ZOOM Rail
Speed and connectivity

# TEACHERS' PROJECT GUIDE

Route options project — Sheet T1

## Introduction

Students take on one of the tasks of the Zoom Rail project team: evaluating four possible routes between Birmingham and London.

With no perfect answer, students must weigh the competing advantages and disadvantages, balancing community, environmental and economic factors to make the best choice. A number of optional wildcards can be introduced along the way. These provide learners with additional challenges to their decision-making process.

The task concludes with learners presenting their chosen route and the decisions that led them to it.

## Contents

The project pack contains the following documents. Items marked(*) are optional:

- An instruction sheet for students (sheet 1);
- An introduction to the project for students (sheet 2);
- A 'remit letter' from the Secretary of State for Rail (sheet 3);
- Four route options – these factsheets (RA-RD) describe possible routes for the railway. Students should consider them, selecting the one they think is most appropriate, and be prepared to explain their choice. Students can use the worksheet provided to record their findings;
- Three expert opinions – these factsheets (E1-E3) explain the environmental, economic and community factors that affect the choice of route. Students should use these to inform and justify their decision;
- Six job descriptions – who works on a major new rail project? What do they do? These short descriptions (J1-J6) introduce six roles and describe the skills and qualifications that underpin them;
- Six wildcards – a set of additional scenarios that challenge more advanced learners and set up related tasks. These cards (W1-W6) replicate the uncertainties and changing circumstances of a major project*;
- A glossary of terms (G1) that students will need to understand in order to complete the project; and
- A pre- and post-exercise questionnaire (Q1 and Q2).

## Additional materials

Students should use the internet and other literature to research additional information that might support their arguments. They should use Powerpoint slides to present their recommendations to the class. Preparing Zoom Rail's presentation to the Secretary of State for Rail offers an opportunity to practise the use of business language and corporate branding guidelines.

## Suggested format

Introducing and working through the project is designed to take around 10 hours and should incorporate the following activities:

1. Researching high speed rail and working through the pre-project questionnaire to benchmark skills, experience and knowledge about the topic;
2. Assessing engineering feasibility;
3. Assessing environmental impact;
4. Assessing the economic case;
5. Examining the evidence and reaching conclusions;
6. Discussing job profiles and additional desk research, potentially with a presentation from an HS2 member of staff;
7. Preparing the presentation;
8. Presenting findings and recommendation, followed by Q&A; and
9. Completing the post-project questionnaire to measure upturn in skills, experience and knowledge, as well as gathering student feedback: was the project too hard? Too easy? Fun?...

## Wildcards

The six wildcards can be issued at any time in stages 2 to 5. They provide students with an additional activity which will not affect the outcome of the route

Wildcards enable teachers to differentiate learning for different ability groups – the more wildcards issued, the more challenging the project. Teachers may issue all six wildcards in the course of the project. However, students will need information on tunnelling before they can use *Wildcard 3 – A bigger dig?* Use this card only after students have worked through *Expert advice: Engineering.* The information they need is in Question 1 and its accompanying info box.

## Learning outcomes

The project will enable students to develop some or all of the CBI's seven employability skills:

- self-management;
- teamwork;
- business and customer awareness;
- problem solving;
- communication and literacy;
- application of numeracy; and
- application of information technology.

## Role-play

The student resources do not require the students to assume one of the six job profiles. Teachers can include this element if they feel that students would benefit from the additional challenge involved.

Using role-play will encourage students to develop skills including:

- critical thinking;
- advocacy and negotiation; and
- persuasive communication, including logic, emotive language and developing counter-arguments.

## Assessment

The project seeks to test students' analytical and reasoning skills and their ability to communicate effectively. This should be the primary basis for assessment.

One of the four options – Route D – is the preferred route. This is not the only acceptable 'right answer'. However, students who have closely understood the opportunities and constraints faced by Zoom Rail as it tries to strike the best balance are more likely to opt for the preferred route; they should also have persuasive grounds on which to support their decision.

## Route evaluation

Each route characteristic has been awarded a score between 1 and 4.

- 4 is the best, i.e., the most desirable characteristic when choosing a preferred route. For example, the fastest journey times, cheapest, fewest environmental impacts.
- 1 is the worst, i.e., the least desirable characteristic in choosing a preferred route. For example, the slowest journey times, most expensive, significant environmental impacts.

The accompanying tables identify the information that should inform the choice of route, and shows how each route scores on each of the criteria. Table 1 shows the scores awarded to each route. Table 2 explains the route characteristics for which points were awarded.

Therefore, the route with the highest score - Route D - is the best route in terms of its balance of community, environmental and economic impacts. Route A is the least suitable

Students should discover that certain characteristics can score well and poorly, depending on the criteria by which they are judged. For example, having several stations along the route enables more people to use it. However, it also slows down operating speeds, detracting from the principle of high speed rail.

Some decisions can be substantiated in numerical terms - for example, compare the statistics on demolitions and length of tunnelling. Other factors are more subjective: is preserving a traditional workshop more important than providing work for people with disabilities? Students might even suggest positive factors that are not included in the formal evaluation: could the development of New Ash Heath station be a catalyst for new shops, offices and housing?

The most important part of this exercise is that students hone their analytical and evaluative skills, and demonstrate these through well-reasoned and persuasively articulated arguments.

## Teachers' project guide – Sheet T2
## Table: Scoring the routes

| Evaluation criteria | Route D | Route C | Route B | Route A |
|---|---|---|---|---|
| Proximity to highways | 4 | 3 | 2 | 1 |
| Proximity to waterways | 1 | 2 | 3 | 4 |
| Topography of the land – engineering feasibility + cost | 4 | 1 | 2 | 3 |
| Geotechnical hazards | 3 | 2 | 4 | 1 |
| Proximity to urban settlements | 3 | 4 | 2 | 1 |
| Noise levels (during construction and operation) | 2 | 1 | 3 | 4 |
| Length of tunnelling required – dwellings | 4 | 3 | 2 | 1 |
| Demolition of existing dwellings – costs | 4 | 3 | 2 | 1 |
| Demolition of industrial buildings | 4 | 3 | 2 | 1 |
| Land acquisition | 4 | 3 | 2 | 1 |
| Length of tunnelling – AONB – environmental | 3 | 4 | 1 | 2 |
| Length of tunnelling – AONB – cost | 3 | 1 | 4 | 1 |
| Frequency of city centre stations – connectivity & regeneration | 1 | 3 | 2 | 4 |
| Frequency of city centre stations – line speeds | 4 | 2 | 3 | 1 |
| Frequency of interchange stations – Operating speeds and journey times | 2 | 3 | 3 | 2 |
| Frequency of interchange stations – Connectivity | 4 | 3 | 2 | 4 |
| Frequency of interchange stations – Environmental | 2 | 4 | 3 | 2 |
| Infrastructure maintenance depots (IMD) | 4 | 4 | 2 | 1 |
| Effect on wildlife, habitats and ecosystems | 4 | 2 | 3 | 1 |
| Leisure / community facilities | 2 | 4 | 1 | 3 |
| **Score** | **62** | **55** | **48** | **39** |

# Teachers' project guide: Sheet T3
# Table: Evaluation factors

| Category | Strength (4) | Middle-strength (3) | Middle-weakness (2) | Weakness (1) |
|---|---|---|---|---|
| **Proximity to highways** | This route largely avoids major highways. [D] | This route encounters some major A-roads. However, you would not need to build new bridges.<br><br>Instead, the highways could be modified in stages. Your route engineers tell you that the roads would be more congested during the construction of the railway, but that the congestion would be manageable for local residents.[C] | This route encounters several major highways. It is possible to opt for the route without constructing new bridges. However, to modify the existing highways would result in road closures lasting 18 months. Your route engineers tell you that local residents would face major congestion.<br><br>Vehicles delivering materials to the construction site could also face delays.[B] | This route encounters several major roads. Extensive modification to existing highways would be required and an additional bridge would need to be built to avoid a motorway junction. [A] |
| **Proximity to waterways** | This route largely avoids major waterways.[A] | One small waterway could be crossed by a small bridge. [B] | There are two rivers on this route. The second river does not meet the route at a right angle. [C] | There are two major waterways on this route. One of them is in the AONB: a bridge would change the landscape too much, so you need to find another solution. [D] |
| **Topography of the land – engineering feasibility + cost** | The land on this route is relatively flat, with few hills and valleys. [D] | The topography of the land on this route includes some gentle hills and valleys. [A] | The land on this route includes some significant hills and valleys. [B] | This route runs through an area of floodplains. [C] |

# Teachers' project guide: Sheet T3
# Table: Evaluation factors

| Category | Strength (4) | Middle-strength (3) | Middle-weakness (2) | Weakness (1) |
|---|---|---|---|---|
| **Geotechnical hazards** | Around 20% of the route is on former industrial land. This includes land that was once used for mining. [B] | The route includes areas of underground gypsum and salt - sometimes a sign of subsidence risk. [D] | The route has a high natural occurrence of gypsum and salt – sometimes a sign of subsidence risk. Some of the ground along the route may be affected by compression.[C] | Along the route a landslide was last recorded in 2008. [A] |
| **Proximity to urban settlements** | The route encounters three towns with a total population of 48,000.[C] | The route encounters four towns with a total population of 179,000. [D] | The route encounters five towns with a total population of 200,000. [B] | The route encounters eight towns with a total population of 242,000. [A] |
| **Noise levels (during construction and when the trains are operational)** | The closest properties to the route are 500 metres away. Trains would be running at surface at this point. The track and the houses would be separated by dense woodland. [A] | The closest buildings to the route are 200 metres away. These are all industrial buildings, not residential dwellings. [B] | At the closest point, the track would be 500 metres away from houses. The track would be separated from the houses by dense, evergreen woodland. [D] | At the route's closest point there are properties 100 metres away. The train would pass by in a deep cutting. [C] |
| **Length of tunnelling required as a result of dwellings** | This route would pass under 40 dwellings, requiring 3km of tunnels.[D] | This route would pass under 60 dwellings, requiring 4.5km of tunnels. [C] | This route would pass under 80 dwellings, requiring 6km of tunnels. [B] | This route would pass under 100 dwellings, requiring 7.5km of tunnels. [A] |
| **Demolition of existing dwellings and the cost impact** | You could reduce the length of tunnelling by demolishing 20 dwellings. This would reduce tunnelling costs by 10%. [D] | You could reduce the length of tunnelling by demolishing 30 dwellings. This would reduce tunnelling costs by 25%. [C] | You could reduce the length of tunnelling by demolishing 40 dwellings. This would reduce tunnelling costs by one-third. [B] | You could reduce the length of tunnelling by demolishing 50 dwellings. This would halve your tunnelling costs. [A] |

# Teachers' project guide: Sheet T3
# Table: Evaluation factors

| Category | Strength (4) | Middle-strength (3) | Middle-weakness (2) | Weakness (1) |
|---|---|---|---|---|
| **Demolition of industrial buildings and the economic impact of removing businesses** | No demolition. [D] | You could reduce the length of tunnelling by demolishing a number of industrial buildings. 30 people work here in a furniture workshop. The business has been on this site for 70 years. [C] | You could reduce the length of tunnelling by demolishing a number of industrial buildings. This includes a warehouse that distributes nuclear protection suits for the police and the military. It employs 100 people with disabilities. [B] | You could reduce the length of tunnelling by demolishing a number of industrial buildings, including logistics factories which employ over 250 people. [A] |
| **Land acquisition** | Aside from the cases mentioned above and the rail corridor, no additional land is required. [D] | In order to carry out construction work, you need some land for storing building equipment and materials. Your best option is to lease the land for two years. The land is a brownfield site, not a greenfield site. [C] | In order to carry out construction work, you need some land for storing building equipment and materials. Your best option is to lease the land for two years. The area you need is 80 hectares of fertile agricultural land. [B] | In order to carry out construction work, an area of agricultural land is required for permanent acquisition. This is 200 hectares of agricultural ground, which is given over to a large, profitable dairy farm. [A] |
| **Length of tunnelling required as a result of going through an AONB, balancing the environmental and cost impacts** | The route would require 9.5km of tunnelling through the AONB. For 6.5km, the route would be on the surface of the AONB. [C] | The route would require 4.5km of tunnelling through the AONB. It would be on the surface of the AONB for 10.5km. [D] | The route would require 9.5km of tunnelling through the AONB. It would run at surface for 10.5km. [A] | The route would require 4km of tunnel through the AONB. It would run at surface through the AONB for 16km. [B] |

# Teachers' project guide: Sheet T3
# Table: Evaluation factors

<table>
<tr><th>Category</th><th>Strength (4)</th><th>Middle-strength (3)</th><th>Middle-weakness (2)</th><th>Weakness (1)</th></tr>
<tr><td>Frequency of city centre stations - connectivity & regeneration</td><td>The route has two city centre stations: it stops at both Bicester and Warwick. [A]</td><td>A city centre or 'intermediate' station is located at Bicester. [C]</td><td>A city centre or 'intermediate' station is located at Milton Keynes. [B]</td><td>The route has no additional city centre stations. [D]</td></tr>
<tr><td>…and impact on line speeds</td><td>The route has no additional city centre stations. [D]</td><td>A city centre or 'intermediate' station is located at Bicester. [B]</td><td>A city centre or 'intermediate' station is located at Bicester. [C]</td><td>The route has two city centre stations: it stops at both Bicester and Warwick. [A]</td></tr>
<tr><td rowspan="2">Frequency of interchange stations – journey times</td><td colspan="2">Middle-strength (3)</td><td colspan="2">Middle-weakness (2)</td></tr>
<tr><td colspan="2">One interchange station – New Ash Heath. [C]<br>One interchange station – Birmingham International. [B]</td><td colspan="2">Two interchange stations – New Ash Heath and Birmingham. [A & D]</td></tr>
<tr><td rowspan="2">…and the impact on connectivity</td><td colspan="2">Strength (4)</td><td>Middle-strength (3)</td><td>Middle-weakness (2)</td></tr>
<tr><td>The route has two interchange stations.<br>New Ash Heath allows an interchange with Crossrail, connections to Heathrow Airport, and the Great Western Main Line.<br>Birmingham Interchange is a parkway station – people would drive to it or use public transport – as opposed to a city centre station. It is near the National Exhibition Centre (NEC) and Birmingham Airport. [A]</td><td>The route has two interchange stations. New Ash Heath allows an interchange with Crossrail, connections to Heathrow Airport, and the Great Western Main Line. Birmingham Interchange is a parkway station – people would drive to it or use public transport – as opposed to a city centre station. It is near the National Exhibition Centre (NEC) and Birmingham Airport. [D]</td><td>The route has one interchange station at New Ash Heath.<br><br>This allows an interchange between HS2 and Crossrail, connections to Heathrow Airport, and the Great Western Main Line.[C]</td><td>The route has one interchange station - Birmingham Interchange.<br><br>It is near the National Exhibition Centre (NEC) and Birmingham Airport.<br><br>Birmingham Interchange is a parkway station – people would drive to it or use public transport – as opposed to a city centre station. [B]</td></tr>
</table>

# Teachers' project guide: Sheet T3
# Table: Evaluation factors

| Category | Strength (4) | Middle-strength (3) | Middle-weakness (2) | |
|---|---|---|---|---|
| **Frequency of interchange stations - environmental impact** | New Ash Heath only. Some dwellings to be demolished.<br><br>New Ash Heath is located primarily on land that was used for light industry. [C] | Birmingham only.<br><br>To allow for the station building and car park, Birmingham Interchange station will be located in countryside. [B] | Birmingham Interchange and New Ash Heath.<br><br>New Ash Heath is located primarily on land that was used for light industry. To allow for the station building and car park, Birmingham Interchange station will be located in countryside. [D] | Birmingham Interchange and New Ash Heath.<br><br>To allow for the station building and car park, Birmingham Interchange station will be located in countryside. New Ash Heath is located primarily on land that was used for light industry. [A] |

# Teachers' project guide: Sheet T3
# Table: Evaluation factors

| Category | Strength (4) | | Middle-weakness (2) | Weakness (1) |
|---|---|---|---|---|
| **Infrastructure maintenance depots (IMD)** | The IMD would be built at Great Waterton, halfway between London and Birmingham. It would be alongside the route, just north of the Oxford to Bletchley railway line. It would cost around £40 million to build. The land around is relatively flat, so the visual impact would be comparatively small. [D] | The IMD would be built at Great Waterton, halfway between London and Birmingham. It would be alongside the route, just north of the Oxford to Bletchley railway line. It would cost around £40 million to build. The land around is relatively flat, so the visual impact would be comparatively small. [C] | The IMD would be situated one mile to the east of Knapford. New railway lines would need to be built to connect the depot to the high-speed line. The depot would cost around £80 million. It is not in the middle of the route and is surrounded by higher land, meaning that it can be seen in the landscape. [B] | The IMD would be near to Tidmouth. You would need to construct a new freight line to connect it. This line could run alongside the rail route, but this would increase the width of your rail corridor by 8 metres in this area. The depot is not in the middle of the route; it is surrounded by higher land, would be visible from viewpoints in the countryside, and is three miles from a registered park. Building the depot would cost around £120 million. [A] |

# Teachers' project guide: Sheet T3
# Table: Evaluation factors

| Category | Strength (4) | Middle-strength (3) | Middle-weakness (2) | Weakness (1) |
|---|---|---|---|---|
| **Effect on wildlife, habitats and ecosystems** | At one point, the rail line would cross a waterway on a viaduct. It is not expected to have negative effects on river/waterside habitats. There would be no significant effects on the otter, brown trout or European eel which live in the river. [D] | You would have to build a haulage route to a work site. This is a route used by lorries to transport construction materials. Building it would result in the temporary loss of three-quarters of an area of broad-leaved semi-natural woodland. This site - 2.5 hectares in total - would be restored following construction. There would be no significant effect once the restoration work was done. [B] | The route would pass part of a nature reserve. A small area of land would be permanently lost. During construction, a larger area would be lost for about four years - a construction site would be built there temporarily. Most of the nature reserve could remain open to visitors. [C] | Local populations of bats would be affected. Parts of their woodland roosting habitats could be lost. In addition, the loss of other woodland and grassland habitats would leave them with a smaller area for feeding. There could be a permanent adverse effect on the conservation status of local bat populations. [A] |
| **Leisure / community facilities** | The route would be close to a country park used by pedestrians, cyclists and horse-riders. The park would be parallel to the area needed for construction. [C] | The local junior football club site would be lost permanently due to the route and earthworks through the site. There are similar alternative facilities locally, but the site is well established and used regularly by local members. The loss of the facility would result in a major adverse effect, and is therefore considered significant in the local context. [A] | This route includes a long-distance walking route, approximately 160km in total length. A small section of the walking route would be temporarily affected, reducing the size of the recreational route for walking and cycling for approximately 18 months. [D] | The site used by the Gliders' Society would be lost permanently. The site is used daily by its members and there are few local alternatives. [B] |

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# WILDCARDS

Route options project — Sheet W1

## Badgers in danger?

Someone who lives in a small village writes to you, telling you that there are badgers living near one of Zoom Rail's proposed routes. He claims that the setts where the badgers live are more than one hundred years old and are very well hidden: only a few people in his village even know that the badgers are there.

The correspondent is worried that even if Zoom Rail has checked the local records and surveys of the countryside, these will have shown no trace of the setts. As a result, no one will have considered what might happen to the badgers' habitat if the rail line is built nearby.

The letter also explains that if the hidden location is made public, this may result in the sett being damaged or the badgers being harmed.

### Your task

Write a letter back, explaining how Zoom Rail will deal with the enquiry and the concerns it raises.

You should consider the following questions:

- What process might Zoom Rail have used to identify the existence of badger setts and other protected wildlife habitats on its proposed routes?
- Are badgers a protected species? If so, what must the company do to comply with the law?
- How would Zoom Rail's environmental approach (Avoid > Abate > Repair > Compensate) apply here?
- How would you deal with the resident's fears about the location of the setts becoming widely known?



Route options project — Sheet W2

## Uneasy rider

A resident near one of the proposed routes has written to you. Her letter asks for information on how the proposed route would affect access to Public Rights of Way (PRoWs).

The writer explains that her property is too far away from the proposed route to be directly affected; however, she is a keen horse-rider and enjoys going for walks with her dog, so she would like to know more about the construction of the new railway and its effect on access to walks and bridleways.

The letter asks what plans will be made to re-route these rights of way temporarily during construction, so that the public can still get to them and use them. The writer is particularly concerned that construction noise will disrupt her enjoyment of local PRoWs, and that construction vehicles and machinery might scare the local riders' horses.

### Your task

Write a letter back, explaining how Zoom Rail will deal with the enquiry and the concerns it raises.

You should consider the following questions:

- What factors will your company need to consider in relation to the possible closure, diversion and reinstatement of PRoWs?
- What does the law require Zoom Rail to do about access to PRoWs?
- How would you deal with the resident's worries about possible disruption from construction noise?
- What could Zoom Rail do to minimise the impact of construction on the local community?

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# WILDCARDS

Route options project — Sheet W3

## A bigger dig?

A member of the public has written to you. She wants to know why Zoom Rail is not planning to build the entire route in a tunnel. She suggests that an underground railway would be better because:

- there would be less visual impact on the landscape;
- there would be no need to demolish houses;
- the railway would be much less noisy; and
- building and operating a railway underground would be much less disruptive.

The letter gives examples of train routes that are entirely in tunnel, such as the Gotthard Base Tunnel in Switzerland: when it opens in 2016, it will be the world's longest rail tunnel at over 100km.

If they can do it, your correspondent asks, why not you?

She has read on your website that tunnelling is more expensive than building at surface. Even so, she believes that the benefits outweigh the cost, and that Zoom Rail should reconsider its route options immediately.

### Your task

Write back, explaining how Zoom Rail will deal with the enquiry and the concerns it raises:

- Apart from cost, what other factors might prevent the project from being an entirely underground railway?
- Your correspondent mentions environmental factors. Where tunnelling is not an option, how else could Zoom Rail deal with these effects?
- This letter is an opportunity to explain some of the benefits of high speed rail.



Route options project — Sheet W4

## "There's an app for that..."

The year is 2026: the London to Birmingham railway has been built and tested! It will soon be ready for its first passengers.

You are a marketing and communications expert. Zoom Rail wants you to design a campaign to promote railway safety. It should highlight the dangers of irresponsible behaviour on the high speed railway.*

Remember that we're in 2026. Many things that are part of our daily lives now didn't exist 13 years ago: no Facebook, Twitter, tablets, internet access on smartphones, apps or free multi-channel television. So technology is likely to have changed a lot by 2026. Think carefully about the most effective way to communicate with your audience.

### Your task

Create a campaign that explains how to stay safe on the railway. You need to present a proposal to Zoom Rail's Head of Communications.

Your proposal should answer these questions:

- Which groups of people need to be targeted in a railway safety campaign? What are the potential hazards that people would need to be warned about? (Trespassing on the railway, for example).
- How will you get your message across? Think about the communication methods you want to use.
- What would make the safety messages memorable?
- How would you measure how effective the campaign is?
- Can you think of a slogan that sums up your key messages? Explain the choices you would make for the 'look and feel' of your brand – colours, fonts and the use of images could all be really important here.

*Remember: there are no level or pedestrian crossings on Zoom Rail's line.

The materials in this pack are for educational purposes only and are not intended to be a representation of any particular project.

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# WILDCARDS

Route options project — Sheet W5

## Keeping workers safe

It is 2016: construction has begun! You work for a specialist tunnelling company that wants to work with Zoom Rail. You have been invited to an interview, to see whether you and your company are up to the job. Zoom Rail's Senior Procurement Manager says:

"*Safety is important for us. We are committed to:*

- *designing safety into everything we do;*
- *looking after one another and creating a safe and secure working environment; and*
- *keeping information secure.*

*Please explain how your company will uphold these values and help with Zoom Rail's 'zero accidents' target."*

### Your task

Prepare a five-minute presentation to explain your company's health and safety measures.
Remember: this is an interview. Use confident, persuasive language to emphasise why your company is the best. You should explain:

- how you protect your workforce. Which of the measures are required by law, and which are extra measures that your company applies by choice?
- how you protect the public near building sites; and
- how your company raises awareness of health and safety, and educates people about it. (This could include not just your employees, but also the public.)

Finally, think about the challenging questions that the interviewer may ask you... and then get one step ahead by preparing some great answers!



Route options project — Sheet W6

## Go with the flow...

The high speed network will revolutionise travel by moving large numbers of people - fast! Zoom Rail's trains can be up to 400 metres long and carry up to 1,100 passengers. There will be 14 trains an hour, each way, connecting London and Birmingham.

To make things run smoothly, train companies need to cut down 'dwell time' – this is the period when a train is in a station while passengers get on and off. You must ensure this happens safely but quickly. Otherwise, trains waste valuable extra minutes in stations: this increases overall journey times and limits the number of trains that can run on the network.

Zoom Rail's Operations Concepts Manager wants to keep dwell time short – and he needs your suggestions.

### Your task

Recommend designs that will get passengers on and off trains quickly and safely, as well as helping them to move around the station efficiently. Think about the things that can affect dwell time:

- **Platforms** – passengers can delay a train if they are on the platform on time... but at the wrong end of the train from their seat. How could you stop this from happening?
- **Station layout** – platforms will be long and station concourses will be large. Can you suggest ideas to make it easier to get around the station?
- **Luggage** – passengers getting on and off with heavy luggage can delay the onward journey. How would you solve the problem?
- **Mobility** – How could you ensure that the new trains and stations are easily accessible for elderly travellers, passengers with disabilities, and families with young children?

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