

2024 NASA Space Apps Challenge

NASIAN



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Project Title

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CHAPTER 1. Introduction:

The **United Nations Sustainable Development Goals (SDGs)**, established in 2015, aim to promote human development while protecting the environment. Among these, **Goal 5: Gender Equality** and **Goal 13: Climate Action** highlight two critical global issues that, while often considered separately, are deeply interconnected.

1.1. GOAL 5: GENDER EQUALITY

Empowering women and girls to take control of their bodies and lives is crucial for solving our biggest social and environmental crises. [Gender inequality](#) is one of the main drivers of high fertility rates. Not a single country has yet achieved full equality, and the worst gender-based injustices and crimes continue to be common and widespread. According to the UN, ending gender-based violence, harmful practices (including child marriage and FGM), preventable maternal deaths, and unmet family planning needs is affordable and within reach, but still suffers from a [severe funding shortage](#). In the meantime, the [number of women and girls subjected to harmful practices](#) is increasing due to slow progress and population growth.

“The proportion of women and girls subjected to FGM is decreasing overall, but the number of women and girls subjected to it is growing because of population growth. That number could grow from 4.1 million in 2020 to 4.6 million a year by 2030, since the cohort of girls in many high-prevalence countries is growing.”

1.2. GOAL 13: CLIMATE ACTION

Unsustainable consumption patterns in high-income countries are largely responsible for the climate crisis but every additional person on our planet adds more emissions. A comprehensive review of available climate solutions by Project Drawdown found that [slowing population growth](#) through the combination of educating girls and providing family planning would be one of the most powerful ways to reduce atmospheric CO₂ by 2050. The 2019 *Scientists’ Warning of a Climate Emergency*, endorsed by more than 11,000 scientists, called for ending and ultimately reversing human population growth, among other transformative actions, to avert the worst effects of climate change.

Climate change disproportionately impacts marginalized groups, particularly women and gender minorities, who often face greater challenges during environmental crises such as droughts, floods, and natural disasters. These challenges are exacerbated by existing inequalities in access to resources, economic opportunities, and political power. Understanding the link between gender inequality and climate change is essential for developing solutions that promote both equality and sustainability.



Figure 1: Gender inequality and Climate change

1.3. Gender Equality and Climate Action: An Interconnected Challenge

While at first glance, **gender equality** and **climate action** may seem like separate concerns, they are deeply linked. Climate change exacerbates existing inequalities, particularly for women, children, and marginalized gender groups, making these vulnerable populations more susceptible to the adverse effects of environmental degradation. According to the **UNDP**, 80% of people displaced by climate change are women and children.

1.4. Key ways in which climate change and gender inequality intersect

1. **Displacement and Vulnerability:** Climate disasters such as floods, droughts, and extreme weather disproportionately affect women and children, who often have fewer resources and lower mobility to recover from crises.
2. **Economic Impact:** Women, particularly in developing countries, are highly reliant on agriculture, which is vulnerable to climate change. Droughts, floods, and other climate events disrupt their livelihoods, deepening the cycle of poverty.

3. **Health and Safety:** Gender minorities face greater risks of gender-based violence (GBV) in the wake of climate disasters, as seen in refugee camps and displaced communities. Moreover, women often suffer disproportionately from health impacts related to food insecurity and water scarcity.

1.5. Objective of the 2024 NASA Space Apps Challenge

The **2024 NASA Space Apps Challenge** is an international hackathon designed to foster innovative solutions to pressing global issues using open-source NASA data. This year's challenge focuses on **modeling the relationship between climate change and gender inequality**. The goal is to understand how climate action and gender equality can be addressed together to promote sustainable development for all.

Participants are tasked with:

- **Modeling the Intersection:** Using open-source data, teams must analyze how climate change disproportionately affects gender minorities and propose solutions that promote equality and sustainability.
- **Designing Solutions:** Teams are encouraged to design innovative tools such as data visualization dashboards, interactive websites, or localized community solutions. Solutions should address both the gender-specific impacts of climate change and how gender-inclusive policies can strengthen climate resilience.

1.6. UN Development Programme

In conclusion, recognizing the intersection of gender inequality and climate change is essential to building effective strategies for sustainable development. Through data-driven approaches, we can model these relationships and implement solutions that empower all communities while safeguarding the planet.

CHAPTER 2. Problem Statement & Challenges

The **United Nations Sustainable Development Goals (SDGs)** provide a blueprint for achieving global peace, prosperity, and environmental protection. However, two seemingly unrelated goals—**Goal 5: Gender Equality** and **Goal 13: Climate Action**—are deeply interconnected. Climate change exacerbates gender inequality by disproportionately impacting marginalized groups, including men, women, and children, particularly in the aftermath of climate-driven disasters. Addressing this relationship is crucial for achieving sustainable development.

Challenges:

2.1. Increased Vulnerability of Marginalized Groups

Climate change creates **disasters** like floods, droughts, and hurricanes that lead to widespread displacement, destruction of livelihoods, and a heightened risk of poverty. Women, especially in rural and developing regions, face greater vulnerability during these crises. For example, after natural disasters, women often lose access to income, healthcare, and education.

A study by **UN Women** shows that **80% of those displaced by climate change are women and children**. This is particularly true in **low-income countries**, where women's access to resources such as land, technology, and finances is already limited.



Figure 2: low-income countries women

2.2. Gendered Division of Labor

In many regions, women are primarily responsible for household tasks, including **gathering food, water, and fuel**. Climate change, through events like **droughts** and **deforestation**, makes these resources scarce, significantly increasing women's workload. According to a report by **UNDP**, the time spent by women collecting water can increase by as much as 50% in regions affected by drought.

2.3. Gender-Based Violence (GBV)

During climate-related disasters, the risks of **gender-based violence** (GBV) increase dramatically, particularly in displaced communities. In refugee camps and disaster zones, women and girls face heightened risks of exploitation, human trafficking, and domestic violence. A report from **UNHCR** noted that **1 in 5 women refugees** have experienced sexual violence, and these rates often spike in post-disaster contexts.

2.4. Economic Disparities:

The economic impact of climate change often exacerbates existing gender inequalities. Women are more likely to work in sectors vulnerable to climate shocks, such as **agriculture** and **informal labor**. For example, in Africa, where women make up 60% of the agricultural workforce, climate change-induced droughts and floods disproportionately affect their income and food security. According to the **World Bank**, women are **14% more likely to suffer income loss due to climate change** compared to men.

2.5. Limited Access to Climate Adaptation Resources:

Women and gender minorities often face barriers in accessing the resources necessary for climate adaptation, such as **financial tools**, **technology**, and **training**. For instance, fewer women have access to credit and land ownership, which are essential for recovering from climate-induced economic losses. According to **FAO**, **less than 20% of landholders worldwide are women**, restricting their ability to invest in climate-resilient farming practices.

2.6. Data Visualization:

To effectively model the intersection between gender inequality and climate change, we will use data from global institutions like the **World Bank** and **NASA's Socioeconomic Data and Applications Center (SEDAC)**. The following graph highlights how **climate vulnerability** increases with **gender inequality**, particularly in regions like Sub-Saharan Africa and South Asia.

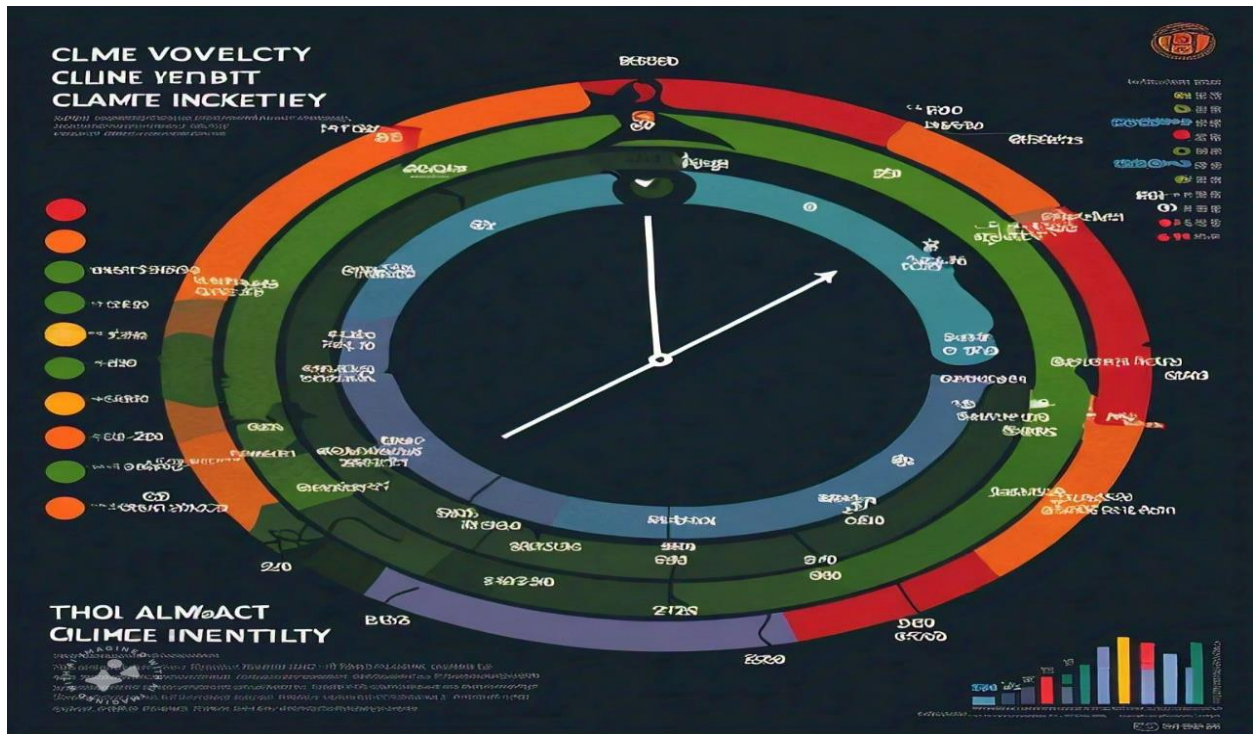


Figure 3: Graph Climate Vulnerability vs. Gender Inequality

2.7. Key Challenges to Address

- **Economic Empowerment:** Lack of access to financial resources leaves women disproportionately vulnerable to climate change's economic effects.
- **Social Disparities:** Cultural norms and responsibilities often prevent women from adapting to or recovering from climate impacts.
- **Increased GBV:** As climate-induced crises intensify, gender-based violence increases, necessitating focused interventions for safety and support.
- **Underrepresentation in Climate Decisions:** Women and gender minorities often have limited decision-making power in policies related to climate change and adaptation.

The intersection of **gender inequality** and **climate action** represents a critical challenge for sustainable development. Without addressing the specific vulnerabilities faced by women, men, and children, climate solutions will remain incomplete. Integrating gender equality into climate action strategies will ensure a more inclusive and effective path toward achieving the **UN SDGs**.

CHAPTER 3. Project Objectives

The aim of this project is to model the relationship between **climate change** and **gender inequality** and propose effective solutions that address both issues in the context of **sustainable development**. The following are the core objectives:

3.1. Model the Relationship Between Climate Change and Gender Inequality

Objective: To use open-source data to explore and map the impact of climate change on gender inequality.

1. **Data Sources:**

- **NASA's Socioeconomic Data and Applications Center (SEDAC)** provides data on climate vulnerability and social factors.
- **World Bank Gender Data Portal** offers gender-disaggregated economic and social data that we can combine with climate information.

2. **Approach:**

Using datasets on climate disasters and gender inequality, we will identify patterns such as the following:

- Economic losses faced by women in agriculture and informal sectors due to climate change.
- The rate of gender-based violence (GBV) during and after climate-induced disasters, as shown in refugee or disaster-affected areas.

Visual Representation:

A **graphical analysis** will be developed to demonstrate the connection between increasing climate disasters and growing gender inequalities. The model will showcase how both global and localized climate disasters exacerbate gender disparities.

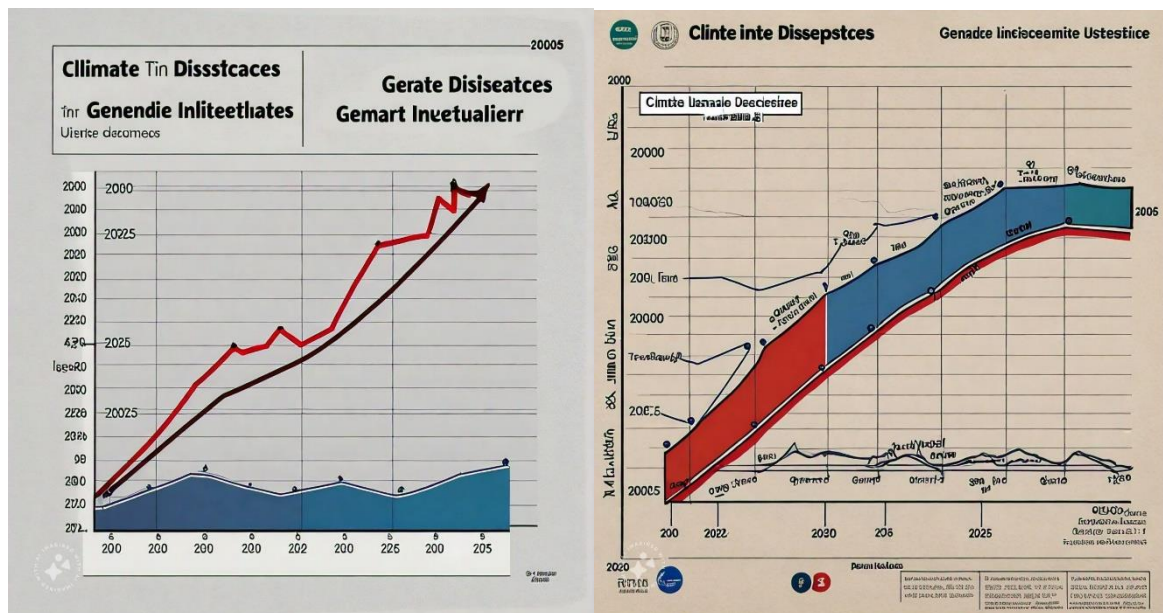


Figure 4: Climate Disasters vs. Gender Inequality Over Time

3.2. Identify and Address Vulnerable Regions

Objective: To map out regions most vulnerable to the dual crises of gender inequality and climate change, using a data-driven approach.

- Method:**
 By cross-referencing gender inequality data from the **UN Gender Inequality Index** with climate disaster data from sources like **NASA** and the **UN's World Meteorological Organization (WMO)**, we will create vulnerability maps. These maps will identify the areas where women are disproportionately affected by climate-related disasters.
- Example Case:**
 For example, in regions like **Sub-Saharan Africa**, droughts and flood disproportionately affect women, who are primarily responsible for gathering water and maintaining agricultural livelihoods. This leads to a deeper examination of the **gendered division of labor** during climate crises.

Visual Representation:

An **interactive vulnerability map** will be developed to show the most affected regions globally.



Figure 5: Vulnerable Regions to Climate Change & Gender Inequality

3.3. Propose Sustainable and Gender-Inclusive Solutions

Objective: To design actionable solutions that promote both gender equality and climate action, focusing on community-specific and scalable initiatives.

1. Solutions Include:

- **Climate-Resilient Agriculture:** Educating women farmers on drought-resistant crops and sustainable farming techniques.
- **Economic Empowerment:** Establishing climate adaptation funds specifically for women and marginalized groups, allowing them to rebuild livelihoods after disasters.
- **Policy Advocacy:** Promoting gender-inclusive climate policies that consider the needs of women and girls in disaster-prone areas.

2. Solution Models:

- These solutions will be modeled and tested in specific high-risk communities, such as the **farming societies in Sub-Saharan Africa** and coastal regions of **South Asia** where women are highly dependent on agriculture and face heightened vulnerability.

Visual Representation:

We will create **infographics** to outline proposed solutions and their potential impact on both gender equality and climate resilience.

Infographic:



Figure 6: Climate Resilience & Gender Equality Solutions

3.4. Increase Awareness and Advocacy Through Data Representation

1. Objective: To enhance the representation of gender-disaggregated data on climate impacts through digital platforms.

- **Data Gaps:** Currently, gender-specific data on climate impacts is underreported, limiting the understanding of these intersections. To address this, we propose:
 - Developing an **interactive website** or **dashboard** to highlight the gendered impacts of climate change.
 - Encouraging governments to include **gender-disaggregated data** in national disaster reports and climate change policies.
- **Example Solution:**
A **web-based platform** that visualizes gender-climate data, helping decision-makers to tailor their interventions more effectively.

Visual Representation:

A **dashboard** that highlights key metrics, such as economic losses for women due to climate disasters, will be developed to enhance visibility and support advocacy efforts.

3.5. Promote Global and Local Policy Change

Objective: To use our findings to advocate for gender-responsive climate policies at both the global and local levels.

- **Global Policy Advocacy:**
International organizations such as the **UNFCCC** and **UN Women** should incorporate gender-inclusive approaches in their climate frameworks. This includes ensuring that women have equal representation in climate decision-making bodies.
- **Local Policy Change:**
On a local level, governments should create policies that guarantee:
 - Women's equal access to climate adaptation resources.
 - Legal frameworks to prevent gender-based violence during and after climate disasters.

Visual Representation:

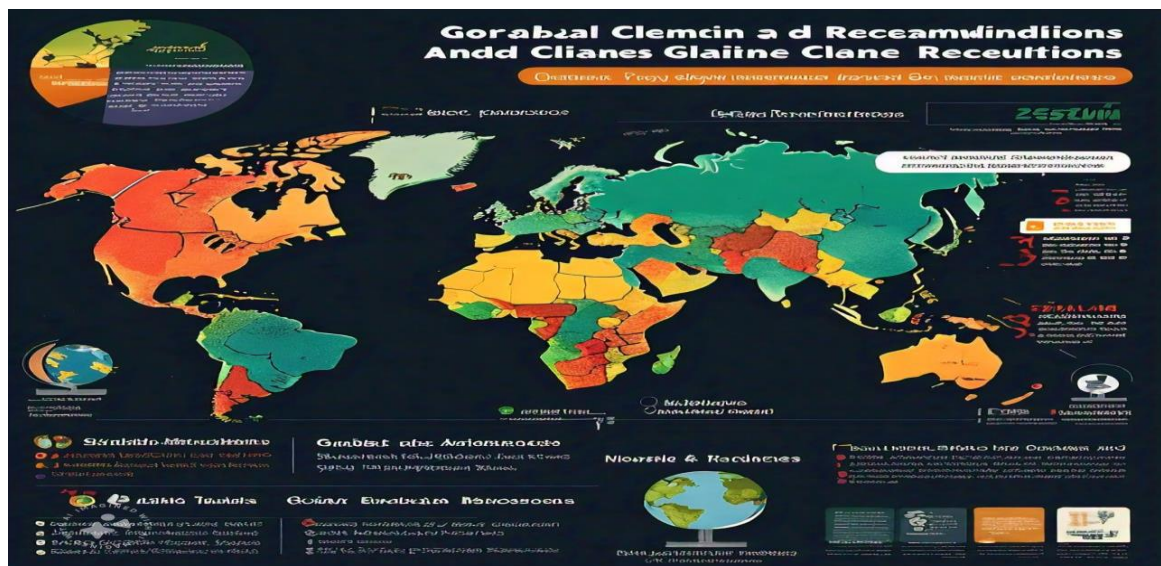


Figure 7: Global Policy Changes for Gender and Climate Equality

An **infographic** on global policy recommendations and localized actions will be provided.

CHAPTER 4. Proposed Solutions

4.1. Local, National, and International Policy Recommendations

To effectively integrate gender equality and climate action, it is crucial to develop robust policies at multiple levels:

Local Level:

- **Community-Based Climate Resilience Plans:** Local governments can design programs that empower women and marginalized groups by providing access to climate-adaptive technologies, such as drought-resistant crops and renewable energy sources like solar panels.
- **Gender-Inclusive Disaster Preparedness:** Local disaster management teams should ensure shelters, evacuation plans, and recovery efforts cater to the unique needs of women, children, and gender minorities. This includes access to reproductive healthcare, gender-based violence (GBV) services, and financial aid.

National Level:

- **Climate Action and Gender Equality Task Forces:** Countries can form specialized committees to ensure gender equality is integrated into national climate policies. This would involve setting aside funds for female-led initiatives, equitable access to disaster relief resources, and the inclusion of gender-disaggregated climate data in national reports.
- **Green Jobs for Women:** Encourage female participation in the renewable energy sector through targeted policies, including quotas for women in green jobs, tax incentives for companies that hire women in climate-related industries, and dedicated funding for women's entrepreneurial ventures in sustainability.

International Level:

- **Global Climate and Gender Partnerships:** International bodies like the UN can foster partnerships that share resources and expertise on climate-resilient practices targeting gender inequality. This includes supporting policies that provide technical support, funds, and capacity-building for women and minorities in vulnerable regions.
- **Climate Change and Gender in International Agreements:** Gender equity should be explicitly included in international climate agreements like the Paris Agreement, ensuring nations are held accountable for addressing the disproportionate impact of climate change on women and gender minorities.



Figure 9: At Local Level



Figure 8: At International Level

4.2. Educational Integration at School, College, and University Levels

Education plays a key role in raising awareness about the interconnectedness of gender inequality and climate action. Integrating these topics into curricula will foster long-term behavioral changes and innovation:

School Level:

- **Climate and Gender Equality Awareness Programs:** Schools should incorporate lessons on how climate change affects different genders differently. Environmental science curricula should highlight real-world examples, such as women in agriculture facing climate challenges.
- **Eco-Friendly Initiatives for Students:** Schools can encourage gender-sensitive eco-friendly initiatives like tree planting, waste management projects, and renewable energy campaigns, where both boys and girls work together.

College Level:

- **Climate Action and Gender Studies Courses:** Colleges can offer interdisciplinary courses that combine environmental science, sustainability, and gender studies. These programs will prepare students to tackle complex problems at the intersection of climate change and gender inequality.
- **Student-Led Climate and Gender Equality Clubs:** Colleges can foster student-led clubs that promote environmental sustainability and gender equality. These clubs can host events, workshops, and campaigns to educate peers about the urgency of these issues.

University Level:

- **Research and Innovation Hubs:** Universities should establish research centers that focus on gender and climate issues. These centers can collaborate with local governments and international organizations to develop innovative climate-resilient technologies aimed at marginalized communities.
- **Scholarships and Grants for Women in STEM:** To promote female leadership in the green economy, universities can offer scholarships and grants for women pursuing degrees in environmental science, engineering, and other climate-related fields.



Figure 12: At School Level



Figure 10: At College Level



Figure 11: At University Level

4.3. Media and Social Awareness Campaigns

Media plays a vital role in shaping public perception and awareness of gender inequality and climate change. Effective campaigns can inspire action and advocate for policy change:

Social Media Campaigns:

- **Hashtag Movements:** Social media platforms like Twitter, Instagram, and TikTok can host global hashtag movements that highlight the gendered impact of climate change. Campaigns like #SheFightsClimateChange can share stories of women leading environmental efforts, raising global awareness of these issues.
- **Influencer Partnerships:** Social influencers with large followings can be engaged to promote gender-sensitive climate action, using their platforms to educate the public on sustainable behaviors and policy advocacy.

Traditional Media:

- **Documentaries and News Features:** News outlets and film producers can create documentaries that showcase the stories of women affected by climate disasters, as well as the innovative ways they are adapting. This can inspire both grassroots movements and policy changes.

- **Public Service Announcements (PSAs):** National television and radio networks can run PSAs that emphasize the importance of addressing both climate change and gender inequality simultaneously.



4.4. Technological Solutions: Interactive Dashboards and Data Visualization Tools

To make data on gender inequality and climate change accessible and actionable, we propose creating digital tools that help visualize and analyze complex datasets:

Interactive Dashboards:

- **Gender and Climate Impact Tracker:** A web-based interactive dashboard that tracks climate disasters globally and visualizes their gendered impact. The tool can provide real-time data on how women and minorities are affected by climate events like floods, droughts, and hurricanes. Users can explore detailed reports on specific regions, gender disparities in climate resilience, and the allocation of recovery funds.

Data Visualization Tools:

- **Climate and Gender Maps:** Maps that visualize climate vulnerability hot spots in relation to gender inequality can help policymakers and aid organizations target resources more effectively. These maps can display data such as female-headed households in flood-prone areas, access to healthcare post-disaster, and gender-based violence reports.

Predictive Analytics:

- **AI-Based Predictive Tools:** Machine learning models can be employed to predict regions that will face the highest gender-specific vulnerabilities due to future climate change. These tools will help governments and NGOs preemptively allocate resources, ensuring women and marginalized groups are better protected before disasters strike.



Figure 13: AI-Based Predictive Tools

By integrating gender equality and climate action through these educational, policy-driven, media, and technological solutions, we can work toward achieving the United Nations Sustainable Development Goals in a way that promotes sustainability and equality for all.

CHAPTER 5. Conclusion

5.1. The Importance of Gender-Inclusive Climate Action for Sustainable Development

Gender-inclusive climate action is vital for achieving sustainable development because it recognizes the unique challenges faced by different genders in the context of climate change. Women, men, and children experience the impacts of climate change differently due to existing social norms, economic roles, and cultural practices. Addressing gender inequality in climate policies not only enhances the resilience of marginalized communities but also fosters more effective climate action.

Key Points:

- **Empowerment of Women:** Women play a crucial role in resource management, agriculture, and community leadership. When empowered, they can contribute significantly to climate resilience and sustainable practices.
- **Economic Benefits:** Gender-inclusive policies can lead to better economic outcomes. Studies have shown that closing gender gaps in labor force participation could boost global GDP by \$28 trillion by 2025.
- **Enhanced Decision-Making:** Including women and marginalized groups in decision-making processes leads to more comprehensive and effective solutions to climate challenges. Diverse perspectives can improve strategies for climate adaptation and disaster resilience.

5.2. Call to Action

Empowering Communities to Tackle Gender Inequality and Climate Change

To combat gender inequality and climate change effectively, a multi-faceted approach is essential. Stakeholders, including governments, NGOs, and local communities, must work collaboratively to implement solutions that address these intertwined challenges.

Action Steps:

1. **Integrate Gender Perspectives into Climate Policies:** Governments must ensure that gender considerations are embedded in national and local climate policies. This can be achieved by conducting gender assessments of climate-related projects and programs .
2. **Promote Education and Training:** Providing education and training programs for women and girls in climate-smart technologies, disaster management, and leadership roles can empower them to take active roles in climate action initiatives.
3. **Increase Funding for Gender-Sensitive Climate Initiatives:** Allocate resources for programs that specifically target the needs of women and marginalized groups, such as microfinance for women-led climate projects.

4. **Enhance Data Collection and Analysis:** Develop mechanisms to collect and analyze gender-disaggregated data on climate impacts and responses, ensuring that decision-makers have the information needed to address gender disparities effectively.
5. **Community Engagement and Advocacy:** Foster community engagement to raise awareness about the links between gender equality and climate change. Local leaders can play a crucial role in advocating for policies that support both goals.



Figure 14: Gender-Inclusive Climate Action Meeting

Achieving gender equality and effective climate action are not only moral imperatives but also practical necessities for sustainable development. By empowering communities to tackle these challenges together, we can create a more equitable, resilient, and sustainable world for all.

CHAPTER 6. References

6.1. Cited Research, Data Sources, and Additional Reading

United Nations Sustainable Development Goals (SDGs)

- Official UN platform detailing all 17 SDGs, including **Goal 5: Gender Equality** and **Goal 13: Climate Action**.
- Link: [UN Sustainable Development Goals](#)

NASA's Socioeconomic Data and Applications Center (SEDAC)

- Provides global population and climate-related data to understand the socioeconomic impacts of climate change and gender vulnerability.
- Link: SEDAC Data Hub

UN Women Gender Data Portal

- A comprehensive resource on gender-disaggregated data for analyzing gender equality and its intersection with climate change.
- Link: UN Women Gender Data

World Bank Gender Data Portal

- Offers gender-specific data across various sectors such as education, labor, and health, which can be used to model climate impacts on women and other gender minorities.
- Link: [World Bank Gender Data](#)

United Nations Framework Convention on Climate Change (UNFCCC)

- A rich repository of climate change data, reports, and initiatives that intersect with socioeconomic issues, including gender impacts.
- Link: UNFCCC Data

Climate Watch Data

- Provides open data to track climate progress and socio-economic impacts, offering visualizations and interactive tools to explore gender and climate dynamics.
- Link: [Climate Watch](#)

Global Gender Gap Report 2023

- Published by the World Economic Forum, this report presents global data on gender equality, which can be correlated with climate vulnerability data.
- Link: Global Gender Gap Report 2023

NASA Earth Data: Climate Indicators

- A source for global climate data that includes parameters like temperature, CO2 levels, and deforestation, useful for assessing climate-related gender inequalities.
- Link: [NASA Earth Data](#)

IPCC Special Report on Climate Change and Land (2019)

- This report by the Intergovernmental Panel on Climate Change provides insights into how land-use changes, driven by climate change, disproportionately affect marginalized communities, including women.
- Link: IPCC Report

World Resources Institute: Climate Impacts and Gender Inequality

- Explores how climate disasters exacerbate gender inequality and provides data on resilience strategies for vulnerable populations.
- Link: WRI Report on Gender and Climate

The Lancet: Gender Equality and Climate Change

- A journal article examining the intersection of gender inequality and health impacts related to climate change.
- Link: The Lancet Article

These references offer a solid foundation of data and research for analyzing the connection between **gender inequality** and **climate change**, which can help develop sustainable solutions for future projects.
