Geography Notes

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2.1.1 Understanding Development

Types of Development

Economic Development
Can be both quantitative (money) or qualitative (*e.g.* infrastructure)

Socio-political Development
Relates more to society (*e.g.* education, health care, safety, freedom of speech)

Sustainable Development
Takes into account environmental factors

Cultural Development
Involves participation in cultural activities, cultural cohesion or dislike of other cultures, interpersonal trust, computer use, freedom of self-determination etc.

Approaches To Development

Top-Down Approach

- Large scale, centrally planned and controlled
- Local population is not involved in decision-making process
- Premised on the occurrence of strong trickle-down or 'spread' effects - modernization will inexorably spread from urban to rural areas

Development Models (Top-Down Approach)

Core-Periphery Model (CPM)

- **States that:** Sustained economic growth over long time periods (higher marginal productivity of core, with peripheral urban areas working to supply their core) leads to greater level of interdependence → progressive integration of the economy (convergence of income & welfare differentials)

Stage 1 Pre-Industrial Economy	Independent local centres with **no hierarchy** • Communities are isolated and self-sufficient, with minimal economic flows with other centres • No surplus production • Represents pre-colonial/pre-industrial stage
Stage 2 Colonial Expansion	Usually **transitional and unsustainable stage** • Single strong centre (usually the result of colonialism) • Rapid growth in core with **urban primacy** • Core feeds on peripheries and peripheries are drained • Advantage tends to benefit only a small elite of urban consumers located at the core
Stage 3 Multi-Nuclear Model	Typical industrial economy • Development of sub-cores, leaving a series of inter-metropolitan peripheries → **multiple core model** • Point of polarisation reversal (development starts to be concentrated in parts of former periphery)

Stage 4 Post-Industrial Economy	• **Functionally interdependent system** of urban cities where there is no longer a periphery • All urban areas depend on each other with flows of capital and people in both directions

- **Limitations of the CPM**
  - The model is descriptive and simplified instead of explanative
  - CPM assumes that economic development will ultimately lead to a spread or trickle-down effect
    - However, in reality, government intervention is required for a transition from 2rd to 3th stage.
  - The model suggests a core with multiple peripheries; however, there can be multiple cores with multiple peripheries too
    - A core can also be a periphery at the same time

Dependency Theory

- **States that:** While capitalism produces wealth in core areas, it also engenders poverty and underdevelopment in periphery areas
  - Colonial powers (core) develop by extracting the surpluses of the colonies (periphery) and perpetuate their underdevelopment
  - Underdevelopment in poorer countries (periphery) is a result of their relationship with richer, more powerful countries (core); regions that are the most underdeveloped today had the closest links to cores in the past
    - Not because the peripheries have lesser resources, knowledge, cultural development, etc, but because they were (and are still being) exploited by richer, more powerful countries
    - Hence severing ties with the cores is the way to progress
- Theory focuses on importance of understanding historical context (like colonial history) of underdeveloped societies to understand the existing system of exploitation of the periphery by the core

Case Study: ***Brazil***

- Portuguese colonial powers extracted resources like hardwood, sugar, gold and diamond from Brazil to be transported back to Portugal
- Cities like Rio de Janeiro, Sao Paulo and Parana played a huge part, and developed initially, but development was a form of satellite development (not sustainable as development was neither self-generating nor self-perpetuating)
- When Portugal pulled out, productivity declined → decline in foreign and local economic interest → **underdevelopment**

- **Limitations of Dependency Theory**
  - Suggests that poorer regions have to delink from the core (i.e. global economy) to develop → In a globalized world, such a possibility is difficult
  - Ignores advantages colonial power can bring to colonies:
    - Singapore and Hong Kong inherited urban, infrastructural and legal systems from British
  - Ignores internal agencies within peripheries → Factors like poor governance and corruption can be as destructive as exploitative cores

Bottom-Up Approach

- Smaller scale (to help local periphery area)
- Local population initiates, plans and controls development and is involved in decision-making process → seeks to empower those at the bottom
- Bottom-up strategies are varied and stress alternative paths to development → can involve partnerships on different levels:
    - State ←→ NGOs
    - State ←→ local community
    - NGOs ←→ local community
- Regardless of aims or strategies of bottom-up development, this still requires strong state control with clear direction to make it possible

Case Study: ***Peru***

- Micro-hydro scheme initiated by Practical Action (an NGO) that brings miniaturized hydroelectric dams to rural, remote villages to provide power
- Especially useful for villages with very low per capita income, as it provides cheap electricity, allowing access to technology, as well as keeping government expenditure low → win-win situation
- Part of the cost is paid for by the local villagers → instils local ownership

Development Indicators

Gross National Product (GNP) per capita

- Total domestic and foreign value of a nation divided by total population
- **Limitations:**
    - No indication of distribution of national wealth → not indicative of inequality within the country
    - Reveals little about quality of life or well-being of society
    - Environmental and social factors not considered

Human Development Index (HDI)

- Indicator combining different factors of development:
    - Life expectancy
    - Educational attainment (adult literacy and combined primary, secondary and tertiary enrolment)
    - GNI per capita in purchasing power parity (PPP) in US dollars
        - ***PPP:*** *ability to buy local goods and services*
- Countries with the highest HDI are Norway, Switzerland and Australia, while those with the lowest are Eritrea, Central African Republic and Niger
- **Limitations:**
    - Reflects long-term changes like life expectancy and may not respond to recent short-term changes (*e.g.* outbreaks in diseases)
    - Composite indicator → shows general idea of country's development, doesn't show specifics; not all data is available at any one time
    - Development is defined by the Western world, meaning it might not apply to all communities (*e.g.* some rural communities pass down education by word of mouth, art and dance rather than formal schooling)
    - Does not take environment (*e.g.* pollution) or inequality into account
    - Higher HDI due to increase in GNI does not necessarily mean an increase in economic welfare of people → depends on how it is spent

Multidimensional Poverty Index (MPI)

- Tabulated using 2 aspects:
  - **Incidence:** % of people who are poor
  - **Intensity:** average % of dimensions in which poor people are deprived
- Indicator combining different aspects of poverty:
  - **Education:** years of schooling, child enrolment
  - **Health**: child mortality, nutrition
  - **Standard of living:** electricity, drinking water, sanitation, flooring, cooking fuel, assets
- **Benefits:**
  - Can be deconstructed by region, ethnicity and other groupings → good tool for policymakers to know where to provide more help and monitor impacts of policy intervention
  - Identify those with greatest intensity of poverty → effective and targeted allocation of resources → help address MDGs strategically
  - Can be adapted to national level using indicators and weights that make sense for the region and thus adopted for poverty eradication programs
- **Limitations:** Some of the criteria used to measure standard of living in the MPT are highly contextual

Indicator	What MPI looks at	Exception
Flooring Indicator	A floor made up of dirt, sand or dung indicates poverty	Many informal settlements in urban areas in Asia and Latin America (like favelas) have buildings with two or more floors made of concrete
Sanitation Indicator	Lack of an improved toilet or shared toilet indicates poverty	Pit latrines do work well in low population density rural areas but not in high density urban areas
Cooking Fuel Indicator	Use of wood, charcoal or dung indicates poverty	In many squatters across Philippines, many homes may use LPG or CNG for fuel but still live in dire poverty

GINI Coefficient

- Measurement of income distribution; helps define gap between rich and poor
- Ranges between 0 and 1; can also be expressed as percentage, from 0-100%

Variations in Levels of Development

- Gap between richest and poorest is continuing to widen - richest 1% of world's population receive as much income as poorest 57%
  - 80:20 rule where top 20% get 80% of income, resources, etc in the world
- Ratio of income of world's richest 20% of population to world's poorest 20% of population
  - 1960 – 30:1
  - 1980 – 45:1
  - 2000 – 70:1

Millennium Development Goals (MDGs)
8 MDGs, agreed by UN in 2000, each to be achieved by 2015:

1	Eradicate extreme hunger and poverty
2	Achieve universal primary education
3	Promote gender equality and empower women
4	Reduce child mortality
5	Improve maternal health
6	Combat HIV/AIDS, malaria and other diseases
7	Ensure environmental sustainability
8	Develop a global partnership for development

MDG Post-2015

- Good progress with some goals in some parts of the world, but overall progress is best described as 'patchy'
    - *E.g.* For major targets of eradicating hunger and poverty (by reducing by half the proportion of people living on less than US$1 a day), the measure has fallen in general, with substantial progress in Southern, Eastern and South-East Asia, but little progress in Sub-Saharan Africa (>40% of population still live in less than US$1 per day)
- While some poorer nations are showing enhanced incomes in relation richer nations in the West, majority are continuing to fall further behind

2.1.2 Geography of the Global Economy

Sectors of the Economy

Primary

- Exploitation of national resources that are usually transformed to form usable goods; includes industries such as agriculture, fishing, mining and oil extraction
- Still a significant share of activity in LDCs, but this sector is declining overall

Secondary

- Transformation of primary commodity into final use by consumers or components for incorporation into other final products
- Sector still expanding in LDCs but contracting in most DCs
- Can range from labor-intensive, low-tech manufacturing to high-tech, automated manufacturing

Tertiary

- Distribution of outputs of secondary sector to places and markets where they can be assembled, consumed or purchased;
    - *E.g.* retail trade, transportation, entertainment, personal services
- Improvements in transport, telecommunications and computing technology since the 1980s have transformed operation and reach of firms in both secondary and tertiary sector

Quaternary

- Intellectual services that assemble, transmit and process information, knowledge and expertise used by activities in the 3 other sectors
    - *E.g.* banking, finance, business, professional services, media, insurance, administration, education, R&D
- Share of tertiary and quaternary sectors in total has expanded steadily and now account for around 80% of jobs in many developed countries

Transnational Corporations (TNCs)

TNC: *Firm that controls and coordinates other firms' activity in more than one country*

Some Categories of TNCs

- Agribusiness (Monsanto, Del Monte)
- Petrochemical (Shell, Chevron)
- Textiles (Nike, Zara)
- Motor car (GM, Ford)
- Electronics (Apple, Samsung, Sony)

Foreign Direct Investment (FDI)

Directions of FDI

- **Inward FDI**: invest which a country received from another country
- **Outward FDI**: investment which a country spends in another country

What can be considered a FDI?

- Factories; for example, when Toyota sets up a factory in Thailand, Thailand considers the move inward FDI while Japan considers the move outward FDI
- Mergers and acquisitions
- Diversification of TNCs through buying up shares in another company

Positive Impacts of TNCs

Direct job creation

- Many poorer economies would not be able to provide enough jobs for their rapidly growing population, leaving many people unemployed without TNCs
- Thus, TNCs, especially those in manufacturing sector, play an important role in job creation in these countries through labour intensive nature of production

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Industrial linkages

- These linkages are created when a TNC needs raw materials from other (local) companies; removes the need for TNC to invest in other industries
- *E.g.* Nike can create industrial linkages with rubber plantation owners in Thailand or Indonesia when they require rubber to make their products → aids economy

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Joint Ventures (JV)

- JVs are mutually beneficial partnerships between companies. In this case, partnerships between TNCs and local companies help to develop local economy
- Inevitable transfer of skill, knowledge and technology leads to development of local talent, and thus the workforce of the host country

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Structural shift of economies

- FDIs allow LDCs to shift from agrarian to industrialised economies (perceived as a positive as it involves moving to a higher value economy)
- Primary industries, though important, are less profitable, while being vulnerable to fluctuations such as weather and changes in global demand

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Multiplier Effect

- Injection of money can lead to more money being 'created' when it gets reinvested in economy

Case Study: ***Coca-Cola in China***

- Direct employment of 13,800 workers by Coca-Cola led to a multiplier effect of 30, indirectly employing 414,000 workers in total (*e.g.* glass suppliers)

Microfinancing

- Some TNCs help local communities by granting small loans → important avenue for entrepreneurship and a possible future of economic independence for many people living in LDCs (e.g. Citibank Citi Foundation, Grameen Bank)
- Scholarships are also given out by TNCs such as Shell and Philip Morris to help the people in LDCs
- Granting of microloans with low or sometimes no interest is crucial in preventing desperate loaning of money from illegal money lenders → helps to stop vicious circle that makes the poor poorer

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Environmental and Social

- Some TNCs may contribute to reforestation efforts in countries, *e.g.* Daikin in Indonesia
- TNCs may participate in the 'fair-trade' international label requirements, *e.g.* source locally and pay its farmers fairly

Negative Impacts of TNCs

Impermanence of jobs

Footloose TNCs

- Economies heavily dependent on manufacturing will face massive unemployment and loss in GDP when spatially mobile (footloose) TNCs relocate
- *E.g.* in mid to late 1990s, many hard-disk manufacturers such as Seagate and Maxtor pulled their production out of Singapore → massive unemployment overnight → workers were unable to find new jobs quickly as the jobs they have been doing were considered repetitive and low skilled

Flexible production systems

- TNCs practice flexible production systems resulting in impermanence of jobs
- Examples of flexible production systems
    - *Just-in-time production:* TNCs do not hold an inventory of stocks, instead ordering from suppliers when needed → reduces storage costs for TNCs
    - *Outsourcing:* TNCs outsource their production to third party subcontractors → can relocate easily as they do not own infrastructure
    - *Flexible business practices:* Hire & fire policy of Western TNCs, instead of secured employment in Japanese TNCs

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Minimal transfer of skills that result in labour immobility

- Bulk of TNCs' investments, especially manufacturing TNCs, are assembly line jobs which require low-level skills and are repetitive
- Many workers have skills which are not transferrable to other industries (workers are 'de-skilling'); workers who are laid off find it hard to transfer their skills to other industries unless it is of the 'same type' (i.e. assembling, packing, etc.)

Exploitation of cheap labour

- Workers may be paid higher wages in absolute terms but are paid a lower wage relative to their productivity (they make less than they should)
- Many workers in LDCs are paid less than US$2/day

Profit repatriation

- Profits are remitted back to firms' home countries (*e.g.* In 2012, Coca-Cola repatriated $6.1 of the $9.8 billion earned in China back to the US)
- *However,* profit repatriation can be avoided through corporate taxes imposed by local government (*e.g.* Singapore has a 17% corporate tax)

Leakages

- Refers to revenue lost to other economies, like when TNCs import most of their raw material from another country rather than sourcing from the host economy, resulting leakage and lowered multiplier effect

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Economic hegemony

- TNCs domination on global economy makes it hard for SMEs to compete
    - Price wars, predatory pricing, product differentiation

- Stifling of local competition and entrepreneurship (especially evident in countries like South Korea and Japan, whose economies are dominated by large TNCs which are family owned conglomerates, called chaebols or keiretsus)

Geography of uneven development

Case Study: ***Maquiladora Border Effect (USA-Mexico)***

- In border areas in Mexico, maquiladoras receive more investment as a result of the North American Free Trade Agreement (NAFTA) due to the availability of cheap, unskilled labour, proximity to US (reduced transport cost) as well as cheaper land costs, all of which benefit American TNCs
- **Uneven development within a country:** Even though the border regions have benefitted greatly from the investments, unemployment in the southern regions remain as high as 40%, and competition for jobs is high
    - The disparity has also contributed to rising social inequality
        - Only the rich can get high-paying jobs
        - Rise in drug cartel/gang recruitment as people try to earn money
    - Corrupt government institutions further diminish economic gains
- **Uneven development between countries:** Due to NAFTA, Mexican farmers have restriction of subsidies which do not apply to American farmers, resulting in the dumping of surplus American crops into Mexican market → agriculture TNCs from USA benefit more than small local farmers in Mexico
    - USA as the core while Mexico is periphery
- Maquiladora Border Effect can also be observed between JB and Singapore, Hong Kong and Shenzhen

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Sweatshop phenomenon

- Poor, inhumane working conditions (long hours standing, low pay, petty punishments, poorly ventilated and unsafe workspaces etc.)

Case Study: ***Gap, Inc. in Bangladesh***

- Sweatshop phenomenon observed in Bangladesh, children as young as 10 are bought from parents to work and are exploited, some unpaid; 60% of the children report being abused by supervisors
- 1 in 10 workers are under age of 14, 8 million workers below 17
- Child labor brings half of 5 million working children below 14 out of education system, causing adult literacy to stagnate at a low 57%

Rise of 'consumerism-culture'

- TNCs promote an excessive local consumerism culture (*e.g.* Nike may promote a 'fashion culture' which is not necessarily a healthy lifestyle)
- TNCs promote the homogenisation of cultures on a regional and global scale → lead to rise of 'global monoculture', also known as 'McDonaldisation'

Environmental impacts

- Large TNCs have been responsible for large-scale environmental disasters

Case Study: ***Shell in Nigeria***

- Pipelines built above ground through farmlands, in front of houses result in oil leakages → water pollution, spills making agricultural land infertile, devastating health and economic consequences
- Nigerian government is not stopping Shell → several environmental and human rights activists executed (e.g. Ken Saro-Wiwa)

Further perspectives of TNCs

Culture Embeddedness of TNCs

- Cultural embeddedness of TNCs are often tied to their country of origin
- *E.g.* Japanese TNCs despite being global still practice traditional cultural norms, such as loyalty to the organisation, diligence (expected to work overtime without additional pay), presence of a well-established corporate hierarchy, and male leadership.

Reverse Outsourcing

- Outsourcing of production back to TNC's home country
- Usually occurs due to concerns with protection of intellectual property, product quality control, rising demands for higher wages and geopolitical instability, etc.
- *E.g.* Apple moved some parts of the MacBook assembly line back to Austin, Texas, USA in 2013

New International Division of Labour (NIDL)

- In early 19th century till 1950s, the traditional international division of labour (IDL) was the prevalent mode of trade
  - Periphery (colonies) provided raw materials and agricultural products → for industrialised economies of the 'core' (Western Europe and USA)
  - High-value manufactured goods were mainly exchanged between richer, more industrialized countries and some were exported back to LDCs
  - IDL promotes the Fordist production system (Just-in-Time production), where one product is mass produced "in case anyone wants it" → became increasingly unfeasible logistically
- However, from 1960s onwards, the NIDL started to emerge
  - TNCs created labour-intensive export platforms in newly industrializing economies (NIEs) in response to falling profits in core countries
  - NIEs in 1980s (including Singapore, Hong Kong, Taiwan and South Korea) started gaining prominence and became sub-cores (and even cores)
  - NIDL promotes a form of post-Fordist production (Just-In-Time production) where there is mass production that allows for customization

Causes of NIDL

Pull Factors

Shift in comparative advantage to NIEs

- Factors of production (land, labour, capital and entrepreneurship) are more abundant in NIEs as compared to DCs

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Advances in production technologies

- Allowed for fragmentation of the production process (manufacturing of different parts done separately)
- Started the search for cheap and efficient labour, later found in LDCs with a youthful population as a plentiful source of labour

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Unsaturated consumer markets in NIEs

- Markets in DCs have become over-saturated
- Economies in NIEs were becoming increasingly attractive due to rising middle class population with a growing disposable income → relocating to these countries made more economic sense to TNCs

Improvements in transport and communications

- Increase in affordability and accessibility
- Advances in air transport and container shipping, which allowed for the transportation of large volumes of goods at a low cost (containerization)
    - Also facilitated movement and tracking of these products

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Role of state and supranational bodies

- Set up Special Economic Zones (SEZs) such as specially demarcated hubs, industrial/technology/bio-technology parks, e.g. One-north, Jurong Island
    - Allows companies to enjoy external economies of scale as a result of economies of agglomeration, where firms share pre-built infrastructure which will help them cut costs ('plug-and-play infrastructure')
- Use of policies which favour TNCs like tax incentives

Case Study: ***NIDL in the EU***

- Despite NIDL, manufacturing has remained in developed economies like Germany because of EU's open market → free flow of goods, capital, labour
- *E.g.* TNCs like BMW manages to keep manufacturing in Bavaria, Germany by employing cheaper labour from Eastern European countries like Poland, Czech Republic and Slovakia

Push Factors

High labour costs in developed countries

- Strong labour unions in DCs such as USA often bargain for higher remuneration, benefits, severance packages and pension funds, translating to more than 25% higher labour costs for TNCs
- Compared to, say, Singapore, which has a nationalised trade union (NTUC); works as a bridge for the government, employers and employees → harmonious union has become a rather attractive incentive for TNCs to locate to Singapore

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Saturated markets and changes to product life cycles (PLC)

- New state-of-the-art products are usually manufactured in developed countries initially, and then relocate to economically poorer markets towards the end of its product life cycle to save costs
    - Saturated markets for some goods forces firms to lower prices in DCs
    - In DCs, these goods are already obsolete while households in LDCs are still aspiring to own them
- Weight gaining products are costly to ship and manufacturing may move closer to where demand is to save on transportation costs and time
    - ***Weight-gaining products:*** *products which gain in weight and bulk as it moves down the production chain, such as computers and cars*

Resistance to change from supranational institutions

- For example, each country in the EU have the right to veto a policy → bureaucratic red tape acts as an impediment for TNCs to do business there and drives them to relocate manufacturing to LDCs
- *e.g.* Germany ranked #107 in ease of starting business

Global Production Networks (GPN)

GPN: *a network system that is coordinated and controlled by globally significant TNCs across geographical and temporal boundaries and involves a network of overseas affiliates, through which a specific good is produced, distributed and consumed.*

- Results in a situation where one country's development is intrinsically linked to another's, making economies interconnected and interdependent with others

Case Study: ***What does Singapore do to plug itself into a GPN?***
Singapore is consistently ranked 1st in Ease of Doing Business Index, which measures legal and financial state regulations on a business (including last year in 2015)

- Political stability, low corruption (7th least corrupt government in the world)
- Low corporate tax (17% in 2010, which is among lowest in the world)
- Investments into R&D (Singapore commits $19 billion to R&D this year)
- Provides plug-and-play infrastructure for firms ($30 billion in Fiscal Year 2015), as well as SEZs such as Biopolis and Fusionopolis
- Provision of skilled labour through Singaporean education system
- Well established global transportation hub (Singapore Changi Airport is one of the busiest and connected airports regionally and globally; the Port of Singapore is the world's 2nd busiest port)

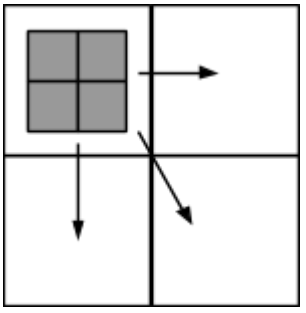
Intra-firm Networks

- Capacity of firms to capture the value of GPNs is determined by the ability to utilise local human and natural resources, as well as of the political and social environment of the host country

Corporate and regional headquarters
• Formulate important strategies and make decisions • Most TNCs will have one main corporate HQ and some regional HQs
Research and development (R&D) facilities
• Activities include product development, new process technologies, operational research, etc. • Higher level of R&D is usually carried out in corporate HQ, with lower level R&D being conducted in the regional HQs (focus more on localisation of products according to needs of individual markets) • Due to intellectual demands of R&D, more of it is conducted in DCs with a higher pool of educated and skilled labour as compared to LDCs with a large, youthful but poorly educated and skilled workforce
Transnational operating units
• Cover a wide range of labour-intensive activities from manufacturing, sales,

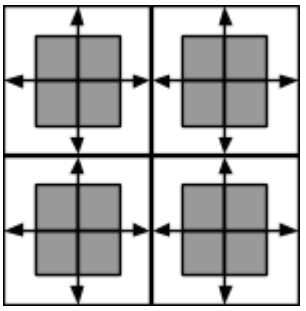
marketing to after-sales services
- Can be found all over the globe, but are located more in LDCs, with large youthful population who demand lower wages, resulting in lower costs

Globally Concentrated Production



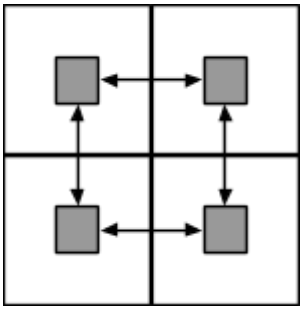
- TNC has tight control of subsidiaries; applies to some resource extraction and manufacturing industries
- Does not generally work well for service industries, as services are harder to export
- Most TNCs start with this strategy in their early years, when they are likely to concentrate production in their home country and export to the rest of the world
- Over time, evolution from this strategy is mostly due to changes in comparative advantage

Host-Market Production



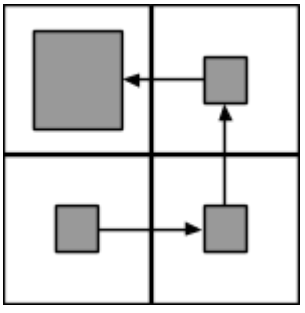
- Preferred where there are considerable barriers to trade in hosts (i.e. restrictions/taxes/etc on imports)
- Minimal centralised control → operation in hosts favor predominantly local business orientations and is very sensitive to local demand
- No sales occur across national boundaries as products and services are highly customised to local tastes and preferences, *e.g.* HSBC Asia vs HSBC America

Product-Specialization for a global or regional market



- Applicable mainly to manufacturing firms, *e.g.* electronics, automobile and petrochemical industries
- Regional production units have significant autonomy and may be involved in developing new products
- *E.g.* First-ever global design centre for HP's Imaging and Printing Group was opened in SG in 2010 while its high-end computer services remained coordinated by global HQ in California

Transnational Vertical Integration



PCS

- Most developed organisational structure, but very demanding in terms of management expertise and control to ensure strict coordination between units
- Main advantage is to exploit spatial variations in production costs

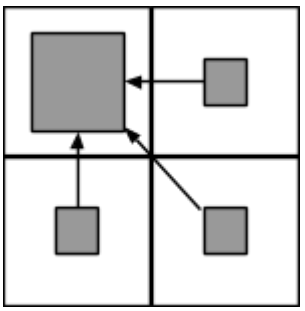
Production Chain Sequence

- Each production unit performs a separate part of the production sequence, and the output of one plant is input of next plant
- *E.g.* Zara – Cotton grown and fabric is spun in India → fabric is dyed in Bangladesh → dyed fabric goes to Spain or Portugal to be sewn into garments

Final Assembly Plant Production

- Each production unit performs a separate operation in a production process and ships it output to a final

assembly plant in another country
- *E.g.* Apple – Manufacturing of different components done in geographically dispersed countries like France, Japan, Costa Rica, etc, but final assembly in China



Final APP

Inter-firm Networks
- The governance of contractual relationships and technological linkages between firms and their suppliers determines the output of said firms

Original Equipment Manufacturers (OEM): Firms which produce products under a brand, send exact specifications for parts to other firms who then produce, exactly, the parts that the purchasing firms want
- The finished products are exactly the same as if the buyer had produced them (*e.g.*Foxconn, AsusTEK, Quanta manufacturing are OEMs for Apple)

Original Design Manufacturers (ODM): Firms which produce products under a brand inform other ODM firms what parts they are looking for, and buy whichever part suits their needs the best without providing exact specifications
- Supplier learns and develop new tech and expertise to engage in design and manufacturing → ODM firms design with their OWN specifications
- *E.g.* Sony produces iSight camera module for Apple iPhones; Samsung supplying around 100 million units of 5.5 inch panel OLED screens for Apple
- ODMs can also be OEMs that are engaged in designing their own parts and selling them under their own brand names

Subcontracting/Outsourcing
Engagement of independent firms to produce goods specifically for principal firm

Note:
- **Outsourcing** is when part of the production process is no longer done by TNC but by another company which is not owned by parent firm
- **Offshoring** is when part of the business locates overseas but may still be owned by parent firm

Commercial Subcontracting
- Supplier will produce OEM products at first so finished products are exactly the same as if the buyer had produced them
- To increase profits, supplier may learn and develop new technology and expertise over time and engage in ODM → create 'no-logo' products → sell to bigger companies for branding and distribution
- Buyers specialize in brand management and marketing of products bearing their brand name and is most common in electronics industry, *e.g.* prominent notebook commercial subcontractors like Quanta and Compal

Industrial Subcontracting

- Suppliers carry out only OEM production on behalf of its customers
- Do not engage in ODM and distribution to customers
- Common in sports apparel industry, *e.g.* Nike

Advantages of outsourcing	***Disadvantages of outsourcing***
• Frees up TNC to focus on R&D, marketing and advertising, which reduces risk and capital requirements • TNCs do not need to build infrastructure or manage employees → more flexible and spatially mobile • Lower labour costs	• Quality of products might be compromised unless QC is observed • Unpredictability of employment of local labour • Possible leakage of confidential trade info → piracy problems • Lack of stringent intellectual property laws or weak enforcement

Strategic Alliances, JVs and mergers and acquisitions

- Cooperative approaches to competition like strategic alliances and joint ventures result in firms usually sharing costs of R&D, expertise and labour, *e.g.* Star Alliance, Wal-Mart and Li & Fung
- In contrast, mergers and acquisitions necessarily undergo ownership change, e.g. Fuji-Xerox, ExxonMobil, Disney Pixar
    - **Mergers** are unions between similarly sized companies
    - **Acquisitions** are 'takeovers' of a small firm by a larger one

Franchising and cooperative agreements

- TNC owner of a registered trademark agrees to let a franchisee use those rights provided that the franchisee follows the TNC's guidelines (e.g. 7-Eleven, McDonald's, KFC)
    - Provides lower cost for service TNCs to expand into many markets
    - Service TNCs will not be exposed to risks arising from unfamiliar local cultures and social practices
- Allows TNCs to rapidly internationalise market presence and promote consumerism of products
- Cooperative agreements encompass a wide range of inter-firm relationships that range from licensing agreements to non-equity forms of cooperation

Case Study: ***Boeing***

Intra-firm networks

- *Corporate HQ:* Chicago
- *Regional HQs:* 17 of them in Australia, China, India, etc.
- *R&D facilities:* 11 Boeing research centres in Australia, Brazil, US, Russia, etc.
- *Transnational operating units:* Final assembly plant production
    - Originally in USA → shifted to China in late 2015

Inter-firm networks

- Subcontracting and customising of components from all over the world (e.g. Japan, France, USA, etc.)
- *JVs:* TATA (India), SIA Engineering (SG), Lockheed Martin (USA)

2.1.3 Governing the Global Economy

Roles of the State in the Economy

The Ultimate Guarantor

- Deals with financial crises
    - *E.g.* USA had to bail out GM, Chrysler and Ford in 2007-2009 financial crisis
- Guarantees national economic instruments, and maintain value of currency and government bonds that help finance national debt
- Securing international economic treaties (such as free trade agreements (FTAs) to advance common economic interests)
- Establish and maintain property rights and uphold the rule of law

Regulator

States often engage in a wide variety of regulation of economic activities, that take place within and across borders such as:

- *Market regulation* to ensure the 'fairness' of market
- *Regulation of economic flows*, which is important in a time of accelerated globalisation associated with massive cross-border flows of capital, commodities, people and knowledge
    - Regulate capital flows by restricting financial capital from entering and leaving country without complying with length regulatory procedures (e.g. Malaysia's response to 1997 Asian economic crisis)
    - Border regulation of labour flows and illegal immigration flows (e.g. refugees fleeing the Middle-East for the EU)

Manager of the national economy

- Trade strategies
    - Most states aim to encourage exports and limit imports
    - Most states have to adhere to trade organisations (e.g. World Trade Organisation, ASEAN Free Trade Area) rules
- FDI strategies
    - States combine tax incentives, availability of prime land, supporting industries and workforce characteristics to form an attractive package for foreign investors *(inward FDI > outward FDI)*
- Industry strategies
    - Simulate certain areas of economic activity, usually with financial incentive or corporate taxation
- Labour market strategies

Business owner

- States own some firms, which can be categorized into:
    - State-owned enterprise (SOEs): Public enterprises directly owned and **managed by the states**, *e.g.* Petrobras (Brazil), Petronas (Malaysia), Gazprom (Russia), Indian Railways
    - Government-linked corporations (GLCs): Business enterprises in which the state has a direct or indirect stake, yet **leave management to professional managers**. States may own some shares, but these firms are mainly operated as (mostly) autonomous, profit-driven businesses, *e.g.* Singapore Airlines, Temasek Holdings, Taiwan Semiconductor

Investor

- Certain states have become global investors through their own national funds, known as *sovereign wealth funds (SWFs)*. SWFs are developed through accumulation of capital through following means:
    - Huge resource endowments in home countries (e.g. oil in Norway and Saudi Arabia) and favorable economic situations
    - Significant trade imbalances through exports: surplus foreign exchange reserves are turned into national funds for global investment
    - Longstanding conservative fiscal management and discipline: significant govt budget surpluses over time are accumulated to form SWFs

Provider of public goods and services

Usually these goods or services are seen as too risky or unprofitable for individual private firms, yet are fundamental to population's well-being

- Transport
- Health
- Education
    - At tertiary level, most universities are dependent on state funding
- Infrastructure (especially basic facilities and amenities)

E.g. In SG, the state employs 141,000 civil servants in 16 ministries and more than 50 statutory boards. SG is recognised as one of the most efficient and least corrupt bureaucracies in the world.

Spatial Expressions of State's Involvement

- *District and industrial parks*
    - Focus on attracting light industries, e.g. garment manufacturing, furniture, home appliances, etc.
- *Industrial regions*
    - Heavy industries such as oil, refinery, chemical plants (e.g. Jurong Island as a petrochemical hub)
    - Usually more pollutive in nature and tend to be located further away from residential zones
- *Export processing zones (EPZs)*
    - Focus on manufacturing of goods specifically for export (e.g. Shenzhen and Batam have EPZs)
    - Usually located in countries with a comparative advantage in labour

Purpose of Setting Up These Zones

- Promote investments in specific area → spur economic development in specific area which the state intends to pursue
- Have clear demarcated zones for various industries, which may require specific infrastructure or are pollutive
- Provide tax relief/grants/holidays to targeted industries, thus encouraging TNCs to inject FDI into economy
- Have well-built infrastructure (also termed 'Plug & Play') → similar industries locate together to enjoy shared infrastructure → creates economies of scale → increases pull factor for TNCs

Global Financial Institutions (GFI)

World Bank Group

- Owned by member countries, and president is a national of the largest shareholder (US citizen)
- Initial purpose was to provide loans to European countries to rebuild economies after WW2; today, they provide loans for development, including:
    - Basic health and education provision
    - Social development and poverty reduction
    - Public service provision
    - Environmental protection
    - Private business development
    - Macro-economic reforms
- *E.g.* in 2008-2009, World Bank granted $58.8 billion in development assistance through loans and grants, with Africa and South Asia being the biggest recipients.
- **Controversy:** Some states and benefitted from World Bank's assistance and engage in virtuous circle of successful development pathways (e.g. post-war Germany, Japan, Asian NIEs), but other weaker and dependent states have benefitted less from the World Bank (e.g. Chile and Peru)

International Monetary Fund (IMF)

- Closely associated with World Bank Group
- Initial purpose to regulate exchange rate and lender of last resort
- Today, they resolve large financial deficits accrued by individual nation states by providing loans when economies are in trouble

Structural Adjustment Policies (SAPs)

- Before loans are granted by World Bank or IMF, a country will usually have to adopt SAPs, called 'Shock Therapy' today
- Open up country's economy to international markets, encourage more free trade

*Case Study: **Java***

- In Java, liberalisation of markets → increase in demand for agricultural goods, encouraging farmers to switch from less profitable staples to more profitable fruits and vegetables
- However, negative impact: increased profitability of these crops → encourage farmers to extend cultivation into steeply sloped volcanic soils, resulting in more soil erosion

However, SAPs are rife with controversies, such as:

- *Market entry of TNCs,* which forced many local SMEs into bankruptcy
- *Deregulation and privatisation of SOEs*
    - Which would most likely result in price increases of public utilities as they become profit-seeking enterprises, e.g. Bolivia in 1998
    - Artificially increased competition in the utility industries, resulting in price wars; burden of price increase is often left to the consumers
- *Reduced government public spending*
    - May result in healthcare and education becoming costlier for the poor, *e.g.* In Tanzania, cutbacks in public health services (esp. clinics and

maternity leave) led to increase in under-five mortality from 193 per thousand in 1980 to 309 per thousand in 1987
    - Leads to widespread unhappiness, social and political unrest
- *Devaluation of currency,* which may make exports more competitive but imports costlier; prices in the country increase especially for import dependent countries
    - *E.g.* Ghana success story: timber exports increased from US$16mil in 1983 to US$99mil in 1988. However, this reduced the Ghana forest area by 75%
    - *E.g.* Peru → currency devaluation in 1980s → fuel prices increased 31 times overnight, bread prices increased 21 times overnight
- *Sustainable development was not a priority* → World Bank and IMF did not consider environmental impacts, causing widespread environmental degradation
    - Ironically environmental protection would further state spending, went against main idea of SAPs of reducing govt spending

Poverty Reduction Strategy Papers (PRSPs)

- The successor to SAPs, PRSPs are strategic documents which IMF and World Bank use to coordinate aid to low-income countries
- Countries have to produce PRSPs as prerequisite for lending → written by national government but involving civil society, making it more bottom-up
    - Meant to be country-drive, result oriented, comprehensive, partnership-oriented and long-term
- Goals have to be in line with MDGs

World Bank Environment Strategy

- In recognition of neglect to the environment, World Bank published this strategy in 2001 with environmental sustainability goals
    - Improve quality of life, environment and poverty reduction
    - Improve quality of growth (sustainable)
    - Protect regional and global commons

World Trade Organisation (WTO)

- Main role to supervise and liberalise international free trade
- What WTO does:
    - Administers trade agreements
    - Provides a negotiating forum
    - Handles trade disputes
    - Monitors national trade policies
    - Provides technical assistance and training for LDCs
- **Controversy:** Some have claimed WTO and its enforcement of global trading rules has actually increased uneven development at the global scale
    - Many LDCs find it hard to engage in protectionist trade policies because of WTO rules, leaving their smaller domestic industries struggling to complete with TNCs
    - Many DCs like USA and EU continue to flout WTO rules by protecting domestic producers in politically sensitive sectors such as steel, clothing and agriculture
    - *Conflict of interest*, *e.g.* Guatemala & WHO vs WTO; Breast milk vs powder milk → Gerber Baby Foods Corporation has used the WTO to suppress a Guatemalan law that encouraged mothers to breast-feed their children

Involvement of Non-State Actors

NGOs by Scale

Community-based organisations

- Smaller scale, bottom up NGOs that arise out of people's own initiatives
- *E.g.* sports clubs, neighbourhood organisations, religious organisations

Citywide Organisations

- *E.g.* Rotary International, Lions Club International, chambers of commerce and industry
- *E.g.* LAMP community
    - Help homeless living with mental illnesses in Skid Row, LA
    - Holistic help with is customized such as mental health treatment, drug recovery, budgeting, etc., in addition to providing meals, shelter, etc.

National NGOs

- Provides aid on a national scale
- *E.g*. YMCA, Red Cross → they have state and city branches

International NGOs

- Usually have sufficient resources to implement projects on their own
- *E.g.* Save the Children Organisation, OXFAM, CARE, Ford and Rockefeller Foundation, International Red Cross

NGOs by Service

Charitable Orientation

- Top-down effort with little participation by beneficiaries
- *E.g*. Meet needs of poor → distribution of food, clothing or medicine; provision of housing, transport, clothes, etc.

Service Orientation

- Programme designed by NGOs and people are expected to participate in its implementation and receiving the services
- *E.g.* Provision of health family planning or education services

Participatory Organisation

- Self-help projects where local people are involved particularly in implementation of project by contributing cash, tools, land, material, labour, etc.
- In a typical community development project, participation begins with needs definition and continues into planning and implementation stages

Empowering Organisation

- Aim is to help poor people develop a clearer understanding of social, political and economic factors affecting their lives and strengthen their awareness of their own potential power to control their lives
- Maximum involvement of people with NGOs acting as facilitators

Watchdogs

- NGOs that critically monitor the activities of governments, industry, or other organisations
- Alert public when they detect actions that go against public interest, *e.g*. International Crisis Group, Centre for Digital Democracy, Corporate Watch

2.2.1 Valuing the Environment and Natural Resources

What Is A Resource?

- A resource is something which can be drawn upon for use
- *Natural resources* are taken by people and shaped into *manmade resources* for consumption in a capitalist market economy
- *Stock resource:* non-renewable natural resources that are finite and take millions of years to form, such as crude oil and fossil fuels
- *Flow resource:* renewable natural resources that are renewable within a short time; consists of *critical* (exhaustible if used beyond their regenerative capacity) and *non-critical* (non-exhaustible) zone resources

Human-Environment Relationships

Value of the Environment

- *Instrument value:* value as a resource to be used
- *Intrinsic value:* value outside of its economic value
- *Inherent value:* middle ground – value an element beyond its use as a resource but still relate it to how it makes us feel

Approaches to how we value resources

- Anthropocentric or human-centred
  - Only humans have intrinsic value and the environment is only of instrumental value
- Ecocentric or nature-centred
  - Humans as well as non-human entities have intrinsic value
- Deep and shallow ecology
  - Shallow ecology: anthropocentric position
  - Deep ecology
    - Form of ecocentrism where everything has intrinsic value
    - Consider humans as of equal value as non-human entities

Resource Appraisal and Factors Influencing It

Resource Appraisal: *The evaluation of a substance by society in respect of the functions they can perform and according to levels of development and aspirations of society.*

Cultural: Value systems and traditions

Local scale

- Some countries are more conscious of how they utilise resources than others; depends on the resources available and the number of people using resource
  - **Good:** Scandinavian countries like Norway have a more environmentally friendly approach → Norway has one of the highest renewable-resource use rate in the world
  - **Good:** The Hmong who reside in many parts of Asia practice shifting cultivation and hunting, which does not damage the ecosystem beyond its regenerative capacity
  - **Bad:** Rapidly industrialising countries like China and India adopt a rather piecemeal approach to the environment and are less willing to compromise economic development for environmental causes (but this mindset is changing in China more recently)

Regional and global scale

- Platforms like UN Climate Change Conference and agreements like Kyoto Protocol exist, but there is still limited concerted effort on a global scale
- Most countries still adopt varying approaches to resource appraisal and management due to diversity in culture, customs, politics and economies
- **Good:** EU has one of the most extensive environmental laws
    - Water Framework Directive aims to achieve good qualitative and quantitative status of all water bodies collectively
    - Euro 6 emission standards (collective emissions standards for all vehicles)
- **Bad:** Not much has been done in SEA to prevent haze

Socio-economic: income levels, education, profitability and pricing

Income and education levels

- **Good:** Richer countries like Singapore with labour expertise are able to adopt green and eco-friendly technological measures more readily, such as constructing eco-friendly buildings which utilise less energy and water by tapping on solar energy, energy efficient lighting and building design, rainwater capture for irrigation, green landscaping to reduce ambient temperatures, etc.
    - The public in wealthier countries is also generally more educated and thus socially willing to switch to eco-friendly alternatives
- **Bad:** Poorer countries may lack financial resources or technological knowhow and adopt a more utilitarian approach towards resources

Profitability

- To be profitable and practical to be tapped on for large scale economic use, it has to be:
    - Available
    - Accessible
    - Affordable
- *E.g.* recent technological advancement has allowed the profitable extraction of shale gas through fracking for countries like the USA; hydropower in Bhutan: seen as profitable, plans to install 10,000 MW of hydropower by 2020, of which 80% will be exported to India.

Market Pricing

- Price is determined by economists and traders in various commodity exchanges around the world through supply and demand; however, in doing so, the environmental cost of products is obscured
    - Environmental aspects are only sometimes factored into price such as adding cost of conforming to government environmental regulations (e.g. Carbon tax in Ireland in 2010)

Technological

- Technological advancements can provide substitutes for a resource → reduce demand and depletion of resource in favor of more renewable ones
- Access to technology is closely related to socio-economic condition of a country, since significant investments in R&D is required

Political: influence of states and international organisations on resource appraisal

- Through the implementation of resolutions, quotas and regulations

- *E.g.* Margaret Thatcher's watch resulted in closure of more than 20 coal mines in UK → critics felt Thatcher government's decision was also a politically motivated attempt to break the strong workers' union even though it forced the UK to switch to alternative less polluting sources like natural gas
- *E.g.* International organisations (cartels) such as OPEC (Organisation of Petroleum Exporting Countries) determine quantity and price of crude oil → highly influential as it supplies 40% of global oil supply. Oil embargo by OPEC in 1973 caused prices to quadruple from $3 to $12/barrel.

Case Study: ***China and the South China Sea***

- Recently, China has backed its expansive claims of the (Paracel and Spratly) islands in the South China Sea with island-building and naval patrols
    - Air-strips, filling-stations, radars etc.
- Due to possible reserves of natural resources that have not been exploited yet, as well as access to a major shipping route and fishing grounds

Perspectives on the Relationship between Population and Resources

Carrying Capacity: *the largest population of humans/animals/plants that an environment can support indefinitely without degrading; constantly in flux as the environment changes*

Population Levels

Underpopulation

- Population is too small to utilise its resources effectively
- Population < maximum carrying capacity
- Increase in population may lead to increase in standard of living in country
    - Usually, when a country can increase its population without any negative consequences on SOL, they are underpopulated
    - Consequences from underpopulation are thus usually not as dire as consequences from overpopulation

Case Study: ***New Zealand***

- 4.6 mil population (with 29.8 mil sheep)
- 1.9% population growth rate, yet experiencing 2.7% economic growth rate for the next five years; 0.913 HDI
- Increase in population leads to increased economic activity, resulting in increased economic productivity and further economic development

Optimum population

- Population = maximum carrying capacity
- Any change in population will result in a lower SOL; at this point, the country is making best use of resources (i.e. experiencing the highest SOL)
    - Most allocatively efficient
- Optimum population level is not static, but dependent on level of tech

Case Study: ***USA***

- Optimum population of 320 million with 0.7% (stable) population growth rate
- 0.915 HDI
- Discovery of new resources (e.g. fracking)

- Fracking turned US from importer to exporter of oil and gas, which combats resource scarcity by reducing need for imports; helps to maintain optimum population level of the country

Overpopulation

- Too many people, not enough resources
- Population > maximum carrying capacity
- Population > resource availability
- Overpopulated areas are often on the verge of famine and experience high emigration out of the country

Case Study: ***Ethiopia***

- 1973 population = 26 mil; 2016 population = 94 mil
- 2.6% population growth rate
- US$570 GDP/capita, with 0.442 HDI; because of food scarcity, 7-8mil Ethiopians need food aid to survive, and this rises to 15mil in times of drought

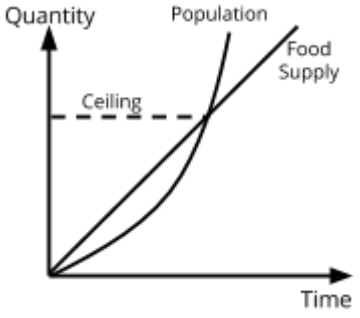
Population density and state of population

- Over/underpopulation is not necessarily linked to population density
  - *E.g.* Pop density in Japan (not overpopulated) = 6535 per km^2, pop density in Mali (overpopulated) = 12 per km^2
- State of population depends on ability of country to tap on resources to provide a decent standard of living for its people

Population Theories

Malthusian Theory

- **States that:** Food supply/resources increase at an arithmetic rate while population increases at an exponential rate; when left unchecked, population growth will ultimately exceed carrying capacity where there is not enough food supply or resources → state of overpopulation



Case Study: ***Irish Potato Famine***

- Potato was the staple food of the Irish (but for the poor, it was their only food), as well as feeding crop for livestock; too many people with only one type of food that is not enough due to potato blight → famine
- Famine led to deaths of about 1 million people; a further 2 million people emigrated from Ireland

Negative and positive checks (to control population)

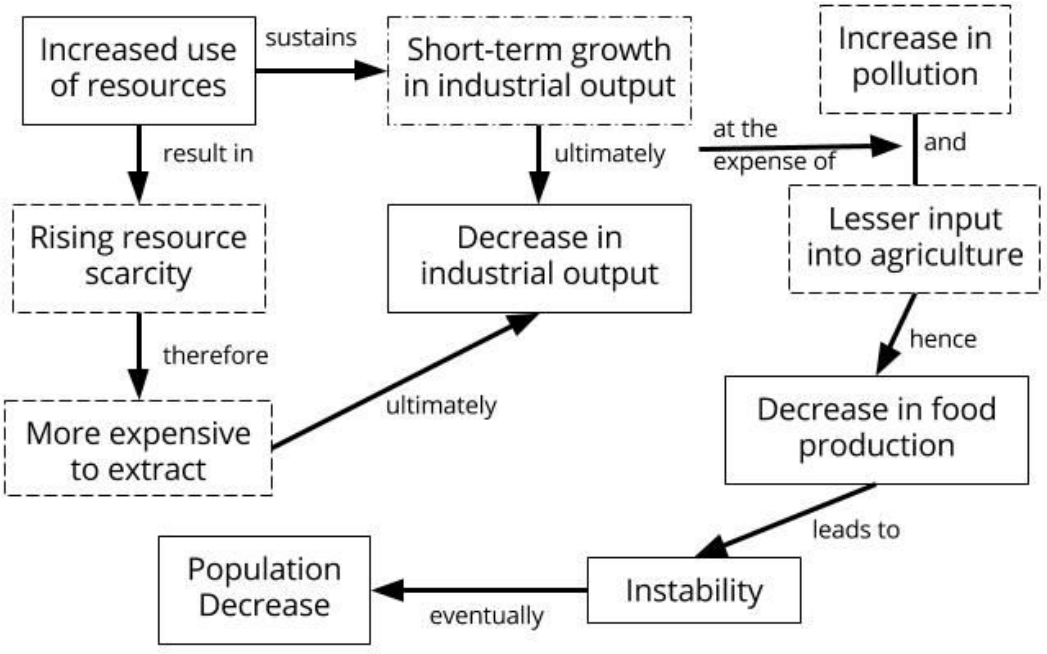
- **Negative checks:** lower fertility rates, delayed marriage, having fewer children, sex abstinence
  - Borne out of inability of people to provide for next generation
- **Positive checks:** increased mortality rates, lower life expectancy (e.g. disease, famine, war)
  - Largely external factors that may lead to a collapse of state mechanisms due to the lack of resources

Limitations of Malthusian Theory
Used to be accurate, but less accurate in modern times

- Shrinking or stabilising global population
    - Many DCs do not have a 'Malthusian' problem → instead, their populations are shrinking; LDCs are also starting to see slowing down or a stabilising population growth rate
- Malthusian 'check' of later marriages seems to apply to DCs, but underlying motivations are different
    - Instead of fear of hunger, it is due to broader socioeconomic and cultural factors such as self-centred lifestyles, empowerment of women, etc.
- Malthus's negative checks were driven primarily by abstinence and concerns about provision
    - Today, use of contraception is considered as another driving factor
- Assertion that food production can't expand exponentially and keep up with population growth is flawed because, in the long run (after 30-100 years), as compared to a constant-size population, a moderately growing population improves SOL more in both LDCs and DCs
    - Growing population helps to advance knowledge and increase productivity and output at higher rate than population growth
- Malthus assumes all countries are 'island' agriculture nations with no trade
    - However, there is so much global trade now, and thus not really applicable to modern (developed) world
    - State of disequilibrium will continue to exist as it is inevitable that some countries will enjoy food surpluses while others suffer food deficits
    - Still, the theory can be applicable to very poor regions in the world (e.g. Sub Saharan Africa)

The Neo-Malthusian Theory (also known as the Limits to Growth Model)

- **States that:** the quest for unlimited growth in both population and material goods in a world with finite resources will lead to a collapse in society



Stage 1 (1900-2000): Population, food and industrial output increases

- Industrial Revolution, Green Revolution
    - Mechanisation of agriculture
    - Use of fertilisers and pesticides
    - Use of High Yielding Variety (HYV) seeds (e.g. IR8 which has 10 times the yield of traditional rice → success throughout Asia and dubbed the Miracle Rice)

Stage 2 (2000-2050): Population continues to increase but food and industrial output drops drastically

- For continued growth in industrial output, there needs to be ever-increasing use of resources
- But resources become more expensive to obtain, needing more capital for resource extraction → industrial output per capita starts to fall → industrial input into agriculture falls, causing food production per capita to fall → both food production and industrial output per capita starts to fall

Stage 3 (2050-2100): Population is projected to decrease in response to decline of food and industrial output drops

Boserup's Theory

- **States that:** Population growth is needed for resource growth; and even if the population increase meant some initial problems, it would lead to greater innovation, whether in agro-technology or otherwise → higher SOL
    - Threat to resources will force society to adapt cultivation and production strategies to increase the resource pool (e.g. new agricultural techniques, alternative fuel/power sources)
    - To the point that food production, using the *same amount of land*, will *increase* without *significant degradation to the resource base*

Case Study: ***Papua New Guinea***

- Population density of Wahgi Valley, PNG at least 173 per km^2 in 1950s
- Indigenous intensive agriculture systems, deforested up to 2400m above sea level → independent centre of plant domestication
    - Taro, banana, yam and sugarcane domesticated in PNG without modern technologies; over 7000 years of agriculture
    - Maintains food production innovatively
- Independently develops crop rotation to maintain soil nitrogen levels
- Shows that given population pressure and increasing demand, society will lead to innovate solutions to combat these problems

Case Study: ***Israel***

- Arid zone with less than 500mm of annual rainfall
- Population doubled over last 25 years
- To reduce surface runoff and evaporation, irrigated crops below soil surface, targeting roots, hence increasing water efficiency. Also utilised treated wastewater.
- Now: mostly self-sufficient, produced 12x more food in 2002 compared to 1975 with the same amount of water usage

Case Study: ***Japan***

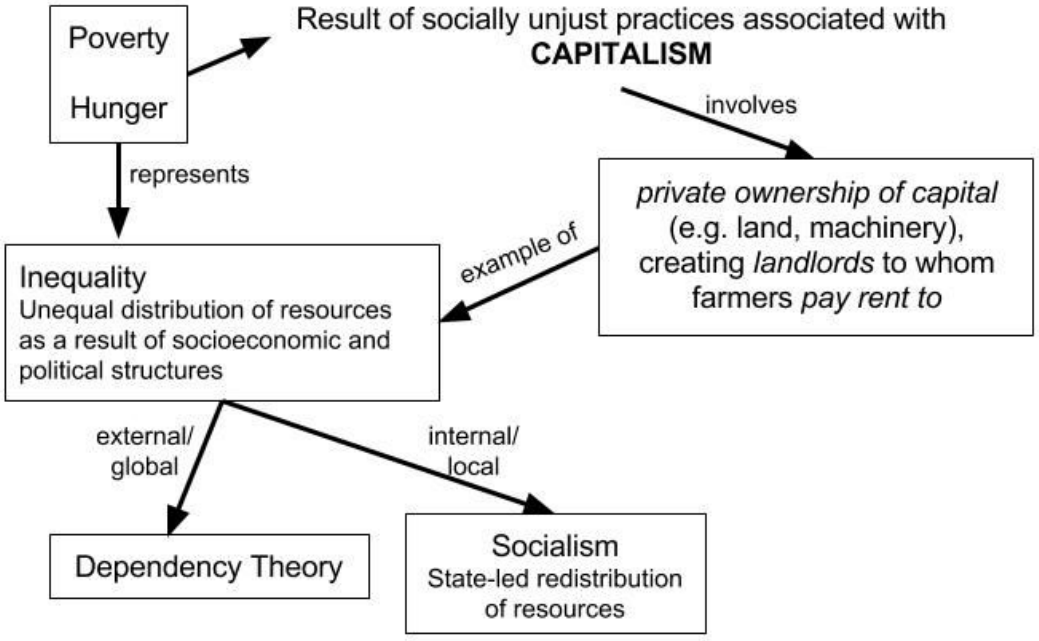
- Construction of Kurobe Dam due to insufficient supply of electricity in 1950s as a result of industrial and population growth
  - 1448m above sea level, in Kurobe Gorge
  - Japan's largest dam by capacity and highest by elevation (1450m above sea level)
  - Annual capacity of 1bn kWh

Limitations of Boserup's Theory

- Boserup attributed population increase in an area <u>only to natural increase</u> (deduct death rates from birth rates), and did not consider <u>immigration or emigration</u> (significant in modern globalised world)
  - ***Immigration:*** *sudden large increase in population due to movement into a host country*
  - ***Emigration:*** *sudden decrease in population due to movement out of country*
- Theory centred mainly on land-use systems relying on agriculture intensification in a given area → assumes that <u>amount of land available or accessible is fixed</u>
  - In reality, area of cultivation is in constant flux
- Relationship between population growth spurring agricultural development is not as straightforward → neglects <u>use of technology and mechanisation</u>
- If Boserup's theory is completely true, surely countries experiencing acute famine should be <u>at the forefront</u> of agri-technological developments?
  - Considering Boserup's assertion that innovation increases according to societal necessity

Structuralist Perspective (also known as Neo-Marxist Theory)

- **States that:** Poverty, hunger and other social ills are the result of socially unjust practices <u>associated with capitalism</u>



- Socioeconomic and political structures (e.g. corruption, mismanagement of resources, war, etc.) → unequal resource distribution
- In other words, inequality, poverty and hunger are not caused by lack of food or resources but by existing structures
    - We have 1.5 times enough food produced to feed everyone in the world, yet 795 mil people suffering from chronic malnutrition

Case Study: ***USA***

- The US produces 15 million calories/acre of cornfield annually, of which only 3 million is used as human food
- 40% of US corn used to make ethanol, 36% of US corn used as animal feed
- Mandate on corn-based ethanol is responsible for 75% of food price increases
    - As supply for food decreases, price increases
- $90 billion is used in corn subsidies since US corn is no longer competitive in the global market → how could this be used better?

Case Study: ***Burundi***

- 11 million human population, 2.5% population growth rate, 6.3 fertility rate, HDI 0.4; wxperienced most severe hunger, malnutrition worldwide according to 2013 Global Hunger Index.
- Landholding fell sharply from 9-12 acres per person in 1970s to 1 acre now, due to absence of clear land ownership policies and cultural practice of sub-dividing land among sons.
- Disputes as a result of land shortage:
    - 85% of legal disputes pertain to land
    - 19% increase in arson related to land conflicts
    - Civil war from 1993-2005

Limitations of Structuralist Perspective

- Negate effect of human agency; portrays people as victims of socioeconomic and political structures, without considering that human beings can practice free will
    - *e.g.* Even though Audi compensated farmers in San Jose Chiapa, Mexico for their land, the farmers did not benefit because of their failure to invest/start businesses, instead spending their money on partying.
- Alternative of capitalist system, the socialist system, did not work well either (*e.g.* Failure of Socialist Soviet Union, even had to buy US wheat in some years)
- Places too much emphasis on structures and negates environmental carrying capacity, which when exceeded, leads to degradation
    - Just because people can access the resources easily, does not mean it is well-managed; management involves the concept of stewardship: the long-term and sustainable care of the resource in question
    - Requires the recognition of a limit based on existing demands and resources available depending on the level of technological advancement
- *e.g.* Mismanagement of Aral Sea: Soviet Union diverted two rivers that nourished the Aral Sea for desert irrigation. Initially fruitful: could grow rice, cereals, cotton, but Aral Sea later mined beyond carrying capacity, leading to drastic drop in water levels. Water from elsewhere had to be brought in to prevent salinisation.

2.2.2 Managing Resource Base

Nature of Resources

Actual Resources

- Resources which have been surveyed; quantity and quality determined
- Being used in present times

Potential Resources

- Undiscovered or unknown resources
- Potential resources which have the prospect of being used later on

Resources Availability in a Capitalist Market Economy

Proven Reserves

- Reasonable certainty to be recoverable (over 90% chance of being present)
- If a reserve is considered to be proven, this does not guarantee a successful drilling, mining, etc. operation

Conditional Reserves

- Recoverability of resource from known reservoirs is contingent on a number of factors, such as ease and cost of extraction using existing technology, environmental impacts, political considerations (i.e. political concerns if resources lie over disputed areas)

Hypothetical Reserves

- Undiscovered resources that may reasonably be expected to exist

Speculative Reserves

- Undiscovered resources that may occur in known types of deposits in geologic settings where no previous discoveries have been made
- *E.g.* Due to presence of natural resources in surrounding SEA countries, speculative reserves have been source of political tension in South China Sea

Resource Scarcity

Type of Scarcity	Concerns
Physical Scarcity	• Increasing population beyond carrying capacity • Human populations exceed the food production capacity of the land, causing the depletion of renewable resources such as fish, soils or timber • Growing demand for water for human use threatens aquatic ecosystems and the ability of river systems to replenish themselves
Geopolitical Scarcity	• Use of mineral exports as a political weapon • Shift in location of low-cost mineral sources to 'hostile' or unstable blocs of nations
Economic Scarcity	• Demand at current price levels exceeds the quantity supplied, resulting in shortages • Needs exceed the ability of individuals or countries to pay for resources supplies • Rich economies can always outbid the poor for essential resources, creating unequal patterns of resource use • Economic exhaustion or falling demand for specific minerals or renewable resources causes economic and

	social disruption in producer regions or in nations dependent on them
Renewable and environmental resource Scarcity	• Distribution of essential biogeographical cycles (*e.g.* the carbon cycle and the greenhouse effect) threatening sustainability of life on earth • Pollution load exceeding the 'absorptive' capacity, causing economic health and amenity problems • Loss of plant and animal special (biodiversity) and landscape values, with wide, but poorly understood, long-term consequences

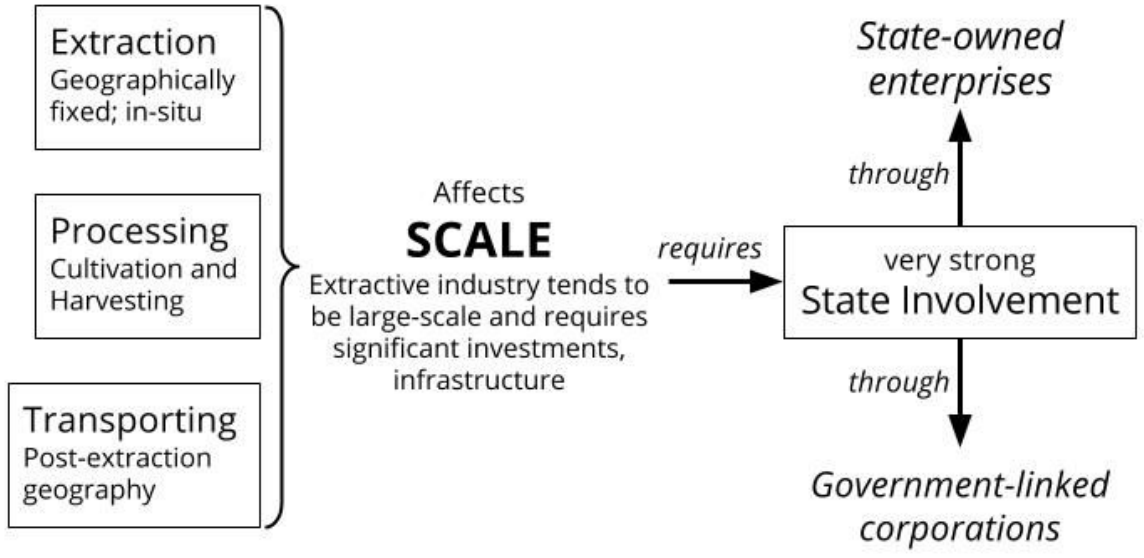
Extractive Industries

Commodification of Resources

In order for natural resources to be utilised in a capitalist economy, they must be assigned a monetary value, making the good inherently linked with economic demand. The variables determining history and geography of nature's commodification include:

- *Science & tech knowledge*: new technology can reveal element of nature that was not previously known as a commodity
    - Creates demand for substance that did not previously exist
        - *e.g.* uranium was not a commodity until 100 years ago, but it is now used in nuclear power generation, medical tech, and weapons manufacturing
    - Technology can also create a commodity through new forms of extraction, making it possible to use a previously unusable resource
        - *E.g.* Sunlight can now be harnessed through solar panels
- *Economic circumstances:* Even if a resource can be extracted, it might be too expensive to extract it, up until a market circumstances change where it will become worth it to extract these resources (i.e. revenue > costs)
    - *E.g.* oil in Canada was not extracted because of its high costs, until the price of oil increased up to US$100 per barrel

Characteristics of Extractive Industries



Case Study: ***Durian Production in South East Asia***

- **Extraction:** Durian is a tropical, seasonal crop that bears fruit only twice a year, corresponding with the warmer season (May-July)
- **Processing:** Requires seasonal labor force (typically migrant labor) to harvest the crop; the time taken to harvest varies between countries
- **Transporting:** Quick harvesting and transport is necessary to keep fruit fresh
- **Scale:** Large scale due to land allocated for agriculture, as well as the arterial roads and highways needed for the transport of the harvested crop

Case Study: ***Russia's Natural Gas (Gazprom)***

- **Extraction:** Urengoy gas field in NW Siberia is the second largest gas field in the world and is mined exclusively by Russian gas producer Gazprom
- **Processing:** Requires semi-skilled labor of rig workers and skilled engineers
  - Single gas well by drilling or expanded by fracking
- **Transporting:** Supplies to many EU and Central Asian countries
- **Scale:** The government-linked corporation owns 170,000km of gas pipelines

Establishing Resource Ownership

Communal Access

Resources are owned[1] by all members of a community. Stewardship[2] and use[3] of the resource is borne by all members of the community.

- [1]Land ownership is the de facto right of the entire community; this results in a decentralized form of ownership by the state
- [2]Refers to the care of the resource by the community through sustainable usage
- [3]The community is free to use the resource for subsistence or commercial gain

State Ownership and State Exploitation

As it suggests, resource is owned[1] and exploited[2] by the state through an SOE or GLC[3].

- [1]Ownership of the resource may come under a ministry or statutory board
- [2]The cost of extraction and the resulting profits is accrued by the state
- [3]The credibility of SOEs and GLCs in the global market is linked to the state

Case Study: ***Petrobras***

- Petrobras is a petroleum TNC, based in Rio de Janeiro, Brazil
- Invested in exploring, extracting, refining and marketing of crude oil, the transport and trading of natural gas, and biofuel production
- 64% of shares owned by Brazilian government
- Plagued by corruption scandals, with ex-Presidents Luiz Inacio and Dilma Rousseff implicated and resulting in US$24 billion in debt for Brazil

State Ownership and Private Exploitation

The resource is owned[1] by the state but exploited[2] by private firms in the country.

- [1]Even with the public-private partnership present, the resource still belongs to the government; but this way, the state saves money on extraction costs
- [2]TNCs usually pay licensing fees to get the rights to extract the resource (usually done through bidding); all costs and profits are accrued by the TNC, and the state is paid royalties based on the amount of resources extracted

Case Study: ***Shell in Nigeria***

- Shell was granted an exploration license in 1937, and its first commercial oil field was built in Oloibiri, Niger Delta, in 1958
- This caused social and political tensions with the indigenous Ogoni people, as well as environmental degradation later on

Private Ownership and Private Exploitation

Very common economic model, where a firm or individual owns[1] the resource and hence is entitled to reap all the benefits[2] from it

- [1]Owners are responsible for all activities within the land, but are still subject to taxation by the state
- [2]Costs of extraction are also accrued by the owners

Case Study: ***Nunley Brothers, USA***

- The brothers own Coyote Ranch (around 1220km^2) in Texas
- They are the 24th largest landowner in the country, and the ranch has operated for 70 years as a family business, specializing in Angus beef
- Recently diversified to allow hunting within the land
- Uses technology to improve productivity: tagged cows, genetic testing, rotational grazing

Resource Companies in Emerging Economies

In developing countries, resource companies tend to be either state-owned or government linked, due to scale and demands of funding, developing, extracting, processing and distributing the resource

- *E.g.* China National Petroleum Corporation - publicly listed SOE belonging to the Chinese government with 30 international projects

Resource Companies in Developed Economies

On the other hand, there is a reversed trend in developed economies; deregulation and privatisation of SOEs are preferred here partly due to the perception that they are 'lumbering, inefficient, unproductive giants' as a result of the bureaucracy involved

- *E.g.* Privatisation of UK utility SOEs

The Age of Fossil Fuels

- Due to the Industrial Revolution in the 1800s, human society has become dependent upon the exploitation of non-renewable energy resources
    - Invention of the steam engine required the use of coal
    - *E.g.* the three fossil fuels: coal, gas, oil
- Advantage of fossil fuels is that they are readily accessible, a highly accessible source of energy, easy to convert with existing tech and cost-efficient to use
    - However, they are also the largest source of greenhouse gases
- Of the three, *oil* is the most versatile fossil fuel
    - Easily transported over long distances, as well as forming the basis of many other industries like plastics and petrochemicals
    - Created many resources for which commercially viable substitutes are still unavailable, like jet fuel

Impact on the environment
The capitalist system involves extracting, transforming, transporting, consuming and eventually discarding, which produces waste at every stage

- Petroleum is a large culprit - almost everything we use is made of one of the products of crude oil (after fractional distillation and refinery)
- Long term impact on the regenerative qualities of the environment

The Resource Curse

States that: Countries that are *highly dependent on resource endowments* tend to *grow slower, more corruptly or violently* than those that are resource-poor. Caused by:

Failure to save income, while spending unsustainably

- Some countries spend the revenue earned from these resources into white elephant projects or unneeded policies
    - ***White elephant project:*** *an expensive project that is useless*
- *E.g.* The Malaysian government spent 2.5% of its GDP on Petronas Twin Towers

Failure to redeploy income for sustainable development

- Usage of resource income to stabilise local producers may end up over-protecting them such that they are not incentivised to maximise efficiency and cannot compete with international TNCs when economy opened up
- *E.g.* Proton, Perodua failed to expand outwards after years of government protection through high car import taxes.

Formation of an 'enclave economy'

- ***Enclave economy:*** *economy that is so isolated that multiplier effect is negligible*
- This results in the costs outweighing the revenue earned, which causes the government to haemorrhage funds; often due to flawed government structures
- *E.g.* Even though Nigeria exports oil, it is still a net importer of oil due to lack of development in its own refinery capabilities - relies on others to refine the oil

Economic leakages

- Considering the high costs of extraction, only foreign TNCs are capable of entering the industry, leading to TNC domination
    - Can result in unchecked profit repatriation

'Dutch Disease'

- Sudden discovery of resources and subsequent influx of FDI of local currency increases the costs of exports for the country, ultimately reducing its revenue
- *E.g.* in Netherlands, high revenue generated by natural gas discovery led to sharp decline in competitiveness of other sectors, resulting in drastic decline in growth

Negative Externalities

- Unanticipated influx of resource income tends to promote crime and corruption, armed conflict and human rights abuses; can result in state instability
- *E.g.* Global demand for diamonds have helped to fund civil wars in Africa as groups clash over diamond mines and funded by profits from the diamond trade

Limited job creation

- Over time, the local jobs created by the discovery can decrease as mechanization and import of cheaper foreign labor takes effect
- *E.g.* Sino Iron Project created few jobs for local Australians as the company in charge of it hired cheaper Chinese labour to work in its iron mines

Case Study: ***Venezuela***

- **Failure to save income:** Government under Hugo Chavez abandoned free-market principles in favour of socialism
- **Enclave economy:** Oil makes up 95% of Venezuela's exports, 50% of government revenues and 30% of GDP
- **Leakages:** Nationalization of oil companies prevented leakages, but made the government bear all the costs of extraction
- **Dutch disease:** Overvalued the national currency and weakened the competitive edge in the production of staple goods
- **Negative externalities:** Authoritarian, corrupt government, massive rural-urban migration and abandonment of agriculture
- **Limited job creation:** Quadrupling of workforce but jobs are impermanent
- ❖ Venezuela's overdependency on oil revenue backfired during the oil crisis in 2014 - government reserves have dwindled to US$20 billion
  - ➢ Resulted in hyperinflation - highest in the world
  - ➢ Rising debt and currency depreciation
- ❖ Government-imposed price ceilings have created a shortage in necessities
- ❖ Government is treating symptoms rather than root causes
  - ➢ Calling for all women to stop using hair dryers to save electricity, installing biometric systems in supermarkets to prevent looting etc

Escaping the Resource Curse

Accountability

- Government has to be accountable to the public for its decisions - e.g. implementation of independent judicial system
- Minimal corruption and promotion of inclusivity and equitability, both in top-down and bottom-up initiatives

Infrastructure

- Requires competent and long-term planning
- Adequate investments in physical and social infrastructure

Pre-existing Wealth

- Countries with little wealth prior to resource discovery often lack structures and institutional capacity to handle influx of income
- Wealth helps to ensure more equitable outcomes

Economic Diversification

- Helps to reduce reliance on commodity exports (primary industry)
- Helps to minimise fluctuations which may damage the economy

Case Study: ***Nigeria (suffers from resource curse, oil, developing country)***

- **Accountability:** corrupt oligarchy where the elites control everything
- **Infrastructure:** relatively advanced transport infrastructure, but inadequate refinery infrastructure (imports 70% of oil despite being an oil producer)
- **Pre-existing Wealth:** 65% of GDP depends on agriculture, subsistence economy
- **Economic Diversification:** Heavily dependent on oil exports

Case Study: ***Alberta, Canada (suffers from resource curse, oil, developed country)***

- Obtains oil from loose sandstone
- C$101.3bn in resource revenue, but government expenditure increase is greater than inflation and population growth, overshooting budget by C$50bn
- Only C$4.5bn has been saved between 2004-2014, with a C$10.4bn shortfall in 2016 that is projected to increase to C$30bn → unsustainable

Case Study: ***Norway (escaped resource curse, oil, developed country)***

- **Accountability:** Norway put oil reserves under state control; formed the Government Pension Fund to manage revenue (US$830 billion, 2014)
  - Later had an SOE (Statoil) manage extraction and processing
- **Infrastructure:** highly advanced physical and social infrastructure
  - 13% of GDP invested in education
  - Roads, railways, airports, seaports → interconnectedness of cities and neighbouring countries
- **Pre-existing Wealth:** GDP/c of US$3306 in 1970 when oil was discovered
  - Strong timber, shipping and fishing industries
- **Economic Diversification:** heavy investments in tertiary and quaternary industries in addition to existing primary and secondary industries
  - Established shipping industry, electricity exporter
  - Aquaculture industry
  - Research clusters (Oslotech Science Park)

Case Study: ***Botswana (escaped resource curse, diamonds, developing country)***

- **Accountability:** Continuous multi-party democracy that is relatively corruption free and with sound institutions and good governance
- **Infrastructure:** per capita income of US$70 to US$16300 in 30 years
  - Adequate spending on social infrastructure, with free basic education and universal access to HIV treatment
  - Controlled population growth
- **Pre-existing Wealth:** Rich coal deposits, but were dependent in international aid up to the 1970s
- **Economic Diversification:** heavy investments in ecotourism and higher-end manufacturing that helps to reduce dependence on diamond mining
- **Other considerations:** Cultural homogeneity - Tswana local tradition of Kgotla that dictates followers to obey rule of law and respect private property
  - Avoided tribal clashes the way other African countries suffered from

2.3.1 Water Resource Management

- 97.2% of water is saline and undrinkable - the rest is in lakes, underground stores etc.; freshwater is locked in glaciers and ice
- Top five countries with the most freshwater are Brazil (12%), Russia, US, Canada, China

Water Use Around The World

Developing Countries

- Domestic consumption is generally lower than the developed world
- Rapidly industrializing LDCs consume more water than those with slower economies
- Agricultural consumption may be higher due to the need to feed growing population
- Unmaintained, leaky water infrastructure leading to 3900 children dying everyday due to dirty water or poor sanitation
    - In response, the UN has worked towards and reportedly succeeded in its seventh Millennium Development Goal's tenth target: "Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation"

Developed Countries

- Domestic consumption is generally higher than in developing world
    - *E.g.* 380 litres per person per day in the USA
- Higher quality water infrastructure, and improved efficiency in water use in agriculture and industry
- Export of water and virtual water to high demand countries
    - **Virtual Water:** water that is hidden from view, embedded in the production process of certain goods

Case Study: ***China***

- **Export of water**
    - Rising concerns over pollution and rising affluence fuelling demand for bottled water from other countries
    - 200 container loads of mineral water are exported from Canada to China every month
- **Export of virtual water**
    - Mainly through agricultural exports
    - *E.g.* 1200 litres per 450g of rice, 1960 litres per 450g of chicken

Uses of Freshwater and Sources of Water Stress

Domestic Use

- Water used for indoor and outdoor household purposes, as well as drinking and washing purposes
- Domestic consumption of water has gone up and will continue to rise - growing population

    - Overconsumption is present in both the developing and developed world, though per capita domestic consumption is still lower in the developing world

Industrial Use

- Water used for industrial processes at nearly every stage of production; examples: high pressure water cutters, fracking
    - Use of potable/non-potable water
- Falling industrial consumption is observed in the developed world due to technological advancements
- However, general industrial consumption of water is still increasing
    - Large populations demanding for more energy
    - Industrial expansion as developing nations plug into GPNs

Agricultural Use

- Includes water used for irrigation of crops and livestock farming
    - Livestock farming generally tends to consume more water than crop farming
        - Livestock farming water use ranges from 34-76 trillion gallons annually
    - Water consumption for irrigation
        - 34 litres for one glass of wine
        - 920 litres for 500g of bread
        - 10500 litres for a pair of jeans and a cotton T-shirt

Uses the most water of the three; despite technological innovations, the high demand for water persists

- As population increases, agricultural water consumption increases to accommodate the increased food demand
- At the same time, a growing middle class means that more people can afford a largely meat-based diet, increasing demand for the meat
- Poor crop choice in unsuitable climates - 'thirsty crops'
    - *E.g.* Sugarcane in Brazil, known as the world's thirstiest crop
        - Draws heavily from groundwater, and depletes soil nutrients; reduces surface runoff
        - Fuelled by the global demand for sugar
        - Recently challenged by Europe's greener alternative, sugar beet

Case Study: ***China and its water use***

- South-North Water Diversion Project: aims to divert water from the wetter south to the drier north, with volumes of up to 44.8 billion cubic meters annually from the Yangtze River to the Yellow River Basin
- Impacts
    - Costs US$80 billion to build, and will go up over time
    - Displaces hundreds of thousands of people, including 400000 who were relocated for the expansion of the Danjiangkou reservoir
    - Depletion of underground aquifers
- Underlying causes of water shortages in the north are not addressed

    - Pollution, inefficient agricultural, domestic and urban use all contribute to water insecurity in the north
    - The North needs improved local pollution monitoring and better irrigation infrastructure
    - Better local management of resources is the way to secure and sustainable water supplies - need to reduce demand and protect existing supply rather than just increase supply

Sanitation
Refers to the provision of facilities and services for the safe disposal of human waste

- Trend of improvement - 54% in 1990 to 68% in 2015 of global population has access to sanitation systems; however, 2.4 billion people still lack access in 2015

Effluent
Refers to liquid waste or sewage discharged into a river or sea, usually through wastewater discharge from industrial facilities

- Sources include untreated wastewater discharge from industries, and untreated sewage discharge from a lack of proper sanitation systems
- This, combined with a lack of proper sanitation systems, contribute to extensive water supply contamination, possibly causing the transmission of serious diseases like cholera, dysentery and hepatitis A
    - 10% of the world population also consumes food irrigated using wastewater
    - *E.g.* 16.1% of China's soil and 19.4% of farmland is contaminated with heavy metals; the phenomenon of 'cancer villages' - where abnormally high rates of cancer are observed in villages due to industrial pollution - is also an issue

Poor Infrastructure
The lack of investment in water related hard and soft infrastructure encourages water overuse and worsens misuse

- Hard infrastructure: Physical systems
    - Inadequate water delivery systems
        - Leaky, rusty pipes
        - Water loss from uncontrolled withdrawal
    - Inadequate water and sewage treatment
- Soft infrastructure: Social systems
    - Institutions which are required to maintain standards of water quality
        - Monitors and enforces regulations
        - Targets all three types of water use
    - These institutions tend to be more effective in MEDCs than in LEDCs

- The lack of both infrastructure types arises from
    - Conflicts between different tiers of government
        - Court orders to close polluting factories and build wastewater treatment plants are ignored by state and national authorities
        - Slow bureaucracy and red tape
    - Conflicting needs

        - Farming, industrial, religious, domestic etc
    - Limited resources
        - Prioritisation of economic development over environmental problems
    - Corruption
        - Even with environmental laws, the lack of proper enforcement makes them ineffective

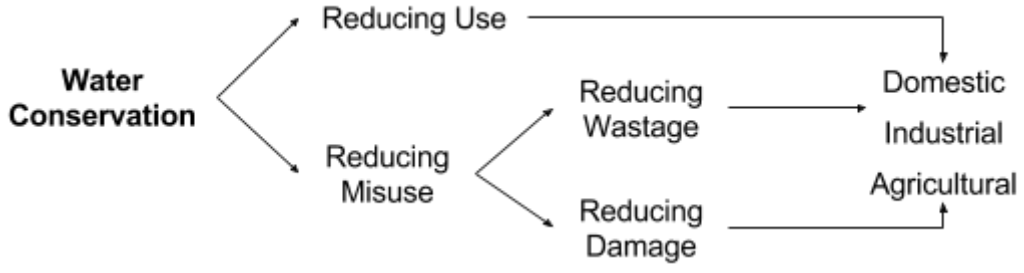
Case Study: ***United States***

- Most pipes in the United States are over 100 years old, and wastes 1.7 trillion gallons of water a year due to the lack of pipe replacement systems
- In 2015, the Hollywood Hills section of Los Angeles experienced a significant leak where over 100,000 gallons of water flooded the streets
    - Caused by aging water mains that date back to 1926
- Cities which have budgetary issues are more vulnerable
    - Poorer areas like Flint and Detroit are at high risk
    - Above-average levels of lead were found in many children who consumed this contaminated water
    - Detroit has lost more than a million residents since 1950, making it more difficult for the city to maintain its water infrastructure
    - Flint's water is 19 times more corrosive than it should be due to iron contamination from rusty pipes
        - Ironic considering that they are only 112 km from Great Lakes

Case Study: ***India***

- The Ganges River is the longest river in India at 2,600km and the third longest river in the world, and is also sacred to Hindus
    - Gangetic plains are some of the most fertile land on Earth; 10% of the world population lives there and earn their livelihood
- Untreated sewage is killing the Indian rivers - only 160 out of 8000 towns have both sewage systems and treatment plants
    - Factories, chemical plants release untreated effluent directly into the Ganges, and raw sewage from 29 major cities is often dumped
    - Includes corpses, funeral pyre ashes etc

Water Conservation



Conservation through technology

- Domestic water use
    - Low-flow devices

    - Efficient appliances (Water efficiency labels)
    - Water-free amenities
        - *E.g.* Goclean Waterless (Canada) - water-free car wash
            - Uses natural rather than chemical surfactants to wash cars
            - Plant-based soap which is biodegradable
            - Eliminates need for water
            - Conveyer-belt car wash uses 320 litres per car, while home car washing used 500 litres
- Industrial water use - reducing water input along stages of production
    - Increasing efficiency
    - Alternative sources of water other than freshwater - rainwater, fertigation water, blackwater, graywater
        - For use in the cooling of machines

Case Study: ***Ford***

- Reduced water consumption per car from 9800 litres to 4000 litres in 2013
- Recycling of water to reduce input
    - Water capture along production stages to minimise loss
    - Reduction of water in painting processes
    - Dry-machining with mist rather than continuous water flow
    - Water recycling using reverse osmosis
- Saves 3.3 billion litres of water a year, with cost savings of US$22 million annually

- Agricultural water use - reducing water input in irrigation
    - Drip irrigation
    - Hydroponics, aeroponics
        - Space saving, higher density
        - Reducing water input in irrigation - up to 90% less water is used with no chemicals leaching into water
        - Crops grow faster due to an absence of weeds and parasites

Case Study: ***Bright Agrotech, Wyoming***

- Provides management, financial and feasibility consulting regarding hydroponics and aquaponics for residential and commercial uses
- Indoor and outdoor vertical system (farm walls) which saves space

Case Study: ***Netafim Drip Irrigation***

- Uses state of the art drippers for advanced automated systems
- Ensures timely delivery of irrigation to reduce waste via evaporation
- Saves up to 30 to 65% of water compared to traditional systems
- Takes into consideration evapotranspiration rates, soil type, plant type etc
- Can be adapted for wet rice cultivation as well

Education to reduce misuse
Education of the public on the proper use and care for water resources helps to develop intrinsic motivations for such conservation

- Goes hand-in-hand with laws and regulations, which serves as extrinsic motivation, and includes disincentives like fines and jail terms
- *E.g.* PUB Public Education

Increasing Water Resource
Desalination
Reverse Osmosis: water is forced at high pressure through membranes which remove salt, leaving freshwater as output

- Requires a lot of energy, making it expensive, but recent advances in technology have decreased the costs over time

Seawater Greenhouse
Enables the growth of crops in arid regions, using seawater and solar energy

- Involves pumping seawater to arid locations which is then used to humidify and cool the air before being evaporated and distilled to produce freshwater
- Done in Oman, Canary Islands, Abu Dhabi, Somaliland

Water Recycling
Recycling of used water that has not yet come into contact with faeces (shower water, laundry, wash basins etc)

- Standard water treatment - greywater and freshwater (through reverse osmosis)
- *E.g.* NEWater technology meet 30% of Singapore's water needs, with plans to triple by 2060

Rainwater Harvesting
Involves collecting and storing rainwater from rooftops, land surface or rock catchments

- Can be done in residential, commercial or industrial buildings
- Old buildings, in particular, can be refitted at minimal cost
- However, the method is dependent on precipitation patterns, and can collect only a limited quantity at a time

Tragedy of the Commons (Garrett Hardin, 1968)
Economic theory which states that as the demand for a resource overwhelms the supply, every individual who consumes an additional unit directly harms others who can no longer enjoy the benefits.

- Commons as naturally occurring resources across space and easily accessible to all, with examples including pastures, fields, forests, lakes etc
- Protection is thus necessary to safeguard the interests of the community - "freedom in a commons brings ruin to all"
    - Tragedy as the inevitable result of the shared use of resources

Assumptions

- Neo-Malthusian perspective
- World's resources are finite - the more people, the less each person's 'share' is
- Technological advances has its limits

- Impossible for population to keep increasing and yet satisfy individual desires
    - Everyone is interested in satisfying their own needs - products of inherent selfishness and systemic problems stemming from capitalism

Suggestions

- Need to control population growth and prioritize needs
- Need for institutional or governmental regulation of the commons
    - "Mutual Coercion Mutually Agreed Upon" to combat selfish human nature
- Control of access
    - Already difficult within geopolitical boundaries, with a greater challenge for global commons
- Creating disincentive for misuse
    - Proactive enforcement of laws
    - Blacklisting of firms by countries and consumers
        - However, this may cause political tensions
    - Accurate market pricing to include environmental costs
- Creating incentive for proper or reduced use
    - **REDD+**: Industrialised countries pay developing countries to maintain natural endowments, involving multiple parties like indigenous tribes, local farmers and state entities
    - Carbon cap and trade schemes
    - Education and 'calls to conscience'

Privatisation of the commons

- While unjust - the benefits of the commons are concentrated on the few - Hardin states that "injustice is preferable to total ruin"
- As the benefits of exploitation is tied directly to the health of the commons, private owners will maintain it so that it will last
- Regulating privatisation and intergovernmental efforts
    - Not all commons can be privatised, especially those that transcend geopolitical boundaries (such as the air, oceans etc)
    - Limits:
        - Economic priorities over environmental concerns
        - Lack of bite, especially for intergovernmental regulations
        - Slow diplomacy due to multiple layers of negotiations

Case Study: ***Los Angeles, California***

- Central Valley aquifer extends for about 640 km under Sacramento Valley
- Subterranean water formed around 10000 to 20000 years ago, and makes up California's largest reservoir
- Unregulated and unmonitored use is prevalent, with over 100,000 unmetered wells, leading to overuse in all three areas
    - Agriculture is the largest culprit
    - Wells are going deeper over time
- Land subsidence is at around 30 cm a year, with worst hit areas having subsided over 8.5 metres due to overpumping

Private or public ownership?

- Need for private ownership
    - Ageing infrastructure and need for private investment
    - Realistic rates vs subsidised low rates
    - Responsibility and accountability, which is at a higher level than government owned resources
- Need for public ownership (state-owned)
    - Infrastructure may not be repaired by firms due to high costs
    - Rates often increase, adversely affecting the poor
    - Private firm's main duties are to shareholders, not to society or nature
- **Public-Private Partnership (PPP):** long-term contract between a private party and a government entity, for the provision of a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance
    - Taps on private expertise and public funds
    - Closely linked to build-operate-transfer (BOT), which is a form of project financing, wherein a private entity receives a concession from the public sector to finance, design, construct and operate a facility as stated within the contract

Case Study: ***Manila, Philippines***

- 25-year concessions made in 1997 for water and sanitation services, one for the West Zone (Maynilad) and the East Zone (Manila Water) each
- Tariff limits were enforced and fixed until 2003 when concessionaires were to pay a concession fee to the state
    - However, tariffs were increased in 1998 due to Asian Financial Crisis
- Manila Water was able to meet its commitments and has had its concession extended for another 15 years
- Maynilad filed for bankruptcy in 2003 and services were re-nationalised - handed back to the state - in 2005

Limitations

- Are humans necessarily driven by selfish natures?
- **Common good:** a community that shares its natural endowments has a strong incentive to protect them to the best of its ability, even if it means not maximising current production
    - Resources are essential to a community's survival in the long run

Case Study: ***Ancient Hawaii***

- Local management by those who work the land, but with communal protection
- Mutual Agreement
    - 'Kapu' (right to do something) granted by high chiefs, with local chiefs appointed to administer the right
- Mutual Coercion
    - Harsh punishment by death for abuse of 'kapu'
- The common good

    - Punishments, while harsh, are not always administered
    - Resulted from deep ecological understanding
        - Knowledge of fish-spawning seasons
        - Ecological survey of environment before fishing rights were granted
    - Religious reverence of resources and respect for tribal hierarchy
    - Sharing of the catch that prevents private accumulation

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- Tariff limits were enforced and fixed until 2003 when concessionaires were to pay a concession fee to the state
    - However, tariffs were increased in 1998 due to Asian Financial Crisis
- Manila Water was able to meet its commitments and has had its concession extended for another 15 years
- Maynilad filed for bankruptcy in 2003 and services were re-nationalised - handed back to the state - in 2005

Water Conflict

Causes

- Shortage of supply due to unsustainable consumption, leading to land subsidence and saltwater intrusion
- Ever-growing demand due to large population, increasing water use in all sectors

    - *E.g. Egypt's high total fertility rate (2.81) places substantial pressure on its water supply in order to feed its people, and is not helped by its cultivation of thirsty crops like sugarcane, wheat and grapes*
- Pollution from domestic sewage, industrial effluent and runoff
    - Aggravates water conflict by creating a shortage in other countries
- Other triggers
    - Ethnic and racial tensions
    - Weak local and transboundary governance to protect river basins

Solutions

Regional water agreements

- International Commission for the Protection of the Rhine (ICPR) signed by Rhine-bordering countries (France, Germany, Luxembourg, Netherlands, Switzerland)
    - Includes the monitoring of water quality and aquatic life
    - Flood monitoring and management
    - Set within broader EU frameworks

International water agreements

- UN Convention on Protection and Use of Transboundary Watercourses and International Lakes
    - Aims to facilitate international cooperation but is still dependent on the willingness of countries