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An Analysis of Grey Multiattribute Decision-Making Optimization Concerning Gender and Sustainable Environment

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Abstract: Sustainable development is defined as development that meets the needs of the present generation, but does not compromise the satisfaction of future generations' needs. It emphasizes the concept of needs and constraints. Women's lack of development is not the result of insufficient involvement in production, but the fact that much of the cost paid by women is ignored and they do not get the rewards and affirmations they deserve. There are also many other factors of uncertainty. Therefore, this study considers that grey multiattribute decision-making refers to when there are factors of uncertain or incomplete information in the process of decision-making, after obtaining the actual decision-making combination effect by calculating the effect of the combination of all possible decision-making elements to select a scheme according to the decision matrix. The research results show that a mixed economic system is the best scheme for women's economic security. Developing a gender and sustainable environment can be optimized by actively creating new friendly workplace practices, including designing flexible working hours and working environments, promoting multiple vacation schemes, assisting employees in their career development, and providing family care and support services.

Keywords: sustainable development; uncertainty; grey multiattribute decision-making; gender

1. Introduction

The perspective of women's participation in development emphasizes that women must also be beneficiaries of and participants in the modern development process, and encourages women to achieve liberation by participating in production. It has influenced the position by which the United Nations and various international aid agencies emphasize equality, believing that women should receive the same development assistance. Some Western countries have established special international programs with women as assistance recipients; for example, in 1970, US Senator Charles H. Percy proposed amending the Foreign Assistance Act to help women in developing countries enter the economic system. It also influenced the United States Agency for International Development (USAID) to formulate a policy on assisting women's participation in development in 1982. Nevertheless, the view of women's participation in development has not been included in the gender concept, and while

it focuses on gender, it ignores that there are social relationships in the interactions between genders and involves equality between men and women [1,2].

The point of view of gender and development (GAD) is an attempt to revise the view of women's participation in development. It emphasizes that the gender positions of women and men are mutually related. GAD holds that past developments imply a male-centered and modern linear development mode, and emphasizes a single economic orientation to judge a country's progress while ignoring the importance of culture, society, politics, spirit, and other aspects. Women's lack of development is not the result of insufficient involvement in production, but the fact that much of the cost paid by women is ignored, and they do not get the rewards and affirmations they deserve. GAD emphasizes that if gender differences can be considered, the implementation of development plans will have obvious results [2,3].

Sustainable development is defined as development that meets the needs of the present generation and does not compromise the satisfaction of future generations' needs, meaning that it emphasizes the concepts of needs and limitations. The former holds that developing countries should meet their own development needs, while the latter holds that scientific and technological research and development and social organizations should ensure that the environment can meet current and future needs [4]. From the perspective of the relationship between environment and development, first, sustainable development integrates the values and national interests of both developed and developing countries and emphasizes that all countries must change their production and consumption patterns; second, sustainable development hopes to harmonize economic development and environmental protection and emphasizes the indispensability of both; third, sustainable development implies a strong anthropocentrism, which assumes that the premise of environmental problems is that people should continue to develop; and finally, the limit of growth is not a biological or material problem, but a social, scientific, and technological problem, suggesting that environmental problems can eventually be solved [2,5–7].

Since the 1970s, gender issues, development studies, and environmental issues have attracted international attention; however, they have not been dealt with independently. Many women have actively participated in environmental issues and worked hard to show the relationships between various kinds of human oppression. They have also extensively considered human attempts to control the natural world [8]. The collision between feminism and environmental issues forms ecofeminism, which hopes to analyze the relationships between women and nature and between dominance over nature and ruling over women, and enable women to play a role in solving environmental problems [2,9,10]. Ecofeminism holds that the existing patriarchy and dualistic thinking result in gender issues and environmental issues, which share similarities, as women and nature are equally belittled. Ecofeminism opposes anthropocentrism and believes that the idea of humans dominating nature should be changed, and it opposes androcentrism and believes that it oppresses the rights and status of women to ensure male superiority and domination, i.e., the cultural values of patriarchy [2,10,11]. Patriarchal cultural values emphasize the hierarchy of values, that is, there are different value hierarchies among people and between people and nature; thus, men who are higher in the hierarchy are entitled to the power of ruling over other individuals, animals, plants, and natural resources. Ecofeminism criticizes patriarchy as providing a theoretical basis for domination over women and the exploitation of nature, and rationalizing the conquest and seizure of women, natural environments, and even colored races in the development process [2,12].

Ecofeminism holds that the essence of women leads to a universal relationship between women and nature that transcends historical and geographical contexts. This inherent nature promotes a profound understanding of the environment and a natural instinct to care for environmental problems. Ecofeminism holds that the essence of women is closer to nature than that of men. In contrast, the key aspect of male ecology is hostility toward and domination over nature. Ecofeminism attempts to transcend culture and equate women with nature, reproduction, materials, and other subordinate characteristics with essential descriptions. Women are considered to seek to live in harmony with

nature, while men regard the natural environment as a hunting ground to compete with each other. Therefore, women are more suitable for protecting nature than men and have the responsibility to end human domination over nature and the estrangement between humans and nature [13–15]. Through the ethics of care, as established by women's own physiological roles and the care for offspring and family, women should redefine the relationship between humans and nature [2,16].

The view of women, the environment, and development criticizes the development plans of developed countries to assist developing countries with hiding the biased thinking of Western-centered and male-centered culture, which has a negative impact on local natural environments and female life. The view of women, the environment, and development holds that human beings have focused on economic development since the industrial revolution, while women have been the victims of environmental degradation caused by such development. Constant production and expansion are basically results of the male-centered point of view, and have caused the deliberate destruction of the environment and high consumption of resources by human beings. Male-centered development plans destroy natural ecology, as well as women's productive activities, by depriving women control over land, water resources, and forests. Rather than benefiting from development plans, women have suffered from the aggravated burden of household chores due to environmental degradation. For example, in the rural areas of many developing countries, because water and forest resources are excessively exploited, women have to travel farther to access water and firewood, which takes time and energy away from caring for their families [2,9,14,17,18].

Nevertheless, based on ecofeminism, the view of women, the environment, and development also adopts an essential description of the connection between women and nature, meaning that women are regarded as a homogeneous and undifferentiated whole, while the possible influences of other factors, such as country, region, class, ethnic group, and culture, are ignored. When the view of women, the environment, and development is transformed into policies and interventions, unexpected negative impacts can occur. First, this view excessively romanticizes and simplifies the inherent relationship between women and the environment, while placing the responsibility for environmental protection on women, which aggravates their heavy burden and leads them to feel like cheap and even unpaid laborers in environmental protection work [17]. Furthermore, the view of women, the environment, and development transforms women from users of natural resources and victims of pollution to guardians of the environment. The original intention of role transformation was to legitimize women's participation in various sustainable plans. However, it turns out to be a stereotype to regard women as a special target group while ignoring the different influences of men and women on environmental changes. The implementation of ecofeminism in politics paradoxically exacerbates the imbalance of division of labor between genders, thus increasing women's burden of labor [2,19].

Ecofeminism (or ecological feminism) is a political and social movement. It believes that there is a certain relationship between the oppression of women and the degradation of nature. Ecofeminism theorists consider the interactive relevance between gender discrimination, control of nature, racial discrimination, speciesism, and other social inequalities. The gender and development (GAD) view is an attempt to revise the perspective of women's development and emphasizes that the positions of women and men are related to each other through the gender concept. The GAD view holds that past development implies a male-centered and modern linear development model, which emphasizes a single economic orientation to measure the progress of countries while ignoring the importance of culture, society, politics, spirit, and other orientations. Women's lack of development is not due to their inadequate participation in production, but rather to the fact that much of the cost paid by women is ignored and they do not receive the rewards and affirmations they deserve. The GAD view emphasizes that if gender differences can be taken into account, then the implementation of development plans will yield significant results [2,3].

Sustainable development refers to a development mode that not only meets the needs of contemporary people, but also does not harm the needs of future generations under the condition of protecting the environment. Sustainable development emphasizes that development within the

economic system must be interlinked and self-sufficient. Sustainable development emphasizes the coordinated development of three elements, environment, society, and economy; promotes the overall progress of society; and avoids benefiting one side at the expense of other aspects and the overall benefit to society. Ecofeminism represents new values of equality, mutual respect, and sustainable coexistence. The basic purpose of ecofeminism is to challenge the necessity of power relations and try to transform moral law into laws based on mutual benefit and interdependence. Ecofeminism advocates the development of a self-sufficient regional economy, respect for nature, and peaceful coexistence. Therefore, a cooperative society that combines the production and consumption of a community of people and gender equality, which were once among the most important ideals of mankind, have become issues of ecofeminism. This paper explores the ideological correlation between domination over women and over nature and looks to dismantle all domination relationships and pursue the sustainable coexistence of humans and nature. Ecofeminist values promote a new society of coexistence and mutual respect. The standards of a new society include mutual respect, care, nonviolence, diverse cultures, universal participation, noncompetition, nonhierarchical organization, holistic thinking, and recycling of natural resources [3,20].

In gender studies, sustainable development and decision-making are mentioned in related research. Mechanization is currently undergoing a renaissance in agricultural research and development, and the new emphasis is on equity and sustainability, as reported in [21]. In that study, the introduction of feed shredders in seven villages in northern Tanzania was assessed from the perspective of farmers. Data collected through focus group discussions and surveys were used to conduct gender analysis of the technology within a broader framework of sustainable intensification indicators. The results not only brought people's attention to the continuous challenges of mechanization in small-scale farming, but also showed that the sustainability of technology depends on equity dynamics at the family and community level. A broader approach to gender issues can strengthen its interdisciplinary advocacy. Suggestions to promote sustainability include gender-sensitivity training and group models and interaction changes based on business and fair decision-making rules [21].

Regarding the gender perspective and reflecting upon the gender role in governance with a focus on sustainability development, previous studies pointed out that after considering gender in this context, both the equity and power games between genders are threatened [22]. In addition, for effective ocean governance, the contribution of women's voices is necessary. Some key contributions of women in research fields related to ocean governance are described as examples. For example, if women do not participate in fishery decision-making and management, then the overall picture of socioecological connections in the marine ecosystem will have somewhat of a void. Overall, women are often regarded as the main actors in promoting sustainable development due to their inclusive and collaborative roles. Similarly, women have always advocated for the common interests of marine protection and brought forth important (often neglected) concerns. In the maritime industry, women have expanded the pool of innovative and intelligent growth. In addition to promoting multiple possibilities of women's participation in marine governance and decision-making, this view also highlights how gender bias affects our interaction with the ocean. It is thus necessary to reduce structural and systemic barriers that continue to lead to gendered decision-making related to the ocean [22].

Market-driven development is changing the landscape and resulting in different decision-making impacts and interactions at the intersection of gender, age, and class [23]. In Kapuas Hulu, West Kalimantan, Indonesia, the Dayak community, which implements agricultural production, is choosing to maintain the traditional land-use system and adopt rubber, oil palm, and forest protection (REDD+) as part of its livelihood strategy. Although REDD+ is considered to be an alternative to oil palm as a sustainable development option, it is far from being fully implemented. At the same time, oil palms have become a big industry, with large plantations providing employment opportunities and generating new sources of prestige, but this has created competition around the traditional land-use system. The Gender Asset Agriculture Project (GAAP) was adopted as a framework and an interdisciplinary approach was applied to highlight the power relationship between the genders in

land, labor, and social capital in this transition process. The results show that market intervention measures have led to significant changes for men and women, young and old people, and farmers and wage earners, and created new opportunities and risks for others. Those who have the ability to acquire knowledge, from inheritance rights to market information and employment opportunities, are best able to take advantage of these opportunities. The potential and limitations of gender equality in sustainable development have been discussed in the literature with the aim of achieving household food security [24]. The potential lies in paying attention to women's access to land and natural resources, which can significantly improve their ability to produce and procure food. The limitation lies in the lack of attention to production constraints faced by women farmers, forests and fisheries are not regarded as major food sources, and it is not clear what natural resources women need to acquire and why. In addition, other goals of food security in terms of supplying nutrition, such as sustainable development of forests and fish resources, do not mention gender equality. The gender silence may not only be harmful to food security, but also could further realize established goals of resource protection [23,24].

Many studies have analyzed the role of electricity as a catalyst for economic development, but there are significant knowledge gaps as to whether these systems can be designed in a gender-sensitive manner to promote equal opportunities for socially inclusive entrepreneurs at the local level [25]. There are three major contributions in the literature. First, in order to show the relationship between gender and electricity entrepreneurship, we present a literature overview to define the agendas of gender with regard to energy and entrepreneurship and how they intersect and understand the influence of gender. Second, we integrated the key factors that hinder and promote empowerment related to electricity and entrepreneurship and found weaknesses in the literature. Third, we provide an outline of the concept and formulate a framework that shows how to design power systems, so that both men and women can gain favorable and economic power. In addition, we also show how local value chains can benefit from such power inclusion. Finally, through our framework, we propose strategic actions and identify the points of intervention for power system decision-making, planning, design, and operation [25].

To reveal the role of women's empowerment and gender equality in sustainable development in Ethiopia, [26] used qualitative methods and secondary data as data collection tools. The results of data analysis show that the role of women in different aspects of sustainable development has been less reflected in the country. The women's labor force has been rarely used in Ethiopia's economic development, as the country's politics has been controlled by men. Women's status in society has been downgraded to making little contribution to social development. In addition, women's rights have not been properly protected to enable their participation in various issues, and they have suffered extreme violations. In addition, women have been seriously affected by environmental problems, and less emphasis has been placed on their participation in environmental protection. The researchers concluded that unless women are empowered and gender equality is achieved so that women can participate in the economic, social, political, and environmental sectors along with men, the country cannot achieve sustainable development. The fact that women make up half the country's population should enable them to be active participants in all development initiatives in the country. This is a convincing situation. Therefore, this paper suggests that the government make a firm commitment to empower women in decision-making and use all of the country's potential to achieve sustainable development [26].

Based on the view that diversified boards will adopt a more balanced view and pay more attention to social responsibility and stakeholder concerns, previous studies have examined the impact of gender diversity of boards as measured by the quality of sustainable development reports [27]. After controlling for corporate governance and corporate reporting incentives, reporting behaviors, and reporting environments, we found that a gender-diversified board of directors is associated with a higher quality of sustainable development reports, and independent female directors have a greater influence on the quality of reports than male directors. The results have an impact on decision-making and provide evidence for more compliance or interpretation than quota-based approaches [27].

A social, ecological, and economic understanding of food security can vary according to the gender of the assessment experts [28]. Understanding these differences is key to formulating upgrading strategies (UPS) that can help stabilize and enhance food security. This is closely related to the study of food value chains (FVCs) in sub-Saharan Africa, where self-sufficient farmers are extremely vulnerable to food insecurity. The potential social, ecological, and economic impacts of UPS in the target area should be carefully assessed before implementation. This paper reports on gender-based conceptual differences and evaluates these differences through an impact assessment of food security and social, ecological, and economic aspects of the Tanzanian FVC conducted by agricultural scientists. This work is included in a larger multidisciplinary study project. It was found that impact assessment varies to some extent according to the gender of the experts and depends on the criteria used in the assessment. Women scientists are more cautious in the decision-making process and more stringent in restricting UPS and the most familiar criteria. In addition, female respondents believed that UPS has less impact on the economic and social sustainability of food safety than their male colleagues. Therefore, a distinction should be made between female and male agricultural experts in strategic selection and implementation. This may help reduce gender-specific challenges faced by African farmers [28].

Unlike previous studies and methodological applications [29–31], this research integrates grey multiattribute decision-making and TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) to analyze an optimal scheme and provide a proposal for optimization under different policies of the expected average value of gender equality policy factors (adopting unconditional entry law) of 30 gender-friendly enterprises in Taiwan, based on the upper limit effect measurement, lower limit effect measurement, and specific center effect measurement.

2. Discussions on Gender Differences and Occupational Characteristics

Wang [29] suggested that the phenomenon of gendered technology exists at all times in all countries. In response to the policy of gender mainstreaming, the conscious problem of this paper arises from questioning and criticizing the factors that have caused gender bias in the fields of science and technology. In view of women's position in these fields, this paper conducts an in-depth exploration of the phenomenon of gendered technology from the macro social context to the micro personal context, and reflects on the possibility of consolidation and flow of the boundaries of gender in science and technology as seen from the sociology of science and technology and feminist perspectives. First, this paper analyzes the historical causes of gendered technology and its influences on women's learning of science and technology. We offer seven theories of gendered technology: capability, selection, society, education, temperament, culture, and knowledge content theories, and propose three ways to deconstruct gendered technology: allow more women to enter science and technology, make good use of women's characteristics, and develop a female or alternative science and technology.

Chang [32] persuaded individuals to adopt information technology (IT) to introduce new information systems and organizational changes. Innovation is an important issue, and it is also important to explore the understanding of IT benefits in the process of its adoption and use. The framework of this study is mainly based on the technology acceptance model (TAM), which includes two endogenous variables (subjective norm and internal training), one exogenous variable (supervisor support), and one disturbance variable (gender), and then proposes an extended theoretical framework to examine the individual differences in the beliefs of both genders before and after IT adoption (continued use). This study adopted a $3 \times 3 \times 3$ Latin square sample design to stratify and randomly extract 2857 valid samples from the large, medium, and small manufacturing industries, service industry, and schools, and used LISREL software to conduct structural analyses regarding the decision-making behaviors of men and women before and after IT adoption. Randomization was used to avoid interference in the study results by personal income, occupation, educational background, and other variables, and to control these disturbance variables. Analysis of structural equation modeling (SEM) found the following: (1) Regardless of the early or late stage of IT adoption, the subjective norm of integrating the technology acceptance model (TAM) and the theory of reasoned action (TRA) is the

best way to explain the adoption/use behavior of computer technology. (2) In the early stage of IT adoption, men are more likely than women to be influenced in their intention to use IT by ease of use, scientific and technological practicability, and subjective norms of IT (social expectations by working partners and trading partners). (3) To effectively introduce IT, organizations should make users feel that the technology is human-friendly (easy to use) in the early stage of adoption, while in the later stages, it is necessary to strengthen internal training within the organization. (4) Whether before or after IT adoption, technological factors (ease of use and practicability) and organizational factors (subjective norms of peers and supervisors, internal training, supervisor support) are the main factors that directly/indirectly affect people's intention to adopt IT.

Hu et al. [33] held that the gender digital gap is an important issue in terms of improving public information literacy in various countries. Based on the rapid growth of the ICT (Information and Communication Technology, ICT) utilization rate of women, this study analyzed the impact of information and ICT capabilities of businesswomen in Hakka regarding their business operations through a questionnaire survey and interview. The investigation used purposive random sampling to investigate 49 women managers in the Miaoli District, and conducted in-depth interviews with six of them. The literature used for analysis was based on the information overload theory, knowledge gap theory, science and technology dissemination theory, adaptive structure theory, scientific and technological power theory, etc. The results show that: (1) most female managers were 35–45 years old, with a high school degree or above, most of them had children, and their families supported their business; (2) in terms of ICT capability and application, female managers believed that the most important computer application for ICT was Internet blogs; (3) ICT knowledge and skills were learned and acquired mostly through self-learning from work experience; (4) it was difficult to learn ICT because their work was too busy and there was not enough time to study; (5) in terms of ICT capability, ANOVA showed that respondents with a high school education had better ICT capability than those with a university education. Other variables, such as age, family support, and company background, were not significant. A qualitative interview analysis of female managers found that they all affirmed that ICT capability had positive benefits for business operation. There was a common phenomenon of a digital gap in business operation; they realized that they had insufficient information capability and expressed a willingness to actively participate in training courses and improve their ICT capability to expand the business level and scope. They hoped that the resources provided by the government would include basic ICT training courses and that ICT experts could visit their businesses to offer guidance.

Women entrepreneurs have increased the economic well-being of various countries, as reported in [34]. That study examined whether the stages of economic development (SED) have a similar impact on women entrepreneurs in a national context. The findings highlighted the necessity of global public policies by incorporating theory and practice. By understanding the barriers faced by women entrepreneurs and what solutions are most effective in the development stage of countries, these results will help in further formulating policies to promote women-owned businesses. The empowerment of women is an indicator of social change and a priority of sustainable development goals [35]. Debates continue over what areas constitute women's empowerment and how to measure empowerment in various countries. Demographic and Health Surveys (DHSs) are the most extensive source of data on women's empowerment. Factor analysis confirmed the model of three potential domains for women's empowerment in each country, capturing human/social assets, gender attitudes related to wife abuse, and women's participation in family decision-making. Multicountry confirmatory factor analysis identified an invariant three-factor model for women's empowerment and a subset of country-specific projects. The results of the study provide a standardized and invariant criterion that can be used to monitor women's empowerment in East Africa and perhaps even other countries [34,35].

A cross-sectional design can be used in most development-correlated studies on gender career aspirations and achievements, starting at or after adolescence, as reported in [36]. That study used longitudinal data collected from young Americans aged 11 to 26 years: (1) maps and tables of their

gender career development, i.e., typical gendered career aspirations in childhood and mid-adolescence and achievements in adulthood; and (2) gender attributes in childhood as predictors of gendered career development. The results show that gendered career development differs between men and women. There is less gender typicality in women's desires in childhood and adolescence compared with their careers in adulthood, while men maintain gender typicality from childhood to adulthood. In addition, childhood attributes predict wishes, achievements, and development paths.

Community-based ecotourism is increasingly recognized as a form of sustainable development aimed at promoting local livelihoods, environmental protection, and culture [37]. However, like all development projects, participation and benefits are complicated by environmental factors and social structures (including gender). Women's participation in community-based ecotourism projects in northern Vietnam were surveyed with a gender analysis tool that is commonly used in gender and development studies. The application of Longwe's empowerment framework showed a fairer division of labor, increased income, self-confidence, and community participation, as well as new leadership roles for women. However, inequalities in social strata, child care, and violence against women were still prominent. Finally, suggestions were made to conduct research on and put into practice community-based ecotourism from a gender perspective [37].

Although there is existing work on the relationship between gender and mining in environmental and resource research, the study in [38] deviates from the general feminist analysis of environment and gender. In terms of ecofeminism, most of the debates that draw lessons from ecofeminism have not gone beyond the paternalistic view that mining is anti-female and therefore anti-ecofeminist. That study filled gaps in the literature by investigating specific gender roles from the perspective of ecofeminism, specifically women in the mining movement (WIM). WIM represents the demand for liberal feminism so that women can enjoy equal opportunities in the male-dominated mining industry. However, in the current iteration, WIM does not have a place in the discourse of ecofeminism. WIM is mainly composed of white people, and the key stakeholders of the middle class do not regard themselves as ecofeminists. Therefore, the complex intersection of race, poverty, gender, age, class, and ideology is often neglected. That paper outlined how the epistemological perspective of ecofeminism can provide a new understanding and radicalism for the mining industry more broadly. It introduced the conceptual dialogue of how ecofeminism challenges and reshapes WIM's hegemonic practices and viewpoints in the current iteration, and vice versa, and how WIM informs and enriches our understanding and application of ecofeminism.

Previous studies have theoretically explored the origins and possible psychotherapeutic applications of some neo-pagan, neo-shaman, or mental and spiritual feminist movements currently spreading in Western countries [39]. Although they have great diversity, they are all included in the term "ecofeminist spirit." Their ideological, historical, and cultural origins were analyzed with a special emphasis on psychotherapeutic effects. Women's traditional issues around environmental health, habitat, and livelihood were marginalized in the debate regarding climate change as a scientific issue, and these issues need technical and scientific solutions without dramatically changing ideology and ruling, exploitation, and colonial economy [40].

Feminist analysis can solve these problems and other structural inequalities in the climate crisis and reveal the gender characteristics of excessive consumption in the First World. In addition, feminist animal researchers and anthropologists both regard species consciousness as an untested dimension in climate change. The strange, post-human, ecological, and feminist approaches that are brought together through the interdisciplinary approach of ecofeminism need to address the anti-feminist clues accompanying the scientific response to climate change. Since the 1980s, women's discourse, which is essentially closer to nature, has been severely hit by environmental degradation, and their special understanding of natural resources has influenced global development policies and intervention programs [41]. Although criticism has been made over and over again of the potential risks of passing the burden of environmental protection onto women while freeing men from responsibility, this argument still dominates the current climate change debate. Women are again selected as climate

victims and “powerful agents of change”, because they are considered to be leading the early warning system and determined to save water supplies for communities affected by climate change. This paper explores why and how to keep the connection between women and the environment attractive and influential.

3. Research Method

3.1. Grey Multiattribute Decision-Making for Gender and Sustainable Environmental Development

Women are considered to seek to live in harmony with nature, while men regard the natural environment as a hunting ground to compete with each other. Therefore, women are more suitable for protecting nature than men and have the responsibility to end human domination over nature and the estrangement between humans and nature [13–15]. Based on ecofeminism, the view of women, the environment, and development also adopts an essential description of the connection between women and nature, meaning that women are regarded as a homogeneous and undifferentiated whole, while the possible influences of other factors, such as country, region, class, ethnic group, and culture, are ignored [17]. Therefore, gender and sustainable environmental development are full of uncertain or incomplete information.

In grey multiattribute decision-making, attributes are called events. Set A represents the event set (or attribute set). a_i is an element in the event set, as well as an attribute, $a_i, i = 1, 2, \dots, n$. Alternative schemes are called countermeasures. Set B represents the countermeasure set. b_j is an element in the countermeasure set, as well as a scheme, $b_j, j = 1, 2, \dots, m$. The result of each scheme b_j under attribute a_i is called a situation, which is marked as s_{ij} in the grey multiattribute decision-making analysis. According to the evaluation results of each scheme under each attribute, a result matrix $S = [s_{ij}]$ can be established. The following explanation applies grey correlation analysis. In multiattribute decision-making, each attribute must be considered without distinguishing which one is the target of analysis and which one is the relevant factor. Therefore, a virtual standard column must be established to calculate the grey correlation coefficient $\gamma_{0i}(k)$, and the virtual standard column is composed of the s_{ij} s with the best evaluation results under each attribute. The definition of “best” depends on whether the goal of the attribute is the larger the better, the smaller the better, or nominal is best, where r_{ij} represents the correlation between each element in the sequence $\{s_{i1}, s_{i2}, \dots, s_{in}\}$ corresponding to each attribute a_i and the virtual standard column. The calculation method of the effect measure is to divide it into the upper limit effect measurement (more friendly facilities in the living environment are better), lower limit effect measurement (less workplace discrimination is better), or specific center effect measurement (equal proportion of supervisors of both sexes), according to the goal of the attribute. The order of attribute factors is (R_i) [42–45].

The upper limit effect measurement is applicable to the target being the larger the better (that is, as large as possible), such as benefits, outputs, etc. Therefore, taking u_i^{\max} , the maximum results of all schemes under attribute a_i as the corresponding element in the virtual standard column, the definition of the upper limit effect measurement is shown in Equation (1):

$$r_{ij} = \frac{s_{ij}}{u_i^{\max}}, \text{ where } u_i^{\max} = \max_j s_{ij} \quad (1)$$

The lower limit effect measurement is applicable to the target being the smaller the better (that is, as small as possible), such as inputs of resources, variations, etc. Therefore, taking u_i^{\min} , the minimum results of all schemes under attribute a_i as the corresponding element in the virtual standard column, the definition of the lower limit effect measurement is shown in Equation (2):

$$r_{ij} = \frac{u_i^{\min}}{s_{ij}}, \text{ where } u_i^{\min} = \min_j s_{ij} \quad (2)$$

The specific center effect measurement is applicable to a specified target, such as weather, temperature, etc. Therefore, taking target u_i^{max} under attribute a_i as the corresponding element in the virtual standard column, the definition of specific center effect measurement is shown in Equation (3):

$$r_{ij} = \frac{Min\{s_{ij}, u_i^*\}}{Max\{s_{ij}, u_i^*\}} \tag{3}$$

From the above definitions, it can be seen that the value of the effect measurement r_{ij} is between 0 and 1, and the larger its value, the better the effect of scheme b_j under attribute a_i .

3.2. Multiattribute Decision Matrix and Decision Criteria

Decision matrix D is established by the effect measurement r_{ij} . If there are n evaluation attributes (i.e., $a_i, i = 1, 2, \dots, n$) and m selected schemes (i.e., $b_j, j = 1, 2, \dots, m$), the representation of the decision matrix $D(n \times m)$ is shown in Equation (4):

$$D = \begin{matrix} & & b_1 & b_2 & \cdots & b_n \\ \begin{matrix} a_1 \\ a_2 \\ \vdots \\ a_n \end{matrix} & \left[\begin{matrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & & & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{matrix} \right] \end{matrix} \tag{4}$$

After the decision matrix is formed, the best scheme can be selected according to the decision criteria. The decision criterion of grey multiattribute decision-making is to select the greatest effect measurement among attributes a_i^* , which means that b_j is the best decision scheme under attribute a_i^* . Since the intent is to find the greatest element in each line, it is also called the line decision, as shown in Equation (5):

$$r_{j^*} = Max_j r_{ij} = Max\{r_{i1}, r_{i2}, \dots, r_{im}\} \tag{5}$$

To consider the comprehensive results of scheme b_j in all attributes, we can include the relative weight, w_i , of the attribute, as shown in Equation (6), and use linear weighted sum as the comprehensive score. The calculation of the comprehensive result r_j is shown in Equation (11):

$$w_i = \frac{n + 1 + R_i}{\frac{n(n+1)}{2}} \tag{6}$$

where n is the number of attributes. $R_i \in$ means the order of attribute factors under different requirements.

4. TOPSIS

While the opinions of professional managers (gender equality education experts) are not considered in grey multiattribute decision-making, TOPSIS assumes that professional managers give weights subjectively, and the definition of the best scheme is the one in which all attributes are composed of the best values. This study uses TOPSIS and professional managers to identify the possible factors that affect malicious entity factors. The measurement method of TOPSIS is to take the most ideal solution and the least ideal solution as benchmarks for reference. The ideal solution is to reach the maximum value for the attribute of the larger the better and the minimum value for the attribute of the smaller the better. To facilitate calculation, the smaller-the-better attribute is first adjusted to the larger-the-better

attribute, that is, the ideal solution is scheme A^* , composed of the maximum values of all attributes, as shown in Equation (7), where g_{ij} is the standardized score multiplied by the weight [43]:

$$A^* = \{ \max g_{ij} | i = 1, 2, \dots, m \} = \{ g_i^* | i = 1, 2, \dots, m \} \quad (7)$$

The distance from scheme j to the most ideal solution is the degree of separation S_j^* , and the distance from scheme j to the least ideal solution is the degree of separation S_j^- , which are respectively defined as Equations (8) and (9):

$$S_j^* = \sqrt{\sum_{i=1}^n (g_{ij} - g_i^*)^2}, j = 1, 2, \dots, n \quad (8)$$

$$S_j^- = \sqrt{\sum_{i=1}^n (g_{ij} - g_i^-)^2}, j = 1, 2, \dots, n \quad (9)$$

TOPSIS integrates the two distance measurements to the ideal solution and the least ideal solution by calculating the relative proximity index and integrates the two separation degrees proportionally to measure the advantages and disadvantages of the schemes. In other words, the closer a scheme is to the ideal solution and the farther it is from the least ideal solution, the better the scheme is. This study defines RC_j^* from the perspective that closer to the ideal solution is better, as shown in Equation (10):

$$RC_j^* = \frac{S_j^-}{S_j^* + S_j^-}, j = 1, 2, \dots, n \quad (10)$$

where the value of RC_j^* is between 0 and 1. The closer it is to 1, the farther it is from the least ideal solution and better. The closer it is to 0, the farther it is from the most ideal solution and worse.

$$r_j = \sum_{i=1}^n w_i RC_j^* r_{ij}, \sum_{i=1}^n w_i \% = 100\% \quad (11)$$

Finally, scheme b_j under the added comprehensive result r_j is the best scheme, as shown in Equation (11).

5. Discussion

Under different policies, the expected average values of gender equality policy factors (adopting unconditional entry law) of 30 gender-friendly enterprises in Taiwan are shown in Table 1.

On 8 March 2011, Executive Yuan issued the Gender Equality Policy Guidelines with gender equality and sustainable development as the goals, and proposed 10 major concepts [2,5,46]:

- (P1) Gender equality is the core value of ensuring social equity and justice.
- (P2) Promoting women's rights and interests is the primary task of promoting gender equality.
- (P3) Gender mainstreaming is an effective way to realize people-oriented administration.
- (P4) Participatory democracy is a practical strategy to promote the co-governance and co-determination of both sexes.
- (P5) The mixed economic system is the best protection for women's economic security.
- (P6) Gender-based population policy is the foundation for sound social development.
- (P7) Gender-conscious educational, media, and cultural policy is a solid foundation for the establishment of a gender-equal society.
- (P8) Eliminating gender discrimination and gender violence is the key to safeguarding personal safety.
- (P9) Gender friendliness and a balanced view of body and mind are essential elements to improve the effectiveness of health policies.

(P10) Integrating women's care into environmental protection and technology is a commitment to a sustainable society.

It is hoped that the formulation of this policy program will continue to open up the gender perspective of all sectors of society and promote Taiwan to become a more inclusive, rich, and sustainable society for all citizens [2,5,46].

Table 1. Best schemes for gender equality policy in grey multiattribute decision-making.

Impact Factor	Effect Measurement (RC _j)	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Flexible working hours (hours/month)	Upper limit (0.9)	10	15	6	12	26	15	10	16	12	16
Multiple vacations (days/month)	Upper limit (0.85)	2	1	3	2	4	2	2	3	2	3
Continuing education subsidies (days/month)	Upper limit (0.7)	1	2	1	2	4	2	2	2	2	6
Friendly measures of maternal protection for pregnant employees (number)	Upper limit (0.95)	2	8	5	4	6	7	4	4	3	3
Childcare facilities (number)	Upper limit (0.85)	3	8	4	5	7	8	5	5	1	2
Childcare schemes (number)	Upper limit (0.8)	2	1	1	2	3	2	2	2	1	3
Care and consultation services for employees (hours/month)	Upper limit (0.7)	1	2	3	6	6	2	10	6	8	5
Ratio of male to female employees (%)	Specific center (0.75)	60	55	55	50	50	45	35	70	65	60
Proportion of men and women above managerial level (%)	Specific center (0.7)	75	70	50	50	50	55	75	70	60	70
Cases of gender discrimination (number/year)	Lower limit (0.65)	1	5	2	4	3	4	5	1	2	2

Through the above 10 concepts and 7 connotations: (1) power, decision-making, and influence (P1, P2, P3); (2) employment, economy, and welfare (P5); (3) population, marriage, and family (P6); (4) education, culture, and media (P7); (5) personal safety and justice (P4, P8); (6) health, medical treatment, and care (P9); and (7) environment, energy, and science and technology, it can be implemented and detailed targets can be proposed (P10). Thus, it can be seen that it is indeed urgent for our administrative bodies to cooperate with international trends, open up the gender perspective, promote Taiwan to become a more diverse, inclusive, and abundant sustainable society, and create women's rights and gender equality. Therefore, to start from the most basic gender awareness is the fundamental solution of gender inequality [2,5,46].

The results of the study are shown in Table 2. The mixed economic system is the best protection for women's economic security (P5). For new approaches to actively creating friendly workplaces, besides the discussion of improving job inequality, it is advisable to focus on the human resources management of enterprises and encourage enterprises to take care of employees in the context of balance among work, family, and health, so as to reduce their worries and further improve their productivity and unification. Enterprises can refer to the following practices to strengthen such promotion [28–30]:

1. Design flexible working hours and flexible working environments.

Enterprises can provide employees with more preferential schedules than what is required by law, such as allowing flexible and centralized working hours, or allowing employees to flexibly arrange their work, such as working at home or adopting a job-sharing system, so that employees can arrange their hours and work independently in order to reduce anxiety and stress caused by family care.

2. Promote multiple vacation schemes.

Enterprises can provide multiple holidays more preferential than what is required by law, which is conducive to employees' planning of family care, arrangement of leisure and entertainment, and engagement in social activities. This can include emergency leaves to accompany elderly family members, children, or others to medical treatment, longer family care leaves or volunteer leaves, encouragement for caring for the community and vulnerable groups, so that employees can enjoy multiple holidays and leaves to balance family care and realize their goals.

3. Assist with the career development of employees.

Enterprises can encourage employees to carry out continuous, lifelong learning. In addition to providing courses and channels for further studies, enterprises can also provide education subsidies, education leaves, unpaid leaves, and other ways for employees to further their education for career development and accumulation of professional knowledge and skills, so as to stimulate their enthusiasm for work and realize their potential.

4. Provide family care and support services.

Enterprises can provide friendly maternity protection measures for pregnant employees, childcare facilities, care service information and consultation, and even game rooms for children, after-school pickups, and unpaid leaves for nursing and assistance for reinstatement. They can also provide rest rooms or temporary care spaces for elderly family members, young children, or others who need care so that employees can attend to work and family at the same time.

5. Promote the physical and mental health of and ensure workplace safety for female employees.

Enterprises can provide services such as marriage, family, law, stress and emotion management, work adjustment, and other consulting services to address the physical and mental development of female employees, and reduce the heavy burden of care and housework, which is beneficial in improving their work efficiency and stabilizing their work. That is, enterprises can promote workplace health improvement, healthy life guidance, healthy diet, and relief of workplace pressure, and other channels for both men and women.

Table 2. Implementation results of selection of optimum scheme for gender equality policy in grey multiattribute decision-making.

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
$r_j(P1) =$ 3.79	$r_j(P2) =$ 4.48	$r_j(P3) =$ 4.16	$r_j(P4) =$ 4.65	$r_j(P5) =$ 6.56	$r_j(P6) =$ 5.01	$r_j(P7) =$ 4.37	$r_j(P8) =$ 5.07	$r_j(P9) =$ 3.85	$r_j(P10) =$ 5.06
0.38	0.58	0.23	0.46	1.00	0.58	0.38	0.62	0.46	0.62
0.50	0.25	0.75	0.50	1.00	0.50	0.50	0.75	0.50	0.75
0.17	0.33	0.17	0.33	0.67	0.33	0.33	0.33	0.33	1.00
0.25	1.00	0.63	0.50	0.75	0.88	0.50	0.50	0.38	0.38
0.38	1.00	0.50	0.63	0.88	1.00	0.63	0.63	0.13	0.25
0.67	0.33	0.33	0.67	1.00	0.67	0.67	0.67	0.33	1.00
0.10	0.20	0.30	0.60	0.60	0.20	1.00	0.60	0.80	0.50
0.83	0.91	0.91	1.00	1.00	0.90	0.70	0.71	0.77	0.83
0.67	0.71	1.00	1.00	1.00	0.91	0.67	0.71	0.83	0.71
1.00	0.20	0.50	0.25	0.33	0.25	0.20	1.00	0.50	0.50

6. Conclusions and Future Research Directions

This study presents the positive interactive effects of gender, work, family, and health and achieves an optimal application of gender, sustainable development, and decision-making. Future research directions may be geared toward gender and sustainable environmental decision-making analysis, which often contains factors of uncertain or incomplete information. Therefore, grey multiattribute decision-making is the best technique to study this topic. In the future, studies on similar topics can be conducted for different groups in different occupations (e.g., soldiers in the military).

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