

Sustainable Development versus Gender Gap – Do Women Matter?

Zrównoważony rozwój a nierówne traktowanie płci – czy kobiety mają znaczenie?

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Abstract

Striving for sustainable development of society and economy is a concept that for decades has been the subject of scientific inquiry. Additionally, the sustainable development concept is based on three main and overlapping pillars (social, economic and environmental). Maintaining balance between them is only way to achieve at least acceptable effects of sustainable development. Analyses in this field have focused on identification of boosters and inhibitors of sustainable development. Taking into consideration this context in our paper, the analyses were devoted to identifying whether a smaller gender gap level (e.g. incentives, political engagement, and education) aligns with higher results in obtaining sustainable development goals. Three hypotheses were formulated that state that mitigating the gender gap supports the social, economic and environmental pillars of sustainable development. Indeed, the results of our study show that in particular, a smaller gender gap related to educational attainment and political empowerment of females is connected positively with higher levels of sustainable development of the three pillars in specific countries. The final conclusion is that diminishment of inequality between females and males supports harmonious and sustainable development of societies in social, economic and environmental dimensions.

Key words: sustainable development, pillars of sustainable development, gender gap

Streszczenie

Dążenie do zrównoważonego rozwoju społeczeństwa i gospodarki jest ideą, która od dekad stanowi przedmiot zainteresowania badaczy. Jej podstawę stanowią trzy główne, zintegrowane filary (społeczny, ekonomiczny oraz odnoszący się do środowiska naturalnego). Wskazuje się, że zachowanie równowagi pomiędzy nimi wydaje się być sposobem na uzyskanie co najmniej zadowalających efektów długoterminowego rozwoju społeczno-ekonomicznego. Do szczególnie ważnych aspektów badawczych w tym obszarze zalicza się analizy, których celem jest zarówno identyfikacja czynników sprzyjających, jak i przeciwdziałających zrównoważonemu rozwojowi. Podobne wątki poruszone zostały w prezentowanym artykule. Jego celem głównym było ustalenie, czy mniejszy poziom dysproporcji pomiędzy kobietami i mężczyznami (*gender gap* – np. pod względem dochodów, zaangażowania politycznego, wykształcenia itp.) posiada dodatnie związki z miernikami zrównoważonego rozwoju. Postawione zostały trzy hipotezy badawcze, zgodnie z którymi zmniejszanie *gender gap* wykazuje pozytywny wpływ na społeczny, ekonomiczny oraz środowiskowy aspekt zrównoważonego rozwoju. Szczegółowe wyniki pokazały, że zmniejszanie luki związanej z poziomem edukacji kobiet i mężczyzn, jak również włączanie kobiet w procesy i decyzje polityczne, w bezpośredni lub pośredni sposób przekłada się na wyższy poziom zrównoważonego rozwoju społeczeństw w jego trzech wymiarach. Konkludując, stwierdzić można z pełną odpowiedzialnością, że zmniejszanie dysproporcji pomiędzy przedstawicielkami płci żeńskiej i męskiej sprzyja harmonijnemu i zrównoważonemu rozwojowi społeczeństwa w wymiarze społecznym, ekonomicznym oraz środowiskowym.

Słowa kluczowe: zrównoważony rozwój, filary zrównoważonego rozwoju, *gender gap*

Introduction

The concept of sustainable development combines growing concerns about a range of environmental (ecological) and social and economic issues. This vision was reported for the first time in *Our Common Future. The Report of the World Commission on Environment and Development* in 1987, presented by the former Norwegian Prime Minister, who headed the World Commission on Environment and Development and who is female. The report recognises that civilization has reached a level of well-being that can be sustained if it is managed consciously. It assumes a properly shaped relationship between economic growth, care for the environment and quality of life (WCED, 1987). This brought together environmental and socio-economic questions and recognised development in a much broader sense that means qualitative, rather than quantitative, improvements (Giddings et al., 2002). Studies indicate that it is not possible to solve contemporary environmental problems only by technical means, with no account being taken of the social or economic aspects. Thus, three generally recognised dimensions of sustainable development have been identified: ecological¹, social and economic (Pawłowski, 2008). This concept is diffusing through many areas of people's lives (Domańska et al., 2018).

Sustainable development indicators are scientific constructs that identify various dimensions underlying the concept (Boulanger, 2008). All over the world, stakeholders are undertaking an effort to present in a consistent way the achievements of sustainable development of particular countries. Three general reports seem to be most feasible. The SDG Index shows an overview of countries' performance on the 17 Sustainable Development Goals set by the United Nations General Assembly in 2015 as a part of Resolution 70/1 *Transforming Our World: The 2030 Agenda for Sustainable Development* (2015). These goals are presented in a yearly report prepared jointly by the Bertelsmann Stiftung and the Sustainable Development Solutions Network. Another sustainability measure is the Happy Planet Index from the New Economics Foundation, which reveals how well nations are doing at achieving long, happy, sustainable lives for their people. It is based on a ratio of a country's well-being measurements such as life expectancy, equality and satisfaction, divided by the country's ecological footprint (Jeffrey et al., 2016). Third is the Better Life Index, which compares well-being across countries based on 11 topics that the OECD has identified as essential in terms of material living conditions and quality of life (Mizobuchi, 2014).

There are many different interpretations of sustainable development. We can distinguish two extreme approaches represented by *ecocentrics* who connect

the environment with the socio-economic point of view, tending towards social and economic equality, while *technocentrists* are more likely to support the economic and political status quo (O'Riordan, 1989). Those who take a reform approach recognise that government has a key role in moving towards sustainable development while accepting that there are problems within societies. This view has a strong commitment to social equity and access to livelihood, good health, resources, economic and political decision-making (Hopwood, 2005). Some research projects connected with sustainable development share many common features, including social indicators such as health, household wealth, knowledge, peace and order and gender equity (Rydzewski, 2018).

Thus, gender inequality is an important component that has a significant effect on sustainable development. The SDG Index measures it using four indicators (see Table 1): unmet demand for contraception, female-to-male mean years of schooling of population age 25-plus, female-to-male labour force participation rate and seats held by women in national parliaments. The problem of gender inequality is much more widely described in the *Global Gender Gap Report*, published since 2006 by the World Economic Forum. The report includes a comparison of the countries' results in women's disadvantages compared to men, but it does not measure equality in a strict way, using a calculated gender gap index. It presents the gap between women and men in four key areas: economic participation and opportunity, educational attainment, health and survival and political empowerment. It assesses countries on how well they are dividing their resources and opportunities among their male and female populations, regardless of the overall levels of these resources and opportunities (*The Global Gender Gap Report*, 2017).

Many studies indicate that gender inequalities are the reason for slowing down sustainable development through extracting high economic costs and leading to social inequities and environmental degradation around the world. Moreover, some scientists argue that the gender gap is destroying many sustainable social structures and increasing poverty (Mies & Shiva, 1993). Hence, it is important to investigate whether gender equity is the missing link of sustainable development (Stevens, 2010). Thus, in our research, we focus on gender gap problems that affect all three pillars of sustainability.

Economic Pillar

The relevance of gender as a macroeconomic variable has been recently the subject of academic research. Whether gender inequality has an impact on

¹ Often instead of *ecological*, the notion of *environmental* is adopted.

economy has been investigated (Gutierrez, 2003). Some analysis shows that female educational attainment has a positive effect on economic growth (Benavot, 1989; Hill & King, 1995). GDP growth is slowed by gender wage inequality (Seguino, 2000). Moreover, a World Bank study shows that government strategies that focus on development assistance for women and poverty reduction lead to faster economic growth than *gender neutral* approaches (*Gender Equality...*, 2009). A study conducted from a micro-prospect provides additional evidence in this area. For example, research in behavioural psychology shows that men and women exhibit positive leadership behaviours with different frequencies. Typically, female leaders use those behaviours more often than their male counterparts. That is why women as leaders improve companies' organizational performance in such areas as vision, motivation, accountability, leadership, work environment and values (Eagly et al., 2003; Eagly & Johannesen-Schmidt, 2001). Nevertheless, in 2017, in the G20 countries, women accounted for only on average 17% of corporate board members and 12% of executive committee members of the top 50 listed companies (*Women Matter ...*, 2017). Additionally, in family businesses, women are rarely preferred as successors, and they are excluded from succession not only for social and cultural reasons, but also due to stereotypes and discrimination (Zajkowski, 2018).

Social Pillar

Economic growth, without taking into account basic social issues such as health, household wealth, education and knowledge, peace and order, household equity and gender equity cannot be called fully sustainable (Rydzewski, 2018). Economic development should depend to a large extent on governance policy, which must also focus on social factors.

Women more than men show greater willingness to engage in social actions on behalf of their own. Some research identifies no differences among gender in general social activist orientation on non-specific issues (Corning & Myers, 2002).

However, alternative research shows that women support the social development of their families and their entourage more compared to men. It turns out that women invest a significant part of their earnings in the education and health of their children. What is more, they devote a larger percentage of resources to the development of the family and society than men do (Booth, 2011). Moreover, the study conducted by Inter-Parliamentary Union shows that women in parliament pay more attention than men to social welfare and environmental issues as a general concept (*Women in Parliament ...*, 2017). The presence of women in politics broadens the debates on problems of socio-economic development and expands the number of topics discussed publically that are particularly important for women, including raising

awareness of discrimination based on gender, social policy, health care, including maternal health, and care for dependent persons, including children and the elderly. Additionally, a World Bank report argued that a strong relationship exists between relatively high levels of female involvement in public life and low levels of government corruption (*Engendering Development ...*, 2001).

Environmental Pillar

The concept that draws attention to the special affinity between women and the environment is ecofeminism (Gaard & Gruen, 2005). The problem of the contemporary world that is dominated by men is the treatment of women and nature as *unproductive* elements. Natural links between women and the environment are not properly used. Meanwhile, OECD research on household behaviour finds that women more often than men buy recyclable, eco-labelled and energy-efficient products (*Gender and Sustainable ...*, 2008). Women also strongly believe that individual actions can affect the environment. For this reason, they are more likely to take action to protect the environment. For example, they recycle more often than men and consider clean energy important in their purchasing decisions. Other studies show that women spend more time than men looking for information on sustainable consumption. They are willing to pay more for sustainable products and more often purchase green foods (Stevens, 2010). According to SustainLabour, women are excluded from the green economy because of gender discrimination. Women need to be employed in non-traditional jobs, trained in more sophisticated skills, ensured equal remuneration and high labour standards (*Green Jobs ...*, 2009), engaged in politics activities and supported in their educational opportunities. One of the goals of sustainable development is gender equality. Based on previous findings, it is the first to suggest that to make proper economic, social and environmental contributions to sustainable development, women have to be more intensively included not only in various pro-environmental issues, but also in whole aspects of the general idea.

The aim of the paper is to verify whether diminishment of the gender gap has a positive impact on sustainable development of specific countries. Three hypotheses were formulated.

H1: Mitigating the gender gap supports sustainable development within the scope of the economic pillar.

H2: Mitigating the gender gap supports sustainable development within the scope of the social pillar.

H2: Mitigating the gender gap supports sustainable development within the scope of the environmental pillar.

Verification of the hypotheses was conducted using the methodology described.

Table 1. Sustainable Development Goals, Source: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/> (6.11.2018)

No	SD Goal (subindices)	Indicators used to calculate particular goal
1	No Poverty (Y ₁)	Poverty headcount ratio at \$1.90/day (% population) Projected poverty headcount ratio at \$1.90/day in 2030 (% population)
2	Zero Hunger (Y ₂)	Prevalence of undernourishment (% population) Prevalence of stunting (low height-for-age) in children under 5 years of age (%) Prevalence of wasting in children under 5 years of age (%) Prevalence of obesity, BMI ≥ 30 (% adult population) Cereal yield (t/ha) Sustainable Nitrogen Management Index
3	Good Health and Well-Being (Y ₃)	Maternal mortality rate (per 100,000 live births) Neonatal mortality rate (per 1,000 live births) Mortality rate, under-5 (per 1,000 live births) Incidence of tuberculosis (per 100,000 population) HIV prevalence (per 1,000) Age-standardised death rate due to cardiovascular disease, cancer, diabetes, and chronic respiratory disease in populations age 30-70 years (per 100,000 population) Age-standardised death rate attributable to household air pollution and ambient air pollution (per 100,000 population) Traffic deaths rate (per 100,000 population) Healthy Life Expectancy at birth (years) Adolescent fertility rate (births per 1,000 women ages 15-19) Births attended by skilled health personnel (%) Surviving infants who received 2 WHO-recommended vaccines (%) Universal Health Coverage Tracer Index (0-100) Subjective Wellbeing (average ladder score, 0-10)
4	Quality Education (Y ₄)	Net primary enrolment rate (%) Mean years of schooling Literacy rate of 15-24 year olds, both sexes (%)
5	Gender Equality (Y ₅)	Unmet demand for contraception, estimated (% women married or in union, ages 15-49) Female to male mean years of schooling of population age 25 + (%) Female to male labour force participation rate (%) Seats held by women in national parliaments (%)
6	Clean Water and Sanitation (Y ₆)	High-income countries: population using safely managed water services (%) Other countries: population using at least basic drinking water services (%) High-income countries: population using safely managed sanitation services (%) Other countries: population using at least basic sanitation services (%) Freshwater withdrawal as % total renewable water resources Imported groundwater depletion (m ³ /year/capita)
7	Affordable and Clean Energy (Y ₇)	Access to electricity (% population) Access to clean fuels & technology for cooking (% population) CO ₂ emissions from fuel combustion / electricity output (MtCO ₂ /TWh)
8	Decent Work and Economic Growth (Y ₈)	Adjusted GDP Growth (%) Slavery score (0-100) Adults (15 years +) with an account at a bank or other financial institution or with a mobile-money-service provider (%) Unemployment rate (% total labour force)
9	Industry, Innovation and Infrastructure (Y ₉)	Proportion of the population using the internet (%) Mobile broadband subscriptions (per 100 inhabitants) Quality of overall infrastructure (1= extremely underdeveloped; 7= extensive and efficient by international standards) Logistics performance index: Quality of trade and transport-related infrastructure (1=low to 5=high) The Times Higher Education Universities Ranking, Average score of top 3 universities (0-100) Number of scientific and technical journal articles (per 1,000 population) Research and development expenditure (% GDP)
10	Reduced Inequalities (Y ₁₀)	Gini Coefficient adjusted for top income (1-100)
11	Sustainable Cities and Communities (Y ₁₁)	Annual mean concentration of particulate matter of less than 2.5 microns of diameter (PM _{2.5}) in urban areas (µg/m ³) Improved water source, piped (% urban population with access) Satisfaction with public transport (%)

No	SD Goal (subindices)	Indicators used to calculate particular goal
12	Responsible Consumption and Production (Y ₁₂)	Municipal Solid Waste (kg/day/capita) E-waste generated (kg/capita) Anthropogenic wastewater that receives treatment (%) Production-based SO ₂ emissions (kg/capita) Net imported SO ₂ emissions (kg/capita) Reactive nitrogen production footprint (kg/capita) Net imported emissions of reactive nitrogen (kg/capita)
13	Climate Action (Y ₁₃)	Energy-related CO ₂ emissions per capita (tCO ₂ /capita) Imported CO ₂ emissions, technology-adjusted (tCO ₂ /capita) Climate Change Vulnerability Index CO ₂ emissions embodied in fossil fuel exports (kg/capita)
14	Life Below Water (Y ₁₄)	Mean area that is protected in marine sites important to biodiversity (%) Ocean Health Index-Biodiversity (0-100) Ocean Health Index-Clean Waters (0-100) Ocean Health Index-Fisheries (0-100) Fish Stocks overexploited or collapsed by EEZ (%) Fish caught by trawling (%)
15	Life on Land (Y ₁₅)	Mean area that is protected in terrestrial sites important to biodiversity (%) Mean area that is protected in freshwater sites important to biodiversity (%) Red List Index of species survival (0-1) Annual change in forest area (%) Imported biodiversity threats (threats per million population)
16	Peace, Justice and Strong Institutions (Y ₁₆)	Homicides (per 100,000 population) Prison population (per 100,000 population) Population who feel safe walking alone at night in the city or area where they live (%) Government Efficiency (1-7) Property Rights (1-7) Children under 5 years of age whose births have been registered with a civil authority (%) Corruption Perception Index (0-100) Children 5–14 years old involved in child labour (%) Transfers of major conventional weapons (exports) (constant 1990 US\$ million per 100,000 population)
17	Partnerships for the Goals (Y ₁₇)	Government Health and Education spending (% GDP) High-income and all OECD DAC countries: International concessional public finance, including official development assistance (% GNI) Other countries: Tax revenue (% GDP) Tax Haven Score (best 0-5 worst)

Table 2. Components of gender gap, source: *The Global Gender Gap Report 2017*, p. 4, <https://www.weforum.org/reports/the-global-gender-gap-report-2017> (5.11.2018)

Gender gap areas (indicators)	Detailed ratios
Economic Participation and Opportunity (X ₁)	Ratio: female labour force participation over male value
	Wage equality between women and men for similar work (survey data, normalized on a 0-to-1 scale)
	Ratio: female estimated earned income over male value
	Ratio: female legislators, senior officials and managers over male value
Educational Attainment (X ₂)	Ratio: female literacy rate over male value
	Ratio: female net primary enrolment rate over male value
	Ratio: female net secondary enrolment rate over male value
	Ratio: female gross tertiary enrolment ratio over male value
Health and Survival (X ₃)	Sex ratio at birth (converted to female-over-male ratio)
	Ratio: female healthy life expectancy over male value
Political Empowerment (X ₄)	Ratio: females with seats in parliament over male value
	Ratio: females at ministerial level over male value
	Ratio: number of years with a female head of state (last 50 years) over male value

Methodology and Indicators

We based our study on two sets of data. Firstly, we adopted figures that reflect sustainable development levels of specific countries from the SDG Index and Dashboards Report 2017, *Implementing the Goals of Global Responsibilities*. We extracted the second set of figures from *The Global Gender Gap Report*

2017. From both reports, we used only cumulating figures that describe general aspects of the phenomena even though dozens of detailed aspects of both sustainable development and gender gap were presented in these documents. In working with the first report, we took into account that in 2015, countries adopted the *2030 Agenda for Sustainable Development* with 17 Sustainable Development Goals. Table

1 shows these goals with indicators that were used to assess the level of realization of particular goals in countries all over the world.

To conduct comparison analyses between countries based on across sub-indices, each variable was re-scaled from 0 to 100 by a usage unitarisation method, with 0 denoting worst performance and 100 denoting the optimum. All 17 sub-indices in our analyses are independent variables (Y_s). Furthermore, we divided them in three groups that align with the three main pillars of sustainable development (economic, social and environmental). The economic pillar of sustainable development encompasses goals (sub-indices) 1, 8, 9, and 10; the social pillar, goals 2, 3, 4, 5, 11, 16, and 17; and the environmental pillar, goals 6, 7, 12, 13, 14, and 15. Deeper analyses showed that variable 5 includes gender equality as a component of sustainable development. Hence, we excluded it from further analyses because it is pointless to estimate a model in which both dependent and independent variables represent the same kind of phenomenon. Further consideration and confirmations of hypotheses were conducted in accordance with this division.

The second set of data was drawn from *The Global Gender Gap Report*, which is an insight tool published annually by the World Economic Forum that contains a range of unique contextual data related to four general aspects of a differentiation (or rather, inequality) between men and women. There are four main areas:

- 1) economic participation and opportunity,
- 2) educational attainment,
- 3) health and survival, and
- 4) political empowerment.

On the one hand, some areas are components of the general Global Gender Gap Index, a single index that describes the gender gap in particular countries, as mentioned previously. On the other hand, each consists of detailed ratios, presented in Table 2.

All ratios were calculated so that higher values reflect lower levels of inequality between women and men. For instance, in some countries, 35% of women and 65% of men occupy ministerial positions, so the value is $35/65=0,54$ (54 in scale 0-100), but if the relevant figures are 45% and 55%, respectively, then the value is $45/55=0,82$ (82 in scale 0-100). Additionally, the four indicators (areas) were calculated by use of *weights* presented in the quoted report (p. 6). Nonetheless, a general prerequisite of *The Global Gender Gap Report* was that higher values of indicators and ultimately higher values of the general Global Gender Gap Index represent lower inequality among genders in the country in question. This four indicators were adopted in our research and models as independent variables (X_s).

² If a coefficient besides x_1 in the linear regression model was positive (e.g. $y_1=12x_1$) and statistically significant, meaning that the relation between x_1 and y_1 was positive, we checked Pearson's correlation coefficient for this pair

Additionally, two controls variable were used in models and calculations, GDP per capita PPP in 2016 (X_5) and population in 2017 (X_6).

Elaborating upon the methodology for this research, we have identified four prerequisites.

1. For the ultimate dataset, we have taken only those countries for which relevant data exist in both reports. Ultimately, we calculate correlations (Appendix 1) and linear regression models (Appendices 2, 3 and 4) based on data from 137 countries.
2. We decided to conduct double verification of statistically significant relations among variables using linear regression models (Arbia, 2014; Banerjee et al., 2004; Fotheringham et al., 2002) and Pearson's correlation coefficients (R) (Joseph & Nicewander, 1988; Cowan, 1998). Conclusions are based only on relations in both directions of influence (based on linear regression models). The directions of interrelations were the same and confirmed doubly².
3. We excluded from analysis all relations that were confirmed statistically only by one procedure (models or correlations) as well as interrelations that were not confirmed statistically at all.
4. To assess a power correlation, we followed the proposal of Taylor (1990), where if the correlation coefficient (absolute value) is lower than 0.35, the power of the correlation is considered low or weak; if it is 0.36 to 0.67, the power is modest or moderated; and if it is 0.68 to 1.00, the power is strong or high. Additionally, within the third interval, a very high correlation was indicated if R exceeds 0.90.

These prerequisites were the starting point for the analyses.

Results

Economic Pillar of Sustainable Development versus Gender Gap

The first group of regression models is connected with goals that support the economic pillar of sustainable development. As supports for this pillar, we chose four specific goals: No Poverty (Y_1), Decent Work and Economic Growth (Y_8), Industry, Innovation and Infrastructure (Y_9), and Reduced Inequalities (Y_{10}). For the model that describes the first goal, we discover that women's Educational Attainment (X_2) is positively related to achieving low poverty level (Y_1) (with the regression model, if X_2 grows by 1%, it is expected that Y_1 grows by 1,48%). The Pearson's coefficient (R) equals 0,56, which means

of variables. If a value of a correlation coefficient included the interval (0,1), a positive correlation and was statistical significant, we analysed and interpreted the relation between x_1 and y_1 .

that the correlation between both variables is on the modest level. In the second model, two indicators, Educational Attainment (X_2) and Economic Participation and Opportunity (X_1), are examined as positively related to the Decent Work and Economic Growth (Y_8) goal (with the regression model, if X_2 grows by 1%, it is expected that Y_8 grows by 0,61%, and if X_1 grows by 1%, Y_8 grows by 0,42%). Again, both variables correlate modestly with the goal performance (Pearson's R for X_2 is 0,49 and for X_1 - 0,36). In the third model, we revealed that these goals connected with Innovation and Infrastructure (Y_9) can be supported by strengthening areas that make up Educational Attainment (X_2) and Political Empowerment indicators (if X_2 grows by 1%, it is expected that Y_9 grows by 0,77%, and if X_4 grows by 1%, then Y_9 grows by 0,22%). Again, the Educational Attainment indicator correlates with the goal performance moderately (Pearson's $R=0,51$). We also found that despite the fact that the Political Empowerment indicator is a statistically significant variable in this model, the correlation level with the goal performance should be interpreted as rather low (Pearson's $R=0,31$). In the fourth model, which describes the performance on the Reduced Inequality goal (Y_{10}), we discover only one positive relation with the Political Empowerment indicator (if X_4 grows by 1%, it is expected that Y_{10} grows by 0,3%). However, the strength of the correlation is rather low.

Social Pillar of Sustainable Development versus Gender Gap

To confirm our second hypothesis positing the supportive role of mitigating gender gap in enhancing the social pillar of sustainable development, we decided to show the relations between gender gap indicators and sustainable development goals such as Zero Hunger (Y_2), Good Health and Well-being (Y_3), Quality Education (Y_4), Sustainable Cities and Communities (Y_{11}), Peace, Justice and Strong Institutions (Y_{16}) and Partnerships for the Goals (Y_{17}). In the first model, we reveal that the Zero Hunger goal (Y_2) realization can be supported by boosting Economic Participation and Opportunity (X_1) and Educational Attainment (X_2) indicators (if X_1 grows by 1%, it is expected that Y_2 grows by 0,19%, and if X_2 grows by 1%, it is expected that Y_2 grows by 0,61%). The first correlates with the goal weakly (X_1 , Pearson's $R=0,22$) and the latter moderately (X_2 , Pearson's $R=0,53$). For the next model, we discovered that better realization of the Good Health and Well-Being goal (Y_3) is positively related with the higher Educational Attainment (X_2) and Political Empowerment (X_4) indicators (if X_2 grows by 1%, it is expected that Y_3 grows by 1,39%, and if x_4 grows by 1%, it is expected that Y_3 grows by 0,11%). Educational Attainment is strongly correlated with the goal performance (Pearson's $R=0,74$), whereas Political

Empowerment is correlated only weakly (Pearson's $R=0,24$). In the next model, we found the positive relation between obtaining Quality Education (Y_4) and high level of Educational Attainment (X_2) indicator (if X_2 grows by 1%, it is expected that Y_4 grows by 2,15%). Correlation between Educational Attainment (X_2) and this goal is one of the highest (Pearson's $R=0,84$). In the next model, in which we examine the relations between gender gap indicators and the Sustainable Cities and Communities goal (Y_{11}), we found that two indicators are positively related (if X_1 grows by 1%, it is expected that Y_{11} grows by 0,32%, and if X_2 grows by 1%, it is expected that Y_{11} grows by 1,02%). Economic Participation and Opportunity (X_1) and Educational Attainment (X_2) correlate with this goal moderately (Pearson's $R=0,36$ and 0,62, respectively). The higher performance of the Peace, Justice and Strong Institutions goal (Y_{16}) can be explained with growing values of Educational Attainment (X_2) and Political Empowerment (X_4) indicators (if X_2 grows by 1%, it is expected that Y_{16} grows by 0,37%, and if X_4 grows by 1%, it is expected that Y_{16} grows by 0,15%). The Educational Attainment indicator correlates with the goal performance moderately (Pearson's $R=0,43$), and the Political Empowerment indicator correlates only weakly (Pearson's $R=0,26$). Furthermore, in this model, we found one surprising result—the Health and Survival (X_3) indicator does not support obtaining this goal as the statistically significant relation is negative. Nevertheless, it correlates with Y_{16} on a rather weak level (Pearson's $R=-0,19$). The last goal, Partnerships for the Goals (Y_{17}), is explained only by the Political Empowerment indicator (if X_4 grows by 1%, it is expected that Y_{17} grows by 0,22%), but it correlates with the goal performance only weakly (Pearson's $R=0,18$).

Environmental Pillar of Sustainable Development versus Gender Gap

To test our third hypothesis connecting the supportive role of reducing the gender gap with enhancing the ecological pillar of sustainable development, we examined relations between gender gap indicators and sustainable development goals such as Clean Water and Sanitation (Y_6), Affordable and Clean Energy (Y_7), Responsible Consumption and Production (Y_{12}), Climate Action (Y_{13}), Life Below Water (Y_{14}), and Life on Land (Y_{15}). The most vital relation was found for the Clean Water and Sanitation goal (Y_6), the performance of which can be supported by boosting the Economic Participation and Opportunity (X_1), Educational Attainment (X_2), and Political Empowerment (X_4) indicators (if X_1 grows by 1%, it is expected that Y_6 grows by 0,48%; if X_2 grows by 1%, it is expected that Y_6 grows by 0,95%; and if X_4 grows by 1%, Y_6 grows by 0,15%). The first two correlate with the goal performance on the moderate level (for X_1 , Pearson's $R=0,44$, for X_2 , $R=0,47$), and

the third is little bit weaker (for X_4 , $R=0,32$). In the model that describes Affordable and Clean Energy goal performance (Y_7), we found only one indicator to be statistically significant – Educational Attainment (X_2) (if X_2 grows by 1%, it is expected that Y_7 grows by 2,27%). It correlates strongly with the dependent variable (Pearson's $R=0,69$). The surprising result was found for Responsible Consumption and Production goal (Y_{12}). The relation between Educational Attainment (X_2) and the goal realization level is negative (if X_2 grows by 1%, it is expected that Y_{12} decreases by 0,16%). Correlation between those two variables is on the moderate level ($R=-0,42$). For the Climate Action goal (Y_{13}), only the Political Empowerment (X_4) indicator is statistically significant, but we do not find a statistically significant correlation between them. We also do not find any significant relations between gender gap indicators and the Life on Land goal (Y_{15}). Nevertheless, the model dedicated to the Life Below Water goal (Y_{14}) revealed that boosting the Political Empowerment indicator can lead to its better performance (if X_1 grows by 1%, it is expected that Y_{14} grows by 0,01%). However, the correlation between those two variables was rather low (Pearson's $R=0,18$).

Discussion and Conclusions

Economic Pillar

The economic pillar of sustainable development in our research encompasses four sub-indices: no poverty; decent work and economic growth; industry, innovation and infrastructure and reduced inequalities. Mitigating the gender gap in educational aspects and political engagement is not only positively correlated with economic development, but also can be recognised as a crucially supportive factor for this pillar. Therefore, we recommend that mitigating of the educational and political (political engagement) gender gap aligns with sustainable development success of particular countries in the economic pillar. This finding confirms Hypothesis 1. As pointed out previously, female educational attainment has a positive effect on economic growth, but additionally, inclusion of women's voices in politics broadens the diversity of viewpoints, experiences, interests, and expertise brought into parliamentary debates (Philips, 1995; Mansbridge, 1999). Other evidence suggests that a higher number of women in elected office leads to higher economic advantages (Annan, 2008) and can raise productivity, improve outcomes for children, make institutions more representative, and advance development prospects (*World Development Report*, 2012). This reason seems to be sufficient to undertake actions focused on mitigating aspects of the gender gap.

On the other hand, we expect to find that diminishment of inequality between females and males in economic participation and opportunity should be

strongly correlated and should influence the economic pillar of sustainable development. However, only in one case (the linear regression model) was this relation significant and confirmed by Pearson's correlation coefficient. Without more profound studies, the question of why economic participation of females does not correlate with the economic pillar of sustainable development is difficult to answer.

Social pillar

The social pillar was represented by the variables zero hunger, good health and well-being, quality education, sustainable cities and communities, peace, justice and strong institutions, and partnerships for the goals.

Taking into considerations these components, we confirmed that mitigation of the gender gap can support many of its dimensions. On the basis of our findings, we can accept Hypothesis 2. Again, the most vital element of the gender gap that has the biggest meaning for social aspects of sustainable development is women's educational attainment. Better educated women are more aware of social problems and, thanks to their beliefs about the potential consequences of social matters, are more likely to act. Women's educational level also impacts their political engagement. The better educated and socially aware women are, the better they can transfer their engagement to the regulatory level. This trend is visible in the literature. As mentioned, the presence of women in politics broadens the debates on problems of socio-economic development and supports creating policies focused on social welfare and environmental issues. In our research, we also discover that political empowerment of women is in many cases positively related to achieving the social goals of sustainable development. However, the gender gap dimensions connected with health and survival do not support Hypothesis 2. This finding, being unexpected, needs further study to identify detailed reasons for the negative interrelation. Such a study goes beyond the scope of this paper.

Environmental Pillar

The environmental pillar of sustainable development encompasses the goals of clean water and sanitation, affordable and clean energy, responsible consumption and production, climate action, life below water and life on land. Different pro-environmental purposes can be better achieved by regulatory bodies than by individuals or groups of people because they require implementation of various kinds of regional and international regulations. Therefore, alleviating the gender gap can indirectly impact these aspects. That is probably also why higher educational involvement of females and their engagement and empowerment in politics as well economic issues cor-

relate positively with the environmental pillar of sustainable development. It should be not ignored that the group Green Entrepreneurship Leaders includes such countries as Luxembourg, Finland, Ireland, Denmark and Netherlands (Domańska et al., 2018). Simultaneously, these countries represent relatively high levels of economic development and narrow gender gaps. Due to this fact, they are more able, e.g. to provide clean water for their citizens, to build renewable energy plants, and furthermore to educate their citizens pro-ecologically. This whole bundle of circumstances is likely to moderate indirectly the positive connection between gender gap mitigation and environmental issues. Taking into account this consideration, Hypothesis 3 can be confirmed partly because of the indirect interrelations between gender inequality and environmental issues.

To note a complexity in our analyses, it has to be mentioned that in one case, the relation appeared to be reversed. The model showed that educational attainment affects negatively goal 6, responsible consumption and production. On the basis of available data and without further study, the question of this negative relation remains unanswered. On the other hand, it opens up a new field for more profound research in the future.

Despite some controversial observations, the final conclusion can be drawn that diminishing inequality between females and males supports all aspects of harmonious and sustainable development of societies.

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Appendix 1. Pearson's correlation coefficients of analysed variables

Variables	X ₁	X ₂	X ₃	X ₄	Y ₁	Y ₂	Y ₃	Y ₄	Y ₅	Y ₆
Economic Participation and Opportunity (X ₁)	1									
Educational Attainment (X ₂)	0,110	1								
Health and Survival (X ₃)	0,263**	0,207*	1							
Political Empowerment (X ₄)	0,287**	0,201*	0,131	1						
No Poverty (Y ₁)	-0,156	0,536**	-0,070	0,091	1					
Zero Hunger (Y ₂)	0,221**	0,533**	0,032	0,259**	0,568**	1				
Good Health and Well-Being (Y ₃)	0,039	0,738**	0,052	0,244**	0,746**	0,780**	1			
Quality Education (Y ₄)	0,159	0,842**	0,142	0,223**	0,643**	0,695**	0,858**	1		
Gender Equality (Y ₅)	0,579**	0,693**	0,284**	0,563**	0,297**	0,575**	0,578**	0,688**	1	
Clean Water and Sanitation (Y ₆)	0,441**	0,466**	0,266**	0,313**	0,392**	0,501**	0,443**	0,467**	0,585**	1
Affordable and Clean Energy (Y ₇)	-0,117	0,692**	0,017	0,108	0,770**	0,668**	0,860**	0,803**	0,437**	0,414**
Decent Work and Economic Growth (Y ₈)	0,357**	0,491**	0,027	0,319**	0,547**	0,752**	0,725**	0,657**	0,612**	0,424**
Industry, Innovation and Infrastructure (Y ₉)	0,123	0,506**	-0,033	0,305**	0,520**	0,787**	0,813**	0,694**	0,533**	0,282**
Reduced Inequalities (Y ₁₀)	0,058	0,006	-0,150	0,189*	0,359**	0,445**	0,374**	0,211*	0,107	0,090
Sustainable Cities and Communities (Y ₁₁)	0,364**	0,620**	0,251**	0,263**	0,413**	0,551**	0,667**	0,673**	0,687**	0,606**
Responsible Consumption and Production (Y ₁₂)	-0,106	-0,416**	-0,052	-0,181*	-0,405**	-0,616**	-0,696**	-0,579**	-0,423**	-0,210*
Climate Action (Y ₁₃)	0,050	-0,197*	0,129	0,113	-0,064	-0,114	-0,206*	-0,196*	-0,067	0,245**
Life Below Water (Y ₁₄)	0,028	0,058	0,139	0,178*	-0,041	0,022	0,043	0,080	0,144	0,030
Life on Land (Y ₁₅)	0,132	-0,135	0,043	0,049	-0,106	0,074	-0,044	-0,030	0,018	0,032
Peace, Justice and Strong Institutions (Y ₁₆)	0,043	0,430**	-0,192*	0,256**	0,498**	0,619**	0,713**	0,578**	0,342**	0,108
Partnerships for the Goals (Y ₁₇)	0,064	0,116	0,119	0,178*	-0,162	-0,038	-0,049	0,010	0,142	0,055
GDP per capita PPP in 2016 (X ₅)	0,046	0,384**	-0,006	0,162	0,398**	0,614**	0,675**	0,537**	0,352**	0,084
Population in 2017 (X ₆)	-0,228**	-0,176*	-0,198*	0,000	-0,033	-0,097	-0,203*	-0,134	-0,138	-0,049

** p ≤ 0.01 (two-tailed), * p ≤ 0.05 (two-tailed)

Variables	Y ₈	Y ₉	Y ₁₀	Y ₁₁	Y ₁₂	Y ₁₃	Y ₁₄	Y ₁₅	Y ₁₆	Y ₁₇	X ₅	X ₆
Decent Work and Economic Growth (Y ₈)	1											
Industry, Innovation and Infrastructure (Y ₉)	0,743**	1										
Reduced Inequalities (Y ₁₀)	0,346**	0,444**	1									
Sustainable Cities and Communities (Y ₁₁)	0,557**	0,590**	0,087	1								
Responsible Consumption and Production (Y ₁₂)	-0,630**	-0,794**	-0,329**	-0,472**	1							
Climate Action (Y ₁₃)	-0,191*	-0,288**	-0,023	0,011	0,432**	1						
Life Below Water (Y ₁₄)	0,077	0,094	-0,043	0,156	-0,040	0,043	1					
Life on Land (Y ₁₅)	-0,004	0,007	0,165	-0,016	0,099	0,243**	0,256**	1				
Peace, Justice and Strong Institutions (Y ₁₆)	0,658**	0,804**	0,502**	0,424**	-0,684**	-0,326**	0,025	-0,033	1			
Partnerships for the Goals (Y ₁₇)	-0,175*	-0,117	-0,133	0,071	0,080	-0,079	0,101	-0,029	-0,113	1		
GDP per capita PPP in 2016 (X ₅)	0,608**	0,807**	0,385**	0,378**	-0,840**	-0,449**	0,002	-0,079	0,754**	-0,160	1	
Population in 2017 (X ₆)	-0,086	-0,031	-0,124	-0,232**	0,243**	0,128	0,086	0,008	-0,214*	-0,200*	-0,208*	1

** p ≤ 0.01 (two-tailed), * p ≤ 0.05 (two-tailed)

Appendix 2. Linear regression model related to economic pillar of sustainable development, source: own study

No Poverty (Y ₁)			
Variables	B	t	p
Constant	234,441	1,446	0,150
IV			
Economic Participation and Opportunity (X1)	-0,325	-2,567	0,011
Educational Attainment (X2)	1,485	6,929	0,000
Health and Survival (X3)	-2,868	-1,713	0,089
Political Empowerment (X4)	0,035	0,315	0,753
Controls			
GDP per capita PPP in 2016 (X5)	0,000	2,790	0,006
Population in 2017 (X6)	0,469	0,492	0,623

R = 0.643; R Square = 0.413; Adjusted R Square = 0.386; F = 15.239; N= 137

Decent Work and Economic Growth (Y ₈)			
Variables	B	t	P
Constant	130,781	1,275	0,205
IV			
Economic Participation and Opportunity (X1)	0,422	5,260	0,000
Educational Attainment (X2)	0,613	4,517	0,000
Health and Survival (X3)	-1,840	-1,737	0,085
Political Empowerment (X4)	0,115	1,643	0,103
Controls			
GDP per capita PPP in 2016 (X5)	0,000	7,704	0,000
Population in 2017 (X6)	1,197	1,986	0,049

R = 0.759; R Square = 0.576; Adjusted R Square = 0.557; F = 29.466; N= 137

Industry, Innovation and Infrastructure (Y ₉)			
Variables	B	t	p
Constant	110,233	0,912	0,363
IV			
Economic Participation and Opportunity (X1)	0,171	1,813	0,072
Educational Attainment (X2)	0,778	4,874	0,000
Health and Survival (X3)	-2,255	-1,808	0,073
Political Empowerment (X4)	0,221	2,689	0,008
Controls			
GDP per capita PPP in 2016 (X5)	0,001	14,894	0,000
Population in 2017 (X6)	2,503	3,527	0,001

R = 0.867; R Square = 0.752; Adjusted R Square = 0.740; F = 65.653; N= 137

Reduced Inequalities (Y ₁₀)			
Variables	B	t	p
Constant	531,963	2,497	0,014
IV			
Economic Participation and Opportunity (X1)	0,058	0,346	0,730
Educational Attainment (X2)	-0,545	-1,935	0,055
Health and Survival (X3)	-4,285	-1,947	0,054
Political Empowerment (X4)	0,299	2,059	0,041
Controls			
GDP per capita PPP in 2016 (X5)	0,000	4,644	0,000
Population in 2017 (X6)	-1,442	-1,152	0,252

R = 0.472; R Square = 0.223; Adjusted R Square = 0.187; F = 6.212; N= 137

Appendix 3. Linear regression model related to social pillar of sustainable development, source: own study

Zero Hunger (Y ₂)			
Variables	B	t	p
Constant	72,415	0,806	0,421
IV			
Economic Participation and Opportunity (X1)	0,193	2,749	0,007
Educational Attainment (X2)	0,606	5,103	0,000
Health and Survival (X3)	-1,092	-1,177	0,241
Political Empowerment (X4)	0,065	1,069	0,287
Controls			
GDP per capita PPP in 2016 (X5)	0,000	7,151	0,000
Population in 2017 (X6)	0,741	1,405	0,163

R = 0.726; R Square = 0.526; Adjusted R Square = 0.505; F = 24.089; N= 137

Good Health and Well-Being (Y ₃)			
Variables	B	t	p
Constant	72,511	0,767	0,445
IV			
Economic Participation and Opportunity (X1)	-0,089	-1,203	0,231
Educational Attainment (X2)	1,398	11,180	0,000
Health and Survival (X3)	-1,334	-1,366	0,174
Political Empowerment (X4)	0,114	1,765	0,080
Controls			
GDP per capita PPP in 2016 (X5)	0,000	8,729	0,000
Population in 2017 (X6)	-0,443	-0,798	0,426

R = 0.858; R Square = 0.736; Adjusted R Square = 0.724; F = 60.462; N= 137

Quality Education (Y ₄)			
Variables	B	t	p
Constant	-112,252	-1,092	0,277
IV			
Economic Participation and Opportunity (X1)	0,145	1,806	0,073
Educational Attainment (X2)	2,154	15,857	0,000
Health and Survival (X3)	-0,507	-0,478	0,634
Political Empowerment (X4)	0,016	0,231	0,818
Controls			
GDP per capita PPP in 2016 (X5)	0,000	5,518	0,000
Population in 2017 (X6)	0,888	1,471	0,144

R = 0.878; R Square = 0.771; Adjusted R Square = 0.761; F = 73.038; N= 137

Sustainable Cities and Communities (Y ₁₁)			
Variables	B	t	P
Constant	-149,406	-1,391	0,167
IV			
Economic Participation and Opportunity (X1)	0,324	3,855	0,000
Educational Attainment (X2)	1,023	7,203	0,000
Health and Survival (X3)	1,085	0,978	0,330
Political Empowerment (X4)	0,059	0,804	0,423
Controls			
GDP per capita PPP in 2016 (X5)	0,000	2,295	0,023
Population in 2017 (X6)	-0,365	-0,578	0,564

R = 0.710; R Square = 0.504; Adjusted R Square = 0.481; F = 22.025; N= 137

Peace, Justice and Strong Institutions (Y ₁₆)			
Variables	B	t	p
Constant	435,906	5,406	0,000
IV			
Economic Participation and Opportunity (X1)	-0,003	-0,052	0,959
Educational Attainment (X2)	0,368	3,449	0,001
Health and Survival (X3)	-4,142	-4,975	0,000
Political Empowerment (X4)	0,153	2,777	0,006
Controls			
GDP per capita PPP in 2016 (X5)	0,000	11,291	0,000
Population in 2017 (X6)	-0,898	-1,895	0,060

R = 0.819; R Square = 0.671; Adjusted R Square = 0.656; F = 44.270; N= 137

Partnerships for the Goals (Y ₁₇)			
Variables	B	t	p
Constant	34,198	0,263	0,793
IV			
Economic Participation and Opportunity (X1)	-0,070	-0,689	0,492
Educational Attainment (X2)	0,277	1,612	0,109
Health and Survival (X3)	0,418	0,312	0,756
Political Empowerment (X4)	0,215	2,426	0,017
Controls			
GDP per capita PPP in 2016 (X5)	0,000	-3,318	0,001
Population in 2017 (X6)	-2,156	-2,825	0,005

R = 0.388; R Square = 0.150; Adjusted R Square = 0.111; F = 3.838; N= 137

Appendix 4. Linear regression model related to environmental pillar of sustainable development, source: own study

Clean Water and Sanitation (Y ₆)			
Variables	B	t	p
Constant	-208,365	-1,687	0,094
IV			
Economic Participation and Opportunity (X1)	0,476	4,927	0,000
Educational Attainment (X2)	0,954	5,846	0,000
Health and Survival (X3)	1,483	1,163	0,247
Political Empowerment (X4)	0,146	1,742	0,084
Controls			
GDP per capita PPP in 2016 (X5)	-0,00008	-1,338	0,183
Population in 2017 (X6)	1,081	1,491	0,138

R = 0.643; R Square = 0.414; Adjusted R Square = 0.387; F = 15.249; N= 137

Affordable and Clean Energy (Y ₇)			
Variables	B	t	p
Constant	77,783	0,445	0,657
IV			
Economic Participation and Opportunity (X1)	-0,406	-2,966	0,004
Educational Attainment (X2)	2,267	9,804	0,000
Health and Survival (X3)	-2,042	-1,130	0,260
Political Empowerment (X4)	0,010	0,082	0,935
Controls			
GDP per capita PPP in 2016 (X5)	0,000	3,735	0,000
Population in 2017 (X6)	-0,437	-0,425	0,672

R = 0.758; R Square = 0.575; Adjusted R Square = 0.555; F = 29.270; N= 137

Responsible Consumption and Production (Y ₁₂)			
Variables	B	t	p
Constant	110,628	1,600	0,112
IV			
Economic Participation and Opportunity (X1)	-0,04	-0,731	0,466
Educational Attainment (X2)	-0,162	-1,777	0,078
Health and Survival (X3)	-0,217	-0,304	0,761
Political Empowerment (X4)	-0,021	-0,453	0,651
Controls			
GDP per capita PPP in 2016 (X5)	0,000	-15,295	0,000
Population in 2017 (X6)	0,419	1,033	0,304

R = 0.849; R Square = 0.721; Adjusted R Square = 0.708; F = 56.074; N= 137

Climate Action (Y ₁₃)			
Variables	B	t	p
Constant	-72,976	-0,709	0,479
IV			
Economic Participation and Opportunity (X1)	0,004	0,045	0,964
Educational Attainment (X2)	-0,136	-0,997	0,320
Health and Survival (X3)	1,684	1,584	0,116
Political Empowerment (X4)	0,157	2,247	0,026
Controls			
GDP per capita PPP in 2016 (X5)	0,000	-5,175	0,000
Population in 2017 (X6)	0,361	0,598	0,551

R = 0.506; R Square = 0.256; Adjusted R Square = 0.222; F = 7.457; N= 137

Life Below Water (Y ₁₄)			
Variables	B	t	p
Constant	-116,113	-1,217	0,226
IV			
Economic Participation and Opportunity (X1)	-0,028	-0,372	0,711
Educational Attainment (X2)	0,026	0,209	0,835
Health and Survival (X3)	1,556	1,579	0,117
Political Empowerment (X4)	0,0118	1,820	0,071
Controls			
GDP per capita PPP in 2016 (X5)	-0,000003	-0,075	0,940
Population in 2017 (X6)	0,668	1,191	0,236

R = 0.243; R Square = 0.059; Adjusted R Square = 0.016; F = 1.363; N= 137

Life on Land (Y ₁₅)			
Variables	B	t	p
Constant	23,955	0,191	0,849
IV			
Economic Participation and Opportunity (X1)	0,137	1,396	0,165
Educational Attainment (X2)	-0,260	-1,569	0,119
Health and Survival (X3)	0,514	0,396	0,692
Political Empowerment (X4)	0,039	0,458	0,648
Controls			
GDP per capita PPP in 2016 (X5)	0,000018	-0,320	0,750
Population in 2017 (X6)	0,100	0,136	0,892

R = 0.209; R Square = 0.044; Adjusted R Square = 0.000; F = 0.995; N= 137