entities with shared characteristics, interests, or geographic proximity. Those within the global majority - are diverse groups from all stratas of society, whose unique needs, challenges, and perspectives need to incorporated and well considered.

Ecosystem mapping

Session plan

Session: Ecosystem mapping

Timeframe: 90 minutes

Methods: Information, interrogation, critical thinking, reflection

Useful materials: Reshaping Transport Design Brief, Miro Board (or equivalent)

Context

Mapping provides a foundational understanding of the complex interplay between various elements within a system. It enables stakeholders to identify opportunities, anticipate challenges, and develop holistic strategies that address the underlying dynamics of the topic.

Recognising the interplay between technology, transport modalities and society helps learners grasp how transport solutions must align not only with engineering standards but also with the socio-economic, cultural, and environmental contexts in which they operate. In particular, this approach is essential for addressing the unique needs of the global majority, where Western-centric models may fail.

Session overview

This session presents three exercises that support exploration of the complexity of transport ecosystem, supporting learners to recognising the interplays that influence the development of sustainable transport.

1 **The transport ecosystem**

2 **Mapping who, what, why?**

3 **Focus on community**

Ecosystem mapping

1

The transport ecosystem

Duration: 15 minutes

This is an information sharing exercise that provides context for learners and orients them to consider the complexity of the transport ecosystem. Use the Design Brief as an information source.

Activity

Use slides or briefing sheets to present the following

- **Describe the transport ecosystem** as more than modes of transports but a series of interplays of people, disciplines, considerations and products.
- **Highlight interdisciplinary factors**. Emphasise that sustainable transport requires multiple factors to be considered in any design process to address the issues effectively.
- **Promote community engagement**. Present sustainable transport as a pathway to improving transport equity, ensuring that solutions engage those that it intends to serve, particularly considering the needs of the global majority.
- **Reflect on the significance** of collaboration and knowledge exchange being the way forward to more just transportation systems.

Ecosystem mapping

2

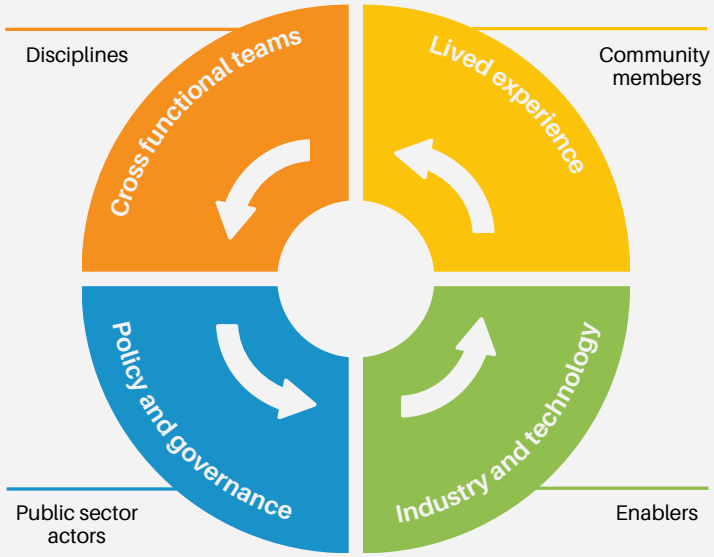
Mapping who, what, why?

Duration: 30 minutes

This exercise focuses on the interdisciplinary collaboration and interplay between different stakeholders that influence the transport ecosystem.

Activity

- **Brainstorming session (5 minutes):** In small groups, learners should brainstorm who should be involved in each areas of the exercise template and write them down. They can use the ecosystem map as a prompt.
- **Perspectives role play (15 minutes):** The groups should then assign themselves as different stakeholders from the brainstorm and decide on a local transport issue (see case studies). From the perspective of their assigned role, they should outline how their role contributes to or helps address the issue.
- **Group discussion (10 minutes):** Bring the whole group together to reflect and discuss things that stood out to them and what they learned from the activity.



Reflection prompts

- Who is involved in the ecosystem and why is it important to consider their role in developing solutions?
- What type of skillsets are required to collaborate effectively within the ecosystem? Don't just think about technical skills, also consider experience and governance.
- Why is it important to have a holistic perspective of the ecosystem, rather than a singular point of exploration?

Ecosystem mapping

3

Focus on community

Duration: 30 minutes

This exercise helps learners critically examine community engagement strategies, reflect on inclusive stakeholder involvement, and collaboratively develop diverse methods and outcomes for effective engagement.

Activity

- **Read case study (5 minutes)**: Ask learners to read the case study on the following page or one of the case studies in the Ecosystem Sandbox (page 30), focussing on the communities experiences and engagement strategies.
- **Global perspective (10 minutes)**: Based on the case study ask learners to individually reflect on who else would be important to engage with (this could be a marginalised group, specific stakeholder or sector) and write down ways in which they would engage with them and what they would hope to gain.
- **Group discussion (15 minutes)**: Divide learners into small groups and have them share their reflections with each other on ways to engage communities. Encourage them to listen for common themes or unique differences and create a shared list of engagement methods and intended outcomes.

Reflection prompts

- Who in the community is it purposeful to engage?
- What are useful ways to engage that particular community?
- How do these insights highlight the need for community engagement in designing inclusive, sustainable transport systems?

Ecosystem mapping

3

Focus on community - Exercise case study

Women's Personal Safety, Participation and Employment Linkage in Urban Public Transport, Mekelle, Ethiopia (Africa)

Reason for Engagement: The project aimed to address challenges including safety concerns, limited participation in transport planning, and employment barriers. Engaging the community, especially women, was crucial to understanding their specific needs and developing inclusive transport solutions.

Methods of Engagement: Both primary and secondary data collection using mixed quantitative and qualitative methods:

- **Surveys:** Gathered data on the experiences and challenges of women aged 18+ who used public transport at least once daily
- **Key informant interviews (KII):** Conducted with stakeholders, including transport operators and policymakers, to gain insights into systemic issues affecting women's safety and participation.
- **In-depth interviews (IDI):** Engaged with individuals to explore personal experiences and suggestions for improvement.
- **Focus group discussions (FGD):** Facilitated group dialogues to discuss common challenges and potential solutions.
- **Participant observation (PO):** Researchers observed interactions within the transport system to intervention areas.

Outcomes: The study revealed that Mekelle's public transport services were largely gender-insensitive, with women frequently facing harassment and exclusion from planning processes.

Recommendations included:

- **Awareness campaigns:** To educate the public on women's transport rights and promote respectful behaviour.
- **Legal enforcement:** Strengthening legal frameworks to address harassment cases promptly and effectively.
- **Capacity building:** Training transport service providers to foster behavioural change and improve service quality.

By actively involving women and community leaders, the project developed targeted strategies to create a safer and more inclusive public transport environment in Mekelle.

- Safety and Mobility Challenges of People with Disability in Mekelle City: Towards Inclusive Urban Transport – A Policy Brief

Ecosystem mapping

Sandbox

Integrated Water and Land Transport in Lagos, Nigeria (Africa)

Project overview: The Lagos State Government is addressing congestion through the Lagos Ferry Services (LAGFERRY), part of an integrated transport initiative offering alternative commuting across the Lagos Lagoon. The service includes ferry routes that connect key areas around the Lagos Lagoon and is integrated with land transport, with plans to expand routes and improve infrastructure. The government is also working to increase safety standards, add new jetties, and improve docking facilities.

Disciplines involved: Urban planning, civil engineering, environmental science, public policy, and community engagement.

Community impact considerations: Many Lagos residents, especially in lower-income communities, spend hours in daily commutes due to congestion and lack of affordable transport. By creating an integrated water transport system, this project aims to reduce commute times, provide affordable travel options, and lessen road congestion and pollution. Community input is essential to ensure that new routes and transport schedules meet the needs of those most affected by traffic and lengthy commutes.

Image: Official Twitter/X handle of LAGFERRY.

Ecosystem mapping

Sandbox

Rural Transport and Solar-Powered Bicycle Sharing in Kigali, Rwanda (Africa)

Project overview: Gura Ride, Rwanda's first solar-powered bike-sharing system, launched in Kigali to promote eco-friendly, affordable transport and reduce congestion and pollution. Operating in urban and rural areas, it provides shared bikes for commuting to work, schools, and markets. Solar-powered docking stations make it sustainable and accessible, aligning with Rwanda's green economy goals.

Disciplines involved: Renewable energy engineering, rural planning, social innovation, healthcare accessibility, and environmental sustainability.

Community impact considerations: By involving community members in design and route planning, the project ensures that the bicycles serve essential routes and that pricing is affordable. The project can boost economic development by improving access to markets and jobs, while the use of renewable energy supports environmental sustainability. Additionally, training locals to maintain the bicycles could create job opportunities within the community. There is also potential to further develop and upgrade the network through electromobility.

- E-Mobility in Low-Income Countries in Africa: Finance, Governance, and Equity
- Electromobility and Renewable Electricity: Developing Infrastructure for Synergies

Resources

HVT Research

- Using creative participatory approaches for inclusive climate resilient transport in Africa
- Inclusive Interchanges Design Brief
- New Thinking For Tomorrow's Transport: Part 1
- Road Note 21 (RN21): Enhancing the mobility of people with disabilities
- State of Knowledge Final Report on Urban Transport

Read, watch, listen

- Sustainable Mobility for All, World Bank
- Gender gaps in urban mobility and transport planning
- United Nations Environment Programme Transport
- Africa Urban Mobility Observatory Action Plan - Blantyre, Malawi

Tools

- Urban Mobility Scorecard Tool
- ITF Gender Analysis Toolkit for Transport policies
- Sustainable Urban Mobility Plan (SUMP) Toolkit
- Global Street Design Guide

C Multi-criteria for decision making

Multi-criteria for decision making

Introduction to the play

Purpose

To navigate how multiple considerations influence designing sustainable and high volume transport.

Educator Note

As educators shaping future transport designers, it's vital to instill a holistic approach that extends beyond just technical aspects. Effective transportation solutions are not simply about moving people from point A to point B; they are about creating systems that respond to the needs and challenges of diverse communities. By teaching learners to integrate social equity, technological advancements, and policy and infrastructure considerations into their design approach, you empower them to prioritise solutions based on specific drivers such as accessibility, environmental impact, and economic growth.

Suggested learning outcomes

1. Recognise the different dynamics between design considerations in local and global contexts (e.g. social, environmental, technical and economic considerations).
2. Demonstrate awareness of how social, technological, and infrastructural factors interconnect in the design of sustainable mobility.
3. Evaluate the impact of engineering projects on local and global communities, ecosystems, and economies, considering sustainability, resilience, long-term consequences and ethics.

Definitions

- **Transport themes:** The integration of technology, infrastructure, and policy to ensure that transportation systems contribute positively to communities and the environment.
- **Social equity and inclusion:** Ensures fair access to transportation systems for all individuals, addressing disparities in mobility and promoting inclusive solutions for marginalised communities.
- **Technology advancements:** Leverages innovative tools and systems, such as electrification and smart technologies, to enhance efficiency, sustainability, and connectivity in transport networks.
- **Policy and infrastructure:** Focuses on creating supportive regulations and robust physical systems, such as roads, bridges, and data-driven frameworks, to enable sustainable and resilient transport solutions.
- **Sustainable Development Goals (SDGs):** A set of 17 global objectives adopted by the UN in 2015 as part of the 2030 Agenda for Sustainable Development. They aim to address social, economic, and environmental challenges to achieve a more sustainable and equitable future for all.

Multi-criteria for decision making

Session plan

Session: Prioritising and decision making

Timeframe: 90 minutes

Methods: Information, interrogation, critical thinking, reflection

Useful materials: Reshaping Transport Design Brief, flip chart and post-its or digital equivalent like Miro Board

Context

Considering social equity, technology, and policy and infrastructure in transportation design allows for a more holistic approach that helps to prioritise for specific contexts.

This understanding helps tailor solutions that not only improve accessibility and sustainability but also address the unique needs of diverse communities. By going beyond modes of transport, designers can strategically make choices about how to approach equity, innovation, and infrastructure in their designs, creating systems that adapt to changing demands, support long-term resilience, and enhance social and economic well-being.

Session overview

This session presents four exercises that outline a range of thematic considerations that support learners to recognise that transport solutions go beyond modes of transport and technology and are influenced by other significant factors.

1 Thematic areas to consider

2 Sustainable development goals

3 Priorities

4 Decision making

Multi-criteria for decision making

1

Thematic areas to consider

Duration: 15 minutes

This is an information sharing exercise that provides context for learners about different thematic areas to consider that impact design choices and outcomes.

Activity

Use slides or briefing sheets to present the following

- **Define the areas** and set the context.
- **Acknowledge** that designing for transport is more than just transport modes and electrification.
- **Highlight interconnectivity** of each of these areas, which means decision making has to be well considered based on the desired outcome to meet people's needs.
- **Promote equity and inclusion.** Present sustainable transport as a pathway to improving transport equity, ensuring that solutions cater to marginalised and under-resourced communities, particularly considering the needs of the global majority.

Reflection prompts

- How does focusing on more than transport modes and electrification change your approach to sustainable transport?
- What aspects of transport design are often overlooked but crucial for creating a comprehensive system?
- How do the different areas of a transport system connect and influence one another?

Multi-criteria for decision making

1

Thematic areas to consider

Social equity and inclusion

Gender, equality and social inclusion

Ensuring equitable access to transportation regardless of gender, socio-economic status, or ability.

Informal

Unregulated or unconventional modes of transportation often serving marginalised communities.

Safety and security

Measures ensuring the protection and well-being of individuals, commuters and infrastructure.

Paratransit

Flexible, individualised, on-demand transportation without fixed routes or timetables, to meet diverse mobility needs.

Print this page and cut out the thematic area cards and titles to complete the 'Priorities' exercise on page 40.

Multi-criteria for decision making

1

Thematic areas to consider

Technological advancements

Low carbon

Transportation methods with minimal carbon emissions.

Electrification

Transitioning to electric-powered vehicles and infrastructure.

Retrofit / modifications

Upgrading existing transportation systems and infrastructure for sustainability.

Technology

Innovations driving efficiency, connectivity, and sustainability in transportation.

Print this page and cut out the thematic area cards and titles to complete the 'Priorities' exercise on page 40.

Multi-criteria for decision making

1

Thematic areas to consider

Policy and infrastructure

Infrastructure

Physical systems supporting transportation, including roads, bridges, and public transit networks.

Policy

Regulations and guidelines shaping sustainable mobility initiatives.

Big data

Utilising vast amounts of data to optimise transportation systems and decision-making.

Transit oriented development

Urban planning focused on creating communities centred around public transportation hubs.

Print this page and cut out the thematic area cards and titles to complete the 'Priorities' exercise on page 40.

Multi-criteria for decision making

2

Sustainable development goals

Duration: 20 minutes

This exercises supports learners to relate sustainable transport to the Sustainable Development Goals (SDGs). This is important as it aligns transport solutions with global priorities, ensuring they address the socio-economic and environmental needs of the global majority. Use the Design Brief as an information source.

Activity

- **Rapid SDG mapping (10 minutes):** In small groups ask learners to rapidly brainstorm and write down how sustainable transport relates to five of the SDGs. This may be through keywords or phrases. The intention is that all 17 are covered by the whole group collectively.
- **Group discussion (10 minutes):** Bring the groups together to feedback on what they hadn't really considered before in relation to the connection between SDGs and sustainable transport.

Reflection prompts

- What is one SDG your group feels is most directly linked to sustainable transport? Why?
- Which SDGs do you think are most impacted by sustainable transport?
- What are potential barriers to aligning transport solutions with the SDGs?

Multi-criteria for decision making

3

Priorities

Duration: 25 minutes

This exercises supports learners to consider how they prioritise the thematic areas when planning sustainable transport solutions.

Activity

- **Prioritisation (15 minutes):** In small groups provide the thematic areas as a set of cards. Ask each group to discuss and place them in order of how they would prioritise them in planning and design decisions.
- **Group discussion (10 minutes):** Each group should feedback their decisions to the wider group for discussion.

Reflection prompts

- **What** thematic area (Social Equity and Inclusion, Technological Advancements, or Policy and Infrastructure) do you think is most critical for sustainable transport, and why?
- **Why** do you think sustainable transport solutions often fail to fully integrate all three thematic areas?
- **Who** might be negatively impacted if one of these thematic areas is overlooked, and how can we mitigate this?
- **Which** thematic area resonates most with you, and why?

Multi-criteria for decision making

4

Decision making

Duration: 30 minutes

This exercises supports learners to understand what others have considered important in the decision making process and how they can learn from those experience to take decisions.

Activity

- **Individual reflection (5 minutes):** Ask learners to pick one of the exercise case studies on the following pages and think about the transport challenge outlined. They should then select three thematic cards that they think would be most important to consider in developing this solution.
- **Global perspective (10 minutes):** Create small groups based on the case study they chose. Groups should compare their individually selected thematic cards and discuss their choices.
- **Group decision (15 minutes):** The group should then collectively decide to prioritise three thematic cards. They should then evaluate how their decision-making is likely to impact the outcomes of the case and discuss any gaps or potential improvements.

Reflection prompts

- How can stakeholders with differing needs and values influence the decision-making process?
- What strategies would you use to balance environmental, social, and technological goals in your plan?

Multi-criteria for decision making

4

Sandbox

Scaling up Gender Mainstreaming in Rural Transport: Policies, Practices, Ghana (Africa)

Implementer: International Forum for Rural Transport and Development (IFRTD)

Overview: This project integrated gender considerations into Ghana's rural transport policies, enhancing women's participation in planning and improving access to flexible, demand-responsive mobility services. By addressing barriers such as safety concerns and cultural norms, the program implemented gender-responsive measures, including training women drivers and creating safe transit spaces. These efforts improved access to essential services like healthcare and education while fostering economic participation and addressing systemic inequalities to promote social equity and inclusion.

Key considerations in decision-making:

- **Social inclusion:** It emphasised creating accessible and inclusive transport options tailored to the unique needs of marginalised groups, particularly women.
- **Safety and cultural sensitivity:** Measures were taken to address safety concerns and cultural norms, ensuring women felt secure while utilising services.
- **Economic empowerment:** By training women as drivers and engaging them in transport planning, the project fostered economic opportunities and encouraged their active participation in the mobility sector.
- **Access to essential services:** Improved transport systems enabled marginalised communities to access critical services, enhancing quality of life.

This case study highlights how gender-responsive transport initiatives can transform rural mobility, promote equity, and support sustainable development goals.

- Women Were Put On The Back-End: COVID-19 mobility constraints and their lessons and implications for gender-equity in sub-Saharan Africa
- Safe and Secure Public Transport in Delhi: Project Completion Report

Multi-criteria for decision making

4

Sandbox

Digital transport solutions for Nairobi's informal public transport sector, Nairobi, Kenya (Africa)

Implementer: Institute for Transportation and Development Policy (ITDP)

Overview: This project focuses on integrating digital technologies into Nairobi's informal public transport system, predominantly operated by 'matatus' (minibuses). The initiative aims to improve service efficiency, passenger experience, and data collection for better urban mobility planning. By implementing mobile applications for real-time tracking, digital fare payments, and data analytics, the project seeks to modernise the informal transport sector and enhance its integration with the city's formal transport infrastructure.

Key Considerations in Decision-Making:

- **Technological integration:** Implementing user-friendly mobile applications for passengers and operators to facilitate real-time tracking and digital payments.
- **Stakeholder engagement:** Collaborating with matatu operators, government agencies, and technology providers to ensure the solutions meet the needs of all parties involved.
- **Data-driven planning:** Utilising collected data to inform urban transport policies, optimise routes, and improve service reliability.
- **Financial sustainability:** Developing business models that ensure the affordability and long-term viability of digital solutions for both operators and passengers.

This case study illustrates how technological advancements can be harnessed to transform informal transport systems, leading to more efficient, reliable, and user-friendly urban mobility solutions.

- T-TRIID Final Report – Metamorphosis Global - High Volume Transport
- Towards the Development of a Surface Transport Decarbonisation - High Volume Transport
- Africa Urban Mobility Observatory
- Autosafety Uganda: Tackling Road Transport Emissions and Crashes from the Source – Rubanga Chapter

Multi-criteria for decision making

4

Sandbox

Catalysing the market transformation of electric three-wheelers in India (Asia)

Implementer: Alliance for an Energy Efficient Economy (AEEE)

Overview: This project focuses on the transition from internal combustion engine (ICE) three-wheelers to electric three-wheelers (e-rickshaws) as a vital step towards sustainable urban and rural transport in India. As three-wheelers are widely used for affordable mobility, the project aims to address environmental challenges by reducing emissions, promoting cleaner energy usage, and improving the life cycle impact of these vehicles. The study highlights key market and policy interventions required to accelerate this transformation, including retrofitting options, financing strategies, and infrastructure development.

Key considerations in decision-making:

- **Environmental sustainability:** Electric three-wheelers emit far less CO2 compared to their fossil-fuel counterparts.
- **Economic viability:** Subsidies and innovative financing mechanisms are crucial to overcoming the higher upfront costs of e-rickshaws and making them attractive for adoption, particularly by low-income operators.
- **Infrastructure development:** A robust network of charging stations is necessary to support large-scale adoption, especially in underserved urban and rural areas.
- **Policy support:** The success of the initiative depends on consistent government policies, including incentives for manufacturers and tax exemptions for operators.

This case study demonstrates how electrification of three-wheelers can transform transport systems in India, offering insights into sustainable mobility, market challenges, and the importance of policy and infrastructure alignment.

- International Transport Forum: Life-Cycle Assessment of Passenger Transport in India
- Springer: Real-World Performance of Electric Two- and Three-Wheelers in West Bengal
- Technical Recommendations for Road Design Considering Three-Wheeler Slow-Moving Vehicles

Multi-criteria for decision making

Sandbox

Resources

HVT Research

- Decision support systems for resilient strategic transport networks in low-income countries
- Capacity Building in Sustainable Urban Mobility for Low-Income Countries: Research on Demand and Success Factors for Future Supply
- A Guide to the Structural Design of Surfaced Roads in Tropical and Sub-tropical Regions
- An Overview of Critical Issues in Transport Planning and Appraisal for LMICs with a Focus on New Approaches, User Benefits and the Environment

Read, watch, listen

- EcoMobility World Festival
- Why the future of sustainability will start with mobility, World Economic Forum
- Sustainable Transportation
- Decision-Making for Sustainable Transport and Mobility: Multi Actor Multi Criteria Analysis

Tools

- Digital Toolkit for Energy and Mobility
- ForFITS Model: Developed by the United Nations Economic Commission for Europe (UNECE)
- The Systemic Risk Assessment Tool (SRAT)

D Generating student projects

Generating student projects

Introduction to the play

Purpose

To design globally responsible sustainable mobility and high volume transport solutions for the global majority using real-world contexts.

Educator Note

Undertaking practical (or project-based) assignments is essential for embedding theoretical knowledge, as it allows learners to apply concepts in real-world contexts, enhancing understanding and retention. This approach is particularly important for addressing the needs of the global majority, as it encourages learners to develop solutions that are relevant, culturally sensitive, and responsive to diverse socio-economic conditions.

The design challenge can be introduced earlier in the module so that the practical activities work in parallel with the module

Suggested learning outcomes

1. Demonstrate ability to critically reflect on complex relationships and tensions to ensure sustainable and equitable results in solutions.
2. Apply knowledge of sustainable mobility and transport to prioritise all peoples and planet in design solutions.
3. Design solutions that uphold global responsibility across their life-cycle by interrogating the role of engineering for people and planet.

Definitions

- **Design challenge:** A structured activity that tasks participants with developing innovative solutions to real-world problems, integrating creativity, research, and stakeholder collaboration.
- **Sustainable mobility:** Transport systems and practices that prioritise environmental sustainability, social equity, and economic viability to meet current and future mobility needs.
- **Low- and middle-income countries (LMICs):** Countries classified by the World Bank based on their gross national income (GNI) per capita, encompassing countries where economic resources and infrastructure are relatively constrained, often facing unique challenges in development, but also offering significant opportunities for innovation and growth.
- **Learning journey:** A structured process of acquiring knowledge, skills, and understanding through exploration, reflection, and practical application, designed to foster personal growth, critical thinking, and the ability to solve real-world challenges effectively.

Generating student projects

Session plan

Session: Design challenge

Timeframe: Minimum 12 hours (equivalent 2-3 hours per week over 4-6 weeks)

Methods: Interrogation, Design, critical thinking, participatory practice, building evidence and justifications, reflection

Useful Materials: Reshaping Transport Design Brief, Sustainable Mobility Context Review

Context

The Reshaping Transport design offers learners the opportunity to engage with real-world design briefs, fostering innovative thinking and practical approaches to enhance transportation systems for the global majority, in regions facing unique challenges, It will help learners expand their understanding of sustainable transportation and to develop ideas or approaches that prioritise environmental sustainability and social equity.

Learners will engage in a comprehensive learning journey based on the Global Responsibility Competency Compass and will deepen their understanding of the sector's challenges and the current initiatives aimed at addressing them.

Session overview

This session presents five stages of practical design, challenging learners to apply the knowledge they have gained to develop a sustainable transport solution for the global majority.

1. **Design Brief: Explore the context**
2. **Define the problem**
3. **Explore solutions**
4. **Justify your recommendations**
5. **Reflection**

Generating student projects

1

Design Brief: Explore the context

Duration: 1 hour

This exercises supports learners to Investigate and understand the socio-economic, environmental, and cultural dynamics of the transportation system within a specific context to identify challenges and opportunities.

Activity

- **Provide an overview of the design challenge (15 minutes):** Use the Reshaping Transport Design Brief as a guide to the steps involved in developing the transport solution.
    - Provide the context for the practical
    - Introduce the materials
    - Provide step by step process
- **Design Brief (30 minutes):** Learners have a preliminary read through the Design Brief to understand what it contains and how it can support their activity.
- **Group discussion (15 minutes):** Learners reflect and discuss the task ahead and the type of challenges that are of particular interest.

Reflection prompts

- What are the most pressing challenges faced by the transportation system in this context?
- How do socio-economic, environmental, and cultural factors influence transportation needs and access?
- What assumptions might I be making about this context, and how can I validate them?
- How do different stakeholders experience and interact with the transportation system?
- What gaps in knowledge remain, and how can I address them?

Generating student projects

2

Define the problem

Duration: 3 hours

This exercises supports learners to narrow down the key issues from the exploratory phase to craft a focused, actionable problem statement aligned with the challenge's goals.

Reflection prompts

- What insights from the exploratory phase stand out as most critical to address?
- Which challenges have the greatest impact on the community, and why?
- How does the problem statement align with the goals of sustainability, equity, and innovation?
- Are there any potential biases or blind spots in how the problem has been framed?
- What constraints (e.g., time, resources, technology) need to be considered in addressing this problem?

Activity

- **Select a challenge area and formulate a group (30 minutes):** Learners should identify key challenge areas and specific location that they are interested in addressing and form groups based on those areas.
- **Assign roles:** It is useful for each group member to have an assigned role or perspective.
- **Research & gather data (120 minutes):** Use the resources and case studies, including and additional reports, and media to understand the chosen context's transport systems and challenges.
- **Identify key stakeholders:** List and analyse the roles of individuals and groups affected by or involved in the transport system (e.g., commuters, local government, businesses).
- **Map the current system:** Create a visual representation of the existing transportation network, highlighting critical inefficiencies, barriers, and opportunities.
- **Review findings:** Revisit insights from the "Explore the Context" activity, identifying recurring themes and critical gaps.
- **Prioritise issues:** Rank challenges by urgency, impact, and feasibility of addressing them within the design challenge scope.
- **Craft the problem statement (30 minutes):** Write a concise statement that outlines the problem, its significance, and its alignment with the challenge's goals.

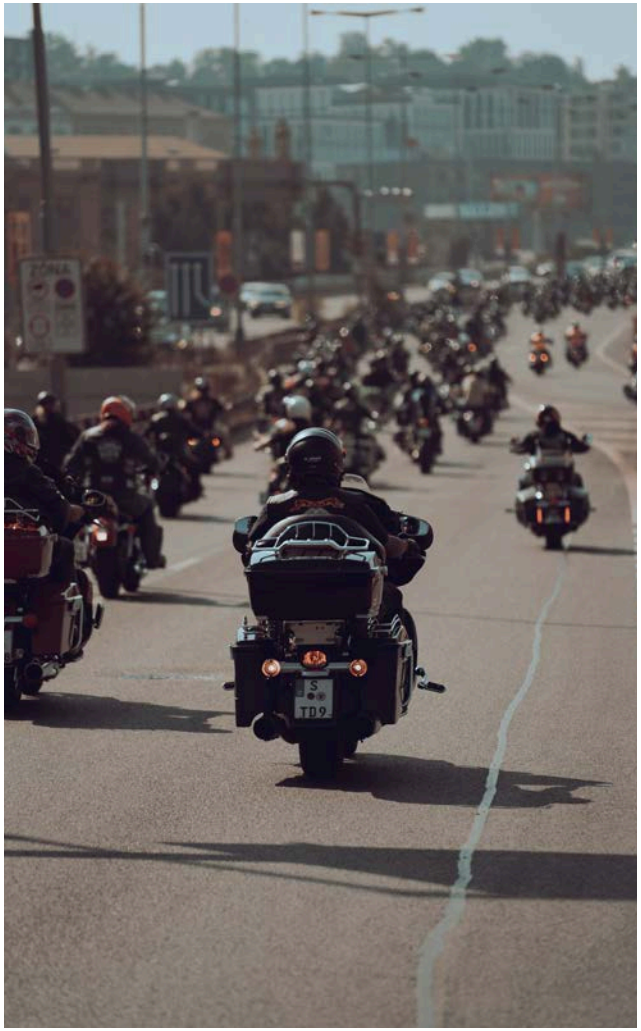
Generating student projects

3

Explore solutions

Duration: 5 hours

This exercises supports learners to generate innovative and diverse ideas, considering creative and practical approaches to address the defined problem while integrating feedback.



Activity

- **Generate ideas:** Use brainstorming techniques (e.g. mind mapping or "How Might We" questions) to create a list of potential solutions.
- **Evaluate feasibility:** Discuss the strengths, weaknesses, and resources needed for each idea, narrowing down to 2-3 viable options.
- **Develop concept notes:** For each selected idea, outline key features, target audience, expected impact, and required resources, technologies and skills.

Reflection prompts

- What innovative approaches or technologies could be applied to address this problem?
- How well do my proposed solutions align with the specific needs of the local community?
- What trade-offs might be involved in implementing these solutions?
- How can I ensure that equity and sustainability are prioritised in my ideas?
- What feedback do I anticipate from stakeholders, and how will I respond?

Concept note template

3

1 Title
A concise, descriptive title for your solution.

2 Problem statement
Clearly articulate the transportation problem you aim to address, including its significance and context.

3 Objective
Define the goal of your proposed solution and what it seeks to achieve.

4 Context and background
Provide an overview of the socio-economic, environmental, and cultural dynamics relevant to the problem.

5 Proposed solution
Outline your idea, describing its features, how it addresses the problem, who it serves and its potential impact.

6 Alignment with global responsibility principles
Explain how your solution embodies sustainability, inclusivity, equity, and regeneration.

Concept note template

3

7 **Stakeholder engagement**
Identify key stakeholders involved and summarise how their input has shaped your concept.

8 **Feasibility and resources**
Highlight the practicality of your solution, including required resources, technologies, and partnerships.

9 **Anticipated challenges and mitigation**
Address potential barriers to implementation and strategies to overcome them.

10 **Expected outcomes and impact**
Describe the benefits of your solution for the community, environment, and economy.

11 **Next steps**
Suggest actions to further refine or implement the solution, including timelines and additional research needs.

12 **Conclusion**
Summarise the significance of your concept and its contribution to reshaping transport systems.

Generating student projects

4

Justify your recommendations

Duration: 2 hours

This exercises supports learners to use evidence, reasoning, and stakeholder input to explain why the proposed solution effectively addresses the problem and aligns with sustainability and equity principles.

Activity

- **Gather supporting evidence:** Collect data, case studies, or research that backs up your solution's effectiveness and alignment with equity and sustainability principles.
- **Engage stakeholders:** Seek feedback from potential users, local experts, or mentors to refine your solution.
- **Prepare a justification:** Write a rationale explaining why your solution is the best fit for the problem, supported by evidence and stakeholder insights.

Reflection prompts

- What evidence supports the feasibility and impact of my chosen solution?
- How have stakeholder perspectives informed my recommendations?
- How does my solution align with principles of global responsibility?
- What challenges or criticisms might arise, and how can I address them?
- How does my solution balance immediate needs with long-term resilience and adaptability?

Generating student projects

5

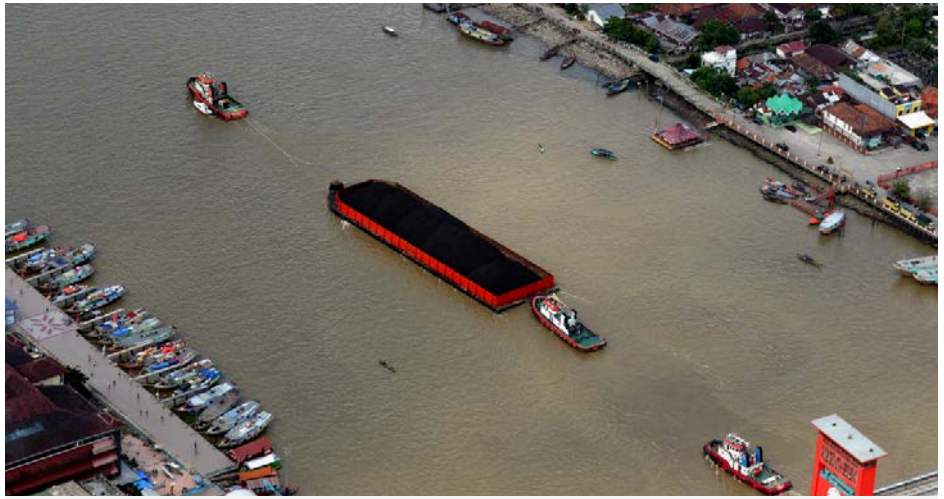
Reflection

Duration: 1 hour

This exercises supports learners to assess the process and outcomes, documenting lessons learned and identifying next steps for personal growth or further project development.

Activity

- **Assess the process:** Review each stage of the challenge, noting what went well and what could have been improved.
- **Document outcomes:** Summarise the final solution and its anticipated impact, including any feedback received.
- **Identify next steps:** Outline personal or team actions to continue learning, improve designs, or advocate for sustainable transport solutions.



Discussion / Reflection prompts

- What did I learn about the transportation system and the community it serves during this challenge?
- How did my initial assumptions change through the process?
- What strengths and areas for improvement did I observe in my approach to this challenge?
- How has this experience influenced my perspective on sustainability and equity in transportation?
- What skills or knowledge will I take forward to future projects, and how can I continue to grow in this area?

Generating student projects

Sandbox

Electric rickshaw fleet for last-mile connectivity, Dhaka, Bangladesh (Asia)

Project overview: Students worked on designing an electric rickshaw fleet to address last-mile connectivity in densely populated areas with limited access to public transport. The project included planning routes, creating a charging station network, and exploring options for integrating digital payment systems. Emphasis is placed on minimising environmental impact and ensuring affordability for low-income residents.

Disciplines involved: Learners engaged in fleet management planning, electric vehicle (EV) systems design, and financial modelling for affordable transport solutions. They also developed skills in user-centric design and community engagement to ensure the solution caters to local needs.

Outcome: Students presented a business model and operational plan to local policymakers and community leaders, including an economic viability assessment. A prototype rickshaw with an efficient battery system was developed, showcasing how the concept could enhance connectivity and reduce carbon emissions in urban areas.

Generating student projects

Sandbox

Solar-powered bus stops with real-time arrival information, Cape Town, South Africa (Africa)

Project overview: Students worked on designing solar-powered bus stops to improve public transport accessibility and reliability while promoting renewable energy. The project involved integrating features such as mobile device charging stations, LED lighting, and real-time bus arrival displays. Emphasis was placed on enhancing user experience and decreasing reliance on conventional energy sources for transit infrastructure.

Disciplines involved: Learners engaged in solar energy system design, IoT technology integration, and sustainable material selection. They also developed skills in energy efficiency planning and data-driven improvements for public transport systems.

Outcome: Students presented a digital model and a functional prototype bus stop to local policymakers and transport authorities, highlighting the potential to improve user experience and reduce carbon footprints in urban transit infrastructure.

Generating student projects

Sandbox - Winners of Reshaping Transport Design Challenge

Revamping Nairobi's Railways: A Sustainable Approach to Public Transit, Nairobi, Kenya (Africa)

Project overview: This initiative aims to transform Nairobi's transportation landscape by revitalising the city's underutilised railway infrastructure. The project focuses on optimising train schedules, upgrading rolling stock, repairing existing tracks, and expanding the railway network to underserved areas. By prioritising rail over road transport, the project seeks to reduce road congestion, lower intra-city travel times, and minimise carbon emissions, contributing to Kenya's broader goals of sustainable development.

Disciplines involved: Participants gained experience in systems optimisation, urban transport planning, and sustainable engineering practices. They also developed expertise in stakeholder engagement, as the project involved collaboration with government bodies, private sector stakeholders, and community representatives to ensure inclusivity and equity.

Outcome: The project presented a comprehensive proposal to policymakers, outlining the technical, environmental, and social benefits of railway revitalisation. Key deliverables included a phased implementation plan, cost-benefit analysis, and a conceptual design for expanded rail routes that prioritise connectivity for underserved communities.

Impact:

- **Environmental:** Potential to reduce road congestion and carbon emissions significantly, supporting Kenya's climate action targets.
- **Social:** Enhanced access to affordable, reliable transport for underserved communities, improving equity in mobility.
- **Economic:** Reduced travel times could boost productivity and lower transportation costs for Nairobi residents.

Commitment to Global Responsibility:

The team demonstrated a deep understanding of sustainable mobility as a cornerstone of global responsibility. Their approach reflected a commitment to human-centred and environmentally responsible design. Post-project, the team pledged three personal actions:

- **Advocacy:** Promoting the development of rapid transit systems in Kenya.
- **Education:** Continuing to learn about global responsibility in engineering and sustainable mobility.
- **Collaboration:** Engaging with stakeholders to champion inclusive, equitable, and sustainable transportation solutions.

Generating student projects

Sandbox

Resources

HVT Research

- Design and Implementation Guide: People with Disability Inclusive Urban Transport Infrastructure
- Transport Technology Research and Innovation for International Development Research
- T-TRIID Final Report – Impact assessment of Kids' Court road safety interventions
- T-TRIID Final Report – Smart Eye for Driver
- City Retrofit for All: Baseline Report
- TRANSITIONS – Informal Transport Compendium Report

Read, watch, listen

- Reshaping Transport Projects
- TUMI (Transformative Urban Mobility Initiative)
- Fueling the future of Transport Podcast

Tools

- Reshaping Transport Design Brief

E Reflection

Reflection

Introduction to the play

Purpose

To critically evaluate the insights gained from exploring sustainable mobility and high-volume transport, considering the perspectives of the global majority.

Educator Note

Reflection and evaluation are critical components of the learning process. These activities allow learners to consolidate their understanding of sustainable transport, assess the impact of their solutions, and identify areas for personal and professional growth. Encourage learners to approach this section with an open and critical mindset, as it not only evaluates their technical work but also their ability to integrate social equity, environmental sustainability, and ethical considerations into real-world projects.

Suggested learning outcomes

1. Demonstrate ability to critically analyse personal and collective experiences in developing transport solutions through reflective practice.
2. Ability to utilise stakeholder insights and collaborative evaluation methods to refine and adapt sustainable solutions, ensuring they are inclusive, equitable, and responsive to diverse needs.
3. Develop aptitude in evaluating the impact of transport solutions on people and the planet, drawing on ethical principles and prior experiences to design adaptive and globally responsible interventions.

Definitions

- **Reflective practice:** Analysing personal experiences and actions to identify successes, challenges, and areas for improvement, enhancing future decision-making and performance.
- **Feedback loop:** A cyclical process where insights and evaluations from participants or stakeholders are used to refine and improve future actions, fostering continuous learning and adaptation.
- **Participatory evaluation:** A collaborative approach where stakeholders, including community members, contribute to evaluating the effectiveness and relevance of mobility solutions.
- **Ethical considerations:** The moral principles guiding the development and evaluation of solutions, ensuring that they prioritise fairness, equity, and respect for diverse communities.
- **Adaptive learning:** The ability to adjust solutions based on feedback and evolving circumstances to enhance their relevance and impact.
- **Lessons learned:** Key takeaways and insights gained through the process of exploring and implementing solutions.

Reflection

Session plan

Session: Reflection

Timeframe: 60 minutes

Methods: Interrogation, Feedback, critical thinking, participatory practice, justifications, reflection, adaptive practice

Context

Reflection and evaluation are essential for ensuring that sustainable transport solutions are both effective and responsive to the needs of diverse communities. By critically analysing the learning journey and activities undertaken, learners gain deeper insights into the real-world implications of their designs, particularly for the global majority.

Session overview

This session presents five stages of practical design, challenging learners to apply the knowledge they have gained to develop a sustainable transport solution for the global majority.

1 **Reflect**

2 **Evaluate**

3 **Adapt**

Reflection

1

Reflect

Duration: 15 minutes

Learners examine their journey through the project, identifying key learning moments, challenges overcome, and shifts in their perspective on sustainable transport.

Activity

- **Facilitate open dialogue:** Foster an environment where learners feel comfortable sharing successes, challenges, and areas for improvement.
- **Encourage self-awareness:** Guide learners to critically evaluate their own contributions, biases, and assumptions.
- **Promote feedback:** Emphasise the importance of incorporating stakeholder feedback into the evaluation process.
- **Highlight iterative learning:** Reinforce that reflection and evaluation are iterative processes that improve decision-making and project outcomes over time.

Discussion / Reflection prompts

- How did your understanding of sustainable transport evolve over the course of the module?
- Were there moments when your personal biases or perspectives influenced your decisions? How did you handle them?
- How did incorporating feedback improve the quality or inclusivity of your solution?

Reflection

2

Evaluate

Duration: 30 minutes

This involves assessing the impact of their transport solutions against predefined criteria, such as sustainability, equity, feasibility, and alignment with global responsibility principles. Stakeholder feedback and data-driven analysis play a crucial role here.

Activity

- **Criteria rating (20 minutes):** Provide a list of evaluation criteria (e.g., sustainability, equity, feasibility, stakeholder satisfaction).
- Learners score each others project (1-5) for each criterion and justify their ratings to encourage critical thinking and assessment skills.
- **Group discussion (10 minutes):** As a group learners should discuss areas for improvement and standouts.

Discussion / Reflection prompts

- How does the project balance technical feasibility with social equity? Could this balance be improved?
- How effectively does the solution align with long-term sustainability goals?
- Did you consider the potential for scaling or replicating this project in other contexts? How would it perform?

Reflection

Adapt

3

Duration: 15 minutes

Learners are encouraged to think about how their findings can inform future projects, ensuring continuous improvement and alignment with sustainability goals

Activity

- **Adaptation mind map:**
  - Central node: "Improving the Project"
  - Branches: Feedback, challenges, tools, and processes
  - Sub-branches: Specific changes or improvements

Discussion / Reflection prompts

- How does this project currently fall short of its objectives, and what opportunities exist for enhancement?
- Was there any conflicting feedback? How will you prioritise or reconcile them?
- Are there emerging tools or technologies that could enhance the project's effectiveness?
- What specific aspects of the project (design, execution, stakeholder engagement, etc.) should be revised, and why?

Reflection

Sandbox

Resources

HVT Research

- Capacity Building Needs Assessment and Strategy for Low Carbon Development
- Using creative participatory approaches for inclusive climate resilient transport in Africa: Guidelines for Practitioners
- A Pan-African Capacity Building Programme on Inclusive Climate Resilient Planning for Active Mobility: Final Report
- Final Report and Capacity Building Strategy: City Retrofit for All
- ODA Reporting for Transport
- Inclusive Climate-Resilient Transport In Africa: Assessment of the needs of transport stakeholders including disadvantaged groups

Read, watch, listen

- Reimagining engineering degrees: How?
- Productivity Game
- Exploring participatory storytelling in complex systems: Post-webinar reflections

Tools

- Gibbs' Reflective Cycle
- Participatory Action Research Toolkit: An Introduction to Using PAR as an Approach to Learning, Research and Action
- Inclusive Mobility Self-Assessment Tool

What next?

The journey to reshape transportation systems to serve all people equitably extends beyond this guide.

This playbook is a starting point - a resource to inspire and support educators and changemakers in evolving how we teach transportation.

Subscribe to our newsletter for updates on globally responsible engineering.

Join the Engineering for People Design Challenge, helping learners explore transportation challenges and community aspirations in real-world contexts.

Transform Education with the Reimagined Degree Map, created with the Royal Academy of Engineering, to help institutions prepare students for 21st-century challenges.

Get in touch

Your feedback is invaluable as we grow this initiative. Share your suggestions or stories at community@ewb-uk.org.

Together, we can shape a future where transportation is inclusive, sustainable, and full of opportunity. Thank you for being part of this critical journey.

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Engineers Without Borders UK

Engineers Without Borders UK are working to reach the tipping point to ensure a safe and just future for all. Part of a global movement of over 30 Engineers Without Borders organisations who work across 89 countries, we inspire, upskill and drive change in the engineering community and together take action to put global responsibility at the heart of engineering.

Learn more at **ewb-uk.org**

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High Volume Transport Applied Research

The High Volume Transport Applied Research Programme (HVT) is a seven-year, £18 million investment by the UK Foreign, Commonwealth & Development Office (FCDO) to undertake research into the complex and interrelated issues of sustainable transport development across Africa and South Asia. This new body of research aims to help inform the decisions of policy-makers in low-income countries and make road and rail transport greener, safer and more accessible, affordable and inclusive and to ultimately make good investment decisions that will help drive economic development and poverty reduction. HVT is delivered through a Programme Management Unit led by the international development consultancy DT Global. HVT comes to an end in January 2025 but a repository of good quality research is available at **transport-links.com**

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