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# The Miracle on the Han River – Can We Still Learn from the Korean Experience? A Sustainable Development Perspective

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## Abstract

**Aim:** The article aimed at assessing Korean economic growth in line with the three pillars of sustainable development.

**Methodology:** The authors employed basic statistical methods, literature analysis, and an examination of national and international reports and analyses.

**Results:** Korean economic growth may be considered sustainable. However, significant problems in the social pillar should be highlighted.

**Implications and recommendations:** The proposed original selection of indicators can be used to assess the economies of other countries. Given limited access to data, the study can be repeated based on data available only in the Korean language in the future.

**Originality/value:** The literature often examines individual policies that impacted on Korea's economic development and, on this basis, proposes solutions for developing countries. However, the broader discourse lacks an assessment of sustainable development beyond the economic aspect, as presented in this article.

**Keywords:** sustainable development, Miracle on the Han River, Korean economy

## 1. Introduction

The South Korean economic phenomenon, called “the miracle on the Han River” enjoys constant popularity in the scientific world. In most cases, individual policies are analysed, such as the HCI Drive Plan or export-led policies, which have contributed significantly not only to the exit from poverty but also the incredible leap to become one of the most innovative countries in the world and an OECD member state in a very short time. For this reason, South Korea is often held up as a role model for developing countries. Nevertheless, there is no consensus in the literature regarding which period should be considered as ‘miraculous’. Moreover, in today’s world realities, the emphasis is on ensuring sustainable development, therefore, it was decided to develop indicators and check whether the Korean economic miracle can still be set as a model for other countries in light of the generally prevailing sustainable development paradigm. First, information on the stages of Korean economic growth was organized. Different methods of creating sustainable development indicators were introduced, tracing their origins back to both the scientific community and social activists associated with organizations such as Sustainable Seattle and the United Nations. These examples demonstrate the global nature of the sustainable development challenge. Twenty-six indicators were selected for analysis and divided into three pillars of sustainable development: ecological, social, and economic. Then the findings were compared with the results of research provided in the scientific world; in light of the analysis, Korean economic growth can be considered sustainable. The proposed set of indicators can be used to analyse the economies of other countries in the future.

## 2. The miracle on the Han River – outline of the issues

The term “the miracle on the Han River” refers to the spectacular economic growth that South Korea experienced, which has been extensively discussed and analysed in the literature. However, there is no clearly defined framework as to what time frame this miracle applies to. One of the proposals for indicating the time points out that the Korean path to economic development began with the end of World War II and, what is meaningful for Korea, liberation from Japanese occupation (Le et al., 2016, p. 254). One can also find other dates: the end of the Korean War in 1953 (ROK Center for Korean Studies, 2019), the beginning of the 1960s (Jeong, 2015, p. 3; Park, 2019, p. 184), or even more specifically, 1962, the year when Park Chung Hee introduced the first five-year plan (Harvie and Lee, 2003, p. 5; Chaudhuri, 1996, p. 19). Thus, it is difficult for researchers to determine the duration of this exceptional economic growth. The available information states that it lasted either one generation (Kim, 2018, p. 86), three decades (Kim, 1991, p. 3), 40 years (Çetin and Karadaş, 2018, p. 94), or as long as six decades (Le et al., 2016, p. 253). Other attempts to determine the end of the Korean economic miracle referred to the Asian crisis in 1997-1998 (Lee et al., 2012, p. 3; ROK Center for Korean Studies, 2019) or the mid-1990s (Jeong, 2015, p. 254). According to Harvie and Lee (2003, p. 5), from a purely economic perspective, the most significant period of South Korea’s economic history was between 1962 and 1989, defined as the development of the economic miracle. The second stage was between 1990 and 1997, identified as the end of the economic miracle. However, when adding the geopolitical backdrop to illustrate the broader context of the initial problems of the Korean economy, the division proposed by Le, Kim, and Kim (2016), which covers the period 1945-2007, is significant. Table 1 summarises the stages of economic development adopted by the authors, along with the most important economic activities undertaken in a given period.

In the first stage of the path to economic growth, South Korea had to face many challenges, in particular normalising the economy following the Japanese occupation and the Korean War. Data from August 1951 indicated that losses in seven industries, i.e. Metal, Machinery, Chemical, Textile, Ceramic, Food, and Printing, amounted to almost $115 million. The estimates did not include smaller factories, therefore the amount was most likely even higher (Rhyu, 2005, p. 206). Raw materials and heavy industry were concentrated more in North Korea, from where refugees fled to South Korea (Goban-Klas, 1999,

pp. 85-88). The United States provided large-scale aid to Korea. This dictated by, among others, the geopolitical US interests. However, due to insufficiently good management (the problem of corruption should be mentioned), the effect was disproportionate to the aid received (Suh and Kim, 2016, pp. 66-67). "The market economy system was established by privatising the confiscated Japanese factories and enterprises properties" (Le et al., 2016, p. 254). Privatisation of enterprises after the Japanese invasion was carried out with the pre-emption right for former employees of these factories during the incursion and administrative employees in the period of 1945-1948, i.e. the rule by US army (Lee, 2001, p. 102). Agrarian reform should also be mentioned because, at the end of the Japanese occupation, the Korean economy was largely based on agriculture, where tenants cultivated the land. Land purchases were allowed, so that from 1945 to 1965 the percentage of "cultivated land under tenancy fell from 65 to 18 percent in South Korea" (You, 2015, p. 68).

Table 1. Stages of Korean economic development in 1945-2007

| No. | Stages of Korea's economic miracle | Duration | Most important political decisions |
|---|---|---|---|
| 1. | Building the Foundation for Market Economy | 1945-1960 | • Establishment of Private Property Ownership and Market Economy<br>• Reform to Privatize the Confiscated Enemy properties<br>• Agricultural Land Reform<br>• Disposing of US Aid |
| 2. | Government-directed Economic Growth | 1961-1980 | • The first five-year economic plan<br>• The financial, fiscal, and trade incentives policy for export promotion<br>• The second five-year economic plan<br>• HCI Drive Plan<br>• Establishment of General Trading Company System<br>• Industrial Adjustment Plan |
| 3. | Adjustment and Shift to Globalization | 1980-1997 | • Industrial Adjustment Plan<br>• Industrial Rationalisation Programme<br>• The Fair Trade Law Implemented<br>• Establishment of new labour-management relations<br>• Market-friendly Development Policy<br>• Liberalisation and Globalisation Policy |
| 4. | Financial Crisis and Restructuring | 1997-2007 | • Big Deal- swapping business among Chaebols<br>• Workout programme<br>• Improving the corporate financial structure<br>• Enhancing the corporate transparency and governance system<br>• Reform of Financial Institutions and Privatization of Public Enterprises<br>• Nurturing Venture Business |

Source: own work based on (Le et al., 2016, pp. 254-262).

Between 1961 and 1980, two main policies dominated, the first based on export promotion and the second focusing on heavy and chemical industries. The industrial policy focused on "encouraging exports and promoting new industries" (Westphal, 1990, p. 44) since the early 1960s, was bearing fruit. From 1960 to 1969, total exports increased from $33 million to $658 million (Frank Jr., Kim, Westphal, 1975, p. 78). The Heavy and Chemical Industry (HCI) Promotion Policy was initiated by the government and announced in January 1973 (Horikane, 2005, p. 382; Soh, 2004, p. 16). The policy focused on the "steel, non-ferrous metals, shipbuilding, machinery, electronics, and petrochemicals sectors" (Castley 1997; Lane, 2022, p. 5, cited in Stern et al., 1995). The reasons for adopting this policy resulted from internal needs, including the creation of an independent military force, as well as external requirements, such as the increasing protectionism of Western countries towards labour-intensive goods and the presence of other developing countries whose labour costs were higher than in Korea (Soh, 2004, p. 16; Chaudhuri, 1996, p. 23). As part of the HCI promotion policy, the state offered not only enormous financial support but, as Galbraith and Kim (1998, p. 3) pointed out after Kim, Ji-Hong (1990) and Leipziger (1987), new financial institutions were established, e.g. the National Industrialisation Fund. Research by Choi and Levchenko (2021, p. 36) proved that the impact of

subsidised loans on enterprise sales turned out to be positive in the long term. Interestingly, its effects were noticeable even 30 years after the subsidies offered by the government ended. However, the literature also indicated the disadvantages of policies to promote HCI, such as the "over-dependence on certain industries, unbalanced regional growth and socio-economic inequalities" (Jung, 2023, p. 31).

In the 1980s, a free market course was adopted. The goals included privatising banks and stopping supporting specific sectors with loans (Cho and Kang, 2013, p. 88; Park et al., 2021, p. 5). Nevertheless, the attachment to interventionism meant that the undertaken changes were not as significant as assumed (Park et al., 2021, p. 5). External factors impacted the economy, such as the second oil shock and the "three lows" phenomenon of the low dollar, low interest rates, and low oil prices, but also internal factors left their mark, where democratisation played a special role (Heo and Roehrig, 2010. p. 80; Noland, 2012, p. 20; The Bank of Korea, 2014, p. 9). Heo and Roehrig (2010, p. 80) saw the causes that laid the foundations for the 1997 crisis in strikes, wage increases, and a dramatic growth in short-term debt. However, there is no consensus in the literature that the wage increases were the decisive factor. Emery (2017, p. 51) expressed a different opinion and saw the causes of the crisis in the financial and business sectors. Chang (1998, p. 1555) also attributed the reasons to the insufficient regulation of economic aspects. South Korea was hit hard by the Asian financial crisis, considered the most serious crisis since the Korean War. First of all, it was pointed out that there was only a year between joining OECD member countries and applying to the IMF for a loan that was considered "the single largest financial bailout in the history of multilateral lending" (Kim, 2005, p. 63). The Korean economy and society coped with the crisis relatively quickly, and in August 2001, Korea returned $19.5 billion to the IFM (Koo and Kiser, 2001, p. 33). This success was mainly attributed to the efficient restructuring of the financial sector (Ito, 2007, p. 38). Korean economic success has been the subject of many scientific publications, where it was assessed using various economic criteria. Lessons for developing countries were pointed out[1]. However, according to the author, it is worth looking at the issue more broadly and assessing Korean economic growth through the sustainable development paradigm currently dominating the world of science.

## 3. Sustainable Development Indicators

The concept of sustainable development has been widely debated and defined over the years. However, the most widely accepted definition comes from the report entitled "Our Common Future", which reads: "It [sustainable development] meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). The concept has become a permanent part of the policies of states, enterprises, and international organizations. However, it should be emphasised that the use of this term has been noticeably abused (Waas et al., 2011, p. 1638). Moreover, the idea itself is not free from flaws, as indicated by, among others, Kotzé and Adelman (2023, p. 242), highlighting its inability to cope with the socio-ecological crisis.

As a rule, one distinguishes three pillars of sustainable development: environmental, social, and economic. However, a proper consideration of this issue requires a comprehensive view of all indicated aspects (Mensah, 2019, p. 9; Szymczak, 2023, p. 281). In an attempt to capture the multi-aspect nature of sustainable development, various indicators are proposed. To show how many purposes the sustainable development concept can be used for, Table 2 presents the divisions proposed by various groups in different periods, including solutions developed by the world of science, social activists working in the non--profit organization, Sustainable Seattle, and the UN as a representation of international organizations.

[1] The articles focus either on developing countries as a whole or on specific geographical areas or countries. One can refer for example to the findings developed by (Adelman, 1999, p. 68; Collins, 1990, p. 107; Domjahn, 2013, p. 22; Kalu and Kim, 2009, pp. 49-50; Kim, 1997, p. 429; Kim, 2015, pp. 28-33; Lee, 2018, pp. 459-462; Mavlianov, 2012, p. 16; Yoo, 2008, 57-61).

Table 2. Sustainability indicators

| Organization that developed the indicators | Name of indicator group | (Research fields) Indicators adopted in a given group |
|---|---|---|
| Sustainable Seattle ("*"Indicators researched until the 1993 report) | Environment | * wild salmon runs through local streams<br>biodiversity in the region<br>* number of good air quality days per year, as reported by the pollution standards index<br>amount of topsoil lost in King County<br>acres of wetlands remaining in King County<br>* percentage of Seattle streets meeting "Pedestrian-Friendly" criteria |
| | Population and Resources | * total population of King County (with annual growth rate)<br>* gallons of water consumed per capita<br>* tons of solid waste generated and recycled per capita per year<br>* vehicle miles travelled per capita and gasoline consumption per capita<br>* renewable and non-renewable energy consumed per capita<br>acres of land per capita for a range of land uses (residential, commercial, open space, transportation, wilderness)<br>amount of food grown in Washington, food exports and food imports<br>emergency room use for non-emergency purposes |
| | Economy | * percentage of employment concentrated in the top ten employers<br>* hours of paid employment at the average wage required to support basic needs<br>real unemployment, including discouraged workers, with differentiation by ethnicity and gender<br>average savings rate per household<br>reliance on renewable or local resources in the economy<br>* percentage of children living in poverty<br>* housing affordability gap<br>* health care expenditures per capita |
| | Culture and Society | * percentage of infants born with low birthweight<br>ethnic diversity of teaching staff in elementary and secondary schools<br>number of hours per week devoted to instruction in the arts for elementary and secondary schools<br>percent of parent / guardian population involved in school activities<br>* juvenile crime rate<br>* percent of youth participating in some form of community service<br>percent of enrolled 9th graders who graduate from high school<br>* percent of population voting in odd-year (local) primary elections<br>* adult literacy rate<br>average number of neighbours the average citizen reports knowing by name<br>equitable treatment in the justice system<br>ratio of money spent on drug and alcohol prevention and treatment to money spent on incarceration for drug and alcohol related crimes<br>percentage of population that gardens<br>* usage rates for libraries and community centres<br>* public participation in the arts<br>percent of adult population donating time to community service<br>individual sense of well-being |
| Balas, Molenda | Social Order | Demographic changes: Fertility rate, Foreign migration rate (in ‰), Actual population growth/decrease rate (in %), Post-working age population per 100 persons of working age |
| | | Public health: Healthy life expectancy at age 65 (in years), Standardized mortality rates for a particular cause: circulatory system diseases, malignant tumors, chronic diseases of the lower respiratory tract, and diabetes; Euro Health Consumer Index EHCI (in points), Urban population exposure to excessive particle matter pollution (PM10) (in µg/m$^3$), Urban population exposure to ozone polluted air (in µg/m$^3$ per day) |
| | | Poverty and living conditions: At persistent risk of poverty (in %), At risk of poverty or social exclusion (in %), Inequality of income distribution (in %), Household debt (in %), Number of dwellings completed per 1,000 population aged 25-34, Average monthly disposable income per person in the household (in PLN) |
| | | Education: Adults participating in education and training (in %), Proportion of children in rural areas aged 3-4 years receiving pre-school education (in %), Public expenditure on education to GDP (in %), Early school leavers (in %), Proportion of population aged 25-64 years with at most lower secondary education (in %) |
| | | Access to the labor market: Proportion of persons in households without employed persons (in %), Long-term unemployment rate (in %), Unemployment rate according to BAEL (in %), Employment rate of disabled people (in %), Gender pay gap (in %), Employment rate of women with the youngest child up to 5 years old (in %) |
| | | Public safety: Road accident fatalities per 1 million population, Crimes detected per 1,000 inhabitants |
| | | Consumption patterns: Structure of passenger cars by age groups (in %), Electricity consumption in households per capita (in GJ), Structure of average monthly expenditure per person in households by type (in %) |
| | Economic Order | Economic development: Growth of gross domestic product per capita (previous year = 100), (in %), Investment rate (in %), Regional differences in GDP per capita to PPP at the NTS 3 level (in %), Debt of |

| | | |
|---|---|---|
| | | the government sector and local government to GDP (in %), Water intensity of the economy (in $dam^3$/thousand PLN), Transport intensity of GDP (freight transport and passenger transport) (2000 = 100), Energy intensity of transport to GDP (2000 = 100), Result (surplus/deficit) of the general government sector to GDP (in %), Gross domestic product per capita to PPP (EU28 = 100) (in %), Gross domestic savings rate to GDP (in %) |
| | | Employment: Employment rate of population aged 20-64 years (in %), Duration of working life (in years), Youth economic and social passivity rate (in %), Professional activity rate (in %) |
| | | Innovation: Share of net revenues from the sale of innovative products in net sales revenues (in %), Human resources for science and technology (in %), Labor productivity (previous year = 100), (in %), Expenditure on research and development activities to GDP (in %), Eco-innovation index (EU = 100), Number of inventions submitted by residents to the European Patent Office per 1 million inhabitants |
| | | Transport: Intermodal transport of cargo by standard-gauge railway transport (in %), Share of rail and inland waterway transport in total transport (in %), Share of the length of railway lines adapted to the speed of 160 km/h and more in the length of railway lines in operation (in %), Number passenger transport per 1 inhabitant of urban areas |
| | | Production patterns: Resource efficiency (in euro/kg), Share of agricultural land area of organic farms in total agricultural land area (in %), Organizations with the Environmental Eco-Management and Audit System EMAS (in pcs), Percentage of green public procurement (in %), Share of samples of agricultural and food products of inappropriate commercial quality (%) |
| | Environmental Order | Climate change: Greenhouse gas emissions in $CO_2$ equivalent (1988 = 100), Greenhouse gas emissions by sectors (in thousand tones in $CO_2$ equivalent), Greenhouse gas emissions per unit of energy consumed (2000 = 100) |
| | | Energy: Share of energy from renewable sources in the final gross energy consumption (in %), Share of energy from renewable sources in the consumption of fuels in transport (in %), Percentage of expenditure on fixed assets in non-conventional energy sources (in %), Energy intensity in the economy (in kgoe/1000euro00) |
| | | Air protection: Emission of air pollutants by road transport per 100 $km^2$ (in Gg), Average $CO_2$ emission per 1 km from new cars (in g), Air quality status (46 zones nationwide in which air quality is assessed) (in %), Emission of acidifying pollutants per 1 $km^2$ (sulfur oxides, nitrogen oxides, ammonia) (in t) |
| | | Marine ecosystems: Size of the fishing fleet (in thousand sq) |
| | | Freshwater resources: Water absorption of industry (in $m^3$/thousand PLN), Percentage of population using sewage treatment plants of at least the second degree (in %), Water consumption per capita (in $m^3$), Capacity of small water retention facilities (in $dam^3$) |
| | | Land use: Share of built-up and urbanized area in the total area (in %), Share of devastated and degraded land requiring recultivation in the total area (in %), Forest cover (in %), Share of the area covered by applicable development plans spatial in the total geodetic area (in %) |
| | | Biodiversity: Share of the area of legally protected areas in the total area (in %), Share of the area of "Natura 2000" areas in the total area (in %), Damage to forest stands by defoliation (in %), Index of the number of common birds in the agricultural landscape FBI (2000 = 100 ) |
| | | Waste management: Non-mineral waste generated per capita (in kg), Municipal waste generated per capita (in kg), Municipal waste disposed of through landfilling per capita (in kg), Municipal waste collected separately to total municipal waste (in %), Recycling of packaging waste (in %) |
| | Institutional-Political Order | Financing sustainable development: Official Development Assistance (ODA) for developing countries (in %), Polish direct investments in developing countries (in PLN million) |
| | | Trade globalization: Imports from developing countries by income groups (in billion euros) |
| | | Cohesion and efficiency policy: Level of trust in public institutions (in %), Perceived corruption index (in points) |
| | | Civil society – openness, participation, and civic activity: Turnout in parliamentary and local government elections (in %), Percentage of households with broadband Internet access at home (in %), Percentage of individuals using the Internet in contact with public administration (in %), Trust index (in points), Percentage of population engaging in volunteering (in %) |
| | | Equality in management: Share of women in managerial positions in the total number of people working in managerial positions (in %), Participation of women in public life (in %) |
| CSD Indicators of Sustainable Development | Poverty | Income poverty: Proportion of population living below national poverty line, Proportion of population below $1 a day |
| | | Income inequality: Ratio of share in national income of highest to lowest quintile |
| | | Sanitation: Proportion of population using an improved sanitation facility |
| | | Drinking water: Proportion of population using an improved water source |
| | | Access to energy: Share of households without electricity or other modern energy services, Percentage of population using solid fuels for cooking |
| | | Living conditions: Proportion of urban population living in slums |
| | Governance | Corruption: Percentage of population having paid bribes |
| | | Crime: Number of intentional homicides per 100,000 population |
| | Health | Mortality: Under-five mortality rate, Life expectancy at birth, Healthy life expectancy at birth |
| | | Health care delivery: Percent of population with access to primary health care facilities, Contraceptive prevalence rate, Immunization against infectious childhood diseases |
| | | Nutritional status: Nutritional status of children |
| | | Health status and risks: Morbidity of major diseases such as HIV/AIDS, malaria, tuberculosis, Prevalence of tobacco use, Suicide rate |

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|---|---|---|
| | Education | Education level: Gross intake ratio to last grade of primary education, Lifelong learning, Net enrolment rate in primary education, Adult secondary (tertiary) schooling attainment level |
| | | Literacy: Adult literacy rate |
| | Demographics | Population: Population growth rate, Total fertility rate, Dependency ratio |
| | | Tourism: Ratio of local residents to tourists in major tourist regions and destinations |
| | Natural Hazards | Vulnerability to natural hazards: Percentage of population living in hazard-prone areas |
| | | Disaster preparedness and response: Human and economic loss due to natural disasters |
| | Atmosphere | Climate change: Carbon dioxide emissions, Emissions of greenhouse gases |
| | | Ozone layer depletion: Consumption of ozone-depleting substances |
| | | Air quality: Ambient concentration of air pollutants in urban areas |
| | Land | Land use and status: Land use change, Land degradation |
| | | Desertification: Land affected by desertification |
| | | Agriculture: Arable and permanent cropland area, Fertilizer use efficiency, Use of agricultural pesticides, Area under organic farming |
| | | Forests: Proportion of land area covered by forests, Percent of forest trees damaged by defoliation, Area of forest under sustainable forest management |
| | Oceans, seas and coasts | Coastal zone: Percentage of total population living in coastal areas, Bathing water quality |
| | | Fisheries: Proportion of fish stocks within safe biological limits |
| | | Marine environment: Proportion of marine area protected, Marine trophic index, Area of coral reef ecosystems and percentage live cover |
| | Freshwater | Water quantity: Proportion of total water resources used, Water use intensity by economic activity |
| | | Water quality: Presence of fecal coliforms in freshwater, Biochemical oxygen demand in water bodies, Wastewater treatment |
| | Biodiversity | Ecosystem: Proportion of terrestrial area protected, total and by ecological region, Management effectiveness of protected areas, Area of selected key ecosystems, Fragmentation of habitats |
| | | Species: Change in threat status of species, Abundance of selected key species, Abundance of invasive alien species |
| | Economic development | Macroeconomic performance: Gross domestic product (GDP) per capita, Gross saving, Investment share in GDP, Adjusted net savings as percentage of gross national income (GNI), Inflation rate |
| | | Sustainable public finance: Debt to GNI ratio |
| | | Employment: Employment-population ratio, Vulnerable employment, Labor productivity and unit labor costs, Share of women in wage employment in the non-agricultural sector |
| | | Information and communication technologies: Internet users per 100 population, Fixed telephone lines per 100 population, Mobile cellular telephone subscribers per 100 population |
| | | Research and development: Gross domestic expenditure on R&D as a percent of GDP |
| | | Tourism: Tourism contribution to GDP |
| | Global economic partnership | Trade: Current account deficit as percentage of GDP, Share of imports from developing countries and LDCs, Average tariff barriers imposed on exports from developing countries and LDCs |
| | | External financing: Net Official Development Assistance (ODA) given or received as a percentage of GNI, Foreign direct investment (FDI) net inflows and net outflows as percentage of GDP, Remittances as percentage of GNI |
| | Consumption and production patterns | Material consumption: Material intensity of the economy, Domestic material consumption |
| | | Energy use: Annual energy consumption, total and by main user category, Share of renewable energy sources in total energy use, Intensity of energy use, total and by economic activity |
| | | Waste generation and management: Generation of hazardous waste, Generation of waste, Waste treatment and disposal, Management of radioactive waste |
| | | Transportation: Modal split of passenger transportation, Modal split of freight transport, Energy intensity of transport |

Source: own work based on (Balas and Molenda, 2016, pp. 102-107; Hardi and Pinter, 1995, pp. 29-30; UN, 2007, pp. 10-14).

The indicators proposed by Sustainable Seattle were developed with a specific region in mind, and the local community participated in their creation (Hardi and Pinter, 1995, pp. 8-9). However, their application with possible adaptations is feasible in other communities. Three main categories were identified for indicators consistent with the sustainable development pillars. The update of the indicators proposed by Balas and Molenda (2016) referred to a national project in Poland. In addition to the pillars of social development, the adopted program and proposed areas for measuring sustainable development included orders corresponding to institutional and political development. In the case of the indicators proposed by the United Nations, they are broadly included in 14 thematic sections, which are divided into subtopics. Themes such as poverty, governance, health, education, and demographics can be encompassed by components of the social pillar of sustainable development. Natural hazards, atmosphere, land, oceans, seas and coasts, freshwater, and biodiversity should be included in the ecological pillar. Furthermore, the economic pillar should consist of economic development, global economic partnership, and consumption and production patterns.

The multitude of approaches to sustainable development can be assessed positively because by analysing a specific country or region, one can make a more detailed analysis that may reflect the nature of the entity being examined. However, this poses a problem in the context of comparing the results between individual studies. In the previously indicated proposals for selecting indicators, regardless of the entity being analysed and what institution/individual proposed the indicators, there were common elements such as education, employment, human health, and water use/access. Drawing on the rich experience of various environments, the article proposes an original set of indicators to examine Korean economic growth. In the author's view, it is important that within each of the three pillars of sustainable development, there is representation from different subgroups. In the case of environmental protection, these include: protection of air, water, land, waste management, electricity and renewable energy. For the social pillar, indicators including health and tackling inequalities are relevant, and for the economic pillar – the economic growth of the state, the efficiency of the authorities and labour-related factors (e.g. minimum wage levels, unemployment). Due to data access limitations, not every subgroup has sufficient representation. Although there are indicators related to protected area or number of forests in the study, in future this should be expanded to include measures related to land degradation. Moreover, data related to government efficiency could contribute to a better assessment of the economic pillar.

## 4. Analysis of the Miracle on the Han River based on sustainability criteria

The analysis of Korean economic growth mainly employed indicators provided by international organizations – the OECD, the World Bank, the IMF, and the UN, as well as the KOSIS (Korean Statistical Information Service) and research published in Korean documents and reports of scientific institutions. It was checked how the value of the indicators changed compared to data from the earliest period, and the change was then evaluated. A positive change was marked in green and a negative change was marked in red. Given limited access to data, the main selection criterion was the assumption that a given indicator must have been present at least at the end of the third stage of South Korea's economic development, i.e. at least since 1997; wherever possible, a longer time frame was used. The test results are summarised in Tables 3 to 5. First, the environmental aspect of Korean economic growth was analysed.

Table 3. Environmental indicators of sustainability

| Indicators | First year of the study | Last year of the study | Change |
|---|---|---|---|
| Mortality and welfare cost from exposure to air pollution (Welfare cost of premature deaths, % GDP equivalent) | 1990 | 2019 | 0.88 |
| Mortality and welfare cost from exposure to air pollution (Premature deaths, per million inhabitants) | 1990 | 2019 | 1.02 |
| Protected area | 1950 | 2022 | 16.80 |
| cali | 1993 | 2021 | 5.36 |
| Freshwater abstractions (Gross abstractions per capita, cubic meters per capita) | 1980 | 2020 | 1.01 |
| Forests | 1953 | 2007 | Figure 1 |
| Patents within environment-related technologies | 1980 | 2020 | 1376.34 |
| Municipal waste, % recycled | 1990 | 2020 | 12.02 |
| Percentage of New and Renewable Energy Supply (%) | 1995 | 2021 | 165.80 |

Source: own work based on (Korea Forest Service, 2014, p. 33; KOSIS Database, n.d.; OECD.Stat Database, n.d.).

Out of the nine areas examined, a positive change occurred in eight of them. Only the indicator regarding mortality and welfare cost from exposure to air pollution (premature deaths per million inhabitants) deteriorated over the period 1990-2019. However, the same indicator but calculated as the welfare cost of premature deaths (% GDP equivalent) has decreased, which should be assessed

positively. In terms of protected nature areas, according to the National Alas of Korea (the National Geographic Information Institute, 2023, p. 122), there were 461 natural monuments in South Korea by 2020. It is also necessary to point out the change in forest areas since the end of the Korean War (Figure 1). The increase in the stocked area during this period was approximately 1.75 times.

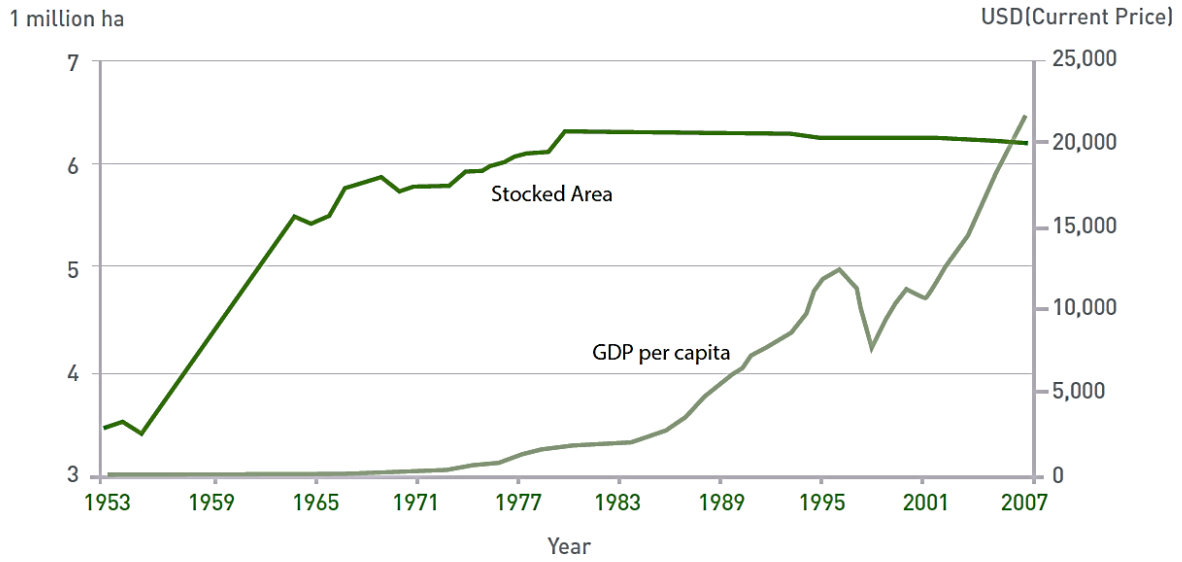


Fig. 1. Changes in Forest Area and GDP per capita (1953-2007)

Source: (Bae et al., 2012 as cited in the Korea Forest Service, 2014, p. 33).

The biggest change can be observed in environment-related technology patents as their number increased from 4 to 5505.35 over 40 years. In the 1960s and 1970s, sustainability could not be initially taken into account when creating national development policies. However, as a result of the growing social awareness of this issue's significance, emphasis began to be placed on environmental protection (National Geographic Information Institute, 2023, p. 120). This can be proved by the increase in the indicator values for the investment in environmental pollution control by the industrial sector, recycled municipal waste, and the percentage of new and renewable energy supply. Although the change in freshwater abstractions is practically negligible, there is significant progress in the perception of the water value. Just as in the 1970s rivers were covered and regulated, since the 2000s the opposite trend has been observed (National Geographic Information Institute, 2023, p. 116). South Korea's economic development was further examined in line with the social pillar of sustainable development.

Table 4. Social indicators of sustainability

| Indicators | First year of the study | Last year of the study | Change |
|---|---|---|---|
| Total population of South Korea (with annual growth rate) | 1949 | 2022 | 2.56 |
| Foods production index | 1961 | 2021 | 4.19 |
| Number of housing units / persons | 1975 | 2010 | 2.14 |
| Out-of-school children of primary school age, both sexes (number) | 1971 | 2018 | 0.11 |
| Illiteracy rate | 1945 | 2008 | 0.07 |
| Proportion of seats held by women in national parliaments (%) – Korea, Rep. | 1997 | 2022 | 6.33 |
| Life expectancy | 1970 | 2021 | 1.34 |
| Maternal and infant mortality Deaths per 1.000 live births) | 1970 | 2021 | 0.05 |
| Non-Medical Determinants of Health: Tobacco consumption | 1989 | 2021 | 0.45 |

Source: own work based on (Byun et al., 2012, p. 93; KOSIS Database, n.d.; OECD.Stat Database, n.d.; World Bank Database, n.d.).

Undeniably, the standard of living in South Korea has improved since the end of the Korean War. All of the nine selected indicators in the fields of health, food, and education show positive changes. The proportion of seats held by women in national parliaments has increased from 3% to 19% over 25 years, which is also a significant change but needs to be further monitored. Importantly, the analysis should be deepened with current trends in the population of South Korea (Figures 1 and 2).

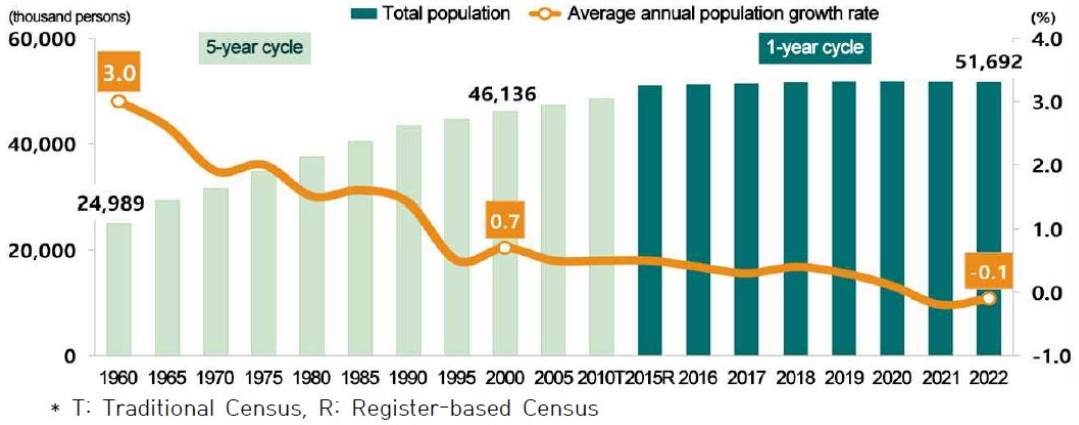


Fig. 2. Total population and average annual population growth rate (1960~-2022)

Source: (Statistics Korea, 2023, p. 2).

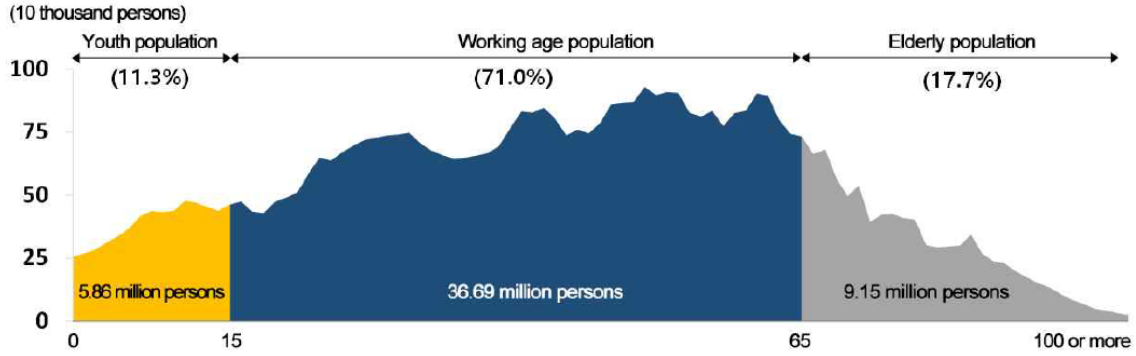


Fig. 3. Total population and average annual population growth rate (1960~-2022)

Source: (Statistics Korea, 2023, p. 3).

Based on the data for 2022, the number of Koreans living in South Korea decreased by 148,000 compared to the previous year (Statistics Korea, 2023, p. 2). The fertility rate was 0.84 in 2020 (Fleckenstein, Lee, Himmelweit, 2023, p. 298). Combining low fertility with the phenomenon of an ageing society, where, according to OECD projections, the 65+ age group will constitute 43.9% of the population in 2026 (OECD, 2022), ensuring an efficient state system for current and future generations will be a significant challenge.

During the analysis the economic indicators were evaluated and outlined in Table 5. Eight indicators were examined, of which seven showed positive changes. The transition from a centrally controlled economy to a free market was taken into account, along with the democratisation of society. Therefore, indicators such as real minimum wages, unemployment, and trade union density were evaluated. It is worth mentioning that although the gender wage gap has decreased, Korea still ranks last in this aspect among the OECD countries (Stansbury et al., 2023, p. 1). In 1961, the GDP growth was 6.9%, and in 2022 it was projected to be 2.6%. Although the Korean economy is not growing at the same pace as in the 1960s, it is still expanding.

Table 5. Economic indicators of sustainability

| Indicators | First year of the study | Last year of the study | Change |
|---|---|---|---|
| Unemployment, total (% of total labour force) (national estimate) - Korea, Rep. | 1969 | 2021 | 0.73 |
| Research and development expenditure % GDP | 1996 | 2020 | 2.16 |
| GDP growth (annual %) | 1961 | 2022 | 0.38 |
| GDP (current US$) | 1960 | 2022 | 420.64 |
| Real minimum wages | 1988 | 2022 | 5.23 |
| Gender wage gap at median | 1988 | 2022 | 0.59 |
| Trade union density | 1963 | 2018 | 1.23 |
| Government revenue, percent of GDP (% of GDP) | 1953 | 2021 | 2.49 |

Source: own work based on (IMF Database, n.d.; OECD.Stat Database, n.d.; World Bank Database, n.d.).

Research on the sustainable development of Korean economic growth divided into ecological, social, economic, and political aspects was conducted by Kim, Lee, Ahn, Lee, and Lee (2021), where they selected 18 indicators to examine; most of them were different from those proposed in this study. The conclusions in the ecological aspect differ regarding the assessment of the size of forests, where it is indicated that a slight decrease in forest areas is currently observed. The authors drew attention to social inequalities that are the result of rapid economic growth and unequal enrichment of society, while the area of wage inequality should be considered convergent. In terms of the economic pillar, the indicators selected by the researchers also showed a positive change in the studied periods. Korean economic growth should be considered sustainable, although for a country devastated after the war, as was the case with European countries after World War II, it was not the primary goal in the initial phase. Most of the indicators examined showed positive changes. South Korea faces new challenges, especially in maintaining economic growth with an ageing society and record low fertility rates.

## 5. Discussion and Conclusions

Sustainable development and its measurement are a significant challenge due to definitional problems and the fact that there are many approaches developed in the world of science, but also by individual countries, international organizations, and social organizations. Whilst selecting indicators for a specific analysed entity may help highlight the progress achieved or areas where further improvement is necessary, yet this hampers the comparability of studies. The article organized the most important data related to the development of the South Korean economy and conducted an original study based on 26 indicators divided into pillars of sustainable development to assess whether Korean economic growth is sustainable. The results of the analysis, along with a comparison with the research of other researchers from 2021, allow the authors to rate the Miracle on the Han River as sustainable development. However, work is still required in the area of social inequality. The greatest limitation of the study was the availability of data in the publicly available the OECD, the World Bank, the IMF, the UN, and the KOSIS databases. Nevertheless, the study with the proposed indicators can be extended to other economies.

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## Cud nad rzeką Han – czy nadal możemy uczyć się z koreańskich doświadczeń? Perspektywa zrównoważonego rozwoju

## Streszczenie

**Cel:** Ocena koreańskiego wzrostu gospodarczego zgodnie z trzema filarami zrównoważonego rozwoju.

**Metodyka:** Proste metody statystyczne, analiza literatury przedmiotu, analiza krajowych i międzynarodowych raportów i analiz.

**Wyniki:** Koreański wzrost gospodarczy można uznać za zrównoważony. Niemniej jednak podkreślić należy istotne problemy w filarze społecznym.

**Implikacje i rekomendacje:** Zaproponowany autorski dobór wskaźników może być wykorzystany do oceny gospodarki innych krajów. Ze względu na ograniczony dostęp do danych w przyszłości można powtórzyć badanie, opierając się na danych dostępnych tylko po koreańsku.

**Oryginalność/wartość:** W literaturze przedmiotu często podejmowana jest ocena poszczególnych polityk, które miały wpływ na koreański rozwój gospodarczy, i na tej podstawie proponuje się rozwiązania dla krajów rozwijających się. Brakuje jednak w szerszym dyskursie oceny zrównoważonego rozwoju, wykraczającej poza sam aspekt ekonomiczny, co zostało przedstawione w artykule.

**Słowa kluczowe:** zrównoważony rozwój, cud nad rzeką Han, koreańska gospodarka