City Building Game: 40-60 minutes

Objectives: Students will assess how to logically plan and design a city/town. Student will create city/town plans conveying change over time and shift in land-use priority. Students will shift city/town development plans under specific, real world, climatic and/or human induced calamity scenarios.

Materials

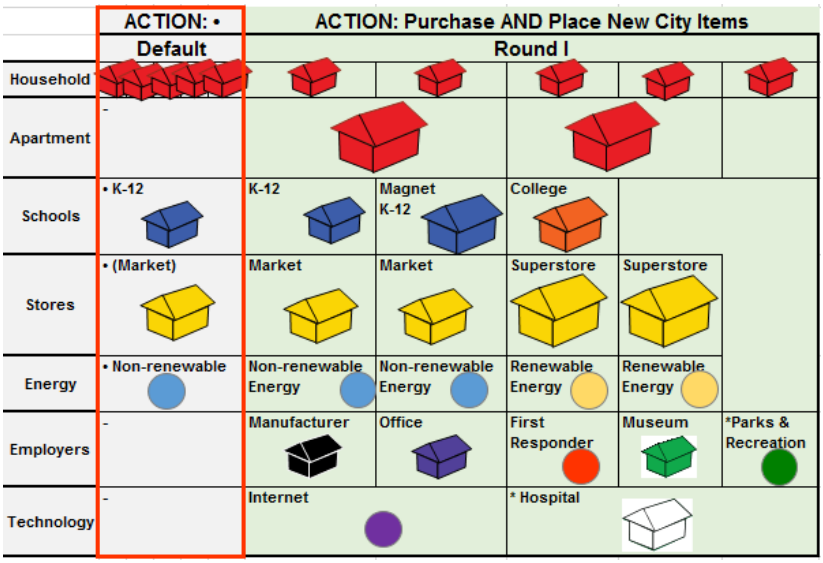
- City Building Menu
- City Template
- Revenue Score Card
- Adjustment Cards (I, II, and III)

Explanation

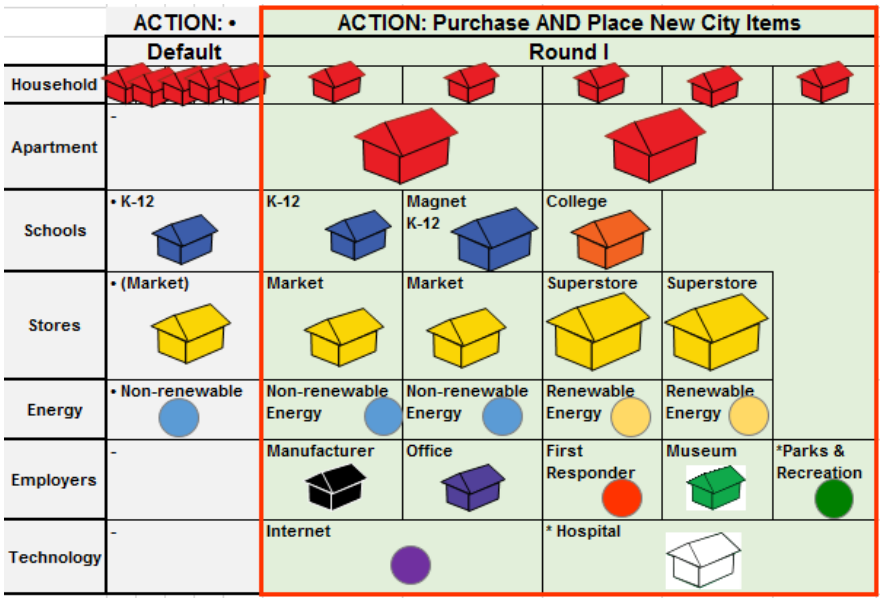
- Students start with a basic (default) city and will be tasked to purchase new infrastructure with given budget. The purpose of building the city is to enhance the overall quality of life (QOL) while maintaining city revenue and environmental quality

To begin:

- Give students "City" platform card to populate the default city (red region highlighted below)
    - 5 house
    - 1 K-12 School
    - 1 Market
    - 1 Non-renewable Energy (to run the city)



- Project "City Building Menu" and discuss the columns with the students. **Note: Each team should have their own City Building Menu for reference.**
- Student teams will purchase new infrastructure (GREEN area highlighted below), and should stay within their city's budget **($40).** Teams should consider the following:
    1) Price of infrastructure
    2) Population (current and projected; e.g. 2 people/home)
    3) Jobs (e.g. commuters in (negative people-jobs) & commuters out (positive people-jobs)
    4) Advantages vs disadvantages
    5) City's Quality of Life (QOL)
- Allow students 10-15 minutes to discuss new purchases. **Note: teams cannot purchase infrastructure until entire team agrees**. **The infrastructure depicted below are simply placeholders; students do not own the infrastructure until they purchase the physical building/token.**
    - **Remind the students to optimize Quality of Life (QOL)!**
    - **Advantages and Disadvantages in the City Building Menu should be taken into consideration (e.g. environmental factors)**
    - **1 Hospital and 1 Parks and Recreation are required purchases in Round 1! This is noted (*) in the menu and city map.**



- Students will then assess the results of their city. Below is an example:

Round I Results: City Ranking				
	City Commuters *(+ : commuters out, - : commuters in)	Price (Total Spent)	City Income (Total	Quality of Life (QOL) (+/-)
Household (2 people/home)	People: 10	$0	$	0
Apartment (10 people/apartment)	People: 10	$6	$4	0
Schools	Jobs: 2	$2	$-1	1
Stores	Jobs: 2	$1	$1	0
Energy	Jobs: 0	$7	$-1	0
Employers	Jobs: 8	$10	$5	6
Technology	Jobs: 3	$12	$-2	3
SUBTOTAL	*People-Jobs= - 6	- $38	$6	10

Round I Results: Additional Ajustments				
	City Commuters *(+ : commuters out, - : commuters in)	Price (Total Spent)	City Income (Total	Quality of Life (QOL)
SUBTOTAL		$	$	
Adjustment I: Commuters and	-	-	-	
Adjustment II: Bonus QOL	-	-	-	
Adjustment III: City Calamity	-	-	-	
Total	-	-	-	

- Allow the teams to reflect on their initial outcomes:
  - Was your team able to bring jobs into your city, or did you have commuters out for employment?
  - Was you team able to optimize City Income and QOL, or one of these specifically?
  - Did you consider the environment when building your city (as highlighted in the advantages and disadvantages section in the City Building Menu)?
- After discussion, move the team into the Adjustment Round, where three QOL adjustments will be made:

- Adjustment 1: Commuters and QOL

Action Card I
Commuters and QOL: Your community wants employment within the city, not outside of it
Action: -1 QOL point/commuter OUT of City AND/OR +1 QOL point/commuter INTO City

- Adjustment 2: Bonus QOL

Action Card II
Bonus QOL: If your community's QOL is high, the city is thriving
Action:

QOL ≥ 6	+4 QOL Points
QOL ≥ 15	+8 QOL Points

- Adjustment 3: City Calamity. We often pick 1/5 calamities randomly, as this represents what occurs in the real world. You can choose to move through more than one calamity with the teams.

Action Card III	Action Card III
Flu Season: as your city's population continues to grow, severe sicknesses can travel quickly	**Poor Air Quality:** the combustion of fossil fuels for transportation, energy, and manufacturers are polluting the air
Action: -1 QOL point for each apartment AND/OR supermarket	Action: -1 QOL point for each commuter into OR out of city, AND/OR -2 QOL points if city uses non-renewable energy

Action Card III	Action Card III
Increase in Car Accidents: The traffic in your city is increasing with population growth, making the risk of car accidents more severe	**Heat Wave:** The effects of climate change is beginning to show up in your city in the form of a severe heat wave
Action: -1 QOL point for each commuter out OR into city	Action: -5 QOL points if you have < 10 first responders

Action Card III
Water Scarcity: The local source of water for your city is running out because it hasn't rained in 6 months, and the growing population continues to waste water
Action: -1 QOL point for each house, -3 QOL points for each apartment, AND -2 for each school

- Students will recalculate QOL in the area highlighted below, based on the adjustments. Note that City Income isn't effected (but could certainly be edited to do so).

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Round I Results: Additional Ajustments				
	City Commuters *(+ : commuters out, - : commuters in)	Price (Total Spent)	City Income (Total	Quality of Life (QOL)
SUBTOTAL		$	$	
Adjustment I: Commuters and	-	-	-	
Adjustment II: Bonus QOL	-	-	-	
Adjustment III: City Calamity	-	-	-	
Total	-	-	-	

Discussion

- **Revisit the discussion questions from above**
- **Facilitate a discussion regarding city resiliency in the midst of population growth and climate change impacts. Note that all of the Adjustment 3 calamity cards are real world risks that we see in central Texas. If the study were to build this city again, what might they do differently to ensure their city is resilient against these risks? Did the students value to QOL within their city, and how might we quantify this in the real world?**
- **Did any of the cities contribute to air pollution? How does this effect the long term health of the city and the natural environment?**
- **How were the cities affected by the City Calamity card? How might they have planned differently to prevent it, AND/OR become resilient to it?**

TEKS

§112.36. Earth and Space Science, Beginning with School Year 2010-2011

(6) Earth and space science strands. ESS has three strands used throughout each of the three themes: systems, energy, and relevance.

(C) Relevance. The interacting components of Earth's system change by both natural and human-influenced processes. Natural processes include hazards such as flooding, earthquakes, volcanoes, hurricanes, meteorite impacts, and climate change. Some human-influenced processes such as pollution and nonsustainable use of Earth's natural resources may damage Earth's system. Examples include climate change, soil erosion, air and water pollution, and biodiversity loss. The time scale of these changes and their impact on human society must be understood to make wise decisions concerning the use of the land, water, air, and natural resources. Proper stewardship of Earth will prevent unnecessary degradation and destruction of Earth's subsystems and diminish detrimental impacts to individuals and society.

(11) Solid Earth. The student knows that the geosphere continuously changes over a range of time scales involving dynamic and complex interactions among Earth's subsystems. The student is expected to:

(E) evaluate the impact of changes in Earth's subsystems on humans such as earthquakes, tsunamis, volcanic eruptions, hurricanes, flooding, and storm surges and the impact of humans on Earth's subsystems such as population growth, fossil fuel burning, and use of fresh water.

(13) Fluid Earth. The student knows that the fluid Earth is composed of the hydrosphere, cryosphere, and atmosphere subsystems that interact on various time scales with the biosphere and geosphere. The student is expected to:

(D) discuss mechanisms and causes such as selective absorbers, major volcanic eruptions, solar luminance, giant meteorite impacts, and human activities that result in significant changes in Earth's climate;

§112.37. Environmental Systems, Beginning with School Year 2010-2011 (One Credit).

(9) Science concepts. The student knows the impact of human activities on the environment. The student is expected to:

(A) identify causes of air, soil, and water pollution, including point and nonpoint sources;

(B) investigate the types of air, soil, and water pollution such as chlorofluorocarbons, carbon dioxide, pH, pesticide runoff, thermal variations, metallic ions, heavy metals, and nuclear waste;

(C) examine the concentrations of air, soil, and water pollutants using appropriate units;

(D) describe the effect of pollution on global warming, glacial and ice cap melting, greenhouse effect, ozone layer, and aquatic viability;

(E) evaluate the effect of human activities, including habitat restoration projects, species preservation efforts, nature conservancy groups, hunting, fishing, ecotourism, all terrain vehicles, and small personal watercraft, on the environment;