

Purpose and Learning Objectives In this project students will learn to use Geographic Information Systems (GIS) to recommend potential routes for a new monorail system in Los Angeles, California to meet one or more of the following goals:

- a. Alleviate current traffic/transportation congestion, bottle-necks/traffic jams, safety issues, and increase overall mobility.
- b. Increase quality of life in the region by increasing transportation to places people frequently go for entertainment, health, food, education, etc.
- c. Increase transportation services for business, commerce, and people commuting to work.
- d. Provide better transportation access/services to low-income, elderly, and vulnerable populations.

Students also conduct a mock, real-life project where they imagine they are preparing a plan to present to a regional transportation board. Learning objectives for this activity are:

- Increasing awareness of transportation planning activities and resources within a region in the U.S.
- Exploring population patterns across the United States
- Profiling population information for their state
- Interpreting thematic GIS maps to answer questions and draw conclusions
- Working with tabular data
- Filtering data to find answers and make decisions
- Interpreting and developing maps using GIS
- Developing visual presentation materials
- Preparing and conducting a presentation
- Collaborating as a group to complete a project (if this project is assigned as a group project)

Estimated Time for Completion

12+ hours. Time for completion can be adjusted by adding more time for using GIS tools, developing route plan(s) (with accompanying maps and other visuals), and preparing a presentation for the regional transportation board. Instructors can modify the project to go into each one of these topics and tasks in more detail. Instructors may also have students work on this project alone, in pairs, or in groups.

Resources/Supplies Required

- Computer with internet access, video player software application and speakers, presentation software such as PowerPoint (optional)
- Students will be using the following documents available on the [Transportation Youth Academy](#) website
 - Project Guide-Design LA Monorail System Routes Using GIS
 - Activity Guide-Patterns of Growing Population
 - Activity Guide-Transportation Planning Using LA GeoHub
 - Student Worksheet-Transportation Planning Using LA GeoHub
 - GIS Maps and Layers in LA GeoHub and ArcGIS
 - Activity Guide-Layering Maps Using LA GeoHub and Arc GIS
 - Student Worksheet-Monorail Route Planning Worksheet

Instructions

Project options: This project may be instructor-led or conducted by students, independently or working in pairs or a group. If this project is assigned as a group project, consider modifying the project so that each group chooses 2 or more goals (above) for developing the route plan. The project can also be expanded/extended to include additional resources, materials, and activities using the Design LA Monorail System Routes project. Refer to the Instructor Project Guide_Design LA Monorail System Routes.

It is recommended that students complete Transportation Exploration: The U.S. Transportation System activity ([Transportation Exploration Activity](#) on youth site) before conducting this activity.

Students will be using two GIS resources/tools for completing this project as follows.

ArcGIS by ESRI: <https://www.arcgis.com/home>

Los Angeles GeoHub: <http://geohub.lacity.org/>

It is recommended you familiarize yourself with these systems and a good way to do so is to complete all of the student activities prior to assigning them to students. It is also recommended that you complete the route planning exercise for each of the 4 goals (above) as well as conduct some further exploration in each system.

Also, prior to starting the project an ArcGIS public account will need to be set-up for each student or pair or group.

You may ask each student, pair, or group to set up their own account or you may set them up in advance for them to save time and/or if you would like to have access to the accounts to review and/or assist students with their work. If you are setting up the accounts in advance, you will need to set up the total number accounts that will be necessary for students or pairs or groups to complete this project. It is suggested that you use the following nomenclature for the Username and Password for each account as follows:

Username: TYAX (Note: TYA stands for Transportation Youth Academy)

Password: GetmovingX

The "X" in the Username and Password are numbered sequentially, so the first user account would use the number 1 instead of the X, the second would use the number 2, and so on up to total number of accounts that are needed. So the Username and Password for the first two accounts are as follows:

Account 1:

Username: TYA1

Password: Getmoving1

Account 2:

Username: TYA2L

Password: Getmoving2

To create the ArcGIS account(s), go to (or instruct students to go to) the Sign In page on the ArcGIS website at: <https://www.arcgis.com/home/signin.html> and click on the **Create a Public Account** box.

1. Provide the following to students as an introduction to this activity: *For this project you will be pretending that you are a manager at a transportation planning company with national experience planning transportation routes. The Los Angeles Regional Transit Board has hired your company to research and recommend potential routes for a new monorail system in Los Angeles, California. You have been chosen as a consultant because of your knowledge of transportation modes, Geographic Information Systems (GIS), and experience with the design of the monorail systems. Your company will present the transit route options you recommend to the Los Angeles Regional Transit Board (the class). The presentation will include charts to display data gathered and maps that show the preferred/recommended routes as well as other materials/items you choose to use.*
2. Ask students to go to the [Transportation Youth Academy](#) website and click on the [Design Los Angeles Monorail Transit Routes Using GIS link](#).
3. Instruct students to familiarize themselves with how a monorail system operates by watching the **SMT Rail Greenest Smart Mass Transit on the planet** video for this project on the website.
- Next students will be designing routes for the new monorail system in the city and county of Los Angeles, California using GIS tools/resources.

4. Introduce GIS using these discussion topics provided by the National Geographic Society.

A. Activate students' prior knowledge. Ask: *When have you used GPS?* Encourage students to share descriptions of using car-mounted GPS devices or GPS on a mobile phone for driving directions, or hand-held GPS devices for activities such as geocaching. Explain that GPS technology uses satellites to pinpoint position on Earth with the aid of a GPS device or unit. It's become a part of many people's daily lives. Then ask: *Have you ever used a mobile phone app that allowed you to use maps to explore information?* Invite volunteers to share the name and details of relevant apps. Explain to students that many apps today include GPS technology, as well as elements of a GIS, which they'll learn about in this activity.

B. Introduce the vocabulary term geographic information system (GIS). Explain that GIS is an acronym that stands for geographic information systems. GIS is a system or tool for displaying and analyzing data related to positions on Earth's surface. Give students a couple of current examples that they are likely to be familiar with, such as using GIS to understand crime patterns in a city or to track wildlife as animals migrate from one area to another. Then ask: *What is the difference between GPS and GIS?* (GPS provides users with geographic data. GIS allows users to display and analyze that data.)

5. Show (or instruct students to watch) the "What is GIS" video to provide them with a broad overview of what GIS is. The video is 1:02 in length and is available at: <https://www.youtube.com/watch?v=LHDCRjAxpI0>. If you want to provide students with an in-depth look into all the ways GIS can be used show (or instruct students to watch) the "A Map for Every Story" video (3:45 in length) available on YouTube at: <https://www.youtube.com/watch?v=2dwZZPj707I>.
6. Next introduce students to GIS for transportation. Here is a definition: Geographic Information Systems for Transportation (GIS-T) refers to the principles and applications of applying geographic information technologies to transportation problems. Show (or instruct students to watch) the "ArcGIS for Smart Transportation" video (1:49 in length) available on YouTube at: <https://www.youtube.com/watch?v=fxST7CGWhv0>.
7. Review the **Instructor Guide-Patterns of Growing Population** document.
8. Inform students they will be learning to use a GIS system called ArcGIS. Refer them to the **Activity Guide-Patterns of Growing Population** on the [Transportation Youth Academy](#) website.
9. Next, inform students they will be learning to use another GIS called LA GeoHub. Refer students to the **Activity Guide- Transportation Using LA GeoHub** on the [Transportation Youth Academy](#) website. For this activity, either show the City of Los Angeles GeoHub video to the entire class or ask students to watch the video independently. The video is available on YouTube at: <https://www.youtube.com/watch?v=aOrJEkTxwb0> and is also available on the [Transportation Youth Academy](#) website associated with this project/activity.

This activity includes questions that students are to respond to and they will use the **Student Worksheet-Transportation Planning Using LA GeoHub** available on the [Transportation Youth Academy](#) website for this purpose. Also, refer to the **Answer Sheet-Transportation Planning Using LA GeoHub** for more information.

10. Instruct students that they will use the GIS tools/resources they just learned to design route plan(s) for the new monorail system to achieve the following goals. Again, this may be assigned to students individually, in pairs, or in groups. If this project is assigned to a group, consider modifying the project so that each group chooses 2 or more goals (below) for developing the

route plan. If time permits, consider having groups plan, combine, and compare routes for all 4 goals.

- a. Alleviate current traffic/transportation congestion, bottle-necks/traffic jams, safety issues, and increase overall mobility.
- b. Increase quality of life in the region by increasing transportation to places people frequently go for entertainment, health, food, education, etc.
- c. Increase transportation services for business, commerce, and people commuting to work.
- d. Provide better transportation access/services to low-income, elderly, and vulnerable populations.

11. In addition to the route maps students create, instruct students to develop other visual aids to use as they present their proposed route design. Instruct them to include information on the research materials they used to support their recommended routes and which goal(s) they were trying to achieve. Ask them to think about which kinds of information would be most helpful to support their recommendations and include that information.

12. Additionally, here are two videos you may provide to students to augment this project:

- a. If you want students to discover how GIS is used to create a smart city where everything is connected through information technology, instruct them to watch the “What is a Smart City” video (3:27) available on YouTube at: <https://www.youtube.com/watch?v=Br5aJa6MkBc>
- b. If students are interested in finding out what careers exist that use GIS – instruct them to watch the “Day in the Life: GIS Analyst” video (4:15) available on YouTube at: <https://www.youtube.com/watch?v=rokWdaGc3u4>

