

UNIT 4 - THE SECONDARY SECTOR

1. THE SECONDARY SECTOR

The secondary sector includes economic activities dedicated to transforming raw materials into products that meet human needs. The main activities are industry, mining, energy production, and construction. Industry is the most important activity in this sector, which is why industrial spaces are its most representative.

1.1. Industry

Industry is the activity that transforms raw materials into finished products, ready for direct consumption, or semi-finished products used as raw materials in another industrial process.

ELEMENTS OF INDUSTRY:

To carry out its activity, industry requires three key elements:

- **Raw materials:** These are natural resources transformed into finished or semi-finished products. Raw materials are classified by origin into plant-based, animal-based, and geological materials. Production is concentrated in a few countries known as CARBS (Canada, Australia, Russia, Brazil, and South Africa), which account for 25-50% of major natural resources. Additionally, countries like the United States and China, as well as some poorer countries specializing in specific resources (e.g., cocoa from Ivory Coast or coltan from the Democratic Republic of Congo), play significant roles. Consumption of raw materials is centered in Western Europe, Japan, the United States, and emerging countries like China and India, which import large quantities for their industries.
- **Energy sources:** These are natural resources that provide the power necessary to carry out the industrial transformation process of raw materials.
- **Production factors:** These include workers (labor), capital (necessary goods like facilities, machinery, and money), and technology (knowledge and methods used in production).

EVOLUTION OF INDUSTRY:

Industrial activity has gone through several phases characterized by the implementation of technical advances and the use of certain energy sources. The resulting industrial landscapes have also evolved over time.

- **Craft production:** Until the mid-18th century, products were made by hand by artisans using traditional tools and low-power energy sources such as human or

animal power or wood. Production was carried out in small workshops, resulting in unique, scarce, and expensive products, usually sold in local markets. Workshops were scattered, so there was no distinct industrial landscape. Many artisans settled in cities, organizing into specialized trade areas, such as textile, forge, and tannery districts.

- **Modern industry:** Modern industry emerged in Britain during the First Industrial Revolution (1770-1850) and continued during the Second Industrial Revolution (1850-1950). Industrial work was then performed with machines powered by stronger energy sources, such as steam engines running on coal during the First Industrial Revolution, and electric and internal combustion engines powered by electricity and oil during the Second Industrial Revolution.

Manufacturing became concentrated in large factories where numerous workers performed specific tasks. The resulting production was abundant, cheap, and homogeneous, catering to distant markets. Industries initially focused on the iron and textile sectors before diversifying.

Industrial locations and landscapes underwent profound changes during these centuries:

- During the First Industrial Revolution, industries were located near mining areas, energy sources, ports, or cities close to railway stations. The industrial landscape was marked by tall brick chimneys, unhealthy worker housing, and railways, earning these areas the name "black landscapes" due to the pollution they generated.
- During the Second Industrial Revolution, industries had more flexible locations. Ports attracted oil refineries, chemical industries, and shipyards, while urban peripheries housed industries aiming to be closer to consumers. The most characteristic industrial landscapes were industrial parks, organized into plots with industrial warehouses and equipped with services, infrastructure, and transportation.
- **Contemporary industry:** This emerged in the mid-20th century thanks to innovations from the so-called Third Industrial Revolution. Industrial work now employs new technologies (microelectronics, IT, telecommunications), uses new materials (e.g., polymers, Nomex), and relies on new energy sources (e.g., nuclear and alternative energies).

Manufacturing is carried out in establishments that distribute the various production phases. These involve highly qualified personnel in areas like production, research, innovation, design, and quality control. The resulting production can be organized into short series of diverse, affordable products tailored to consumer preferences and aimed at global markets. Key sectors include telecommunications, microelectronics, laser technology, aeronautics, biotechnology, and new materials.

CURRENT INDUSTRIAL LANDSCAPES:

Industrial landscapes inherited from the past have been in crisis since the 1970s because their factories have become outdated.

- In some cases, reconversion has been implemented through closures or production and equipment adjustments, alongside efforts to reindustrialize by promoting the establishment of new industries. In other cases, industries have been relocated to cheaper areas.
- Innovative and high-tech industries are located in technology parks or technopoles near dynamic cities. These areas feature highly qualified workers, advanced infrastructure, and services.
- Traditional industries move away from urban areas to classic industrial parks or industrial zones that combine industries and offices.
- In newly industrialized countries, large industrial concentrations have been created, usually near ports for product export. These areas often lack environmental regulations, hosting highly polluting industries.

TYPES OF CURRENT INDUSTRIES:

Current industries are highly diverse and can be classified using various criteria:

- **By their role in the production process:**
 - Base industries: Produce semi-finished products (e.g., steel).
 - Equipment industries: Transform semi-finished products into equipment needed for other industries (e.g., machinery, industrial equipment) or for transport and construction.
 - Consumer goods industries: Manufacture products for direct sale (e.g., textiles, food).
- **By raw material use:** Heavy industries (using large amounts of raw materials), semi-heavy industries (using moderate amounts), and light industries.
- **By technology:** Traditional industries (e.g., textiles), medium-technology industries (e.g., automotive), and high-technology industries (e.g., biotechnology, telecommunications).

1.2. Mining

Mining focuses on locating, extracting, and refining rocks and minerals found in the soil and subsoil. Mineral raw materials make up only a small portion of the Earth's crust and are unevenly distributed. Mining involves prospecting to locate minerals, extraction techniques to obtain them from open-pit or underground deposits, and refining systems to separate usable minerals from the surrounding rock.

1.3. Energy Production

Energy sources used by industries are highly diverse. They are often classified as traditional or alternative, based on their usage, and as renewable or non-renewable, depending on their ability to regenerate naturally.

TRADITIONAL ENERGY SOURCES:

Traditional energy sources are the most widely used due to their advanced technological development. This group includes coal, oil, natural gas, and nuclear energy from fission. All are non-renewable because their consumption leads to eventual depletion. Hydroelectric energy, a renewable source as it continuously renews itself, is also included in this group.

- **Oil:** A mixture of hydrocarbons found in underground reservoirs, formed from the decomposition of animals and plants over millions of years in aquatic environments. It provides gasoline, tar, paints, plastics, etc. The main producers are Russia, Saudi Arabia, the USA, Iran, China, and Mexico. Reserves may run out in 40 years. Its extraction is highly polluting and criticized for its greenhouse gas emissions.
- **Natural gas:** Originates similarly to oil and is often associated with it. It is also obtained through hydraulic fracturing or fracking. Used for electricity generation in thermal power plants, piped gas for heating and cooking, etc. Major producers include Russia, the USA, Canada, Iran, Norway, and Algeria. Reserves may last around 65 years. Traditional extraction pollutes less than oil, but fracking causes severe environmental damage.
- **Coal:** A combustible mineral formed from the decomposition of plant remains buried underground over millions of years. Used for electricity generation in thermal power plants, iron and steel production, and obtaining gas and chemicals. Major producers are China, the USA, India, and Australia. Reserves are abundant but less used due to pollution concerns.
- **Hydroelectric energy:** Derived from water stored behind dams. Mainly used for electricity generation in hydroelectric plants. Major producers include Canada, the USA, Brazil, China, and Russia. Criticized for altering river flows and affecting aquatic life.
- **Nuclear energy from fission:** Obtained by splitting atoms of heavy radioactive minerals like uranium. Mainly used for electricity generation in nuclear power plants. Major producers include the USA, France, and Japan. Criticized for potential nuclear accidents and highly polluting waste.

ALTERNATIVE AND CLEAN ENERGY SOURCES:

Alternative energy sources were developed as substitutes for traditional ones. Development began after the 1973 oil crisis, which forced industrialized countries to explore new energy options. Major sources include biomass, wind, and solar energy. Others, like geothermal and

tidal energy, are in different stages of application, while nuclear fusion remains experimental. All are renewable and considered clean or green as they do not pollute or generate waste. Currently, these sources are less utilized due to high costs or being in research phases.

- **Solar energy:** Comes from sunlight and heat, concentrated using panels to provide heat (hot water, heating) or electricity. Major producers include the USA, Canada, and Australia. Issues include irregularity (daily and seasonal) and storage difficulties.
- **Wind energy:** Generated by wind moving turbines to produce electricity. Major producers include Germany, Spain, and the USA. Problems include wind irregularity and the visual and acoustic impact of turbines.
- **Biomass energy:** Comes from agricultural, livestock, and forestry waste or products from their processing industries, which produce heat or electricity when burned. Major producers include the USA, France, and Sweden. The main issue is CO₂ emissions during combustion.
- **Geothermal energy:** Comes from the Earth's internal heat and is used to heat water, for heating, and to generate electricity. Major producers include the USA, the Philippines, and Mexico. High-power sources are localized in volcanic or seismic areas, while low-power sources are expensive.
- **Tidal energy:** Derived from the force of tides or ocean waves, used to generate electricity. Major producers include France, the UK, and Canada. Problems include high production costs, wave variability, and environmental impact.
- **Nuclear fusion energy:** Generated by fusing light atoms like deuterium or tritium, isotopes of hydrogen extracted from seawater. This can produce large amounts of energy. Issues such as high temperatures and reaction control remain unresolved.

ENERGY IN THE WORLD AND ENERGY SAVING:

Energy is essential in our daily lives. It powers transport, machines, and appliances, and lights homes, offices, and shops. However, its production and consumption are unevenly distributed globally, causing serious problems.

- **Energy problems:**
 - Global energy production and consumption are constantly increasing due to population and economic growth.
 - Most energy needs are met by non-renewable sources, some of which may run out in the coming decades.
 - Unequal distribution of energy resources forces non-producing countries to rely on costly imports, creating dependence on producing countries. Attempts to control these resources have led to international conflicts (e.g., the Gulf War, 1990-1991) or political pressure (e.g., Russia).

- Energy extraction and use cause severe environmental issues, including resource depletion and pollution of air, soil, and water by large industrial and energy facilities, heating systems, and transport.
- **Energy policies:**
 - Environmental policies aim to limit emissions from large energy, industrial, and transport facilities.
 - Energy-saving policies focus on reducing energy consumption. This involves raising awareness among consumers (families, industries, transport, and services) to save energy and use less-consuming technologies.