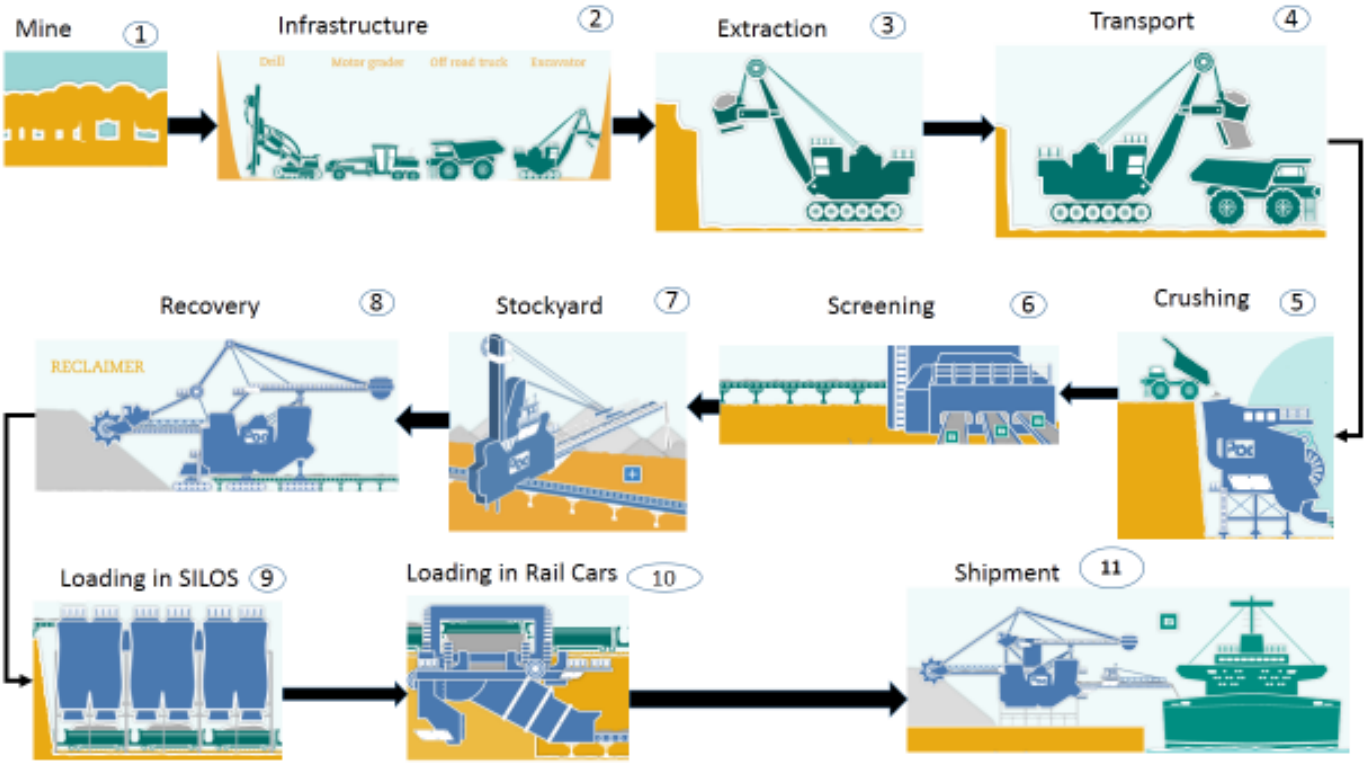
D. Extracting Energy and Resources

Mining. The process of making goods begins with the extraction of raw materials that will be transformed into finished, usable goods. A large portion of the raw materials began underground and must be extracted. The primary sector process of mining is supremely important to the secondary sector of production. The speed, efficiency and accuracy of the mining process determines the quantity and quality of the product. While each metallic ore has its own unique tools, the general process is similar:

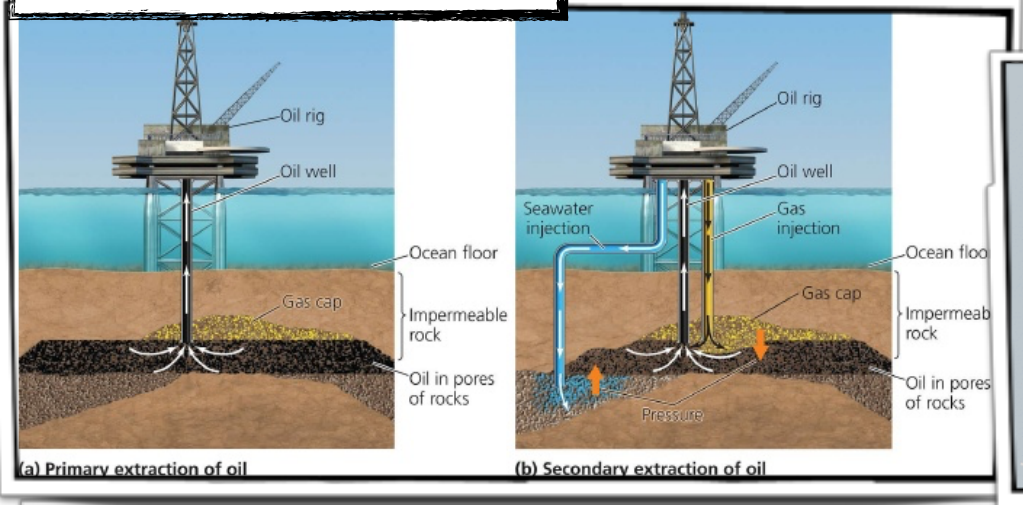


In core and semi-periphery states, the latests in technology and innovation is used. Laborers are paid a reasonable-to-livable wage, as the equipment requires decent skill to use and maintain. In the periphery, the mining “steps” are the same, but the tools demonstrate the extreme differences. Instead of engines, machines and massive equipment, mining responsibilities fall upon human and animal labor. Dangerous shafts are dug, with miners using hand tools burrowing into the earth. Children and young teenagers of large, poor families are sent (or sold) to the mines as a means of trying to earn money for their families. This practice is most common in DTM Stage 2-3 States, where there is a large population of youth, with few jobs or opportunities to employ them. Human or animal power is used to pull the mined materials to the surface.

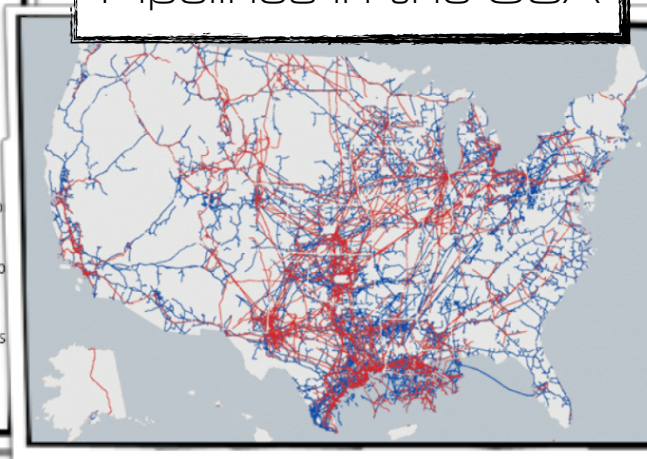
Mining in the Periphery

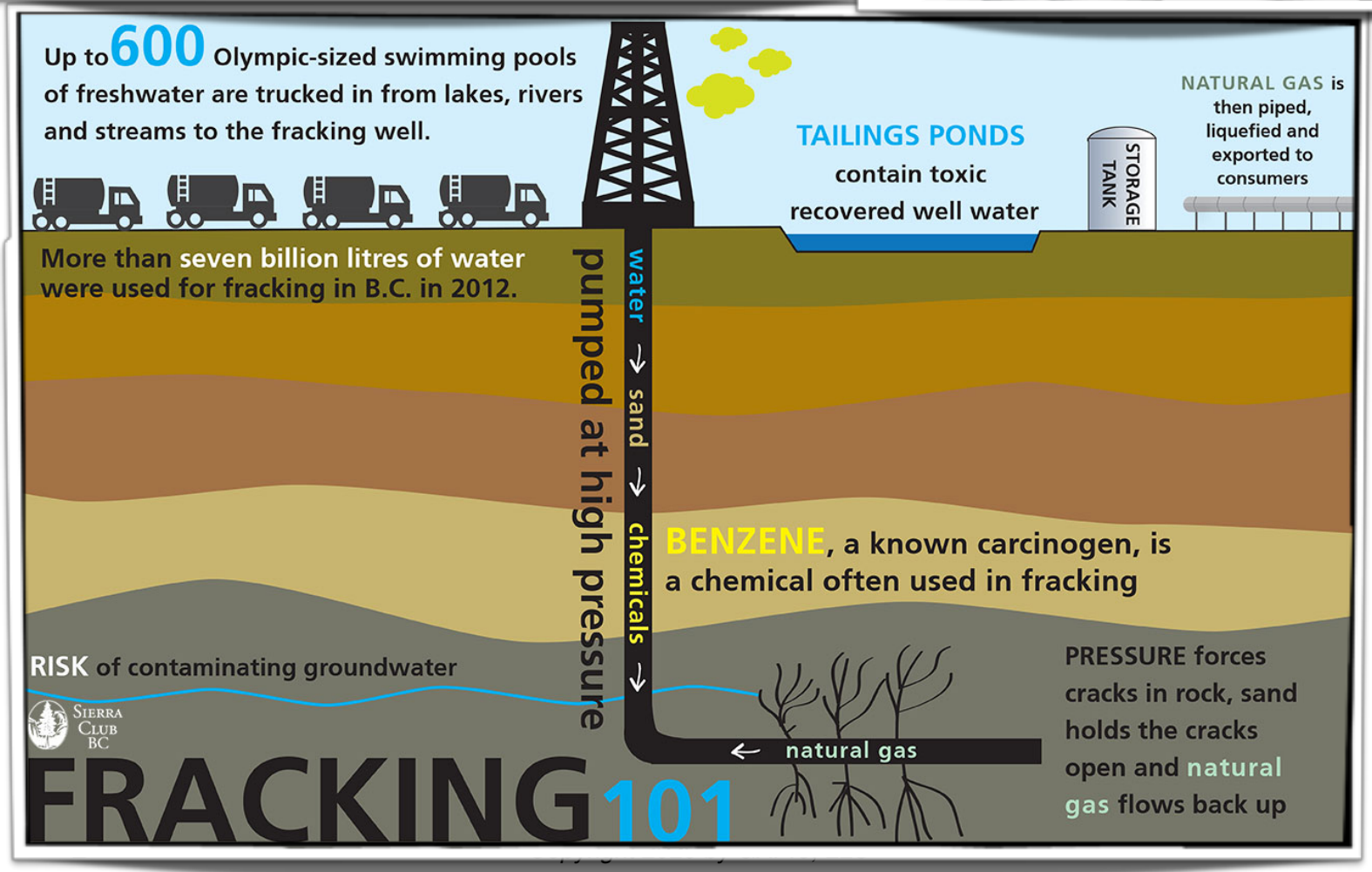
Another important resource in the industrial system is crude oil and natural gas. These important energy fuel deposits are deep within the earth's surface and must be drilled out. Primary extraction is when the oil rig drills directly into the oil deposit, and the natural pressure allows the oil to be pumped immediately to the surface. Secondary extraction requires CO2 or water to be injected into the well, creating pressure that allows the oil to be pumped to the surface. Fracking pumps water, sand and chemicals into the ground to create cracks in the rocks, releasing the natural gas. Once released , the natural gas is captured and pumped to the surface. Once at the surface, the oil and gas are sent to a refinery to be purified for human use. Once refined, the oil and natural gas are transported most commonly by pipelines, although oil can be transported by trucks or railways. In the USA alone, there are 2.4 million miles of pipelines to transport oil and natural gas.

Oil Drilling/Fracking



Pipelines in the USA





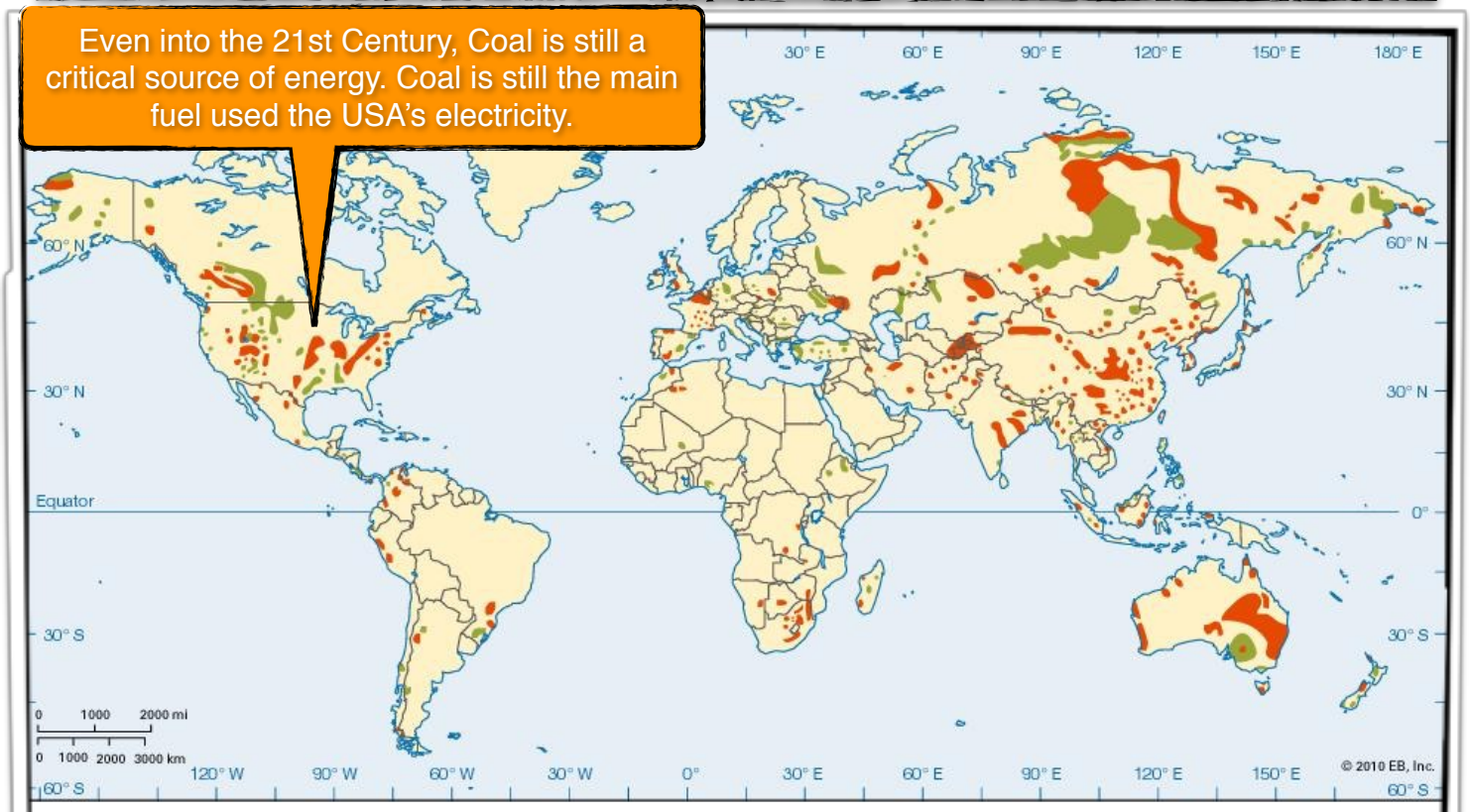
Distribution of Resources. The location of mining industries are environmentally determined. As with other primary sector industries, Mining, drilling and fracking can only take place where the raw materials are naturally available.

Iron and Steel are essential minerals used for the creation of machinery and vehicles. Steel factories were the economic engine of many of the world's most important and prosperous urban centers.

Iron Deposits

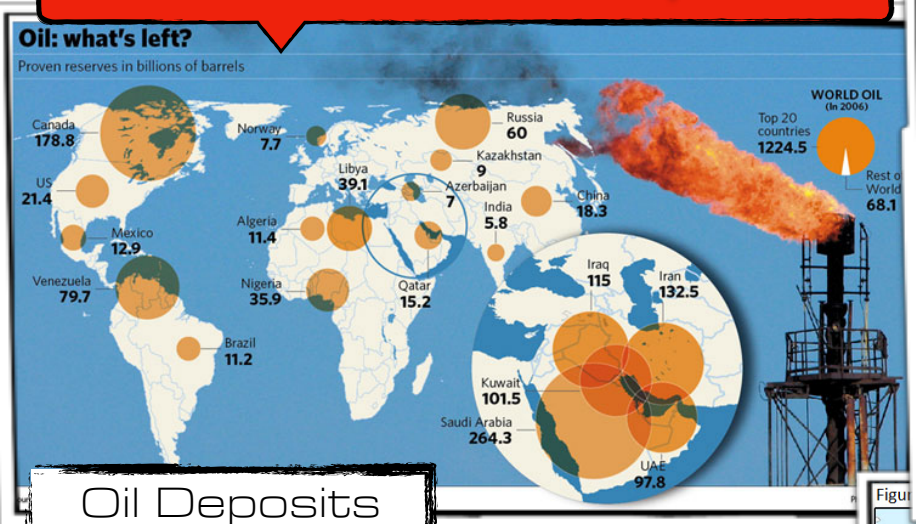
Application #1. Analyze the World Iron & Coal Map. What is the relationship between Core-Periphery States and the location of iron and coal? In the USA, describe the relationship between iron/coal & the US Rust belt? Between iron/coal & major cities in the USA?

Even into the 21st Century, Coal is still a critical source of energy. Coal is still the main fuel used the USA's electricity.



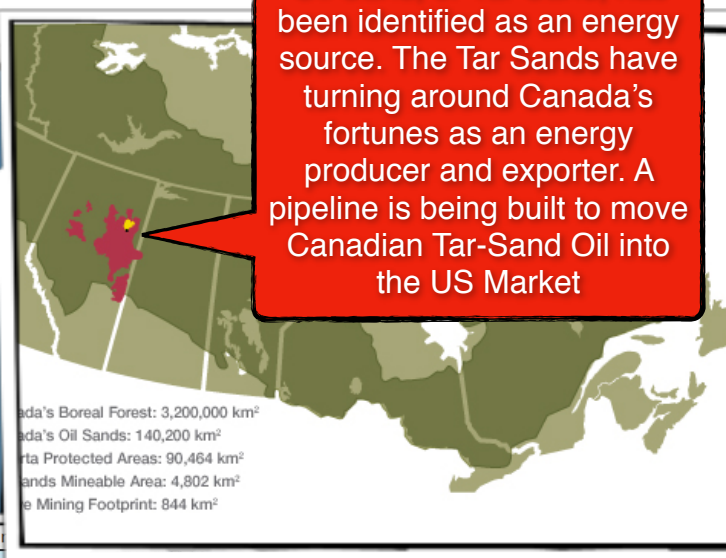
Coal Deposits

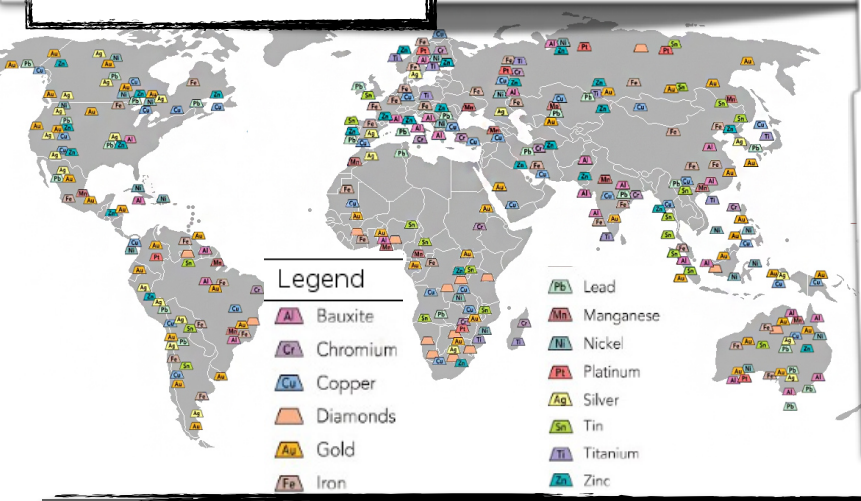
Crude oil and Natural Gas are becoming vital to the global economy. Crude oil is used to power over 90% of the cars, trucks, paints and ships. Natural Gas is competing with coal for use with electricity.

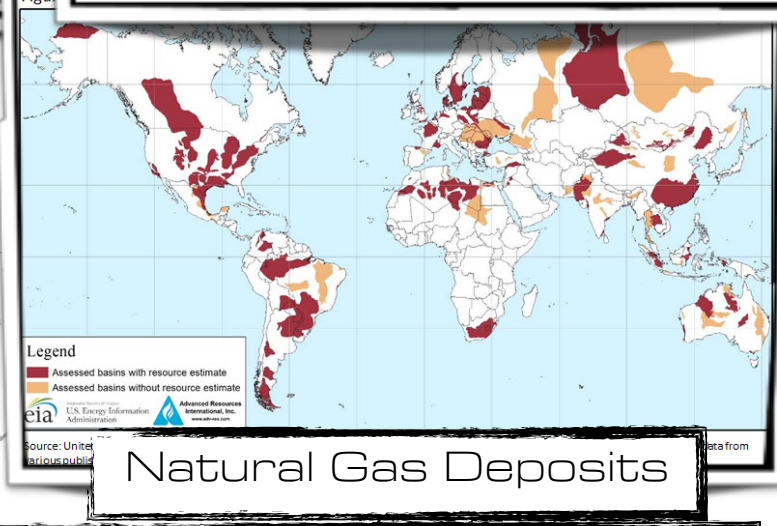


Oil Deposits

Oil Sand, or Tar Sand, has been identified as an energy source. The Tar Sands have turning around Canada's fortunes as an energy producer and exporter. A pipeline is being built to move Canadian Tar-Sand Oil into the US Market







Natural Gas Deposits

Application #2. As technology shifts towards using natural gas, what periphery States are "ready" to become energy exporters? What other periphery regions are resource rich that could become prosperous?

Distribution of Industrialization. When a resource exists within a State's borders, that State has the right to extract, process and export the resource for profit. Borders, while imaginary lines, are both important and controversial because they define ownership of the land, ownership of the air space above the land AND extend down to the core of the earth - defining ownership of the underground resources. Unfortunately, underground resources do not cooperate with State boundaries, leading to tension and conflict. India and China had border tensions surrounding who controlled the resources in the Himalayan Mountains, that just got resolved in 2017. India has an ongoing dispute with Pakistan since the Partition of India in 1947. One of the disputed territories is the Kashmir region, which is rich in natural gas reserves. Iraq and Kuwait went to war in 1992 because Iraq accused Kuwait of diagonal drilling, stealing Iraq's oil.

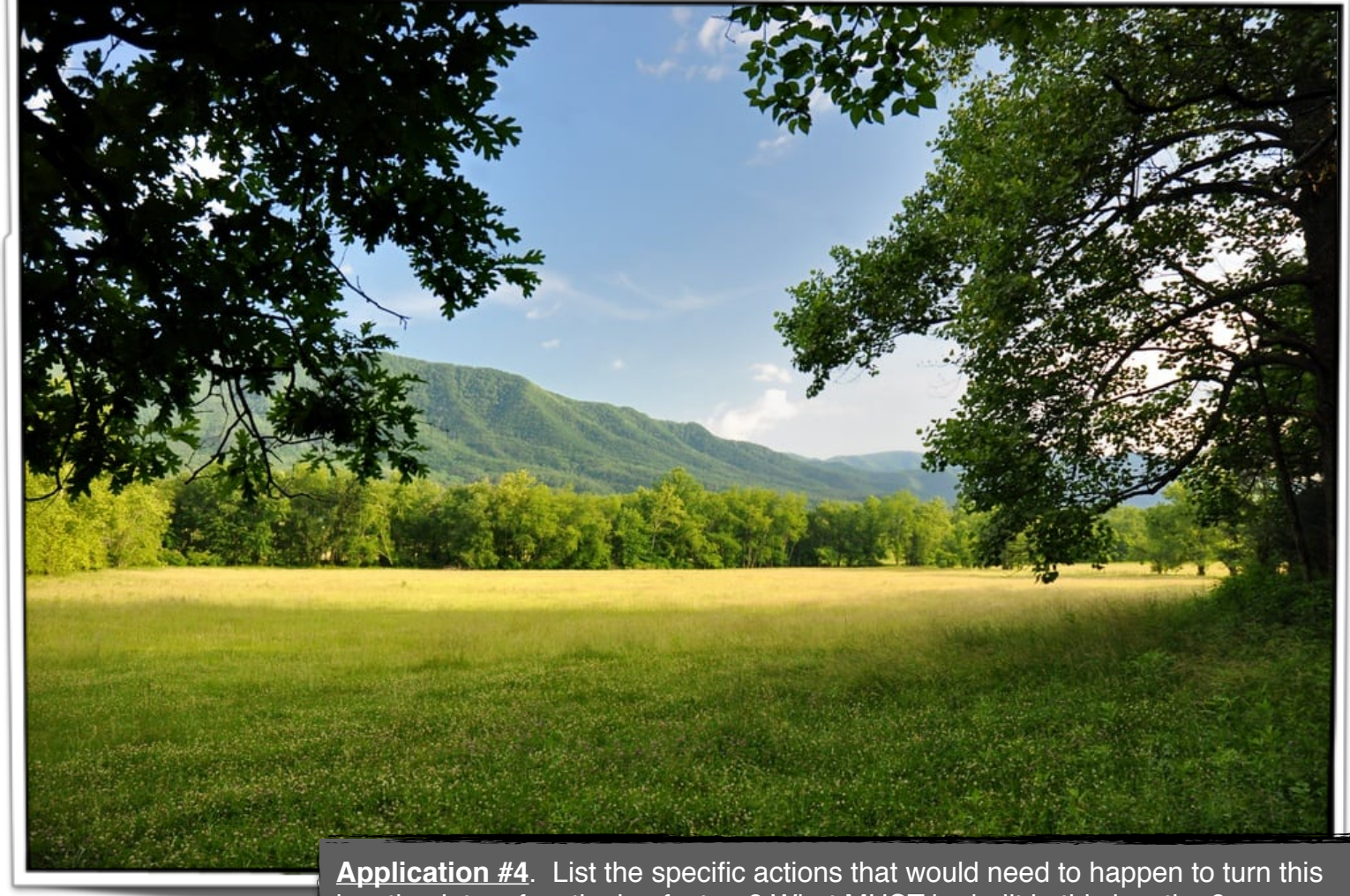
Core and Periphery States possess different capacities to extract the resources. In the core, the most advanced technology is available to extract and process the resources. In the periphery, they often rely on human or animal power - which doesn't work for all resources. It is common for Periphery states to sell the resource-rich land to multinational companies, who bring in the technology to extract. However, the companies export the resources back to their home state, where the minerals are processed/refined/sold for higher profit. As a result, the Core State gets the major profit from the final-finished product, despite the periphery state originally possessing the resource (#Dependency #neoColonialism).

World's Major Industrial Complexes

The location of major industrial centers is directly correlated to the access of resources and the access to the major markets. There are key industrial complex that are important to recognize by name:

- Europe
  - [1] English Midlands (Lancaster, Liverpool, Manchester, Birmingham)
  - [2] Germany's Rhine-Ruhr (Frankfurt, Mannheim, Stuttgart)
  - [3] Netherlands Rhine-Ruhr (Rotterdam)
  - [4] Italy's Lombardy Region (Milan, Torino)
  - [5] Spain's Catalonia (Barcelona)
  - [6] Russia's Ural & Volga
- North America
  - [7] Rust Belt (New York, Boston, Chicago, Detroit, Pittsburgh, Cleveland, Buffalo, Philadelphia, Toronto)
  - [8] Sun Belt (Atlanta)
  - [9] Maquiladoras (Tijuana)
- Asia
  - [10] Pearl River Delta/Guandgong (Hong Kong)
  - [11] Yangzte Delta (Shanghai, Wuhan, Taiwan)
  - [12] Manchuria/Dongbei (Beijing)
  - [13] Kwanto Plain (Tokyo/Yokohama) & Hanshin (Kyoto/Kobe/Osaka)
  - [14] Maritime Industrial Region (Seoul, Korea)
  - [15] Calcutta
  - [16] Bombay

Application #3. What trends/patterns do you observe in the spatial distribution of the World's major Industrial Complexes? What is the relationship between these zones & the earth's mineral resources? Which resource do you think most strongly impacted the factory locations?



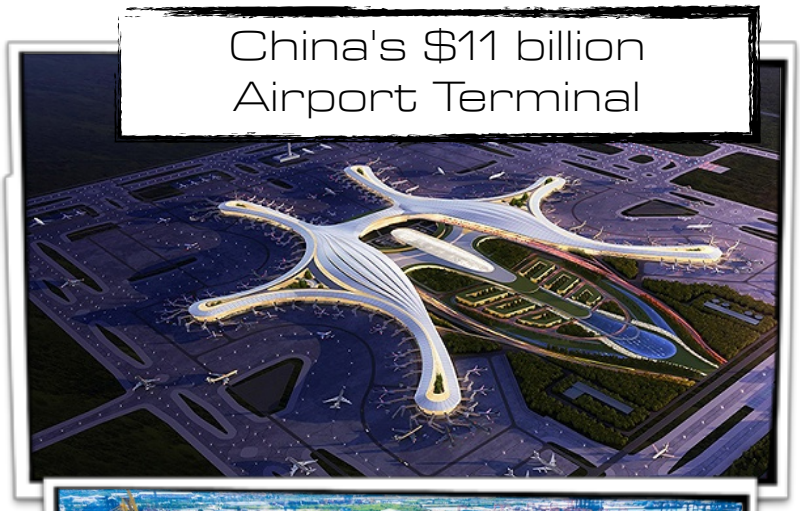
Application #4. List the specific actions that would need to happen to turn this location into a functioning factory? What MUST be built in this location?

E. How to Setup & Connect Factories

The Factory Basics. All factories have a basic set of needs that must be met in order for the factory to successfully function. If the factory is missing any of the following components, the business will fail. Every part of this process is important for its own reasons. This scenario also assumes the land has been rightfully purchased from the government, who has zoned the land for industrial usage. It will also assume the appropriate blueprints and architectural planning has taken place.

- First, there must be transportation infrastructure. Roads and railroads are needed to bring vital materials to and from the area. This includes the construction materials while transforming the area as well as product materials once the factory is functioning.
- Second, there must be sanitation infrastructure. This includes laying the piping for clean water to be brought in and the plumbing for toilet waste removal. Typically, a dam and water filtration system will be required for this process.
- Third, the factory building(s) must be built. The materials need to be brought in, along with the needed equipment and skilled labor to construct the facility.
- Fourth, electrical networks must be established. Factories require power to run the machines. If there is a nearby power grid with sufficient capacity, the facility can be connected. If there is not, the factory will need to establish its own power grid. They could transform a neighboring dam into a hydroelectric dam. They could also establish their own coal or natural gas power station on their campus.
- Fifth, wiring must be put into place for communication networks. Factories need to be able to communicate with their CEO headquarters, resource suppliers, potential customers, government officials and potential workers (to name a few). Phone lines or cell phone towers, plus a robust internet connection are now business essentials to running a functioning business.
- Finally, machines, labor and materials. Once the factory is built, then the resources are brought into make the products and bring the factory to life.

The Transportation Basics. Transportation is an essential part of functioning businesses. Businesses must be interconnected to other cities, businesses and people. They use transportation to bring their workers into to work each day (and possibly clients), bring in needed materials from their supply chain, and export final products to their customers on the next link of the supply chain. The number one rule of business is to make money, which requires the business to spend as little as possible to achieve their needed business goals. Thus, businesses have to take into account a number of cost factors when choosing which mode of transportation will work best for their needs:



China's $11 billion Airport Terminal

Singapore's $1.7 billion Seaport Terminal

Unload Truck w/ $30k forklift or Free by Hand

- **Terminal Cost**. Terminal costs are associated with the loading and unloading of people and goods upon the mode of transit. How much does it cost for the buildings and equipment to get goods on and off? Is special equipment needed? Are specially designed buildings required? For example, trucks have a low terminal cost. The company only requires a ramp or forklift to get goods on and off. People can climb into the cab with no other special equipment. In contrast, airplanes need an advanced airport facility to perform its terminal duties. Airports require air traffic controllers to get the planes into and out of the airport; with special landing strips. Specific equipment is needed for loading people/goods on and off, etc. Because of these requirements, airports have docking fees, handling charges, and a series of other costs and fees that trucks do not have. Similarly, shipping ports require massive shipping yards for ware house storage, controllers and specialized cranes to load/unload the freight. Natural Gas Pipelines have specialized pumps and processing centers that are needed for the gas to enter and exit the pipeline. All of these costs are extremely expensive. The more expensive the terminal cost, the higher the cost for the business to use that mode of transportation. Every cost increases the final cost of the product.
- **Line Cost**. The Line Cost is the cost of moving people/goods over distance. The longer the distance a good has to travel, the greater the cost. However, each mode of transit increases the line costs different rates. For example, trucks require gasoline, which is very expensive. For trips that are a few miles to 200 miles, trucks have a relatively small line cost - the cost of a tank of gas. However, for long trips that are thousands of miles, the costs increase drastically, because of the increased need for fuel. Ships have a high initial cost to get the goods out to sea. But once at sea, shipping is extremely cheap and efficient, even if the trip is thousands of miles. Meanwhile, airplanes have a very HIGH line cost. A Boeing 737 airplane - the most common on the market - burns 750 gallons an hour at the cost of $3,100 per hour.

	Terminal Costs	Line Costs	Route Flexibility	Speed	Capacity
Walking	None	None/Low* *Rapid Distance Decay*	High *Only on land*	Slooooooow (3-5 mph)	Looooow (20-50 pounds)
Railroads/Trains	High* *Requires Railroad Terminals*	Low *Extremely fuel efficient*	Low *Stuck on the rails*	Medium-Fast (60 mph)	High (3k-15k Tons) 200-400 Containers
Trucks	Low	High *Fuel $ increases per mile*	High *Only on Land*	Medium-Fast (70 mph)	Low (9.5 Tons) 1-2 Containers
Ships	High *Requires harbors/ Seaports*	Low* *After initial expense*	High *Only on the sea/ oceans*	Slow (20 mph)	Very High (190,000 tons) 10k-18k Containers
Airplanes	High *Requires airports*	Very High *Expensive Take Off, Fuel $ increases per mile*	High Can fly over seas, but needs land for runway	Fast (564 mph)	Medium-Low (55-160 Tons) 5 Containers*
Pipelines	High *Requires Station*	Low* *Expensive to build, cheap to run*	Low *Stuck in the Pipes*	Slow (15mph)	High (150k barrels/Day, ~22,500 Tons)

- **Route Flexibility.** The Route Flexibility is the amount of freedom the vehicles has to choose where they can travel. Airplanes have high route flexibility. Once into the air, airplanes can travel over land or sea in any direction to any airports. At any point the the pilot can change the plane's direction. The one “catch” is that the airplane must have an airport to safely land. Boats also have a high route flexibility where it can can go anywhere… as long as the boat stays in the water (and depending on the size of the boat, where the water is deep enough). The boat has the ability to change direction and destination at any time. As with airplanes, they must also have a deep water harbor to port. Trucks have a medium route flexibility. Trucks can travel anywhere they wish… as long as there is an appropriately built highways. In the USA, there are 164,000 miles of highway, allowing trucks a large number of options. On the opposite end, trains have a low route flexibility. Trains are stuck on the train rails with very limited possibilities of changing where the train can go. Each mode of transport’s route flexibility is also tied to the landscape. Pipelines have the least route flexibility. Once the pipeline is built, the gas will only travel along that one route, with no ability to change.
- **Speed**. Speed is the rate at which the goods are traveling. Airplanes travel at a high rate of speed, moving goods and people over 500 mph. Trucks and trains can move goods at 60-70 mph, as long as there is limited congestion or traffic (at rush hour, that speed becomes 0 mph). Ships and pipelines move slowly, at 15 to 20 mph.

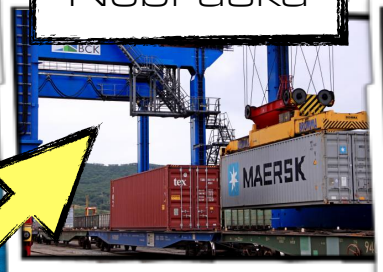
Different Capacities

- **Capacity**. Capacity is the quantity that can be carried per load. Ships have the highest capacity. A cargo ship can carry on average 18,000 shipping containers, averaging 190,000 tons of cargo per trip. China is about to release mega ships that can handle 23,000 containers with 220,000 tons of cargo. In the middle, trains and single pipeline can over 15-20k tons of cargo (depending on the terrain). Bridges and tunnels are critical to "flatten" the line of transportation, keeping the trains and pipelines from having to go up steep slopes. On the low end, a semi truck can handle around 1-2 shipping containers, totally 10-20 tons.

How do goods and people change from one mode of transportation to another? While each form of transportation has its strengths, each mode of transit has its weaknesses. Airplanes are very fast, but can only load and unload at a terminal at the airport. Trains are reasonably fast and efficient, but can only travel on rails and can only load/unload at a terminal in the train station. Ships have amazing carrying capacity, but can only travel over water. Trucks are fast and route flexible, but can only travel by land. When one mode of transit reaches its limit point, it must "Break in Bulk." Break in Bulk is when the cargo is unloaded, broken up and put onto the next form of transportation to take it to its next (or final) location. For example -

- *Scenario 1:* A cargo ship leaves the port of Shanghai with 18,000 containers on Oct 1. 10 days later, the ship reaches the Port of Long Beach in California. The ship cannot go any further, having reached its break-in-bulk point. The 18,000 containers must be unloaded, be inspected by customs, broken up into new groups based upon the final destination. All of the containers going to Nebraska are grouped together. All the containers going to Texas are grouped together. All the containers going to San Fransisco and Oakland are grouped together. Once the bulk is broken up, each collection is assigned the next-best mode of transit. On Oct 12, 180 containers need to travel 1,500 miles Nebraska. They are loaded onto a freight train. On Oct 13, the train pulls into the Union Pacific' Bailey Yard Station. The goods have reached their next Break in Bulk point, as the train cannot leave the rails. The containers going to Omaha are grouped together. The containers going to Lincoln are grouped together. Each container is put on a truck, to be delivered to their final destination(s) on Oct 14. Back at Long Beach, while the Nebraska containers were loaded onto a train, the goods destined for San Fransisco (400 miles), Oakland (393 miles) and San Diego (112 miles) were loaded onto trucks. Because the distance was shorter, route flexibility and speed made trucks the better decision.

Trail to Nebraska

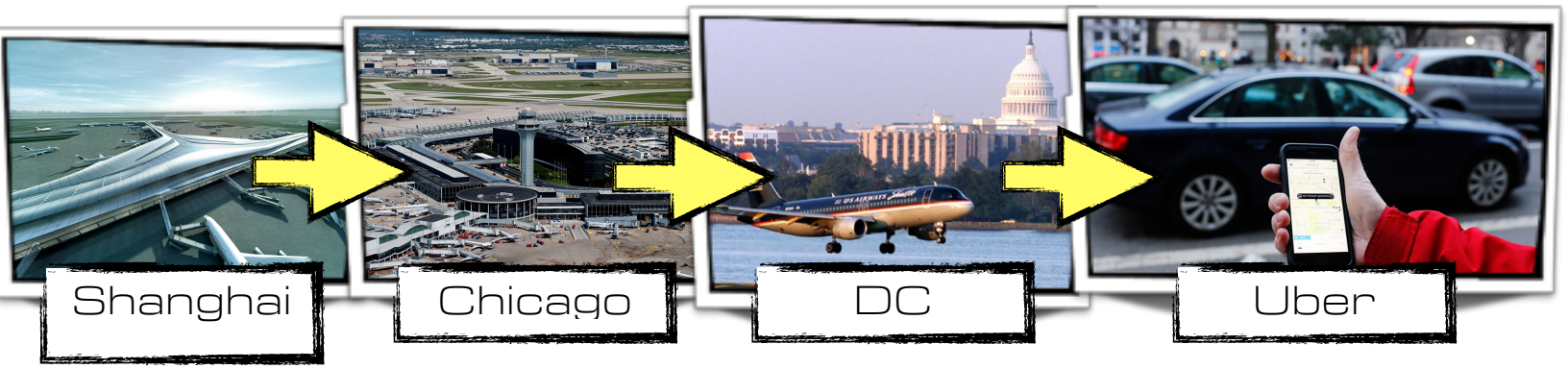


Truck to Omaha

Port Shanghai

Port Long Beach

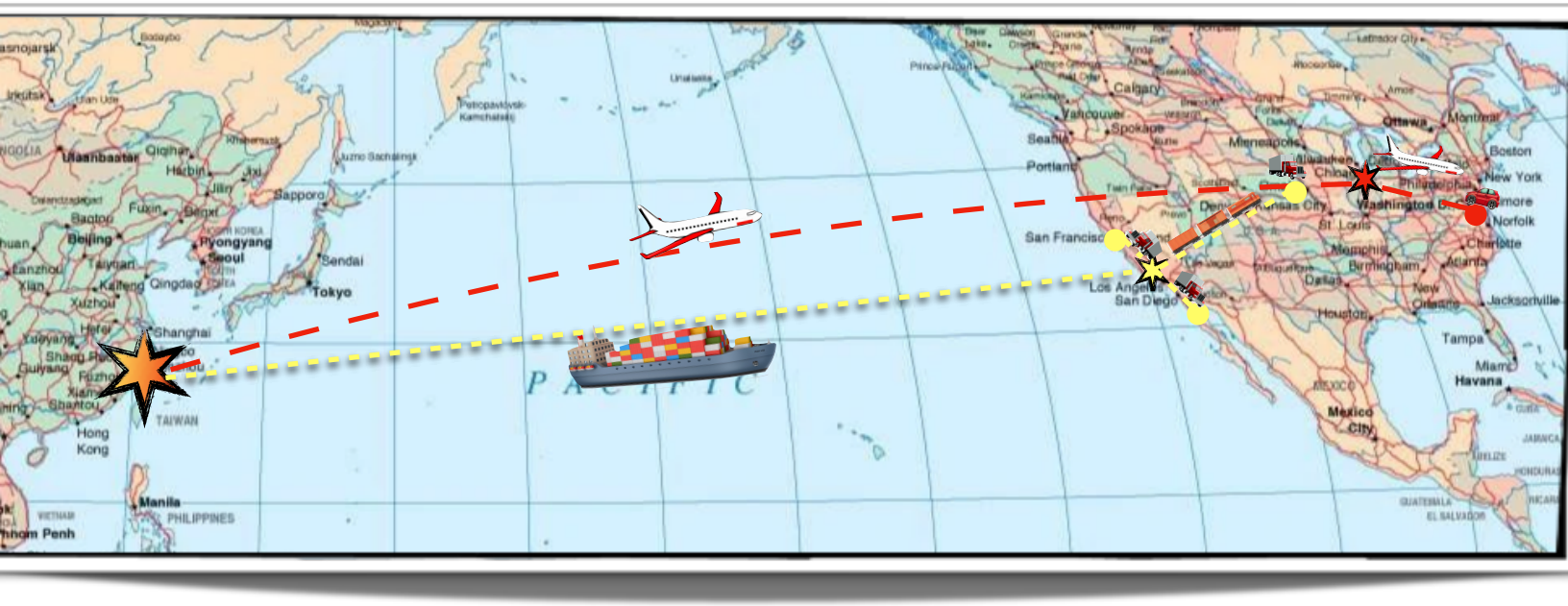
Trucks to San Fran, Oakland, San Diego



- *Scenario 2:* Meanwhile, on Oct 3, the CEO of G-Industries was in Shanghai for a meeting. He must be in Washington DC by Oct 5 for a meeting. This trip is 7,442 miles. Mr. G takes a flight from Shanghai to Chicago (17 hours). The plane broke in bulk, with the people getting off the plane to get onto their next flight. He took a second plane from Chicago to Washington D.C. (1 hour 45min). The plane landed, having to break in bulk. He could not reach the building for his meeting in the airplane. Mr. G boards an Uber that takes him to his final destination on Oct 4th, with a day to spare.

In each of these scenarios, the people and goods used the mode of transportation that best suited their needs. Scenario 1 valued the Ship and Train for their carrying capacity to achieve economies of scale, being willing to sacrifice speed. However, both the ship AND the train reached a point where they could not get their cargo to its final destination. They had to break in bulk, transitioning the cargo to the next mode of transit. Finally, the truck - with its route flexibility - was able to deliver the final goods to the customer. Scenario 2 valued the speed of airplanes, as the CEO had an urgent meeting. Using airplanes, he had to break in bulk twice - in Chicago and at Washington DC - before finally taking the Uber home.

In conclusion, businesses have a number of factors they have to consider when deciding transportation. How are away is the final destination? How many places do I need to get my goods to? How urgent is the need for the product/person to arrive? How many stops/break-in-bulk points? What will be the cost of each option? How many other goods are being shipped this way (will mine be the only one and I have to pay all the costs or will there be a lot of goods being shipped and we share the costs)?

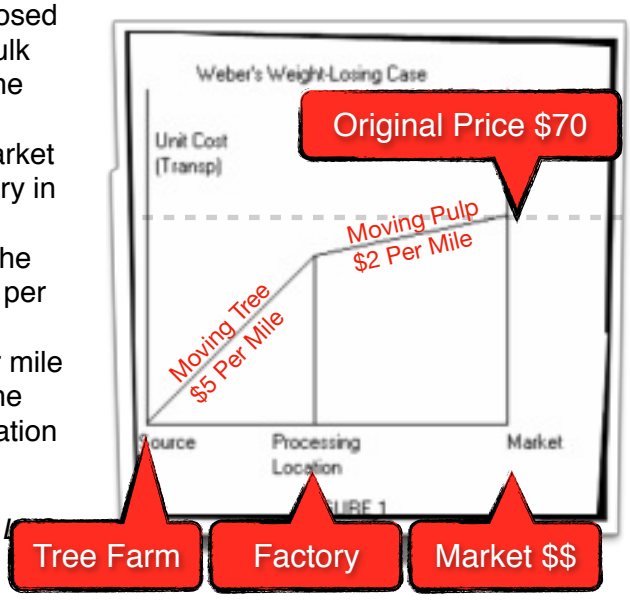


F. Where to Place a Factory?

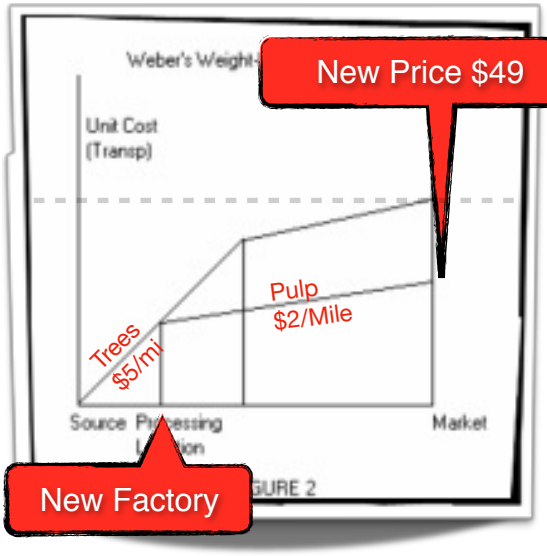
Weber's Least Cost Theory. When deciding where to place factory, businesses must decide which location will result in the lowest production costs, allowing them to maximize profits. In the 1909, Alfred Weber developed a theory about the decision making process of deciding factory locations. Weber's Least Cost theory analyzes the type of industry, the location of raw materials, the location of the market, and the costs of doing business (transportation, labor, taxes, land cost) to determine the prime location for the factory that would result in the LEAST cost to do business.

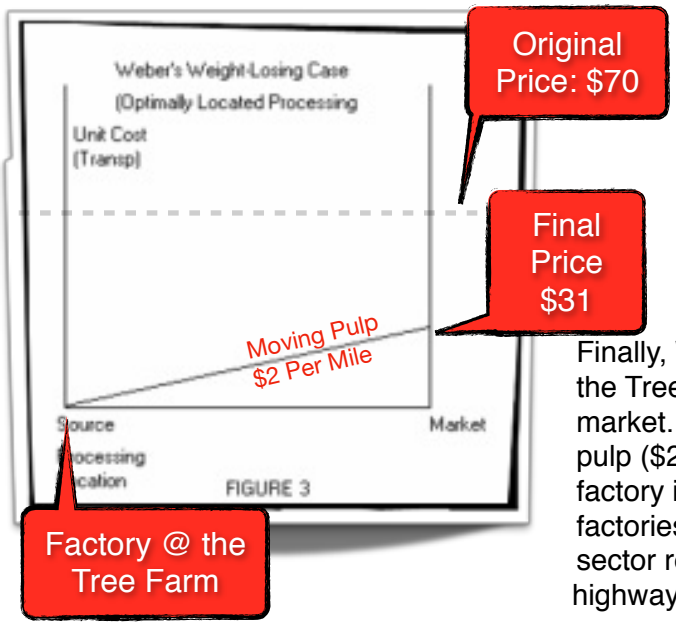
According to Weber, there are two types of factories: Bulk-Loss and Bulk Gain. Bulk-Loss (or weight-loss) industries take raw materials/commodities from the earth and processes them into a usable resources that have less weight or bulk. For example, a bulk loss factory takes the tree, removes the branches and grinds it into wood pulp. The copper and nickel smelting factory takes the ore for the mine and smelts it, removing impurities. By the time the bulk-loss factory is finished, the size and weight of the product is less then the original that came from the earth. Bulk Gain factories are assembly plants that take multiple parts and assemble them into something bigger. They take the individual metal bars, nuts, bolts and screws and assemble them into a desk. They take the parts and pieces and assemble a car. The final product is bigger than the collection of parts and pieces.

- **Bulk Loss Location**. In 1909, Weber's largest concern was the cost of transportation. When looking at cost of transportation, Weber asked which cost more to transport: the input arriving at the factory or the out put leaving the factory. For bulk loss factories, Weber noted that large objects enter the factory, small objects leave the factory. A tree is bigger and heavier than wood pulp. The chunks of ore from the mine were heavier and larger than the spools of copper wire leaving the factory. Weber reasoned that it is harder, heavier and more expensive to transport the bigger object coming into the factory than the final product that left. Weber posed three scenarios: There is a Tree Farm, a Tree Grinding Mill (Bulk Loss) and a Market that wants to purchase the final product. The tree farm must be located near the trees. The market must be located where the city is. Where should the factory go? The market was 20 miles away from the tree farm. Weber first put the factory in the middle - half way between the tree farm and the factory: 10 miles from the farm to the factory, 10 miles from the factory to the market. Weber noted that the cost of carrying the trees was $5 per mile to the factory, but the cost of carrying the wood pulp to the market was $2 per mile. Moving the trees to the factory ($5 per mile x 10 miles = $50) + Moving the wood pulp from the factory to the market ($2 per mile x 10 miles = $20) meant his total transportation cost was $70.

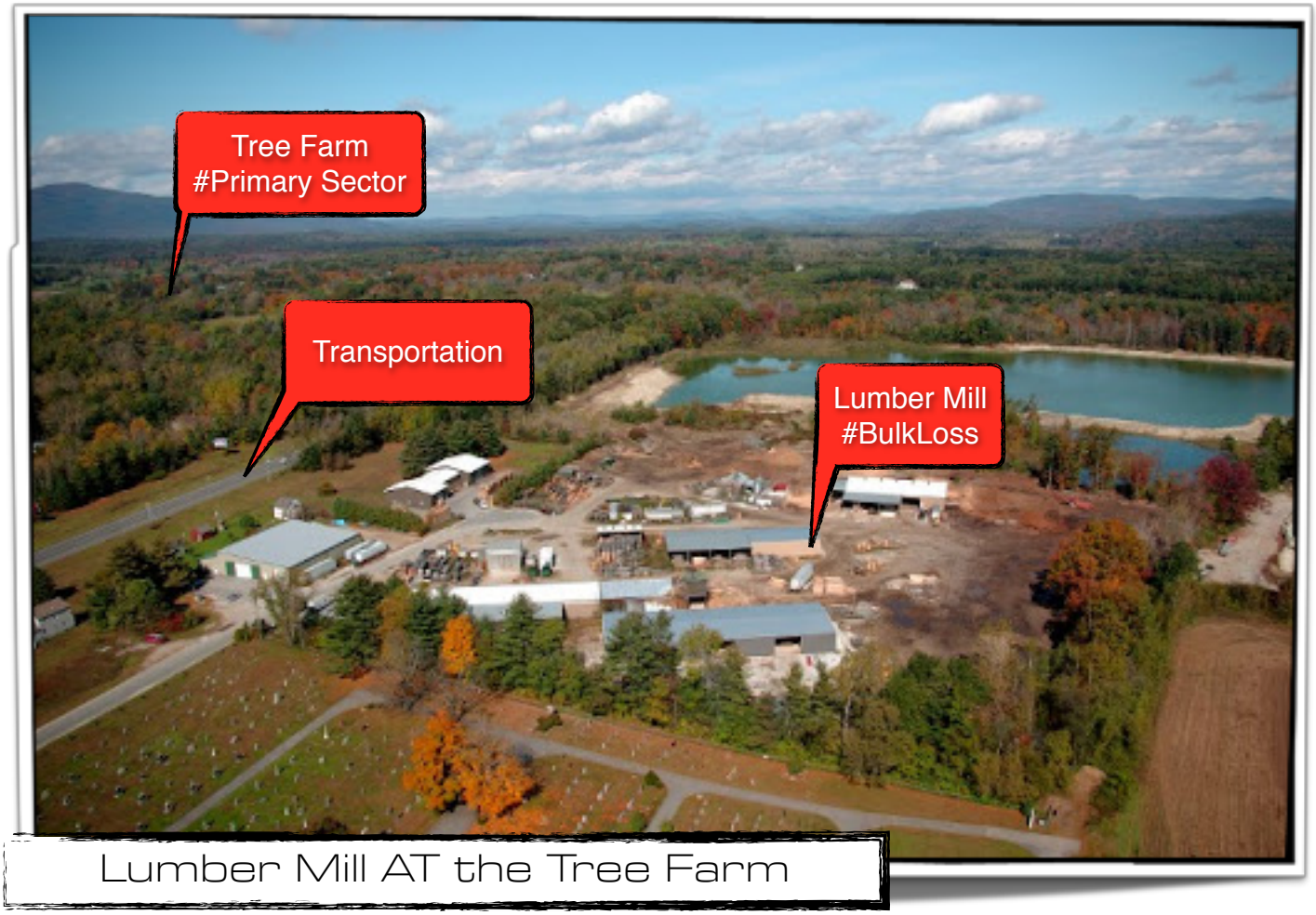


Weber then moved the grinding mill closer to the trees - carrying the trees a 3 miles, but the pulp 17 miles. At his new location, moving the trees ($5/mile x 3 miles = $15) + moving the wood pulp ($2/mile x 17 miles = $34) cost $49. That was a $21 savings!

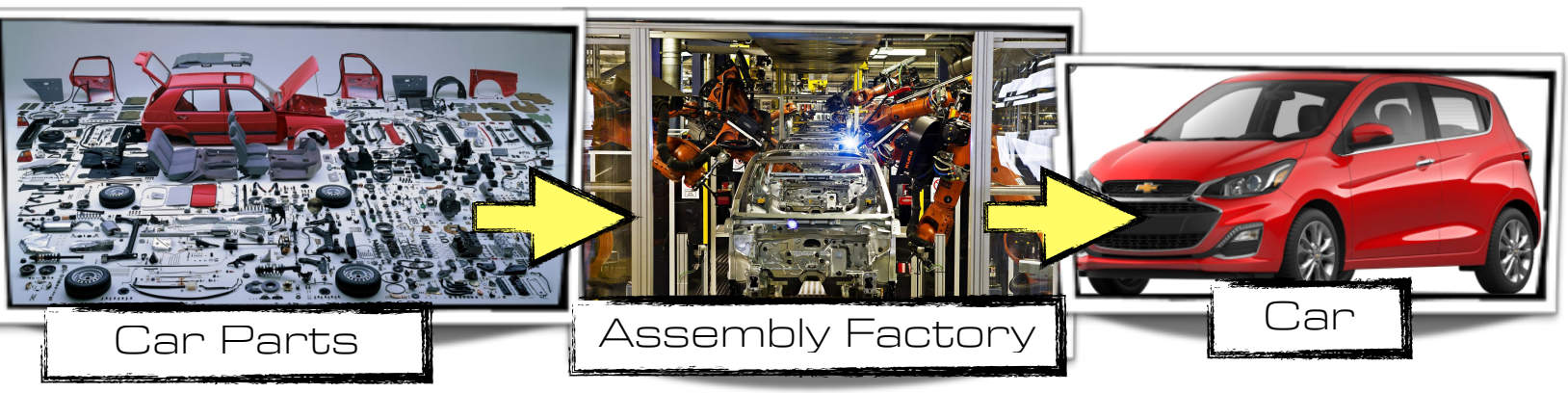




Finally, Weber moved the Bulk Loss Factory on the same property as the Tree Farm - carrying the trees 0 miles and the pulp all 20 miles to market. Moving the trees ($5/mile x 0 miles = $0) + moving the wood pulp ($2/mile x 20 miles = $40) cost $40. Compared to having the factory in the middle, the company saved $31 per trip. Thus, bulk loss factories will fight to be located directly at the location of the primary sector resource. They will also want to be located next to the nearest highway or railway to maximize their cost and productivity.



Lumber Mill AT the Tree Farm

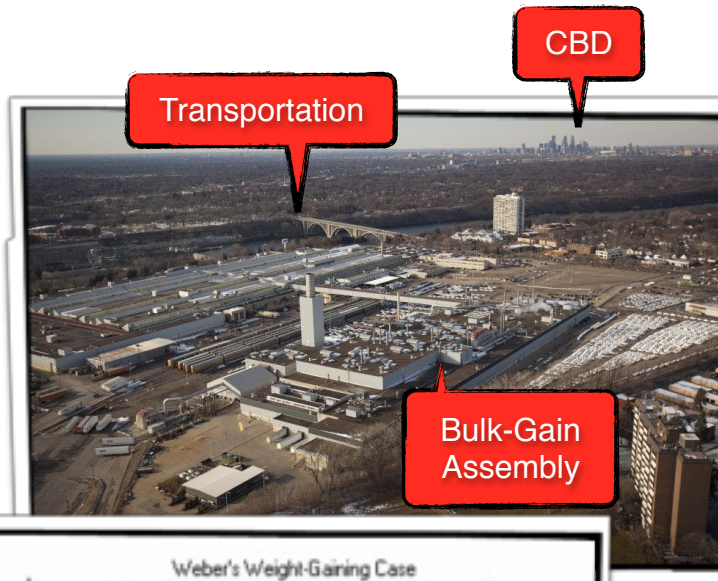


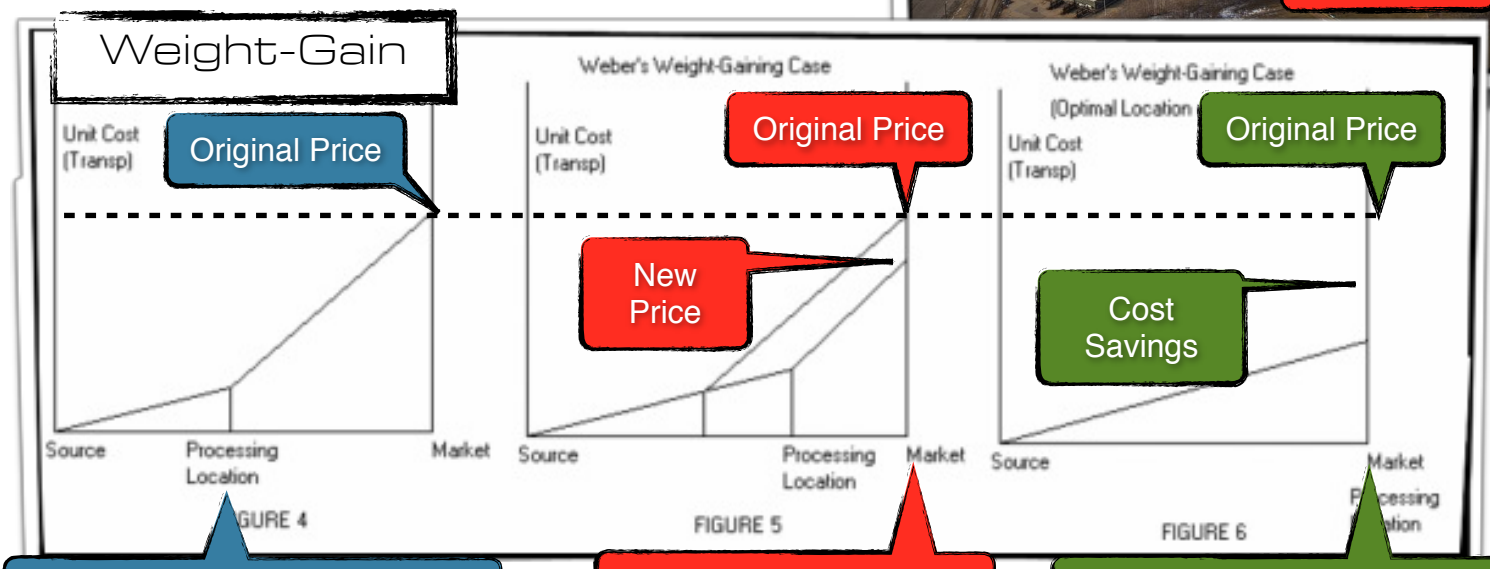
Bulk Gain Location. Weber noted that all factories are not bulk loss, but there are factories that take smaller pieces and assemble them into something something bigger. For a bulk-gain factory, Weber noted that the small parts that arrive at the bulk gain factory have a lower cost to transport then the final, larger product that was assembled. Like Pop/Soft drinks, computers, phones, furniture... small parts assembled into a bigger product. For Bulk Gain, there are the bulk-loss factories that turned the primary sources into the specific car parts and there is the market where the cars are to be sold. The bulk-loss factories are located at the primary resource and the market is located at the cities where people live. Where to place the bulk-gain factory?

The market was 20 miles away from the tree farm. Weber first put the bulk gain factory in the middle - half way between the parts factory and the market. The cost of shipping the parts to the assembly factory is $2/mi but the cost of transporting the final car is $10/mi. Moving the parts to the factory ($2 per mile x 10 miles = $20) + Moving the car from the factory to the market ($10 per mile x 10 miles = $100) for a final cost of $120.

As Weber moved the assembly factory closer to the MARKET, the overall cost decreased: Moving the parts to the factory ($2 per mile x 17 miles = $34) + Moving the car from the factory to the market ($10 per mile x 3 miles = $30) for a final cost of $64.

Finally, Weber mover the assembly factory into the market: Moving the parts to the factory ($2 per mile x 20 miles = $40) + Moving the car from the factory to the market ($10 per mile x 0 miles = $0) for a final cost of $40. That is an $80 cost savings from the first scenario. They will also fight to be located along highway and railway transportation corridors.





The processing factory located half way between the source of the raw material and the market.

If processing factory is moved towards the **Market**, costs goes down.

If processing factory is moved directly to the market where the goods will be sold results in the lowest price.

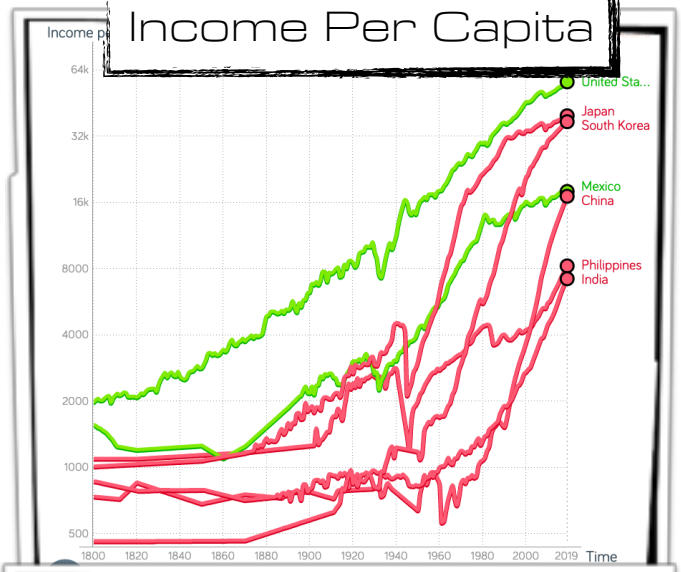
Chicago 1910

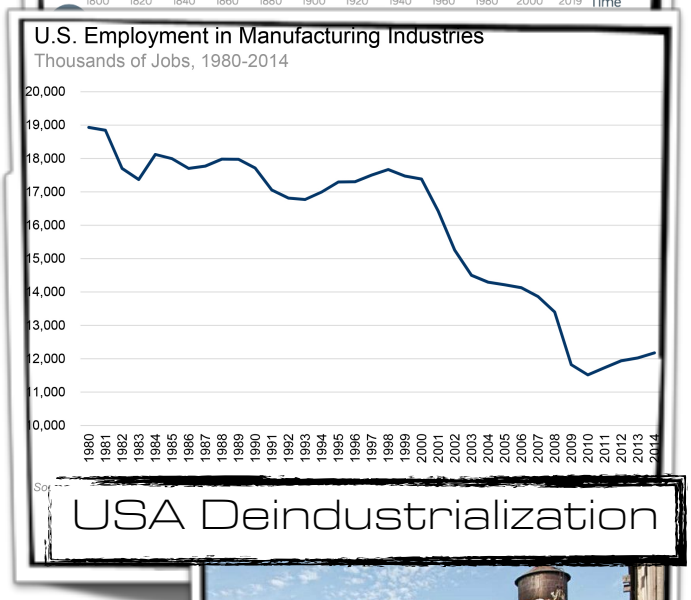
Chicago 2010

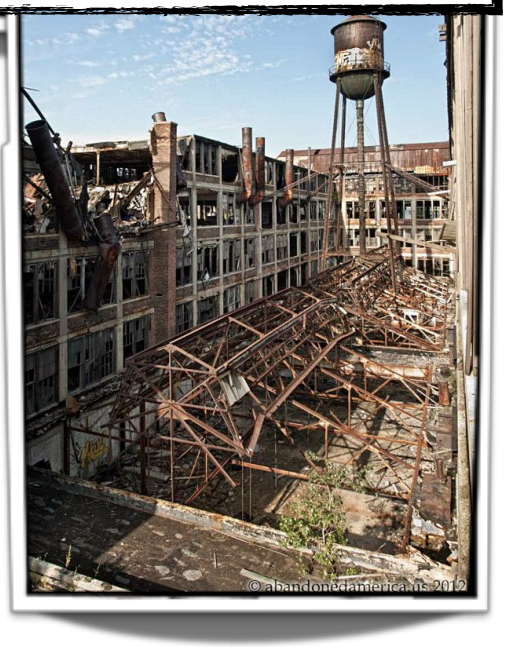
Outsourcing. Since the 1970s, the world has experienced a new phenomena: bulk-gain factories are relocating their facilities further away from their markets - even crossing borders into other States. How could businesses use Weber's Least Cost Theory to conclude that moving further away would give them the Least Cost to do business?

Ships 1910-2010

- **Improved Transportation & Communication**. Since 1909, transportation and communication have improved their speed and cost efficiencies. In 1909, the Model T Ford car traveled at 40 mph, the Wright Brothers were working on some flying contraction, all phones had wires and operators to connect calls, and the moon was really, really far away. In by the 1970s-1990s, cars were hitting speeds of 150 mph, airplanes traveled 500+ mph, computers were becoming connected to form the internet, hundreds of satellites orbited the earth, and wireless phone technology was being developed. People could communicate around the world in hundredths of a second with a touch of a button. Communication and transportation had achieved economies of scale, massive quantities of goods and people for record low costs. An extra 100 mile of travel cost a few extra pennies. These advancements opened up opportunities everywhere - from the cheaper lands on the edge of the cities to create suburbs, to the Southern USA with cheap land, to the industrially developing Latin America and South/Southeast Asia. The world was opening new lands, no laborers, and new markets of possibilities.
- **Free Trade Agreements**. With improved transportation and communication came an increase in international trade. More goods were crossing more borders more frequently. Tariffs and quotas had been a common practice for states to protect their companies against cheaper foreign imports. However in the 1980s-1990s, there was a wave of Free Trade Agreements, removing these barriers and reducing the cost of doing business with other states.







- **Labor and Land Costs**. One area that where businesses saw the opportunity to reduce their costs was in their labor. In the Rust Belt, labor unions had organized the workers to fight for higher wages, health care benefits, and retirement benefits. It was common for a worker in the United Auto Workers (UAW) Labor Union to earn $29 per hour + Benefits. With economies of scale and the rapid speeds in transportation, businesses now saw the opportunity access labor markets in Mexico, the Caribbean, and Asia.

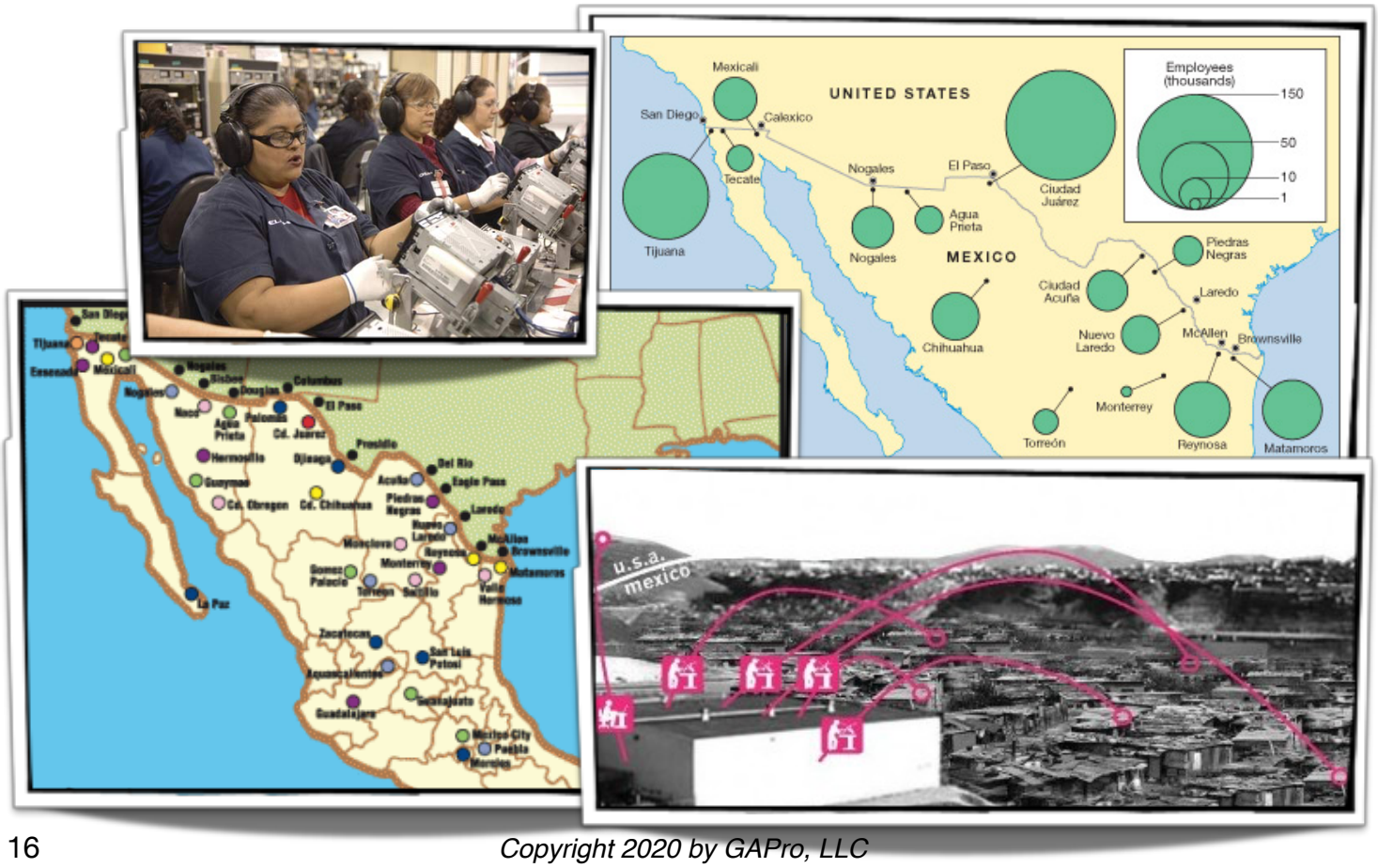
  Foreign States started to setup and zone Export Processing Zones (also known as Free Trade Zones or Special Economic Zones) to encourage American and European companies to come off shore. States' promised access to low wage workers, low taxes, and super cheap land along the coast by ports. Now, textile factories could go from paying American workers in North Carolina $8-10 per hour to China and pay workers $1 per day. Automotive companies could pay go from paying Rust Belt unionized workers $29 per hour + benefits to paying workers in Mexico $1-2 per hour, no benefits. When a factory has ~4,000 workers per factory working 40 hours per week, the cost savings rapidly adds up. In Detroit, 4,000 workers working 40 hours in one week at $29 per hour is $4.64 million. In Mexico's Maquiladora's, the same 4,000 workers would make $160,000 in one week. That is a savings of $4.4 million… per week. In 2020, wages in the Mexican maquiladoras has raised to $8 per hour is $1.28 million per week. This is still a significant savings to the company, that more than compensated for the extra time and cost of the longer transportation commute. Then, there were the land cost savings. In NYC in 2020, property value ranges from $300 per square foot to $3,300 per square foot in Manhattan. Meanwhile, land cost in Shanghai in 2012 was $250 per square foot. In 2003, the cost of office property in China was half that of the USA.
- **Labor Laws & Regulations**. Since 1909, the US government has put in a series of labor and environmental regulations. These have required policies like: minimum wage, minimum work age, over time pay, safety conditions, mandatory public school, endangered wildlife protection, and clean water/air policies. All of these policies put extra financial pressure on American businesses. As a part of the Export Processing Zone package, foreign governments promoted the lack of taxes, labor laws and regulations. This relieved a massive financial burden from multinational corporations that could now pay whatever they wanted, hire whomever they wanted, in whatever working conditions were…. in the words of Weber... least cost.

The result was a massive economic restructuring in America. Factories and industries rapidly closed, moving to the union free "Right to Work" Sun Belt of the USA or off shore to Latin America and Asia. During the 1990s, factories opened in the Maquiladoras at the rate of one factory every day, while the SEZs of China blossomed up their Pacific coast. Detroit, the 5th most preposterous city in the world in 1980, filed for bankruptcy in 2013.

Case Study #1: Maquiladoras. With the development of NAFTA in the 1990s, Maquiladoras began to be built in high volume; at the rate of one new factory per day. These factories were setup within 35 miles of the US/Mexico border, with the intent of creating easy access points from Mexico that connected to the major highways within the US transportation infrastructure. Maquiladoras expanded into the heart of Mexico to take advantage of locations close to raw materials for bulk-loss industries. Companies benefited from Mexico's stable government and economy, port access to cheap Latin American raw materials, relaxed regulations, domestic oil production, affordable land and cheap labor. Mexico benefited from the FDI, the decreased unemployment and the rise of a new middle class of workers.

Maquiladoras have had unintended consequences for both states. The USA has experienced a massive deindustrialization of the Rust Belt; causing massive unemployment and economic restructuring in it's most populated and profitable region. Mexico has experienced a collapse of their corn producing sector, because of the flood of cheap American corn due to NAFTA. This has created a stream of improvised migrants looking for a livelihood. Many migrate to the Maquiladoras, creating a surplus of labor, which keeps wages absurdly low. The housing near the Maquiladoras is close to the factories, but of very low quality. As a result, the workers are exploited, especially women, who work in inhumane conditions for long hours. Others shift to the illegal drug trade and drug cartels, bringing violence and other hardships to the State. These consequences have resulted in the massive migration of displaced farmers and workers to the USA, often illegally due to the inability to pay for the "Legal" processes.

Change may be coming to the Maquiladoras. In 2019, the new Trade Agreement USMCA (US-Mexico-Canada Agreement) has rewritten NAFTA with new trade regulations. One key change is that car parts made in Mexico must be made by factory workers with income above $16/hour to be "freely traded" without tariffs. This is a change for the Maquiladora's average salary of $8/hr for Car Assembly, $4/hr for part manufacturing. Time will tell what impact this has to the USA & Mexican Industrial Complexes.

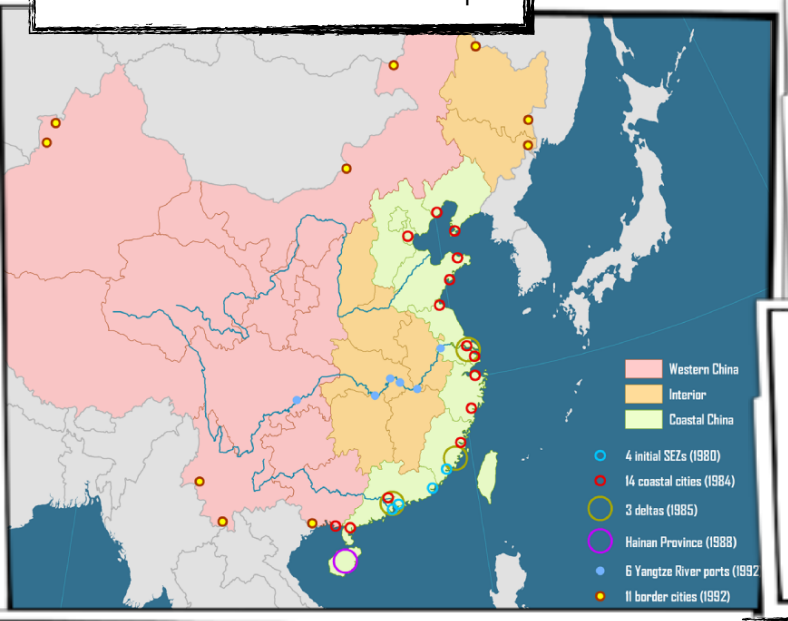


Case Study #2: China's SEZ. After a catastrophic series of failed improvements in the Cultural Revolution under the Communist Mao that resulted in the death of 45 million Chinese citizens, China moved towards an "Open Door" policy. China's government decentralized, drawing regional boundaries and devolving power to provincial governments. They allowed privatization of land and resources.

China zoned regions near its long Pacific coast as being low-corporate tax zones called Special Economic Zones (SEZs). SEZs also had their own unique governing policies, that created more "business friendly" environments. They started with the Pearl River Delta region in 1980, near Hong Kong. Hong Hong had been under British control since the late 1880s, and was significantly more advanced/industrialized than mainland China. China built numerous container ports and railroad infrastructure to allow for easy access to freight ships. China also ensured private property rights for businesses in the SEZ, that they would not be seized by the Chinese government. Finally, China took measures to lower the value of Chinese currency, allowing other countries to have greater purchasing power, getting more exports for their compared to other economic locations around the world. China was already home to the world's largest population, almost purely in the primary sector as subsistence farmers that were willing to work for comparatively low wages.

These measures attracted large amount of business attention from around the world, anxious to get access to the affordable land and cheap labor. The first SEZ grew economically by over 50% in its first year. From its birth in 1980, the city Shenzhen has grown from zero-population to 12 million - larger than NYC. China rapidly expanded the model, zoning 69 SEZ Regions by 2010. To show the amount of Industrial activity, in 2006 just the Sichuan Provence was home to 4,000 shoe manufacturers and produced 10 million shoes. In 2020, China has added over 115 High Tech Development Parks and 165 Agricultural Tech Zones. In 2007, China received an estimated $76 Billion in FDI. All together, since the 1980s, the SEZs have created over 20 million jobs, which is less than 3% of China's working age population… and the growth and success show no signs of stopping.

China's SEZ Map



Top GDPs 1968-2018

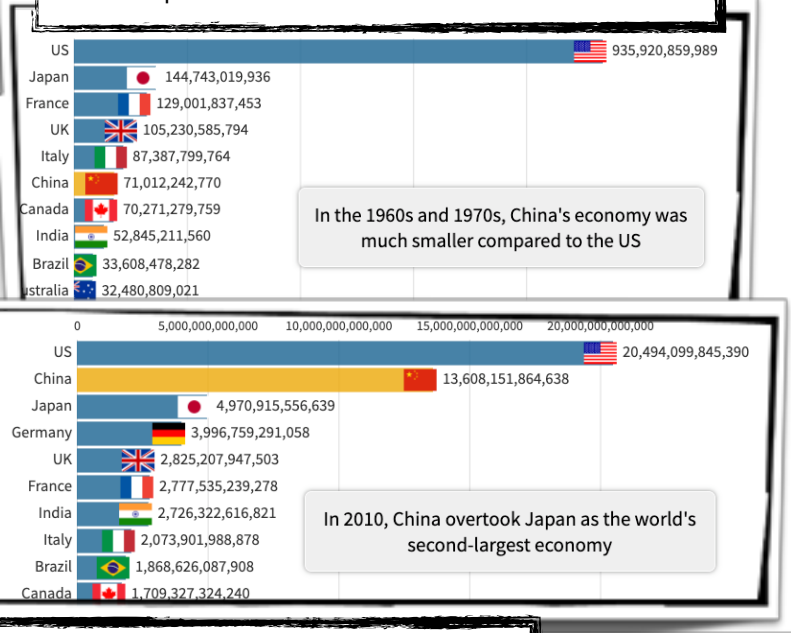
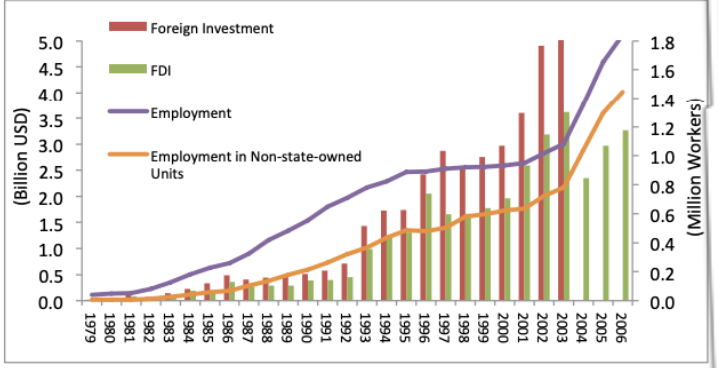


Figure 6. Employment and Foreign Investment in Shenzhen, 1979–2006



Source: Shenzhen Statistics Bureau, various years.

Shenzhen: Population