

Introduction and the Industrial Revolution (Rubenstein p 388 – 389)

1. Industry refers to the manufacturing of goods in a factory
 - a. What does a factory utilize and why? a large # of people as well as considerable machinery and money (capital) to turn out valuable products.
2. What was the Industrial Revolution? a series of improvements in industrial tech. that transformed the process of manufacturing goods.
 - a. What was the spatial pattern of manufacturing before the Industrial Revolution? dispersed. People made household tools and agricultural equipment in their own homes/villages
 - i. What was this system known as? cottage industry system
 - b. (go back a paragraph) Where and when did this originate? northern England & southern Scotland during the second half of the 18th century (after 1750)
 - c. How did it diffuse? to ("continental") Europe and N. America in the 19th (1800s) century, to other regions (E. Europe/Japan) in the 20th (1900s) century.
 - d. What invention was most important for the development of factory-based manufacturing? steam engine
 - i. Why? it induced firms to concentrate production into one building attached to a single power source.
 - e. What effect did the Industrial Revolution have? unprecedented expansion in productivity and ultimately resulted in substantially higher standards of living
 - i. What previous content is this related to? principal cause of stage 2 pop. growth (DTM)
 - ii. What building material became easier to produce due to the steam engine? iron
 - iii. What industry was transformed from dispersed cottages to concentrated factories? textiles
 - iv. What industry developed which helped feed urban factory workers? food processing (canning)
 - f. What two transportation improvements played a critical role in diffusing the Industrial Revolution? How? canals and railroads enabled factories to attract large #s of workers, bring in bulky raw materials such as iron ore and coal and to ship finished goods to customers.

3. Industrial Regions (Rubenstein p 389 – 391)

- a. In what three world regions is industry concentrated? Europe, N. America and East Asia
 - i. What four countries produce 1/2 of the world's industrial output? China, U.S., Japan & Germany
- b. There is lots of info on pgs 390 – 391, I have picked the most important below, use the text, map and captions to answer.
 - i. Along what river is most of Germany's industry located? Rhine River
 - ii. What area in Spain is an industrial cluster? Northeastern Spain (Catalonia)
 - What previous content from Unit 4 Political Geography is this related to? separatist movement in Catalonia feels they "contribute" too much in taxes to Spain
 - iii. What region of Ukraine is an industrial cluster? Donetsk (Donbass)
 - What current events is this related to (also Unit 4)? Russian irredentism has laid claim to this region in E. Ukraine w/ many Russian-speakers. Justify invasion
 - iv. In what areas of North America has industry been traditionally concentrated? NE USA and SE Canada
 - By what term is this vernacular region known (lecture)? Rustbelt
 - v. In what three countries is East Asian Industry concentrated? Japan, China and South Korea
 - How did Japan become an industrial power in the 1950s and 1960s? initially by producing goods that could be sold in large quantities at cut-rate prices then shifting to manufacturing of high-quality electronic products.
 - What two factors have led China to being one of the world's leading manufacturers? world's largest supply of low-cost labor and the world's largest consumer market
 - What country followed Japan's lead? S. Korea What tier have they elevated themselves into? core

4. Site Factors in Industry (Rubenstein p 392 – 393)

- a. What are site factors with regards to industrial production? What are the three main production factors that vary by location? industrial site location factors are related to cost factors of production inside a plant. Cost of LABOR, CAPITAL and LAND vary by location.
 - i. What is the most important site factor on a global scale? labor
 - What is a labor-intensive industry? an industry in which wages & other compensation constitute a high percentage of expenses.
 - What is the average wage paid to manufacturing workers in developed countries? \$35/hour
 - What is the average wage in China and India? \$2/hour

- Does "high-wage" = "labor extensive", why or why not? No, high wages may be paid to workers (like auto workers) but overall labor may not constitute a large % of the value or expense of making cars
- What is an industry called that has lower than average expenditures of labor? capital-intensive
- What is Fordist production? mass production in which each worker in a factory is assigned one task (usually low skill) to perform repeatedly
- What is post-Fordist production? workers are organized into teams that perform a variety of tasks and solve problems through consensus.

- ii. What is capital? funds to establish new factories or modernize existing ones
- Explain how capital is important to the high-tech industry in Silicon Valley? Financial institutions in Silicon Valley have long been willing to provide money for new software and communication firms even though a/lrds. fail.
 - What factors might prevent financial institutions from lending money to entrepreneurs in developing countries? they may perceive a country as being politically unstable, having a high level of debt or ill-advised economic policies

- iii. Besides "terra firma" what other factor is considered within the site factor of "land"? energy
- Where were early factories located? How did this effective their physical design and production process? in cities, usually housed in multi-storied bldgs. which had raw materials were hoisted to upper floors to make smaller parts that then are sent downward on chutes & pulleys (inefficient)
 - (wait until next paragraph) Why were these central locations attractive? because RR lines converged there, manufacturers needed RRs for shipping
 - How are contemporary factories designed? How does this affect the production process? one-story bldgs raw mat'ls are delivered at one end, products are assembled in a logical order and shipped out the other end (efficient!)
 - Where is land available to allow this type of design? suburban and rural locations
 - How did a change in transportation also support this new industrial location? trucks now responsible for transporting most inputs and finished goods. Locating next to highway junctions now important!

5. Situation Factors: Inputs and Proximity to Markets (Rubenstein p 394, 396 - 397)

- a. Situation factors are related to what? transportation of materials to and from the factory.
- b. What two "proximities" are considered when deciding on industrial location?

- i. proximity to inputs ii. proximity to markets
- What is a **bulk-reducing industry**? What is the goal of locating closer to the industry's inputs? an industry in which the inputs weigh more (bulky, more difficult, fragile to ship) than the final product would locate closer to the inputs to minimize transportation cost.
 - What industry does the text use as an example of a bulk-reducing industry? Copper
 - Why? b/c when it is mined it is in a bulky form with many impurities that are eliminated during the smelting process! Since it is more expensive to ship the impure copper ore than the refined wire, the smelting facility would be located closer to the inputs to minimize costs.
 - What is a **bulk-gaining industry**? What is the goal of locating closer to the where the product is sold? an industry in which the final product gains volume or weight (or becomes more fragile) during production. This type of industry would locate closer to the market to minimize transportation costs.
 - What two industries does the text use as examples of bulk-gaining industries? Understand why. metal fabricators b/c the end product is bulkier (also more susceptible to "scratching") and beverage bottling b/c filled bottles are heavier than empty bottles to ship.
 - What specific industry does the text use as an example of a fabricated metal product that is bulk-gaining? motor vehicles
 - What two other types of businesses would also locate near their customers (remember these are NOT "bulk-gaining" industries)? single-market manufacturers (see "just-in-time delivery")
 - perishable products companies

6. Truck, Train, Ship or Plane? (Rubenstein p 398 – 399) "Transportation and Delivery Methods/Issues"

a. Understand the advantages and disadvantages of the following shipping methods:

Method	Best for which distance/products? Why?
Truck	best for short-distance delivery b/c trucks can be loaded/unloaded quickly/cheaply. Especially advantageous if they can reach their destination within one day without extended rest.
Train	used for destinations that take longer than one day to reach, take longer to load/unload but don't need daily rest stops. see containerization below
Airplane	most expensive per unit shipped. Usually reserved for speedy delivery of small bulk, high value packages
Boats	attractive for very long distances. Cost/km is low, can cross oceans. Dominates GLOBAL trade. see containerization below.

b. What is a break-of-bulk point? a location where transfer among transportation modes is possible

- What sites are usually important break-of-bulk points? seaports and airports
- What more recent innovation has facilitated the transfer of packages between modes of transportation? Explain. containerization, containers may be packed into a railcar, transferred quickly to a container ship to cross the ocean and be unloaded on to trucks at the other end. Large ships have been built to hold many containers
- What support facilities have often been built near break-of-bulk points? warehouses

c. How does just-in-time delivery work? the shipment of parts and materials to arrive at a factory moments before they are needed.

- Where should suppliers in the "just-in-time" system locate? near the customer's factory
- What are the two ways that manufacturers save time by using just-in-time delivery with their suppliers?
 - reduces money (capital) that they must tie up in wasteful inventory.
 - save money by reducing the size of the factory b/c space does not have to be wasted to store a mountain
- What are three ways that just-in-time can be disrupted?
 - natural hazards can affect deliveries anywhere in the world.
 - deliveries may be delayed by traffic
 - a strike at one supplier can shut down entire production
↳ union work stoppage

7. Why are Industries Changing Locations? (Rubenstein p 422 – 423, 428 – 429)

- In 2010 what share of the world's industry was outside of developed countries? 1/2 or 50%
- What have transnational companies been especially aggressive in doing in order to remain competitive? using low-cost labor in developing countries
- What jobs have been retained in developed countries? highly skilled workers
- What is this selective transfer of jobs called? new international division of labor
- What is outsourcing? turning over much of the responsibility for production to independent suppliers.
 - What traditional model of mass production does this contrast with? Define. vertical integration in which one company controls all phases of a highly complex production process.
 - What electronics supplier is an example of this? What abuses have they been accused of? FOXCONN poor working and living conditions for workers and the possible use of child labor.
- What three factors have led to increased manufacturing in Mexico?
 - agreements have eliminated trade barriers between US, Mexico & Canada
 - (lecture) What are these agreements? NAFTA → now the USMCA (Trump)
 - nearest low wage country to the U.S.
 - What are maquiladoras? manufacturing plants in Mexico near U.S. border that receive a tax break to take materials from the U.S., assemble it and then export the finished product back to the U.S.
 - What do labor leaders in the U.S. and Canada fear about the integration of North American industry? that more manufacturers will locate to low wage Mexico

- lax environmental regulations
 - What do environmentalists argue about trade agreements with countries like Mexico? that firms will relocate to Mexico because of less stringent environmental regulations. IMPLICATION = MORE POLLUTION
- What challenges does Mexico face regarding the new international division of labor? Mexico has higher wages than China but lower shipping costs. IMPLICATION - is that firms will locate away from Mexico to lower wage LDCs
- vi. What countries are the BRICS countries? Brazil, Russia, India, China and South Africa
 - What advantages do these countries have? 26% of world's land, 42% of inhabitants large economies, rich in critical inputs for industry
- b. In what direction has industry shifted within the United States? from NE to South and West
 - i. How have governments influenced location decisions (see "Debate it" as well) government subsidies
 - What are the pros and cons of this policy?

In favor of this policy	Against this policy
<ul style="list-style-type: none"> • new industry provides jobs to community • new employees will spend more on existing businesses • EVERYONE benefits from new infrastructure 	<ul style="list-style-type: none"> • community spends more on subsidies than it gets back in taxes/jobs. • newcomers cause prices to rise for housing and other services • new industry/workers may change character of the community.

- ii. What type of laws has been a principal lure for manufacturers? Explain their impact. right to work laws require an "open shop" in which union membership is not req'd. This makes it more difficult for unions to organize workers, collect dues and bargain w/strength. Leads to lower wages/benefits
 - (review) How do these laws affect manufacturing costs? decrease manufacturing costs
- c. In what direction has industry shifted within Europe? from NW to Southern & Eastern Europe
 - i. What four Central European countries have seen large increases in investment in industry? Czechia, Hungary, Poland & Slovakia
 - ii. What important site factor is an advantage for a Central European location? lower wages
 - iii. What situation factor is an advantage for Central European location? proximity to W. European markets
 - iv. (review) These relocations were encouraged by policy set by the EU. What has been a reaction to this supranational industrial policy? a rise in Nativism, populist nationalism and anti-EU sentiment in former industrial regions in NW Europe (BREXIT voters)

Note to students: In September, we learned how development was measured and distributed across the world. The next section deals with how countries try to encourage development largely through attracting industry (see above). It would be wise for you to review your Unit 1 Guided Reading and/or reread Ch. 10.1 (Why does Development Vary Among Countries?) and 10.2 (Where are Inequalities in Development Found?) at this time.

Why do Countries Face Development Challenges? (Rubenstein p 372 – 375)

8. Detail the two models that could be followed by countries to encourage development.

a. self-sufficiency path

- i. What is encouraged/discouraged under the self-sufficiency method? domestic production of goods discourage foreign ownership of businesses and to protect domestic businesses from international competition.
- ii. What are four elements in achieving the above goals?
 - limit imports How is this achieved? then
 - set high tariffs on imports to make them more expensive domestic
 - fixing quotas to limit the quantity of imported goods
 - requiring licenses in order to restrict # of legal importers
 - fledgling businesses are isolated from competition w/transnat'l corps.
 - equal investment is spread by govt. across all sectors/regions
 - equal income, rural income keeps pace with urban income
 - with poverty reduction taking precedence over consumption.
- iii. (skip to p 374) What are the shortcomings of self-sufficiency? Summarize but include a description to understand.
 - inefficient industries (since they have a "captive" market protected by the govt.), there is little incentive to improve quality, lower production costs, reduce prices or incr. production.
 - lack of competitiveness, protected from int'l competition feel no pressure to keep abreast of rapid technological changes or prioritize sustainable development and environmental protection.

and corruption.

- a large complex expensive bureaucracy administer rules & processes
- does for permits. Lots of bureaucratic power encourages abuse
- black market. illegally importing goods to avoid tariffs, then selling them for inflated prices on the black market.

- iv. What country implemented the self-sufficiency model from the 1940s to the 1990s? India
- b. (back to p 372) International Trade Path
- i. What do countries following the international trade model need to open themselves up to? foreign investment and international markets/competition
- When did this model become more popular? late 20th century
- ii. What must a country identify in order to embark on this model? distinctive or unique econ. assets
- iii. Who pioneered the International Trade Model? W.W. Rostow Details the stages of this model.

Stage	Details
Traditional society	not started process of development. high % of people in agriculture (primary sector) and a high % of nat'l wealth allocated to "non-productive" activities like the military and religion
Preconditions for takeoff	ELITE (have connections to core thru educ., family, politics, etc.) initiates innovative economic activities. Invests in new tech. and infrastructure, gets support from int'l finance which emphasizes infrastructure to incr. productivity (makes their inv.) profitable
Takeoff	rapid growth in a limited # of economic activities (textiles or food products) other sectors remain dominated by traditional practices.
Drive to maturity	modern technology diffuses from few to many industries which then experience rapid growth. workers become more skilled and specialized → shift to more (secondary) industry
Age of mass consumption	economy shifts from heavy industry to production of consumer goods (steel → refrigerators) internal economic activity is high

- iv. What supranational organization was created to promote the International Trade Model of Development?
- the World Trade Organization (WTO)
- What are the two principal ways it works to reduce barriers to international trade?
 - reduce restrictions on int'l trade like govt. subsidies for exports, quotas for imports and tariffs on both imports/exports. allow free movement of \$ by banks
 - enforcing agreements. WTO is authorized to make a ruling and order remedies. Tries to protect copyrights/patents.
 - What is a progressive criticism of the WTO? anti-democratic b/c decisions are made behind closed doors, promote interests of large corps over poor.
 - What is conservative criticism of the WTO? compromises the power/sovereignty of individual countries b/c it can order changes in taxes and laws it considers unfair trading practices.
- v. What two groups of countries successfully followed the international trade model to promote development? Detail.
- the Four (Asian) Dragons (Tigers) - concentrated on producing a handful of manufactured goods (clothing/electronics). low labor costs enabled them to sell goods inexpensively to MDCs
 - (see "Japan" on page one of this guided reading) How did this group of countries switch their focus as they developed? switched to the manufacture of high quality electronic products.
 - Petroleum-rich Arabian Peninsula states were transformed overnight by escalating oil prices in the 1970s.
 - How did these countries use their petroleum revenues to further promote development? to finance large-scale projects, such as housing, highways, hospitals, airports, universities & telecommunication networks
 - How did the landscape of these countries change? steel, aluminum and petrochemical factories are globally competitive
 - through the diffusion of consumer goods and the import of food from Europe and North America.
- vi. What happened to India's GDP per capita after it switched to the International Trade Model? it increased from \$300 (1990) to \$1,900 (2017)

- vii. What was the difference in annual GDP growth between countries oriented towards int'l trade vs. those oriented towards self-sufficiency? 4% annual growth under int'l trade, 1% under self-suff.
- viii. What are some of the other arguments for and against the International Trade Model (see "Debate It" p. 379)

In favor of the International Trade Model	Against the International Trade Model
<ul style="list-style-type: none"> • generates more economic growth in the long run • benefits consumers through lower prices for products • protection of one type of job can cause loss of other types of jobs. 	<ul style="list-style-type: none"> • retain jobs at home • other countries could be unfair competitors b/c they pay lower wages and have less environmental protections • intl orgs. offer inadequate protection against theft of patents and intellectual property.

Financing Development (Rubenstein p 376 – 379)

9. From what two sources do developing countries secure financing for development?

- a. What is foreign direct investment? investment made by a foreign company in the economy of another country
- i. What ratio of FDI goes to developing countries? only 1/3
- In what particular countries is this investment made? China, Singapore, Brazil, Russia, Mexico
 - (review) What tier would these countries occupy? Semi-periphery
- b. What are the two major lenders to developing countries? Int'l Monetary Fund and the World Bank
- i. Who does the IMF provide loans to? countries experience balance-of-payment problems (debt payments) that threaten expansion of int'l trade
- What are the goals of these loans? help a country rebuild int'l reserves, stabilize currency exchange rates, pay for imports w/out imposition of harsh trade restrictions or capital controls that could hamper the growth of global trade.
- ii. What does the IBRD arm of the World Bank make loans for? reform public administration and legal institutions and implement transportation and social service projects.
- iii. The IMF and World Bank are agencies of what supranational organization? the United Nations
- c. What is an alternative lending source for borrowers too poor to qualify for bank loans? microfinance
- i. What institution is a prominent example of microfinance? Grameen Bank
- Who are the recipients of 3/4ths of these microloans? women
 - Describe how these loans are used, both economically and socially. loans to artisans making handcrafted products. Women use profits to support families. Child malnourishment declines.
 - What has been the default rate on these loans? 1%
- a. Structural Adjustment
- i. What have some countries been forced to adopt when they are unable to repay loans? austerity programs
- What have many LDCs used borrowed funds to build? Why? new infrastructure like hydroelectric dams, flood protection systems, water supply, roads & hotels to make conditions favorable for businesses to open/expand
 - Why has the World Bank judged many of these projects to be failures?
 - projects don't function as intended due to faulty engineering
 - recipient nations squander or spend aid on armaments or the aid is stolen through graft and corruption.
 - New infrastructure does not attract other investment
 - Who else could be damaged by the inability of countries to repay loans? banks in developed countries.
 - What two strategies must leaders choose between when facing an economic downturn?
 - stimulus strategy. Govt. should spend more than it collects in taxes (deficit spending) putting people to work building infrastructure. Once economy recovers, people and businesses will be in the position to pay taxes and pay off debt
 - Austerity. Govt should sharply reduce taxes so that people/businesses can revive economy by spending tax savings. Sharply cut govt. spending to keep debt in check. Debt could prevent economic growth in the future.

- Through what program is austerity imposed on a country in exchange for debt relief?

Structural Adjustment Program

- What do critics claim happens under these programs? Why? poverty worsens b/c benefits are cut, higher unemployment, state jobs are lost and less support is provided for the needy such as pregnant women, nursing mothers, young children & elderly
- According to critics, what are poor people being punished for? waste, corruption and misappropriation (by the powerful) and military buildups.
- Why do international organizations argue in support of structural adjustment programs? poor will suffer if reforms aren't taken. ECONOMIC GROWTH is what benefits the poor in the long run. IMF/World Bank know more innovative, safety net is incl. to ease short term pain

Progress toward Development and Sustainable Development/Alternatives (Rubenstein p 380 – 383)

10. What has been the trend in HDI since 1980? both MDCs and LDCs have made progress in improving HDI

a. Note the variations between developed countries and developing countries across the following variables.

Factor	How has this factor varied between developed and developing countries? This information can also be used below as further commentary on the UN Sustainable Development Goals.
GNI per capita	<u>Since 1980, GNI per capita has increased much more rapidly in developed countries (MDCs) than in developing countries (LDCs)</u>
Education	<u>Since 1980, mean years of education has increased by around the same # in developed (MDC) and developing countries (LDCs)</u>
Life Expectancy	<u>Since 1980, life expectancy has increased by around the same # of years in developed (MDCs) and developing (LDCs)</u>
HDI	<u>The gap in HDI between developed and developing has narrowed. HDI has incr. more rapidly in LDCs than in MDCs</u>

The graphic organizer on the 17 U.N. Sustainable Development Goals has been moved to the end of this guided reading.

11. What has been proposed as an alternative to the International Trade Model (Rubenstein p 382 – 383)?

Fair Trade

- Who does fair trade provide greater equity for? workers and small businesses in LDCs
- What type of products does the fair trade model focus on? exports from LDCs to MDCs
- Detail the three sets of standards below:
 - Producer Standards
 - What is a criticism of the international trade model with regards to the distribution of revenue from the sale of goods produced in developing countries? only a small % of the price a consumer pays reaches the individual responsible for making/growing it.
 - For example, what % of the retail price of clothing sewn in India goes to the Indian sewer? less than 1%
 - What ratio does fair trade return to the producer? 1/3 of the price
 - What are the goals of the producer standards?
 - raising incomes of small scale farmers/artisans by eliminating the middleman.
 - distributing the profits and risks of production/sales more fairly between producers, distributors, retailers & financiers
 - increasing entrepreneurial and mgmt skills of the producers
 - promoting safe and sustainable farming methods and working conditions by prohibiting use of dangerous pesticides and herbicides and promoting certified crops.
 - What benefits do small time producers receive from joining fair trade cooperatives?
 - qualify for credit to buy equipment and improve farms
 - materials can be purchased at lower cost (economies of scale)
 - people who actually grow or make the products democratically manage resources and assure safe/healthy working conditions
 - profits are reinvested in the community instead of in absentee foreign corps.
 - Worker Standards
 - What are some criticisms of how workers are treated under the Int'l Trade Model?
 - oversight of working conditions is minimal
 - workers allege long working hours, poor conditions, low pay
 - child and forced labor is used.

- health problems from poor sanitation and inadequate safety
- injured, ill or laid-off workers are not compensated
- How does fair trade require workers be treated?
 - fair wages that cover food, shelter, education, health care and other basic needs
 - permitted to organize unions and collectively bargain
 - protected by high environmental and safety standards
- iii. Customers
 - Most fair trade sales are in what products? food incl. coffee, tea, banana, cocoa, chocolate, juice, sugar and honey products
 - Which craft products does fair trade supply in North America? decorative home accessories, jewelry, textiles and ceramics
 - How do fair trade prices compare to conventional alternatives? Why? They don't necessarily cost more because they bypass exploitative intermediaries and work directly with producers they can cut costs and return a greater percentage of retail price to producers
 - (lecture) above is not conclusive, some products are more expensive

Energy, Resources and Sustainability Issues: In the past there has been some confusion regarding how much of the following section should be covered in AP Human Geography as opposed to AP Environmental Science. Better safe than sorry.

Rubenstein p 400 – 413

12. In what ways is energy important for the functioning of society?
- a. run/operate factories
 - b. transport inputs into factories and finished goods out of them
 - c. produce food
 - d. keep homes comfortable
 - e. transport people
13. How is the supply and demand of energy distributed between developed (MDC) and developing (LDC) countries?
- a. Demand: heaviest consumers are in MDCs
 - b. Supply: most sources are currently in LDCs, some LDC regions have abundant supply whereas others have little
14. What is the source of 5/6ths of the world's energy supply (define)? fossil fuels, which are formed from the residue of plants and animals buried millions of years ago
- a. What are three main types of fossil fuels? coal petroleum natural gas
 - b. What type of resources are these (define)? "nonrenewable" - they have finite supplies capable of being exhausted
 - c. Where is the CURRENT consumption of fossil fuels increasing most rapidly? developing countries
 - i. What country is now the biggest overall consumer of energy? China
 - ii. What global region has the highest per capita usage of energy? North America
 - iii. In what way is coal mostly consumed? generating electricity
 - d. Where is the current production of fossils the greatest (these answers skip around between pages 402 – 407)?
 - i. Coal China = 1/2, other LDCs = 1/4, MDCs (mostly US) = 1/4
 - ii. Petroleum Russia/Saudi Arabia = 1/4, other LDCs = 1/2, MDCs (US) = 1/4
 - What organization was formed in 1960 to give oil-producing countries more control over their resources as opposed to transnational energy companies? OPEC (Org of Petroleum Exporting Countries)
 - In what global regions are these countries located? Southwest Asia, North Africa
 - How does this organization regulate oil production (lecture)? by setting quotas on how much petroleum a member state can pump, OPEC influences global oil supply and consequently affects price. However, many OPEC member cheat.
 - What other significant oil producers have also joined (lecture)? Nigeria, Venezuela
 - What West European area is also a large producer of petroleum (lecture)? Norway
 - What infrastructure has allowed the US to increasingly use Canada as a supplier of petroleum over OPEC? Keystone and Dakota Access Pipelines
 - Why is this controversial? fears of environmentally damaging leaks
 - What "unconventional" source of petroleum has increased Canadian proven reserves (p 407)? oil sands which are saturated w/thick petroleum called tar
 - How have factories reduced their demand for petroleum (p 406)? by using natural gas

- iii. Natural Gas 1/3 (Russia/SW Asia), 1/3 other LDCs, 1/3 MDCs (mostly US)
- What "unconventional" method has increased US supplies of natural gas (p 407)? Describe. hydraulic fracturing (fracking) involves pumping water at high pressure to break apart rocks and access gas trapped between them
 - This method is considered to be a wasteful use of what other resource? water
 - What have some environmentalists claimed has also resulted from fracking (lecture)? pollution of groundwater and destabilization of the Earth's crust leading to minor earthquakes.
 - Why is European reliance on natural gas a "geopolitical" problem (lecture)? EU is a big consumer of Russian-supplied natural gas which reaches EU thru pipelines that run thru Ukraine and under the Baltic Sea (Nordstream). Some EU countries like Finland and Germany are more dependent on Russian supplies.

15. Alternatives of Fossil fuels. (Rubenstein p 408 – 413)

- a. What other non-renewable source produces 14% of the world's electricity? nuclear power
- What process does this require? fission, splitting uranium atoms in a controlled environment.
 - What European countries are most dependent on this source (incl. %)? France (80%) more than 50% in Belgium, Slovakia and Ukraine
 - What US states are the most dependent on this source (incl. %)? 70% in Vermont, more than 50% in Connecticut, New Jersey and South Carolina
 - What are five challenges that result from the use of this energy source?
 - potential accidents (meltdowns) rare, but when they happen!!!!
 - What are two examples of this challenge?
 - Chernobyl (USSR, Ukraine)
 - Fukushima (northern Japan)
 - radioactive waste remains lethal for many years
 - Where did public opposition, reverse a plan to deal with this challenge? Yucca Mountain, Nevada
 - bomb material
 - limited reserves of uranium
 - Where are these reserves concentrated? Australia (29%), Kazakhstan (13%), Canada (9%), Russia (9%)
 - high cost
 - Why is this? elaborate safety measures are required
 - What "future" process could be an answer to these challenges? nuclear fusion
- b. Define renewable energy. has a theoretically unlimited supply that can't be depleted.
- Complete the following chart summarizing renewable energy sources.

Source	Definition	Use/Distribution	Trends/Limitations
Biomass (example)	Burning wood, plant mat'l & animal waste	Still imp. in LDCs (1/3 rd of prod. in N. Amer, Eur., LDCs) Brazil uses to fuel vehicles	Inefficient = uses more energy to grow than is supplied Crops are used for other things (higher food prices) deforestation
Hydro-electric	Movement of water generates elect.	2 nd most pop. source of electricity Brazil gets 80% of electricity Canada gets 60%	Disrupts ecology by damming rivers Few acceptable sites remain in US
Wind	Turbines spin to generate electricity	China, N. Amer, Europe ≈ 90%	High cost of construction, not all areas are windy Some see as noisy, lethal for birds/bats or a visual blight in visually appealing areas (coasts, mountains)
Geo-thermal	Hot water or steam created by heat from Earth's interior	Volcanic areas, along tectonic plate boundaries Iceland heats all homes/biz	Only available in limited areas also subject to volcanoes and earthquakes.
Solar	generated from Sun Passive – collects heat w/out devices (south-	Only 1% in US, potential is limitless.	Portable units can be used by remote people in LDCs for small usage without large infrastructure investment

facing windows, greenhouses, etc.) Active – collects solar radiation through devices to heat or generate electricity through photovoltaic cells	Sun's energy is free and ubiquitous Does not cause pollution	Need improved efficiency and lower photovoltaic costs to reach "grid parity" (the price it takes to bring this type of electricity onto the power lines) with cheaper sources (largely coal) Some experts say "grid parity" is here or right around the corner due to cheap Chinese manufacturing of photovoltaic cells.
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16. Pollution (Rubenstein p 414 – 419). Define "pollution". more waste is added to air, water and land than these resources can handle.

- i. What physiological density and population term can also be used here to describe the environmental limit that waste must exceed in order to cause "pollution" (lecture)? carrying capacity
- a. What are the three major human activity sources of air pollution? factories, power plants, motor vehicles
 - i. In what two countries is local-scale air pollution the worst? China and India
 - What environmental conditions makes local scale air pollution worse? light winds, clear skies and temperature inversion (air is warmer higher up and cooler near the ground) more common in valleys, basins (L.A.)
 - o What Latin American city exemplifies this problem (lecture)? Mexico City
 - ii. What is an example of regional-scale air pollution? Define. acid deposition which is the accumulation of acids incl. sulfuric acid and nitric acid which can fall as acid precipitation (acid rain)
 - What damage does this phenomenon cause? damages lakes, killing fish and other aquatic life, on land it can injure plants, harm worms and insects and corrode buildings and monuments made from marble or limestone.
 - Why are geographers particularly interested in this type of pollution? bc the worst damage is not experienced at the same location as the emission
 - iii. According to UN scientists (well almost all legitimate scientists really) what global-scale air pollution problem has been linked to human activities? climate change
 - What has happened to the Earth's climate since the late 1800s? increased by 1°C (2°F)
 - o What has this been caused by? humans burning fossil fuels in factories/cars
 - o What is the greenhouse effect? incr. in the Earth's temperature caused by carbon dioxide trapping solar radiation by the surface of the Earth.
 - o Describe the general relationship between wealth and carbon dioxide emissions? as a country's per capita income increases, emissions also increase BUT Europe is an exception w/ high wealth and declining emissions
 - What other global-scale pollution problem has been addressed by global agreements? Ozone Damage
 - o What role does ozone play? protects the Earth from ultraviolet radiation
 - o What damage can radiation cause? damage plants, cause skin cancer, disrupt food chains
 - o What threatened the ozone layer? chlorofluorocarbons (CFCs) such as freon found in air conditioners and refrigerators
 - o What international agreement was designed to address this problem (lecture)? Montreal Protocol
 - o What has been the result (lecture)? ozone layer will revert to pre-1980 levels by mid-century, 2 million skin cancer cases avoided by 2030.
- b. What other vital resource is threatened by overuse and pollution? water
 - i. What are the three major areas of demand for water? agriculture, industry and municipal sewage systems.
 - What agricultural activity in the US is an especially high consumer of water? raising animals/livestock
 - ii. What do humans dump into water that causes Biochemical oxygen demand (BOD)? organic waste
 - Describe how BOD happens? too much decomposing waste causes water to be oxygen starved which kills fish
 - iii. What have scientists recently discovered as a pollutant affecting aquatic life and the food chain? plastic
 - iv. In what two ways can water pollution be categorized? point source and nonpoint source
 - Define point-source water pollution. pollution enters water at a specific location
 - o Two main sources of point-source water pollution? manufacturers, municipal treatment
 - o What legislation has led to much higher water-quality standards? US Clean Water Act (1972)

- What are three water-borne diseases are major cause of death in developing countries due to untreated drinking water? cholera, typhoid and dysentery
- Explain the principal non-point source of water pollution. (phosphorus) agricultural runoff of fertilizers and pesticides (from general, non-specific location)
- What is an example from the U.S. of this problem (lecture)? Lake Erie has experienced algae blooms as the result of agricultural run-off. Shallow depth makes this extreme in the western portion of the lake

c. Solid Waste Pollution (Rubenstein p 418 – 421)

- How does the creation of solid waste differ between MDCs and LDCs? 2x higher in MDCs
- In the US, what are the major sources of sold waste (inc. %)? residences (60%) businesses (40%)
 - List some examples of the most common forms of solid waste. corrugated cardboard, newspapers, manufacturers also discard lots of metal
- What is the most common method of disposing sold waste in the US? sanitary landfill
 - How does this differ significantly from the what we dispose of air or water waste? concentrate solid waste while dispersing air/water pollutants
 - What pollution problem can happen from the concentration of solid waste? groundwater pollution can result from decomposition of solid waste leaking from landfills
 - How has the number and scale of landfills changed since the 1990s? # of landfills has declined by 3/4ths, regional landfills have gotten bigger
 - Besides increased size, what has led to increased landfill capacity? compaction
 - What are some communities (usually wealthier) doing in order to address their sold waste problem? paying to use landfills elsewhere
- (skip to p 420) What two strategies could help reduce sold waste? recycling and remanufacturing
 - Define recycling. the separation, collection, processing, marketing and reuse of unwanted material
 - Detail the extent of recycling in the developed countries of Germany, Japan and the US. Germany (65%), Japan (19%), US (34% in 2015)
 - Define remanufacturing. items are reused in manufacturing incl. paper, plastic, glass and aluminum
- (back to p 419) Disposal of what type of solid waste is especially difficult? hazardous waste
 - Include examples. heavy metals (incl. mercury, cadmium, zinc), PCB, oils from electrical equip, cyanides, strong solvents, acids, toxics
 - What economic activity is the largest hazardous waste polluter? mining operations
 - What effects can the release of these materials into the land have? may leak into soil and contaminate groundwater or escape into atmosphere causing cancer, mutations and chronic ailments

d. Impacts of Near-future Changes in Vehicles (Rubenstein p 496 – 497)

- In what three ways will vehicles be "electrified" in the near future? Describe briefly.
 - plug-in hybrid, battery supplies power at all speeds. Battery can be recharged by gas engine or plug-in. gas engine extends range
 - full electric w/ lithium ion battery. No gas engine
 - What are two challenges faced by this method? lack of recharging stations and disposal of lithium batteries
 - hydrogen fuel cell, hydrogen + oxygen produces a charge. NE has hydrogen refueling stations
- Why is the electrification of vehicles sometimes NOT considered sustainable? the source of electricity might not be sustainable
 - What % of US electricity is generated from the burning of coal? 27. From natural gas? 35
 - Why does the switch to electric vehicles have a different effect on air quality depending on the region of the US? bc electricity is generated differently in various regions. In Pacific NW (where electricity is generated by hydroelectric dams) recharging vehicles will cause less pollution than in the Midwest (which is more dependent on coal-generated electricity)

17. UN Sustainable Development Goals

#	Goal	Comment
Economic		
1	End poverty in all its forms everywhere	Poverty reduced by 50% (1990 – 2010) but in 2018, 766 million still lived in EXTREME poverty, defined by the World Bank as earning < \$1.90/day.
7	Ensure access to affordable, reliable, sustainable and modern energy for all.	1/5 th lack access to electricity and fossil fuels are the principal contributor to climate change.
8	Promote inclusive and sustainable economic growth, employment and decent work for all.	UN wants to increase GDP/capita at least 7%/year in LDCs
9	Build resilient infrastructure, promote sustainable industrialization and foster innovation.	UN estimates 1.5 billion people lack access to reliable phones.
10	Reduce inequality within and among countries.	Income inequality has increased since 1990 within and between countries.
11	Make cities inclusive, safe, resilient and sustainable	Rapid urbanization has put pressure on water, sewage systems and health; 828 million people live in what the UN defines as slums. (rural → urban migration/squatter settlements)
12	Ensure sustainable consumption and production patterns.	1/3 of food rots or spoils (UN) because of poor transportation and harvesting methods.
Social		
2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture.	803 million undernourished (2018) per UN. Double agricultural productivity by 2030.
3	Ensure healthy lives and promote well-being for all at all ages.	Progress has been made in reducing infant and maternal mortality, UN hopes for further reductions by 2030.
4	Ensure inclusive and quality education for all and promote lifelong learning.	UN wants all children to attend school. 61 million do not attend primary school. More than ½ of those is sub-Saharan Africa.
5	Achieve gender equality and empower all women and girls.	Gender inequalities have been reduced but persist in all regions.
16	Promote just, peaceful and inclusive societies.	The UN estimates that corruption, bribery, theft and tax evasion costs LDCs \$1.26 trillion annually.
Environmental		
6	Ensure access to water and sanitation for all.	884 million people lack access to drinking water, and 2.3 billion lack access to toilets or latrines
13	Take urgent action to combat climate change and its impacts.	It is not too late to reverse the recent sharp increase in carbon dioxide emissions that are producing climate change. Sharp decrease in fossil fuel use, incr. use of renewable energy, carbon capture and storage.
14	Conserve and sustainably use the oceans, seas and marine resources.	Progress has been made in water quality (Clean Water Act), but overfishing is a problem.
15	Sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.	Drought, desertification and deforestation are negatively impacting agriculture and biodiversity.
17	Revitalize the global partnership for sustainable development.	Overall aid has increased from MDCs to LDCs